Anglo American Platinum Limited

Rustenburg Platinum Mines

MOGALAKWENA COMPLEX

Integrated Environmental Authorisation / Waste Management Licence Process, Consolidation & Amendment of the Environmental Management Programme (EMPr)

DMRE Reference Number: LP30/5/1/2/3/2/1 50 MR

Alta van Dyk Environmental Consultants cc

Postnet Suite #745

Private Bag X 1007

Lyttelton

0140

Tel: +27 12 940 9457

Cell: +27 82 782 4005

alta@avde.co.za

Date: July 2023

Mogalakwena Complex – 2023 Integrated Environmental Authorization Application Process

This document also supports the following processes:

- **Waste Management Licence Process**
- **Section 102 application**
- **Consolidation with the 2020 EMPr & Amendment**
- **Water Use Licence Application**

Draft Environmental Impact Assessment (EIA) Report

July 2023

DMRE Reference: LP30/5/1/2/3/2/1 50 MR

Project Reference: 002-018

Prepared by: Réata Colyn, Kirthi Peramaul, Tyla Leigh Smith, Lenaldi Görgens, Alta van Dyk

Alta van Dyk Environmental

The opinions expressed in this Report have been based on the information supplied to Alta van Dyk Environmental Consultants cc (AvDEnvironmental) by company officials. The opinions in this Report are provided in response to a specific request from company officials to do so. AvDEnvironmental has exercised all due care in reviewing the supplied information. Whilst AvDEnvironmental has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. AvDEnvironmental does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of AvDEnvironmental's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which AvDEnvironmental had no prior knowledge nor had the opportunity to evaluate.

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT ACTIVITIES

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED), THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED) AND THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998) FOR WATER USES.

VERSION CONTROL

Alta van Dyk Environmental cc

Version: Final for Public comment

Approved by: Alta van Dyk

Signed:

Position: Technical Director

Date: July 2023

NAME OF APPLICANT: Anglo American Platinum Limited (AAP) – Rustenburg Platinum Mines – Mogalakwena Complex

CONTACT PERSONS: Hazel Fiehn / Timothy Seimela / Riaan Blignaut/ Sicelo Ntuli

TEL NO: +27 (0)11 373-6683

FAX NO/email: Platinum.Environmental@angloamerican.com

POSTAL ADDRESS: Anglo American Platinum Ltd, Mogalakwena Mine, Private Bag X2463, Mokopane, 0600

PHYSICAL ADDRESS: Sandsloot Farm, N11 Groblers Bridge Road, Mokopane

CORPORATE ADDRESS: 144 Oxford Street, Rosebank, Melrose, Johannesburg, 2196

FILE REFERENCE NUMBER SAMRAD: LP30/5/1/2/3/2/1 50 MR

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "*will not result in unacceptable pollution, ecological degradation or damage to the environment*".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable, or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

PURPOSE OF THE DOCUMENT / OBJECTIVES OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The environmental impact assessment (EIA) process is an interdisciplinary and multistep procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment. Simply defined, the EIA process helps identify the possible environmental effects of a proposed activity and how those impacts can be mitigated.

The purpose of the EIA process is to inform decision-makers and the public of the environmental consequences of implementing a proposed project. The EIA document itself is a technical tool that identifies, predicts, and analyses impacts on the physical environment, as well as social, cultural, and health impacts. If the EIA process is successful, it identifies alternatives and mitigation measures to reduce the environmental impact of a proposed project. The EIA process also serves an important procedural role in the overall decision-making process by promoting transparency and public involvement.

It is important to note that the EIA process does not guarantee that a project will be modified or rejected if the process reveals that there will be serious environmental impacts. In some countries, a decision-maker may, in fact, choose the most environmentally harmful alternative, as long as the consequences are disclosed in the EIA. In other words, the EIA process ensures an informed decision, but not necessarily an environmentally beneficial decision.

The objective of the environmental impact assessment process is to, through a consultative process—

- determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;
- identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- determine the:
    - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    - degree to which these impacts:
        - can be reversed;
        - may cause irreplaceable loss of resources, and
        - can be avoided, managed or mitigated;
- identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

This Draft Environmental Impact Assessment (EIA) Report will be made available for comments for the period of **30 days from the 17 July to 16 August 2023**. Copies of the Draft EIA Report will be available at the following public places:

Public Place	Locality	Physical Address	Contact Details
Mapela Traditional Council (TC) Office	Magope	MTC Offices Mapela 2	Madimetja Tjale madimetjale729@gmail.com
Mokopane Traditional Council (TC) Offices	Moshate	Moshate, Mokopane	Ms Emily Nkogatse Email: emilynkogatse1@gmail.com
Mogalakwena Mine Social Performance Office	South Concentrator	Mogalakwena Mine, South Concentrator	Mmakgobane Manyathela mmakgobane.manyathela@angloamerican.com
Mogalakwena Library	Mokopane	55 Van Riebeeck Street	Ms Refilwe Madisha
Alta van Dyk Environmental Consultants cc	Olifantsfontein	Unit 2212 9 Mountain Sherman Crescent Midlands Estate	Tel: +27 12 940 9457 Fax: +27 86 634 3967
Kgoro Offices – Mapela TC and Mokopane TC (**Summary Documents**)	Kgoro Offices – Mapela TC and Mokopane TC	Kgoro Offices	N/A
Website	https://www.altavandykenvironmental.co.za		

The following methods of public comment of the Draft EIA Report are available:

- Comments raised during the various public consultation meetings held.
- Completion of the comments sheet and dropping the sheet in the Comment Boxes at the offices of the Traditional Councils as well as at the Kgoro's houses or offices within the doorstep communities.
- Additional written submissions via email, fax or telephone.

DUE DATE FOR COMMENT ON DRAFT EIA REPORT CLOSES ON:

16 August 2023

Comments to be submitted to the Project Manager:

Kirthi Peramaul

Alta van Dyk Environmental Consultants cc
Postnet Suite #745
Private Bag X1007
Lyttelton
0140
Tel: +27 12 940 9457 / Fax: +27 86 634 3967

Alta van Dyk Environmental Consultants cc
E-mail: kirthi@avde.co.za

Face-to-face open day's will be held on the **13** July 2023 at the Mapela TC Office and on the **15** July 2023 at the -Aboo Tayob Hall: 27 Boekenhout Ave, Akasia Mokopane. Both these Open Day events will commence at 10h00 and the Environmental Assessment Practitioner (EAP) and Anglo American Platinum (AAP) team will be available till 16h00.

GLOSSARY AND TERMINOLOGY

"alternative" a possible course of action, in place of another, that would meet the same purpose and need (of the proposal). Alternatives can refer to any of the following but are not limited to alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.

"construction" means the building, erection or establishment of a facility, structure or infrastructure 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 and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.

"Constitution" – Refers to the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996).

"Development" – means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, 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 borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.

"Development footprint" – means any evidence of physical alteration as a result of the undertaking of any activity.

"Development setback" – means a setback line defined or adopted by the competent authority.

"Development site" – Boundary and extent of development works and infrastructure

"domestic waste" Waste, excluding hazardous waste that emanates from premises that are used wholly or mainly for residential, educational, health care, sport or recreation purposes.

"ECO" - Environmental Control Officer: - Person tasked with monitoring implementation of the EMP during construction

"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 t them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, social, cultural, historical and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

"environmental impact assessment (EIA)" An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy which requires authorisation of permission by law and which may significantly affect the environment. The EIA includes an evaluation of alternatives. As well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures enhancing the positive aspects of the proposal and environmental management and monitoring measures.

"environmental management programme report (EMPr)" An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

"Expansion" – means the modification, extension, alteration or upgrading of a facility, structure or infrastructure at which an activity takes place in such a manner that the capacity of the facility or the footprint of the activity is increased.

"footprint" Refers to the surface area of land directly affected by a development or activity; and is directly related to the physical extent and size of the development or activity.

"general waste" - 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;

"hazardous substances or hazardous waste" hazardous substances are substances that are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous substances include, but are not limited to:

- Human excrement, fuel, lubricating oils, hydraulic and brake fluid, acids, paints, anti-corrosives, insecticides, pesticides, detergents, cement, etc.
- Hazardous wastes are the by-products and wastes associated with the use of hazardous substances as well as potentially hazardous items such as spent batteries, old oil filters, light bulbs, circuit boards, sharp objects etc. which requires special collection and handling.

"Impact" – A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

"Incident" – An undesired event which may result in significant environmental impacts but can be managed through internal response

"interested and affected parties" Individuals, communities, or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by the proposal or activity and/ or who are concerned with a proposal or activity and its consequences.

"Land Use" – means the purpose for which land and buildings is or may be used lawfully in terms of a land use scheme, existing scheme or in terms of any other authorisation, permit or consent issued by a competent authority, and includes any conditions related to such land use purposes.

"Land Use Rights" – means adopted land use applicable to land in terms of this By-law or relevant law which has come into operation for purposes of issuing a zoning certificate.

"Layout Plan" – means a plan indicating information relevant to a land development application and the land intended for development and includes the relative location of erven, public places, or roads, subdivision or consolidation, and the purposes for which the erven are intended to be used.

"life of mine (LoM)" number of years that the operation is planning to mine and treat ore, as taken from the current mine plan.

"Maintenance" – means actions performed to keep a structure or system functioning or in service on the same location, capacity, and footprint.

"Maintenance Management Plan" – means a management plan for maintenance purposes defined or adopted by the competent authority.

"mining" The making of any excavation for the purpose of winning a mineral. The term covers reconnaissance, prospecting, mining, or retention operations in relation to a prospecting or mining right, permit or license.

“mining related activities” Activities directly related to mining, which are required for mine construction, operation and/or rehabilitation. Such activities serve no purpose other than to support the construction, operation and/or rehabilitation of the mine, and will be ceased, removed and/or rehabilitated at the end of the life of the mine, unless they can be utilized as part of the end-use requirement of the mine and to the benefit of the local community and environment.

“mitigate” The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

“monitoring” The repetitive and continued observation, measurement, and evaluation of environmental data, to enable the detection of changes over a time period to assess the efficiency of control, management and/or mitigation measures.

“ore” A mixture of ore minerals and gangue from which at least one of the metals can be extracted at a profit.

“ore body” A natural concentration of valuable material that can be extracted and sold at a profit.

“Owner” – means a person registered in a deeds registry as contemplated in sections 1, 2 and 102 of the Deeds Registries Act as the owner of land or beneficial owner in law and includes the Municipality or any other organ of state as an owner or where properties have been vested and is under the control and management of the Municipality in terms of section 63 of the Local Government Ordinance, 1939 (Ordinance 17 of 1939).

“public participation process” A process of involving the public in order to identify issues and concerns and obtain feedback on options and impacts associated with a proposed project, programme or development. Public Participation Process in terms of NEMA refers to: a process in which potential interested and affected parties are given an opportunity to comment on or raise issues relevant to specific matters.

‘‘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.

“resource” The calculated amount of material in a mineral deposit, based on limited drill information.

“run-of-mine” A term used loosely to describe ore of average grade.

“Scoping Report” - A scoping report is a report whose purpose is to describe the methodology and range of activities of the appraisal work to be done in order to begin the process of collating information on relevant plans and programmes and is Finalized in accordance to regulation R 982 dated 4 December 2014.

“shaft” A vertical or inclined excavation in rock for the purpose of providing access to an orebody. Usually equipped with a hoist at the top, which lowers and raises a conveyance for handling workers and materials.

“stockpile” Broken ore heaped on surface, pending treatment or shipment.

“tailings” Material rejected from a mill after most of the recoverable valuable minerals have been extracted.

“Thickener” A large, round tank used in milling operations to separate solids from liquids; clear fluid overflows from the tank and rock particles sink to the bottom.

“Tributaries” – A stream or river which flows directly into a larger river or stream.

“Watercourse” means – (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" – means 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.

"Water quality" means the physical, chemical, toxicological, biological (including microbiological) and aesthetic properties of water that determine sustained (1) healthy functioning of aquatic ecosystems and (2) fitness for use (e.g. domestic, recreational, agricultural, and industrial). Water quality is therefore reflected in (a) concentrations or loads of substances (either dissolved or suspended) or micro-organisms, (b) physico-chemical attributes (e.g. temperature) and (c) certain biological responses to those concentrations, loads or physico-chemical attributes.

"Water Use License" – An authorisation from the Department to a designated water user to use water. The authorisation will provide details on the time-frames and conditions for the designated water use

"waste" Includes any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered.

"waste classification" Means establishing:

i. whether a waste is hazardous based on the nature of its physical, health and environmental hazardous properties (hazard classes), and
ii. the degree or severity of hazard posed (hazard categories).

ABBREVIATIONS

AAP	Anglo American Platinum
amsl	above mean sea level
Au	Gold
BID	Background Information Document
Co	Cobalt
Cr	Chromium
Cu	Copper
CRT	Cathode Ray Tubes
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DWS	Department of Human Settlement, Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FSR	Final Scoping Report
Ha	Hectares
HPGR	High pressure grinding roll
LH	Liquid Hydrogen
I&APs	Interested and Affected Parties
Ir	Iridium
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LEDET	Limpopo Economic Development, Environment and Tourism
LCD	Liquid Crystal Displays
LoM	Life of Mine
LHOS	Long Hole Open Stoping
LLHOS	Longitudinal Long-hole Open Stoping
M3C	Mogalakwena Third Concentrator
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mamsl	Metres above mean sea level
mbgl	Metres below ground level
MNC	Mogalakwena North Concentrator
MM	Mogalakwena Mine
MPRDA	Mineral and Petroleum Resources Development Act
MSC	Mogalakwena South Concentrator
Mm^3	Million cubic metres
m^3	Cubic Metres
m^2	Square metres
m	Metres
NEMA	National Environmental Management Act 107 of 1998
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NEMPAA	National Environmental Management Protected Areas Act 57 of 2003
NEMWA	National Environmental Management: Waste Act 59 of 2008
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act 36 of 1998
NWRS	National Water Resources Strategy
Ni	Nickel
OEM	Original Equipment Manufacturer
Os	Osmium
PCD	Pollution Control Dam
Pd	Palladium
PGMs	Platinum Group Metals
POC	Proof of Concept
Pt	Platinum
PV	Photo Voltaic
RoD	Record of Decision
RDP	Resource Development Plan
SA	South Africa
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
Rh	Rhodium
Ru	Rubidium

SWMP	Stormwater Management Plan
TLHOS	Transverse Long-hole Open Stoping
TSE	Treated Sewage Effluent
WMA	Water Management Area
WULA	Water Use Licence Application
WWTW	Waste Water Treatment Work
ZEHS	Zero Emissions Haulage Solution

EXECUTIVE SUMMARY

Mogalakwena Complex

The Mogalakwena Complex is located near the town of Mokopane within the Mogalakwena Local Municipality which forms part of the Waterberg District, situated in the western quadrant of the Limpopo Province.

The Mogalakwena Mine (MM) was established in 1993 and exploits the Platreef, the primary PGM-bearing horizon developed in the Northern Limb of the Bushveld Complex and is 100% owned by Anglo American Platinum (AAP) Limited Rustenburg Platinum Mines (RPM): Mogalakwena Mine Complex.

Mogalakwena Mine has a mine life of more than 30 years with potential to extend further through the development of underground mining operations.

MM currently has five individual operational pits of which three will be merged into one super pit (i.e., North Pit, Central Pit and South Pit), while one of the remaining open pits, Zwartfontein Pit, has one last pushback planned. Due to the development of the underground mine at the Sandsloot Pit, no further pushbacks will take place at this pit. Furthermore, additional pits are planned in the near future at Mogalakwena Mine.

MM is currently processing, on average 13 Mtpa (based on 2018 and 2019 figures) and aims to reach 22 Mtpa with the implementation of the Third Concentrator (M3C) (still to be constructed). Commodities mined and processed include Platinum Group Metals (PGMs) i.e., Platinum, Palladium, Rhodium, Iridium, Ruthenium, Gold with Nickel, and Copper as associated base metals.

Future Projects

While both underground and open-pit mining are widely accepted mining processes, there is a greater inclination to further expand underground mining when it becomes unfeasible to further extend the open pit operations. The AAP Resource Development Plan (RDP), a strategic planning process, identified five (5) different underground mining areas over the 19 km of strike of Mogalakwena. MM intends to exploit the Sandsloot (Zone 1) resources deeper than the current open pit horizons by changing the current mining method from an open pit mining process to an underground mining process (first phase). Studies are currently being undertaken to confirm the optimal development of the underground mine. MM anticipates that the proposed underground operations could extend the life of the mine by between 30-40 years and will similarly be influenced by market conditions, production rates and future underground mining scenarios.

Simultaneous to the development of the underground, the open pit mining will continue allowing for the final open cuts to continue until optimised shell extent has been reached. South Pit will develop and be extended to bridge South Pit and Central Pit for the further development of the Super Pit. Pit access ramps for the super pit will be maintained to the eastern footwall wall to provide the shortest possible haul route to the WRD's, strategic stockpiles and the primary crushing plant. To allow for final open cut / optimised shell extent, one last pushback/cut is planned for the Zwartfontein Pit.

The development of Sandsloot Underground Mine, changes to the Waste Rock Disposal Facilities, the implementation of stormwater management infrastructure at the Waste Rock Disposal Facilities and the development of the anthropogenic aquifer's forms part of this Regulatory Process. Included into the approval process are projects such as an additional access road from the N11, and projects aimed at the implementation of new technologies such as the Permit to Innovate project and supporting infrastructure only, to the proposed Hydrogen development Project.

Regulatory Approval Process

Mogalakwena Complex received an integrated[1] (NEMA and NEM:WA) environmental authorisation (LP30/5/1/2/3/2/1 (050) EM) on 13 August 2020 and a Water Use Licence (WUL) No. 07/A61G/ABCGIJ/9887 on 4 December 2020 supporting the current open pit operations and all associated infrastructure.

It is the intention of MM to undertake a full Environmental Impact Assessment (EIA) Process in support the future projects allowing not only for the development of the Sandsloot Underground Mine, continued opencast mining and waste rock disposal, but also for the implementation of new technologies and supporting projects to the mining operations.

This regulatory approval process will be undertaken in terms of regulations promulgated under Section 22 and 39 of the Mineral and Petroleum Resources Act, 2002 (Act 28 of 2002) (MPRDA) as well as Section 24 (5) and 44 of the National Environmental Management Act (Act 107 of 1998) (NEMA) and will consolidate the 2020 Environmental Management Programme Report (EMPr) into a single EMPr Report and also allow for some amendments. A Waste Management Licence will be applied for as part of the process in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008). A Water Use Licence will also be applied for in terms of the National Water Act, 1998 (Act 36 of 1998) for the water uses associated with the proposed new activities.

The regulatory approval process supports the development of the following projects:

- Sandsloot Underground Mine inclusive of the Zwartfontein and Tweefontein Spurs;
- Final pushback at the Zwartfontein Pit;
- Development of two in-pit anthropogenic aquifers – Zwartfontein and Sandsloot;
- Further development of the North Waste Rock Disposal Area (Phase 3) and the development of stormwater infrastructure (North-west Pollution Control Dam – Navada Dam);
- Development of an area of the implementation and testing of new and innovative technologies (Permit to Innovate); and
- Supporting infrastructure only, for the proposed Hydrogen Production Facility Project.

Environmental Assessment Practitioner

Alta van Dyk Environmental Consultants cc (an Independent Environmental Consultancy) has been appointed as the independent Environmental Assessment Practitioners (EAP) for the project by Anglo American Platinum (AAP) to carry out the Scoping and EIA process, as to address the impacts of the various projects (Sandsloot Underground Mine, North Waste Rock Disposal Facility Phase 3, North-west Stormwater Management Facility, supporting infrastructure only to the proposed Hydrogen Project, Projects in support of Innovation and new Technologies and supporting infrastructure such as a new access road and existing waste rock disposal areas); a practice which entails amongst others site surveys, scoping of issues and potential impact identification, identifying and describing alternatives, conducting public participation meetings, as well as actual impact assessment and providing mitigatory measures for these potential impacts.

Environmental Setting

The Mogalakwena Complex is located within the Northern Limb of the Bushveld Igneous Complex which is represented by pyroxenite (known as Platreef) that is variably mineralized with PGMs.

The climate is semi-arid and the Mine falls within rainfall zone A6C and evaporation zone 1C which are characterised by a Mean Annual Precipitation (MAP) of approximately 585 mm and a mean annual evaporation (MAE) of approximately 1,800 mm. Mean annual rainfall is 527 mm/year which occurs mainly in the summer months between November and March. Rainfall peaks in December with a mean of 106 mm and there is less

[1] *Integrated Environmental Authorisation was issued in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and National Environmental Management: Waste Act, Act 59 of 2008 (NEM:WA)*

than 3 mm of rainfall per month during winter (June to August). Extreme rainfall days (> 20 mm) are rare, with an average of 3 days per annum.

MM is situated at approximately 1 178 m above sea level and at a latitude of 24˚01' The natural topography has been locally altered by mining activity (tailings and return water dams, pits, rivers diversion, rocks dumps, buildings, etc.).

The soils encountered can be broadly categorised into three major groupings, with a number of dominant and sub dominant forms that characterise the area. The major soil forms are closely associated with the lithologies (geology) from which the soils are derived (in-situ formation), the topography and general geomorphology of the site, the effects of slope and attitude of the landforms and the pedogenetic processes involved affecting the soil pedogenisis and ultimately the soil forms classified and mapped.

Due to the existing mining activities being undertaken on the Surface Lease Area, the land use and land capability has significantly been altered through the mining activities and management of mineral residue deposits. Undisturbed areas outside of the Surface Lease Area, and areas not yet impacted upon by mining fall within three classes namely Arable Land (low potential), Grazing Land and Wilderness Land.

Due to the existing mining activities being undertaken on the Surface Lease Area, all available natural faunal habitats have been altered permanently with minimal animal life moving on the mining area apart from bird species. MM is located within the Makhado Sweet Bushveld vegetation type which forms part of the Savanna Biome. The Makhado Sweet Bushveld is considered vulnerable (VU), however is of least concern (LC). The Makhado Sweet Bushveld is described as comprising of slightly to moderately undulating plains sloping generally down to the north, with some hills in the southwest. The vegetation type typically includes a short and shrubby bushveld with a poorly developed grass layer.

Five broad habitat units were distinguished for the site these are:

1. Bushveld Habitat
2. Freshwater Habitat
3. Erosion Gulley Habitat
4. Rock Habitat
5. Transformed Habitat

The Mogalakwena Mining Complex is located within the Limpopo Water Management Area (WMA) and within the A61 tertiary drainage region of this WMA. The Complex is within the A61G quaternary sub-catchment. The Mohlosane River, the Groot Sandsloot River and the Witrivier are the three main rivers draining the area. The two main river systems that bisect the mine area are the Mohlosane River and the Groot Sandsloot River. The Groot Sandsloot River flows through the mining area, separating the North and South Concentrators, as well as the other pits (to the north of the river) from the Sandsloot Pit (to the south). The Mohlosane River flows directly past the north of the North Concentrator, separating it from the offices and workshops area (to the north of the river) as well as the North, Central, and South Pits. The Witrivier flows just outside the northern mine boundary. Within the mine boundary, a number of furrows, channels, and drainage lines flow in a north-easterly direction across the site towards this river system.

The prevailing wind directions are predominantly from the north-northeast (NNE) with some winds from the north. In terms of air quality, the main risk is dust, (dust fallout, PM10 and PM2.5) from the mine, impacting the closest sensitive receptors. Based on the prevailing wind directions from the northeast, villages and settlements to the southwest will be impacted as a result.

The Mogalakwena Complex is in an area where there are also other mining activities taking place. Current data indicated that the prevailing ambient noise level along the access road to the main entrance to the mine was 43.9BA during the day and 50.7dBA during the night. The noise level along the N11 was 44.7dBA with a maximum noise level of 63.9BA.

The majority of the visual receptors within the Zone of Visual Influence (ZVI) are residential areas (community clusters) and have been deemed highly sensitive visual receptors. People travelling in an around the area to work or home are considered to be moderately sensitive receptors.

Specialist Studies

As part of the integrated process, a team of independent specialists have been appointed as to undertake the required specialist studies. The aim of these studies is to identify and quantify the impacts associated with the various project activities, propose mitigation measures as to manage or mitigate these impacts and provide the required monitoring and auditing requirements.

The specialist studies undertaken as part of the Environmental Impact Assessment (EIA) include soils, land use, land capability, biodiversity (fauna, flora, wetland delineation), hydrology, hydrogeology, noise and vibration, visual and sunlight, air quality, heritage, palaeontological, network assessment, blasting assessment and social impact assessment-economic, and Traffic Assessment. In support of the requirements for closure, the quantum for financial provision has been calculated.

Identified Environmental Impacts

The following impacts were identified as summarised in the table below.

Aspect	Impact	Significance before mitigation[2]	Significance after mitigation
Pre-Construction/Construction Phase			
Topography	Altered Topography	Medium-high (-)	Low (-)
Soils and Land Capability	Loss of vegetation cover/soil protection and soil resource (sterilisation and erosion) and resultant loss of ecosystem services, contamination and compaction.	High (-)	Medium-high (-)
	Loss of vegetation cover and topsoil protection, erosion and permanent loss of resource downslope with negative impact of the receiving environment (streams and rivers) and ecosystem services.	High (-)	Medium-high (-)
	Contamination, salinisation, loss of soil resource and utilisation potential	Medium-high (-)	Medium (-)
Terrestrial Biodiversity (Flora)	Loss of floral SCC	Medium-high (-)	Medium (-)
	Loss of floral diversity	Medium (-)	Low (-)
	Loss of intact bushveld habitat	High (-)	Medium-high (-)
	Loss of functioning CBA 1 habitat (MBH, FWH & EGH) and ESA 2 habitat (MBH, FWH),	High (-)	Medium-high (-)
	Potential proliferation of AIP species	Medium (-)	Low (-)
Terrestrial Biodiversity (Fauna)	Loss of faunal species diversity and habitat availability	Medium-high (-)	Medium (-)
	Loss of faunal connectivity within the landscape	Medium-high (-)	Medium (-)
	Loss of SCC habitat.	Medium (-)	Low (-)
Freshwater	Increased runoff and erosion leading to sedimentation of the of the freshwater habitat.	Medium (-)	Low (-)
	Decreased ecoservice provision.	Medium (-)	Low (-)
	Disturbances to soil leading to increased alien vegetation proliferation and further bush encroachment in the vicinity of the riverine systems.	Medium-high (-)	Medium (-)
	Altered runoff patterns and alteration to flow patterns in the landscape, leading to change in potential recharge of the riverine systems	Medium-high (-)	Medium (-)
	Possible contamination of soil and surface water which is likely to eventually report to the riverine systems	Medium-high (-)	Medium (-)
	Temporary loss of hydrological connectivity between the upstream and downstream reaches of the Mahlosane River where the proposed access road crosses	Medium-high (-)	Medium (-)
	Altered runoff patterns within the local catchment of the Mahlosane River.	Medium-high (-)	Medium (-)
	Physical disturbance to aquatic biota such as macro-invertebrates and amphibious species	Medium-high (-)	Medium (-)

[2] Minimizing or avoiding the described potential impacts

Hydrogeology	Construction of North WRD and North-west PCD could potentially impact receptors in close proximity i.e. Witrivier, wetland and communities.	High (-)	Medium-high (-)
	Site clearing of vegetation and stockpile of topsoil resulting in increased runoff and less recharge from rainfall	Medium (-)	Low (-)
	Water egress due to flooding into Sandsloot Underground from Sandsloot Pit Lake and after high precipitation events	Medium (-)	Low (-)
	Use, handling, transport and storage of hazardous materials (hydrocarbons & chemicals) - Pollution of soil, surface and groundwater with hazardous materials should spillages occur.	Medium (-)	Low (-)
Surface Water	Siltation of watercourses	Medium-high (-)	Low (-)
	Contamination of Surface water and soil	Medium-high (-)	Low (-)
	Flooding of the box cut and shaft	Medium-high (-)	Low (-)
Air quality	Increase in ambient PM_{10} and $PM_{2.5}$ concentrations (mining activities and haul roads)	Low (-)	Low (-)
	Increase in dust deposition (mining activities and haul roads)	Low (-)	Low (-)
Noise	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	Medium (-)	Low (-)
	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas *(North Waste Rock Dump)*	Medium-high (-)	Medium (-)
Paleontological	Loss of fossil heritage	Medium (-)	Low (-)
Heritage	Disturbance of burial grounds and graves	High (-)	Medium-high (-)
	Disturbance of homesteads or structural remains with the risk for unmarked graves	Medium (-)	Low (-)
	Destruction of Initiation schools	Medium (-)	Low (-)
	Risk of Unmarked Graves at Old Settlements and Newer Buildings	Medium (-)	Low (-)
Visual	Visual Impact on visual receptors	High (-)	Medium-high (-)
Sunlight	Impact on available sunlight	Medium (-)	Medium (-)
Traffic	Increased Road congestion, road safety and emissions (internal and external roads)	Medium (-)	Low (-)
Socio-economic	Creation of local employment and business opportunities	Medium (+)	Medium (+
	Potential Impacts on Family structures and social networks associated with the presence of construction workers:	Medium (-)	Low (-)
Operational Phase			
Topography	Altered Topography		Low (-)
Soils and Land Capability	Sterilisation and loss of soil resources, its utilisation potential and ecosystem services of permanent structures, contamination, salinisation and compaction of unprotected sites.	High (-)	High (-)
	Loss of resource, contamination and erosion of unprotected materials (in-situ and stored) and impact on downstream/downwind socio and biophysical environments.	High (-)	Medium (-)
	Continued sterilisation and loss of soil resource, its utilisation potential and ecosystem services due to unmanaged operation of materials transportation/conveyancing (waste rock, Run of Mine ore and pumping activities for all areas covered by infrastructure and operational activities.	High (-)	Medium-high (-)
Terrestrial Biodiversity (Flora)	Loss of floral habitat	Medium (-)	Low (-)
	Loss of floral SCC	Medium (-)	Low (-)
	Proliferation of AIPs	Medium (-)	Low (-)
Terrestrial Biodiversity (Fauna)	Loss of SCC habitat.	Medium (-)	Low (-)
	Establishment and spread of AIP species.	Medium (-)	Low (-)
	Potentially poorly managed edge effects can lead to further habitat loss outside of the proposed footprint areas.	Medium (-)	Low (-)
	Loss of faunal connectivity within the landscape.	High (-)	Medium-high (-)
Freshwater	Reduced water quality with specific mention of increased dissolved salt concentrations and potentially introducing toxins into the system due to accidental spills and potential seepage	Medium (-)	Low (-)
	Potential flooding of freshwater ecosystems and temporary change to hydrological regime due to pipeline failure.	Medium (-)	Low (-)
	Contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts (decreased water quality	Medium (-)	Low (-)
	Changes in the runoff patterns within the site due to increase impervious surfaces; and Contamination of freshwater environment due to unattended spills.	Medium (-)	Low (-)
Hydrogeology	Potential contamination of shallow groundwater resources and surface drainages due to long term liner integrity, as well as the effectiveness of the preparation of the base of the North Waste Rock Dum p Extension	High (-)	Low (-)

	Additional ingress/flooding along Platreef strike from backfilled Anthropogenic Aquifers.	Medium-high (-)	Low (-)
	Contaminated seepage into the Sandsloot UG anthropogenic aquifers and paste backfill, requiring higher pumping and treatment costs of nitrate and sulphates	High (-)	Low (-)
	Reduction in groundwater quantity (real or perceived) due to increased ingresses and the dewatering (active and passive) of the Super Pit and Sandsloot Underground which will be deeper and therefore higher hydraulic gradient towards the voids	High (-)	Medium (-)
	Cumulative impact on water quality and quantity of neighbouring mines mining the Platreef along strike (Proposed Akanani, Platreef)	Medium-high (-)	Medium (-)
	Deterioration of groundwater quality and quantity due to densification of informal settlements surrounding mine and expansion of mine operations towards the western and northern boundary.	High (-)	Medium (-)
Surface Water	Reduced catchment yield	Medium-high (-)	Low (-)
	Siltation of watercourses	Medium-high (-)	Low (-)
	Contamination of surface water resources	Medium-high (-)	Low (-)
	Spillage of the North-west Pollution Control Dam – Navada Dam resulting in increased suspended solids and contaminated run-off water entering the watercourse	High (-)	Low (-)
	Flooding of the box cut open pit area and declines	High (-)	Low (-)
Air Quality	Increase in ambient PM10 and PM2.5 concentrations (mining activities and haul roads)	Medium (-)	Low (-)
	Increase in dust deposition (mining activities and haul roads)	Low (-)	Low (-)
	Increase in dust deposition (Zwartfontein Haul Road)	Medium-high (-)	Low (-)
	Increase in ambient PM10 and PM2.5 concentrations (NWRD Phase 3)	Low (-)	Low (-)
	Increase in dust deposition ((NWRD Phase 3)	Low (-)	Low (-)
Noise	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	Medium (-)	Low (-)
	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas *(North Waste Rock Dump)*	Medium-high (-)	Medium (-)
Paleontological	Loss of fossil heritage	Medium (-)	Low (-)
Heritage	Uncovering and destruction of sensitive artefacts / Graves.	Medium (-)	Low (-)
Visual	Visual Impact on visual receptors	High (-)	Medium-high (-)
Sunlight	Impact on available sunlight	Medium (-)	
Traffic	Increased Road congestion, road safety and emissions (internal and external roads)	Medium (-)	Low (-)
Blasting	Damage to Mine Structures, Private Structures and houses	Low (-)	Low (-)
	Damage to Pipelines, Mine Buildings/Structures, Heritage (MMIEP 11 - potential presence of graves), damage to Power Lines/Pylons and Hydro census	Medium (-)	Low (-)
	Damage to Road	Medium-high (-)	Low (-)
Network	Obstruction to reception of the FM Radio Signals in to Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, and Leruleng communities.	Medium-high (-)	Low (-)
	Obstruction to reception of the FM Radio Signals in surrounding communities other than Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, and Leruleng communities.	Low (-)	Low (-)
	Obstruction to reception of satellite TV	Low (-)	Low (-)
	Obstruction to reception of mobile network signals	Low (-)	Low (-)
	Obstruction to reception of community point to point and long-range Wi-Fi Signal	Low (-)	Low (-)
	Obstruction to reception of community point to point and short-range Wi-Fi Signal	Low (-)	Low (-)
Socio-economic	Creation of employment opportunities associated with project	Medium (+)	Medium-high (+)
	Creation of training and skills development opportunities associated with the proposed project	Medium (+)	Medium-high (+)
	Creation of socio-economic opportunities and procurement associated with project	Medium (+)	Medium-high (+)
	Reduce water loss and carbon footprint	Low (+)	Medium (+)
	Potential of underground mining to reduce the social impacts associated with open pit mining due to the reduced volume of waste rock and the potential impacts associated with Waste Rock Dumps including loss of land, dust and noise.	Low (+)	Low (+)

	Loss of area available for grazing and initiation school sites associated with establishment and operation of NWRD.	Medium (-)	Low (-)
	Safety impacts associated with stormwater collection dam:	Low (-)	Low (-)
Closure Phase			
Topography	Altered Topography	Medium (-)	
Soils and Land Capability	Loss of soil organic matter and nutrient stores and long-term utilisation potential due to erosion and compaction. Potential contamination and salinisation of receiving environment (soil and water bodies)	Low (-)	Medium (-)
	Contamination of in-situ and stored materials by dirty water ingress.	Low (-)	Medium (-)
	Contamination, salinisation, compaction, and erosion of rehabilitated soil resources due to unmanaged and poorly serviced machinery, spillage and lack of well-engineered stormwater controls. Resultant downstream sedimentation and contamination of receiving environment (soils and water bodies)	Medium (-)	Medium (-)
Terrestrial Biodiversity (Flora)	Loss of floral SCC	Medium (-)	Low (-)
	Proliferation of AIPs	Medium (-)	Low (-)
	Loss of favourable growing conditions for floral communities due to disturbance of soils	Medium (-)	Low (-)
Terrestrial Biodiversity (Fauna)	Proliferation of alien and invasive plant specie	Medium (-)	Low (-)
	Improper revegetation of the focus area leading to permanent loss of habitat and food resources for fauna;	Medium (-)	Low (-)
Freshwater	Further altered runoff patterns and alteration to flow patterns in the landscape, leading to change in potential recharge of the riverine systems	Medium (-)	Low (-)
	Increased risk of pollution of surface water, leading to impaired water quality.	Medium (-)	Low (-)
	Contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts (decreased water quality) and unattended spills.	Medium (-)	Low (-)
	Decant from mine pits post closure.	Medium-high (-)	Medium (-)
	Possible failure, seepage and runoff from WRD post-closure.	Medium (-)	Medium (-)
Hydrogeology	Communities use the groundwater resources on the mine as potable water supply	High (-)	Medium (-)
	Post closure impacts on groundwater and rivers associated with waste disposal activities – WRDs	High (-)	Medium (-)
	Rebound of groundwater table and formation of terminal pit lakes with possible decant to river sources	High (-)	Medium (-)
Surface Water	Siltation of watercourses	Medium-high (-)	Low (-)
Air Quality	Increase in ambient PM10 and PM2.5 concentrations	Low (-)	Low (-)
	Increase in dust deposition	Low (-)	Low (-)
Noise	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	Medium (-)	Low (-)
	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas *(North Waste Rock Dump)*	Medium (-)	Low (-)
Paleontological	Loss of fossil heritage	Medium (-)	Low (-)
Heritage	Uncovering and destruction of sensitive artefacts / Graves.	Medium (-)	Low (-)
Visual	Visual Impact on visual receptors	High (-)	High (-)
Sunlight	Impact on available sunlight	Medium (-)	Medium (-)
Traffic	Increased Road congestion, road safety and emissions (internal and external roads)	Medium (-)	Low (-)
Socio-economic	Loss of employment and business opportunities	High (-)	Medium (-)

Public Participation

Public participation will be undertaken during the EIA Phase of this project. The proposed components for the public participation process are inclusive of the following activities:

- Distribution of Notification Letters / Emails
- Distribution of Background Information Documents
- Placement of Newspaper Advertisement
- Distribution of Summary Documents
- SMS Notifications
- Public Open Days

A detailed Stakeholder Engagement Report is being compiled in support of the Environmental Impact Assessment Phase and will be appended as an Annexure to the final EIA report. Annexure 4-1 of this Report includes the Stakeholder Engagement Report which was compiled as part of the Scoping Phase public participation component.

The image (overleaf) provides a diagrammatical flow diagram of the regulatory approval process. The project is currently in the Environmental Impact Assessment Phase.

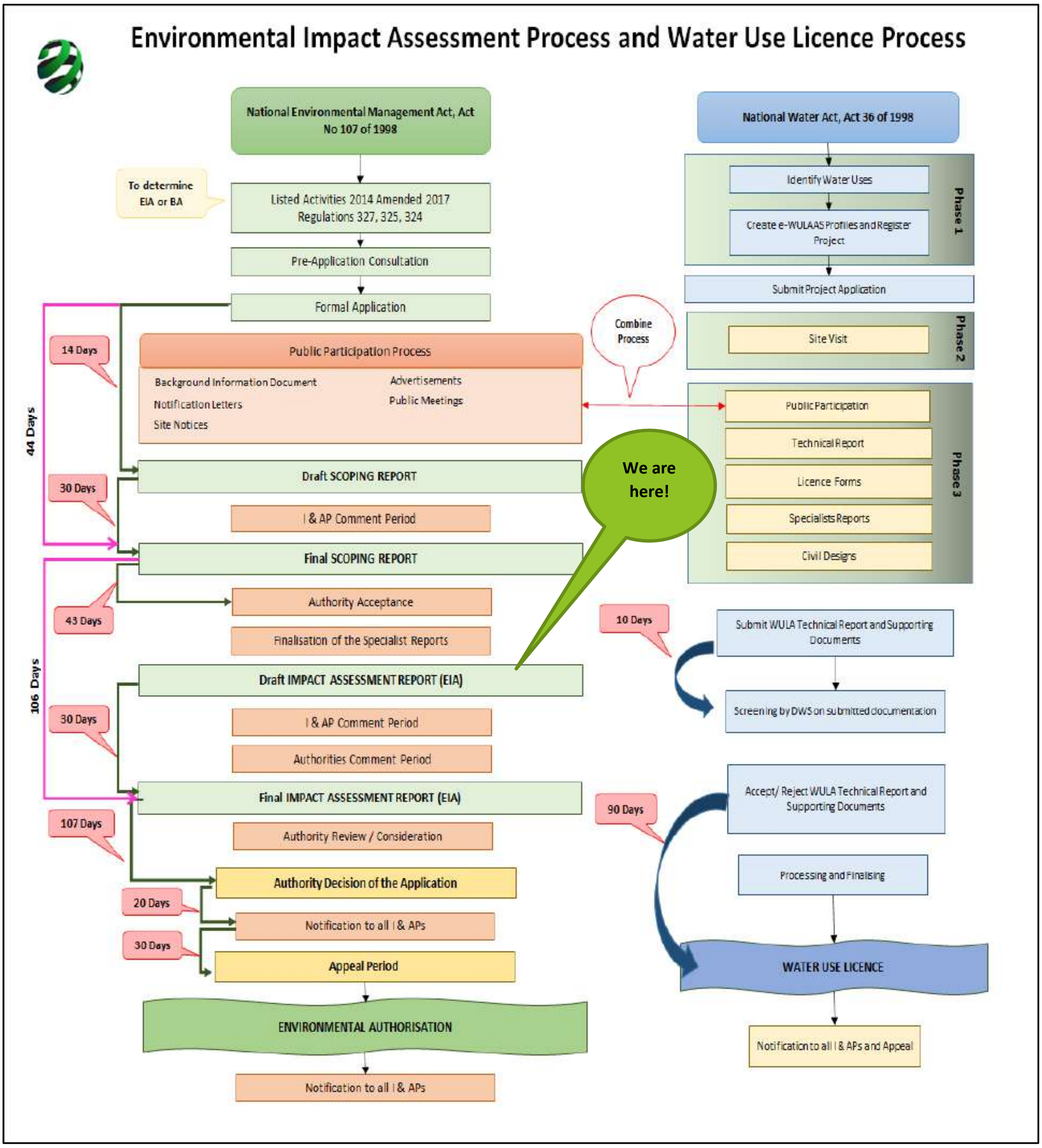

Figure 1-1: Regulatory Approval Process

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MOGALAKWENA COMPLEX

INTRODUCTION AND BACKGROUND

1 INTRODUCTION AND BACKGROUND

1.1 MOGALAKWENA COMPLEX

Mogalakwena Mine (MM) is an Anglo American Platinum (AAP) Rustenburg Platinum Mines (Pty) Ltd (RPM) owned platinum mine situated in the Limpopo Province of South Africa, 70 and 30 km, respectively, from the towns of Polokwane and Mokopane.

Mogalakwena is an opencast mine complex consisting of five opencast pits and two concentrator plants – the Mogalakwena North Concentrator (MNC) and Mogalakwena South Concentrator (MSC) – with the currently planned third concentrator (M3C). Associated with the concentrators are two existing Tailings Storage Facilities (TSF), with two new TSFs planned for the proposed concentrator, namely the Blinkwater Extension Compartment 2 and 3.

The Mogalakwena Mine currently has five individual operational pits of which three will be merged into one super pit (i.e., North Pit, Central Pit and South Pit), while Zwartfontein Pits has one last pushback planned. Due to the development of the underground mine at the Sandsloot Pit, no further pushbacks will be undertaken in the future at the Sandsloot Pit. Furthermore, additional pits are planned at the Mogalakwena Operations (±2040). Open pit mining is undertaken by means of the drill, blast, load and haul method of mining.

The mine is currently processing, on average 13 Mtpa (based on 2018 and 2019 figures) and aims to reach 22 Mtpa with the implementation of the M3C (still to be constructed). The M3C is approved for a total milling capacity of 12 Mtpa (including associated infrastructure i.e., crusher and bulk ore sorting facility) whilst maintaining the North Concentrator (MNC) at 9.3 Mtpa and decommissioning the South Concentrator (MSC). The processing facilities will provide a total milling capacity of 22 Mtpa. Processing facilities in the AAP stable includes purification and crystallization, an acid plant, smelting, ore sorter (multi-sensor), electric furnace, hydrochloric acid (reagent), floatation, high pressure acid leach (HPAL), magnetic separation, solvent extraction, electrowinning, dissolving and crystallising.

Commodities mined and processed include Platinum Group Metals (PGMs) i.e., Platinum, Palladium, Rhodium, Iridium, Ruthenium and Gold with Nickel, and Copper as associated base metals.

1.2 MOGALAKWENA COMPLEX DETAILS

Ownership of Mogalakwena Mine is as follows:

Company	Interest	Ownership
Anglo American plc.	79.2 %	Indirect
Anglo American Platinum Ltd. (Operator)	100%	Direct
Anglo American Platinum Ltd. Wolly owns and operates the Mogalakwena Mine		
Anglo American plc. Held through an effective 79.2% interest in Anglo American Platinum Limited		

Table 1.1 provides the contact details for Mogalakwena Complex in support of the application.

Table 1-1: Contact Details

Component	Details
Company Registration	1931-03380-06
Company Name	Anglo American Platinum Rustenburg Platinum Mines (Pty) Ltd (RPM)
DMRE Reference Number	LP30/5/1/2/2/50 MR
Postal Address	Anglo American Platinum Ltd, Mogalakwena Complex, Private Bag X2463, Mokopane, 0600
Physical Address	Sandsloot Farm, N11 Groblers Bridge Road, Mokopane
Registered Office	144 Oxford Road, Rosebank, Johannesburg, 2196
District and Local Municipality	Mogalakwena Local Municipality Waterberg District Municipality

Table 1-2: Responsible Persons

Name	Designation	Responsibility
Willie Noordman	Senior General Manager (GM)	General Manager for Mogalakwena Complex
Mike Molefe	Safety, Health and Environment (SHE) Manager	All SHE aspects at Mogalakwena Complex
Timothy Seimela	Environmental Superintendent	All Environmental matters at Mogalakwena Complex
Solomon Makgai	Social Performance Manager	Social performance Management
Mandy Jubileus	Environmental Principal Systems and support to Mogalakwena, Twickenham, Mototolo/Der Brochen & Modikwa JV	Environmental support of AAP operations in the Eastern Limb of the Limpopo Province

1.3 INDEPENDENCE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Alta van Dyk Environmental Consultants cc has a team of qualified Environmental Impact Assessment Practitioners (EAPs) in support of the management and execution of the Regulatory Processes. The team will consist of the following team members.

Kirthi Peramaul (BSc Hons Environmental Monitoring and Modelling, Pr.Sci.Nat, Registered EAP). Kirthi has 13 years' experience in the environmental management field and is currently registered with the South African Council of Natural Scientific Professions (SACNASP) as a Professional Natural Scientist (Registration No 400012/18: Environmental Science) and is as a Registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (Registration No 2020/1537). Kirthi specialises in environmental authorisations, environmental compliance monitoring, environmental management plans, water use authorisation, stakeholder engagement, risk assessments and blue and green drop auditing. She has been involved in projects related to Waste Management, Linear Infrastructure, as well as Mixed-Use developments. The Curriculum Vitae of the EAP is attached to Appendix 1.

Reata Colyn holds a B.Sc in Human Physiology, Genetics and Psychology from the University of Pretoria and is currently in the process of finalizing her Master's Degree in Environmental Toxicology and Pollution Control from the University of Ulster, Northern Ireland. Reata Colyn has 6 years' experience in the environmental management field. In terms of professional affiliation Reata is a registered candidate Environmental Assessment Practitioner in accordance with the Environmental Assessment Practitioners Association of South Africa (Reference: 2020 - Ref: 2020/1534). Reata has been involved as an environmental consultant in various EIA's in terms of the National Environmental Management Act (NEMA) (No 107 of 1998), Water Use Applications in terms of the National Water Act (NWA) (No 36 of 1998) and external audits. Reata's responsibilities include the overall management of projects, financial management and the identification and assessment of environmental impacts.

Lenaldi Görgens holds an B.Sc Honours degree in Environmental Science from the North-West University and has one (1) years' experience in the environmental field. In terms of professional affiliation Lenaldi is a registered candidate Environmental Assessment Practitioner in accordance with the Environmental Assessment Practitioners Association of South Africa (Ref: 2022/5188). Lenaldi will assist the project team in the gathering of information, documenting information and feedback from stakeholders and assist in the overall report compilation.

Tyla Leigh Smith holds a B.Sc. in Geography and Environmental Management from the University of Johannesburg and has two (2) years' experience in Environmental Consulting. Tyla has been involved as an environmental consultant in various EIA's in terms of NEMA, Water Use Applications in terms of the National Water Act (NWA) (No 36 of 1998) and external audits. In terms of professional affiliation Tyla is a registered candidate Environmental Assessment Practitioner in accordance with the Environmental Assessment Practitioners Association of South Africa (Ref: 2022/4939). Tyla's responsibilities include the public participation component and the identification and assessment of environmental impacts. Tyla will also assist with the Water

Use Licence Component by assisting in loading information on the e-wulaas system and assist in drafting necessary documentation in support of this process.

Alta van Dyk holds a master's degree in Environmental Management from the University of North-West and a Masters of Law (LLM) degree in International Commercial Law from the Salford University in Manchester. In terms of professional affiliation, Alta van Dyk is registered with the South African Council for Natural Scientific Professions (SACNASP – 400099/02) in Natural Science Services, as well as Environmental Science fields of practice. Alta is also a Registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA). Alta van Dyk has 31 years of experience in the environmental field.

Alta van Dyk has been involved as the project manager in various EIAs in terms of the National Environmental Management Act (NEMA) (No 107 of 1998), the National Environmental Management Waste Act (NEMWA) (No 59 of 2008), the National Water Act (NWA) (No 36 of 1998) as well as the Minerals and Petroleum Resources Development Act (MPRDA) (No 28 of 2002). Her responsibilities included the overall management of the project, the identification and assessment of environmental impacts and the development of environmental management plans.

Alta van Dyk meets the requirements for independence as she does not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the EIA Regulations, 2014 (as amended) and has no vested interest in the proposed activity proceeding, and also has no, and will not engage in, conflicting interests in the undertaking of the activity.

Table 1-3: Contact Details - Environmental Assessment Practitioner

Company Details	Postal Address	Physical Address
Alta van Dyk Environmental Consultants cc Tel: +27 12 940 9457 Fax: +27 86 3967	Postnet Suite #745 Private Bag X1007 Lyttelton 0140	Stand 2212 9 Mountain Sherman Road Midlands Estate 1692

A multi-disciplinary specialist team has been appointed to conduct the various specialist studies to determine the possible impacts that the developments at Mogalakwena Mine might have on the environment and what possible mitigation measures can be implemented to reduce the possible risks. The table below lists the various specialist studies to be undertaken to determine the possible impacts on the environment as a result of the proposed underground mining.

Table 1-4: Specialist Team

Specialist Field	Company	Name
Noise Impact	dBAcoustics	Barend van der Merwe
Soils, Land Use and Land Capability	Earth Science Solutions	Ian Jones
Groundwater	Knight Piesold (Pty)Ltd	Diana Duthe
Public participation meeting Translator	Philanabo Trading (Pty) Ltd	Terry Twala
Blasting and Vibration	Blast management & Consulting	Danie Zeeman
Air quality Impact Assessment	Umoya-Nilu Consulting (Pty) Ltd	Mark Zunckel
Biodiversity	Scientific Aquatic Services Scientific Terrestrial Services	Stephen van Staden
Freshwater & Aquatic Ecology		
Wetland Delineation		
Hydropedology	Zimpande Research Collaborative (Pty) Ltd	
Financial Quantum	Hydrological Environmental Engineering Solutions (Pty) Ltd	Deon van der Merwe
Hydrology Report		
Heritage Impact Assessment	PGS Heritage	Polke Birkholtz/ Henk Steyn
Palaeontology	Banzai Environmental (Pty) Ltd	Agnes Sethole
Social Impact	Tony Barbour Environmental Consultant and Researcher	Tony Barbour
Visual Impact Assessment	Alta van Dyk Environmental	Andrew Thurlow

Specialist Field	Company	Name
Traffic Assessment in support of new proposed N11 Access Road	Corli Havenga Transportation Engineers	Cobus Havenga
Network Impact Assessment	Council for Scientific and Industrial Research	Albert Lysko Musa Mashaba

1.4 RIGHTS TO THE MINERAL RESOURCE

Mogalakwena Mine (MM) holds the Mining Right over the following farms:

Table 1-5: Mineral Rights

Farm Name	Portion Number
Drenthe 778 LR	Portion 0
Gillimberg 861 LR	Portion 0, Remaining Extent
Overysel 815 LR	Portion 0
Zwartfontein 818 LR	Portion 0
Blinkwater 820 LR	Portion 0, Remaining Extent
Sandsloot 236 KR	Portion 0
Vaalkop 819 LR	Portion 0
Knapdaar 234 KR	Portion 0
Tweefontein 238 KR	Portion 2, 2, Remaining Extent
Rietfontein 240 KR	Portion 0

1.5 NEED AND DESIRABILITY OF THIS PROJECT

1.5.1 Combination Mining – Open Pit and Underground Mine Development

While both underground and open-pit mining are widely accepted mining processes, there is a greater inclination to further expand underground mining when it becomes unfeasible to further extend the open pit operations. Shallow deposits are generally mined by open pit mining methods as it is economically superior to most underground mining methods with respect to time to first production, production rate, and other technical aspects. However, open pit mining is sensitive to the mining depth because of orebody geometry and haulage cost.

Combining the open pit and underground mining methods is referred to as combination mining. In the combination mining method, '*transition point*' refers to the point at which the decision has to be taken whether to extend the pit or switch from open pit to underground. The transition point can be driven by a number of factors including surface constraints, sustainability / financial decision around waste movement (strip ratio), environmental factors and corporate strategy.

The transition to underground mining at Mogalakwena could reduce the long term:

- Surface footprint – open pit and waste rock disposal areas extent;
- Waste rock extraction, movement and storage;
- Surface mineral residue storage (waste rock and a significant portion of tailings used to backfill underground voids);
- Reduces dust, noise and vibration;
- Reduces total water usage;
- Reduces total energy requirements;
- Reduces total carbon consumption; and
- Overall environmental impacts.

The AAP Resource Development Plan (RDP), as strategic planning process, identified five (5) different underground mining areas over the 19 km of strike of Mogalakwena. The 5 underground mining areas include (Figure 1-1):

- ***Sandsloot (SST) – Zone 1***
- Mogalakwena South (MGS) – Zone 2
- Zwartfontein (ZWF) – Zone 3
- Mogalakwena North (MGN) – Zone 4
- Tweefontein (TWF) – Zone 5

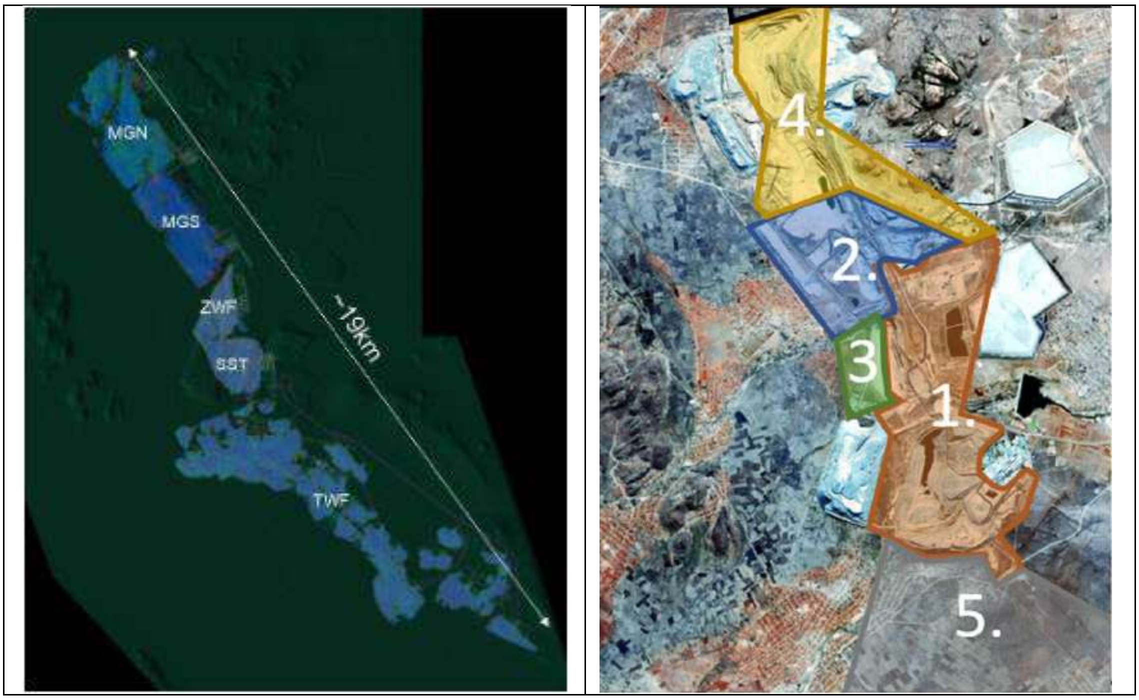

Figure 1-1: Underground Mine Development Zones

Mogalakwena Mine intends to exploit the Sandsloot (Zone 1) resources deeper than the current open pit horizons by changing the current mining method from an open pit mining process to an underground mining process (first phase). Studies are currently being undertaken to confirm the optimal development of the underground mine. MM anticipates that the proposed underground operations could extend the life of the mine with ~49 years and will similarly be influenced by market conditions, production rates and future underground mining scenarios.

Simultaneous to the development of the underground, the open pit mining will continue allowing for the final open cuts to continue until optimised shell extent has been reached. South Pit will be extended to bridge South Pit and Central Pit for the further development of the super pit. Pit access ramps for the super pit will be maintained to the eastern footwall wall to provide the shortest possible haul route to the WRD's, strategic stockpiles and the primary crushing plant. To allow for final open cut / optimised shell extent, one last pushback/cut is planned for the Zwartfontein Pit.

In support of continual combination mining, waste rock material will need to be disposed of on surface. The North Waste Rock Disposal area will be extended in footprint area as well as height to accommodate the additional material removed from both the open pit and underground operations. Waste rock will also be utilised to construct anthropogenic aquifers within the Sandsloot and Zwartfontein open pit areas to support future mining operations with water security aspects.

The development of Phase 1[3] mining, changes to the Waste Rock Disposal Facilities and the development of the anthropogenic aquifers forms part of this Regulatory Process and the full project description is included in Section 4 of this document.

1.5.2 Stormwater Management Infrastructure, Waste Rock Deposition and Anthropogenic Aquifers

To comply with the requirements of the National Water Act, 1998, (Act 36 of 1998), Regulation GN 704 dated 4 June 1999, clean and dirty water needs to be separated on site and all dirty water needs to be contained. In addition to this, surface water runoff across the mine site presents a flooding and contaminant transport risk, as well as an opportunity for water collection, and storage for future use.

To effectively contain all surface water run-off from the northern and western Waste Rock Disposal Areas (North WRD and WRD 02) due to the proposed changes in waste rock deposition and to prevent stormwater in-rush into the mining pit areas, a series of dirty water containment collection canals/tunnels and a dirty water containment facility will be required. Due to topographical limitations, the containment facility needs to be located at the lowest point allowing for run-off water to freely drain towards the facility.

The beneficial use of waste rock material on site allows for the development of an alternative water storage facility in pit (Zwartfontein and Sandsloot) known as anthropogenic aquifers, to curb rapid evaporation supporting water security on site and allows for the implementation of Water Conservation principles in terms of reduce, re-use and re-cycle.

1.5.3 New Technologies

Through its Sustainable Mining Plan, Anglo American is transforming its footprint to achieve the purpose of reimagining mining to improve people's lives and to reduce its impact on the environment. Anglo American acknowledges that climate change is a great challenge and to address this, it is decarbonising its business through its FutureSmart Mining™ programme. In support of South Africa's climate ambitions to cut greenhouse gas emissions by 28% by 2030 and reduce them to net-zero by 2050, Anglo American is committed to achieve carbon neutrality across all its operations by 2040. In South Africa, Anglo American is adopting a regional eco-system approach to renewable energy, with hydrogen expected to play a vital role. Anglo has developed the nuGen™ Zero Emissions Hydrogen Solution (ZEHS) under their FutureSmart Mining™ programme. The nuGen™ ZEHS concept, a retrofitted hydrogen fuel cell and battery-powered module onto a large mine haul truck was officially launched in May 2022 at the MM and has since undergone a thorough and robust testing and development program. AAP is proposing to further develop and scale up the Zero Emissions Haulage Solution (ZEHS) in partnership with the engineering company First Mode potentially at MM.

The nuGen™ initiative is centered around the development of a proposed Hydrogen Production Facility that will ultimately generate clean '*green*' hydrogen to power mine haul trucks on site using Hydrogen Fuel Cell Technology. This will have an estimated reduction of diesel consumption on site by 3000 litres per truck per day, or some 120,000 litres per day for the fleet of trucks in use.

As part of this Integrated Environmental Impact Assessment, MM will authorize supporting infrastructure, required to support the ZEHS for potential future projects.

In 2020 MM applied for an Environmental Authorization in the form of a Regulation 29 amendment for the Pilot (Proof of Concept) ZEHS located adjacent MM's waste/bioremediation site on Portion 0 of Erf No. 818 Zwartfontein. This project included the development of a hydrogen production, refueling system and retrofitting and field testing of a hydrogen powered ultra-class mine haul truck which utilizes a hybrid fuel cell and battery power module. The project also has a 616KW Photo Voltaic (PV) Plant. This project was centered around a small-scale version of a planned production scale phase roll-out, intended for implementation.

[3] *SANDSLOOT COMBINATION MINING – OPEN PIT AND UNDERGROUND MINING PROJECT*

1.5.4 Permit to Innovate Project

An area has been identified on site allowing the operations to trial and pilot new innovations, technologies and research in smaller scale, temporary projects, prior to implementation on site and will be aimed at improving mining practices and reducing environmental associated impacts on site.

1.6 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

MM anticipates that the proposed underground operations could extend the life of the mine with between 30-40 years. MM has a Life of Mine expectancy of 76 years (as of Jan 1, 2021). Mogalakwena has a Mining Right which is currently valid from 23 July 2010 to 22 July 2040.

1.7 STRUCTURE OF THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT (DEIR)

The Draft Environmental Impact Report (DEIR) has been structured as follows:

Table 1-6: Requirements for Environmental Impact Assessment Report

Chapter	Content
Chapter 1	Introduction and Background
Chapter 2	Regional Setting and Locality
Chapter 3	Existing Open Pit Operations and Approvals
Chapter 4	Future Operations
Chapter 5	Alternatives Considered
Chapter 6	Legislative Background
Chapter 7	Environmental Status Quo
Chapter 8	Public Participation Process
Chapter 9	Draft Environmental Impact Assessment
Chapter 10	Draft Environmental Management Programme Report
Chapter 11	Monitoring and Maintenance Programme
Chapter 12	Financial Provisioning
Chapter 12	Professional Opinion of the EAP and Impact Statement
Chapter 13	Undertaking regarding correctness of information
Chapter 14	References

1.8 REQUIREMENTS FOR THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

The DEIR Report has been structured in accordance with the requirements as specified in Government Gazette No 38282 dated 04 December 2014, Regulation 982.

Table 1-7: Requirements for the Environmental Impact Assessment Report

No	Description	Reference
a)	Details of: the EAP who prepared the report the expertise of the EAP to carry out scoping procedures	Chapter 1.3 Appendix 1
b)	the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Chapter2 Appendix 2
c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;	Section 4

	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
d)	a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Chapter 6 Chapter 4
e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Chapter 6
f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	Chapter 1.5
g)	a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Chapter 5
h)	A full description of the process followed to reach the proposed development footprint within the approved site, including: i. details of the development footprint alternatives considered	Chapter 4 & 5
	ii. details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Chapter 8
	iii. a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Chapter 8.4
	iv. the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 7
	v. the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (a) can be reversed; (b) may cause irreplaceable loss of resources; and (c) can be avoided, managed or mitigated;	Chapter 9
	vi. the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Chapter 9
	vii. positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 9
	viii. the possible mitigation measures that could be applied and level of residual risk;	Chapter 9
	ix. if no alternative development locations for the activity were investigated, the motivation for not considering such; and	Not Applicable
	x. a concluding statement indicating the preferred alternative development location within the approved site;	Chapter 5
i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures	Chapter 9
j)	an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated	Chapter 9

k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Chapter 7 & 9
l)	an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Chapter 5 & 9 Appendix 2
m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Chapter 9
n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Chapter 5 & 9
o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Chapter 10
p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Appendix 5-1 to 5-16
q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 13
r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Chapter 4.10
s)	an undertaking under oath or affirmation by the EAP in relation to – (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	Chapter 14
t)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Chapter 12
u)	an indication of any deviation from the approved scoping report, including the plan of study, including– (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	Not Applicable
v)	any specific information that may be required by the competent authority; and	Chapter 1.10
w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not Applicable

1.9 REQUIREMENTS FOR THE ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT (EMPR)

The DEIR Report has been structured in accordance with the requirements as specified in Government Gazette No 38282 dated 04 December 2014, Regulation 982 and includes the Draft Environmental Management Programme Report.

The requirements of a Draft Environmental Management Programme Report (EMPr) are indicated in Table 1-8.

Table 1-8: Requirements for the Environmental Management Programme Report (EMPr)

No	Description	Reference
a)	Details of:	Chapter 1.3

	(i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	
b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 4
c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Chapter 4 Appendix 2
d)	a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including– (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Chapter 8 & 9
e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	Chapter 9 & 10
f)	a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Chapter 10
g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapter 10 & 11
h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	Chapter 10 & 11
i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Chapter 10 & 11
j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Chapter 10 & 11
k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Chapter 10 & 11
l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	Chapter 10 & 11
m)	an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Chapter 10 & 11
n)	any specific information that may be required by the competent authority.	Not Applicable

1.10 COMPETANT AUTHORITY REQUIRMENTS

Table 1-9 provides an indication of where the DMRE's comments have been addressed in the EIA/EMPr.

Table 1-9: Relevant Report Section where DMRE Comments have been Addressed

No	DMRE Comment	Relevant Report Section where comments have been addressed
1	The Department has evaluated the submitted SR and Plan of Study for Environmental Impact Assessment and is satisfied that the documents comply with the minimum requirements of Appendix 2(2) of National Environmental Management Act, 1998 (as amended) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014. The SR is hereby accepted by the Department in terms of regulation 22(a) of the NEMA EIA Regulations, 2014.	The acceptance of the Scoping Report is noted. Refer to Appendix 3 for the acceptance letter.
2	You may proceed with the environmental impact assessment process in accordance with the tasks contemplated in the Plan of Study for Environmental Impact Assessment as required in terms of the NEMA EIA Regulations, 2014.	Noted
3	Please ensure that comments from all relevant stakeholders are submitted to the Department with the Environmental Impact Assessment Report (EIAR). This includes but is not limited to the Provincial Heritage Resources Authority, Provincial Environmental Department, Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS) and the local municipality. Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department.	Comments provided by the stakeholders during the scoping phase has been provided in Stakeholder Engagement Report which is provided in Appendix 4-2. All comments received during the availability of the Draft EIA will be documented and submitted with the Final EIA.
4	In addition, the following amendments and additional information are required for the EIR and EMPr:	
a	Details of the future land use for the site and infrastructure after decommissioning in 20-30 years.	Refer to Appendix 5-9 for the Financial Provisioning for the Rehabilitation and Remediation. Refer to Chapter 12.
b	The total footprint of the proposed development should be indicated.	Refer to Section 4
c	Should a Water Use License be required, proof of application for a license needs to be submitted.	Refer to Chaper 6.5.1 and Appendix 6.
d	Possible impacts and effects of the development on the vegetation ecology with regard to low land highland interface in the locality should be indicated.	Refer to Chapter 9 and Appendix 5-6 Part A & B
e	The impacts of the proposed facility on avifauna and bats must be assessed in the EIA phase.	Refer to Chaper 9 and Appendix 5-6 Part C
f	Possible impacts and effects of the development on the surrounding industrial area.	Not applicable as no industrial area surrounds the Mogalakwena Mine.
g	A construction and operational phase EMP to include mitigation and monitoring measures.	Refer to Chapter 10
h	Should blasting be required, appropriate mitigation measures should be provided.	Refer to Chaper 9 and Appendix 5-4
5	The applicant is hereby reminded to comply with the requirements of regulation 3 of the EIA Regulations, 2014 with regards to the time period allowed for complying with the requirements of the Regulations.	Noted
6	Please ensure that the EIAR includes the A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, have the following attributes: • Maps are relatable to one another. • Co-ordinates. • Legible legends. • Indicate alternatives. • Scale; and • Vegetation types of the study area.	Refer to Appendix 2, 5 and throughout the EIA report.
7	Further, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provisions of any Specific Environmental Management Acts (SEMAs), proof of such application will be required	The application is for a NEMA Scoping and EIA/EMPr amendment and Consolidation as well as a NEM:WA Scoping and EIA/EMPr. Refer to Section 6 of the report.

8	You are requested to submit four (3) hard copies of the EIAR and EMPr and at least one electronic copy (CD/DVD) of the EAR and EMPr to this Regional Office.	Noted
9	Your attention is brought to Section 24F of the NEMA which stipulates "that no activity may commence prior to an environmental authorisation being granted by the competent authority".	Noted

2 REGIONAL SETTING AND LOCALITY

This section describes the regional locality of Mogalakwena Complex as well as a brief history.

2.1 REGIONAL SETTING AND LOCALITY

The Northern Limb of the Bushveld Complex is located in the Limpopo Province of SA. The Northern Limb is approximately 120km in length and a significant source of future platinum production in SA.

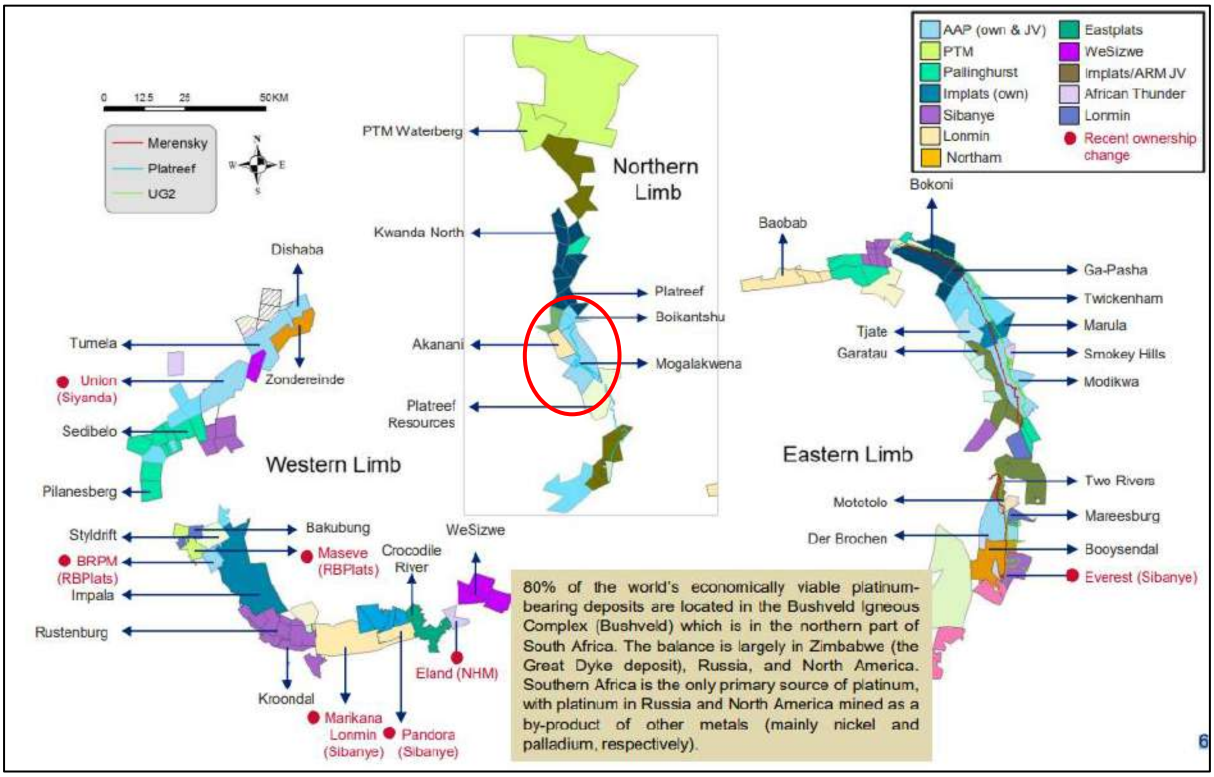

Figure 2-1: South African Geographical PGM Landscape (AAP, 2019)[4]

Table 2-1 indicates the distances to the nearest major towns as measured from the Mogalakwena North Concentrator. MM is located within the Mogalakwena Local Municipal area and within the Waterberg District Municipality.

Table 2-1: Locality of the Mogalakwena Mining Complex in relation to the major towns

Major town	Approximate Distance and Direction to major towns in relation to the project as measured from the North Concentrator Plant
Mokopane	25km in a south-south easterly direction
Polokwane	55km in an easterly direction
Modimolle	93km in a south-westerly direction

[4] *Anglo American Platinum Limited, 2019. The Business of Mining. https://www.angloamericanplatinum.com/~/media/Files/A/Anglo-American-Group/Platinum/investor-presentations/2019/noah-capital-conference-the-business-of-mining.pdf*

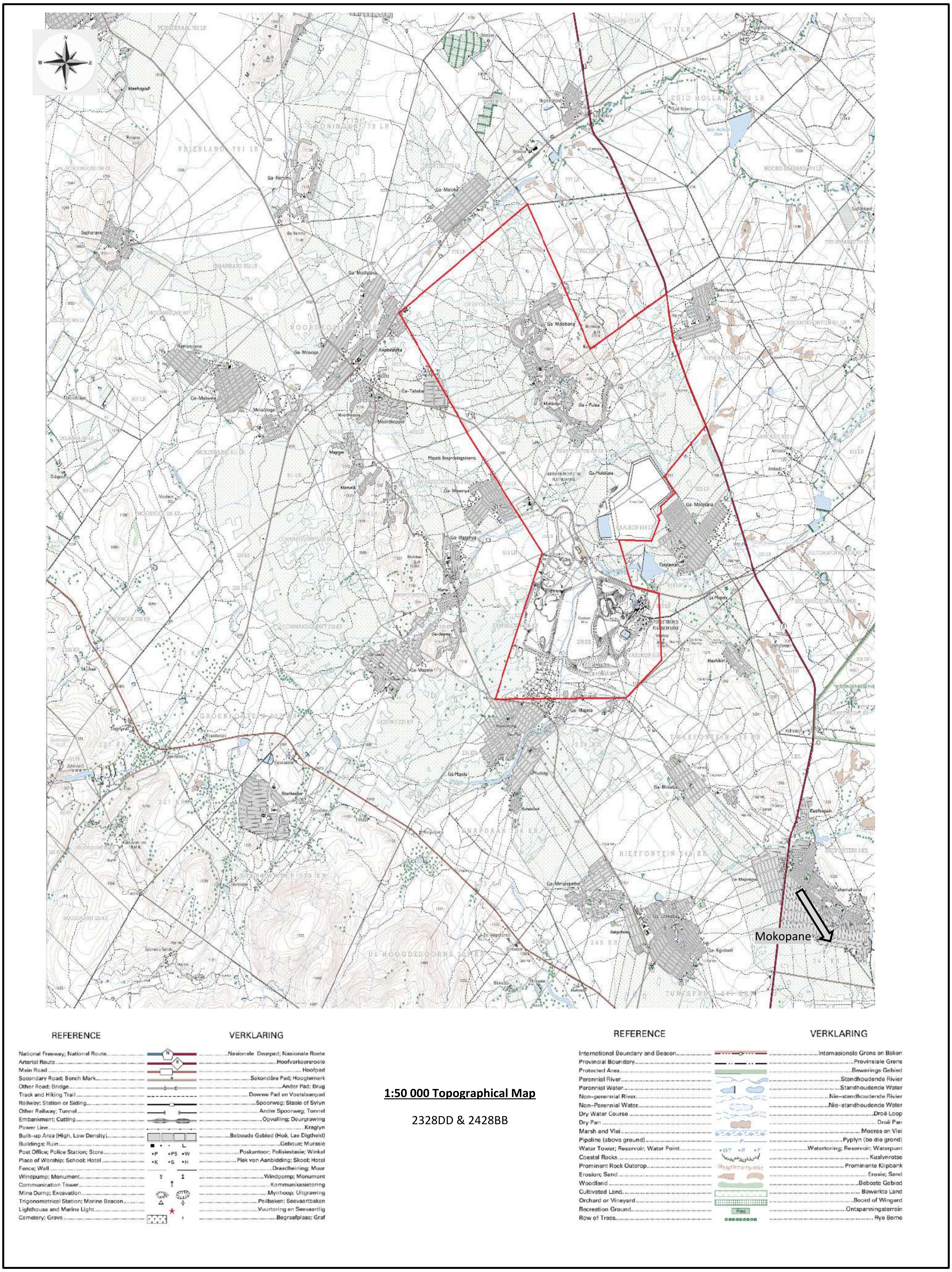

Figure 2-2: Locality Map (1:50 000 Topographical Map – 2428BB & 2328DD):

2.2 BRIEF HISTORY[5]

The earliest recorded prospecting activity commenced on the farms Tweefontein and Sandsloot in 1926. Trenching, drilling and bulk sampling preceded the start of mining activities on the Zwartfontein, Sandsloot and Vaalkop farms. This was accompanied by construction and commissioning of the beneficiation plant.

Mining and production halted following the Great Depression of 1929, with activity on the tenement only resuming in 1968, by Johannesburg Consolidated Investments (JCI), the predecessor entity of Anglo American Platinum. Between 1968 and 1989, building on a comprehensive field mapping and sampling programme, significant volumes of exploration drilling were completed along the strike extent on the northern limb. The results of this exploration allowed for effective target assessment, and vectored focus on the originally identified properties of Sandsloot, Tweefontein, Vaalkop, along with Overysel immediately to the north.

In the late 1980s and early 1990s, evaluation activities which included bulk sampling and underground trial mining were undertaken. The outcome of these activities became key drivers in adopting a high-tonnage, low-grade extractive method of the extraordinarily thick and variable Platreef orebody. Bulk open pit was selected as the preferred mining method, with primary production beginning at Sandsloot in 1992. This was followed by extensive exploration programmes and development of the Zwartfontein pit in the early 2000s.

MM has been operational since 1992. The original EMP was undertaken by Johannesburg Consolidated Investment (JCI) Limited in 1991, mainly in terms of the Environmental Conservation Act (Act no. 73 of 1989) and the Mines and Works Act (Act no. 27 of 1956) AAP then took ownership of Mogalakwena Mine. The Mogalakwena Mine, previously known as Potgietersrus Platinum Limited, changed its name in March 2008 to Mogalakwena Platinum Mine and most recently to Anglo American MM. MM is a wholly owned subsidiary of Anglo American.

Subsequent to the original 1991 EMP, a number of EMP Amendments and Addendums were developed and approved under the Minerals Act, 1991 and the Mineral and Petroleum Resourced Development Act, 2002 (MPRDA) for additional mining and processing activities for areas that were not included in the original EMP. In 2002 the MPRDA was promulgated which required a more comprehensive environmental impact assessment and stakeholder engagement for an EMP or EMP Amendment.

This expansion of the operations continued with exploitation of Central and North pits in 2006 and 2008 respectively, now the primary mining areas of Mogalakwena since 2021.

The MM Right covers an area of 37 211ha. This includes the Central Block and Kwanda North Prospecting Rights that are now incorporated into the Mogalakwena Mining Rights.

The mine is at steady state production and is positioned for optimised organic growth and to deliver maximum value. The mine is also focusing on exceeding industry benchmarks through technology and innovation. MM exploits the Platreef, the primary PGM-bearing horizon developed in the northern limb of the Bushveld Complex.

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[5] *Anglo American Platinum Limited, 2021. Ore Reserves and Mineral Resources Report. https://www.angloamericanplatinum.com/~/media/Files/A/Anglo-American-Group/Platinum/report-archive/2021/ore-reserves-mineral-resources-report.pdf. Date of access: 15 August 2022.*

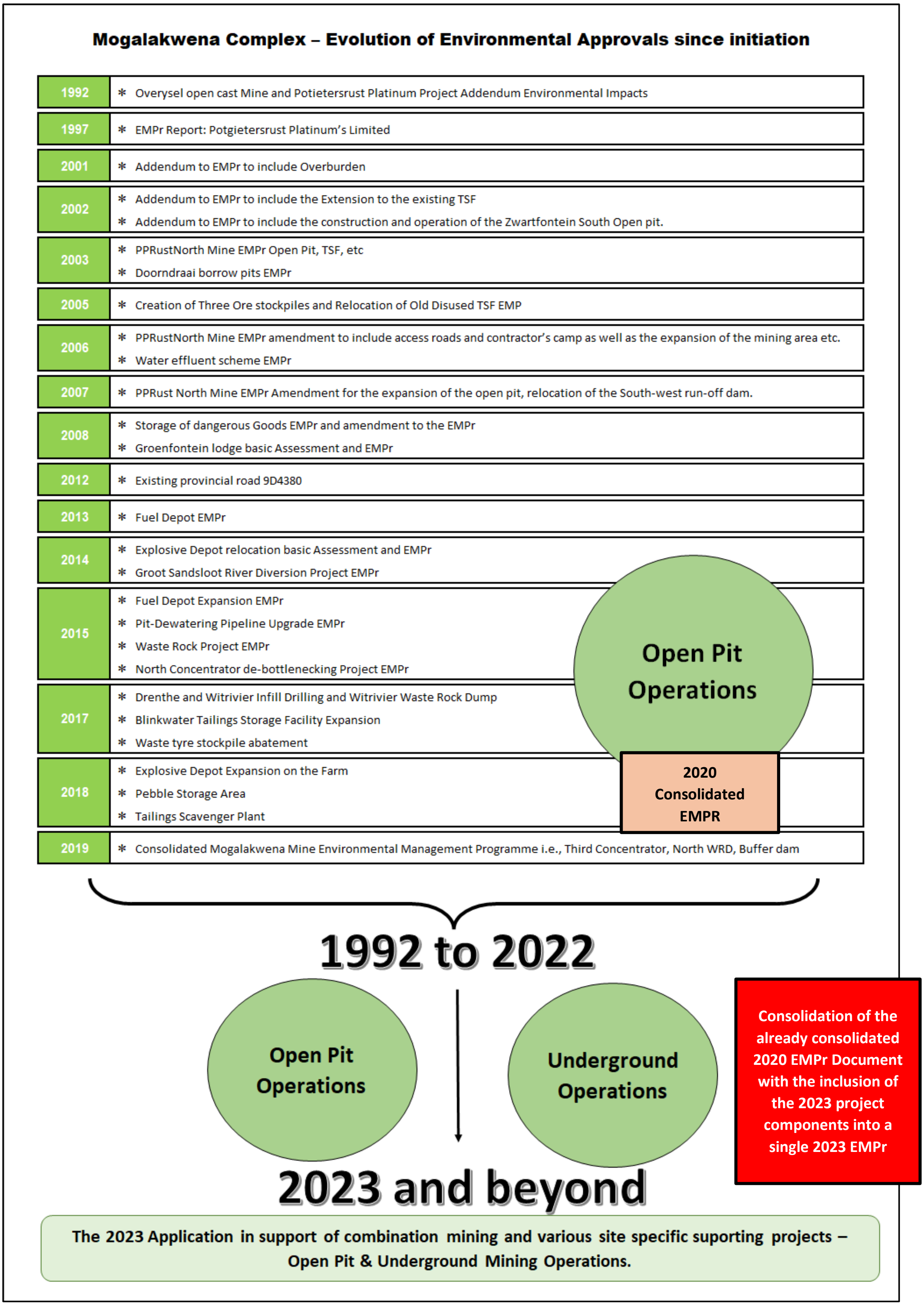

Figure 2-3: Approval Processes to date (Consolidated EMPr)

2.3 MINERAL RIGHTS

The MM Right covers an area of 37 211ha. This includes the Central Block and Kawanda North Prospecting Rights that are now incorporated into the Mogalakwena Mining Rights.

Anglo American Platinum holds a converted Mining Right under the Department of Mineral Resources and Energy (DMRE) ref LP 50 MR, valid from 23 July 2010 to 22 July 2040.

Table 2-2: Mineral Rights Property Description

21 Digit Surveyor General Code for each farm portion	Drenthe 778 LR	T0LR00000000077800000
	Gillimberg 861 LR	T0LR00000000086100000
	Overysel 815 LR*	T0LR00000000081500000
	Zwartfontein 818 LR*	T0LR00000000081400000
	Blinkwater 820 LR*	T0LR00000000820000000
	Sandsloot 236 KR*	T0KR00000000023600000
	Vaalkop 819 LR*	T0LR00000000819000000
	Knapdaar 234 KR	T0KR00000000023400000
	Tweefontein 238 KR	T0KR00000000023800000
	Rietfontein 240 KR	T0KR00000000024000000

**Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela and Mokopane Traditional Authorities (TAs).*

2.4 SURFACE LEASE AREA / SURFACE RIGHTS AREA

The Mogalakwena Mine holds the surface ownership to the following properties:

Table 2-3: Surface Rights Property Details

21 Digit Surveyor General Code for each farm portion	Armoede 823 LR	T0LR00000000823000000

The Mogalakwena Surface Lease area covers the following properties:

Table 2-4: Surface Lease Area Property Description

21 Digit Surveyor General Code for each farm portion	Blinkwater 820 LR	T0LR00000000820000000
	Sandsloot 236 KR	T0KR00000000023600000
	Overysel 815 LR	T0LR00000000081500000
	Zwartfontein 818 LR	T0LR00000000081400000
	Vaalkop 819 LR	T0LR00000000819000000

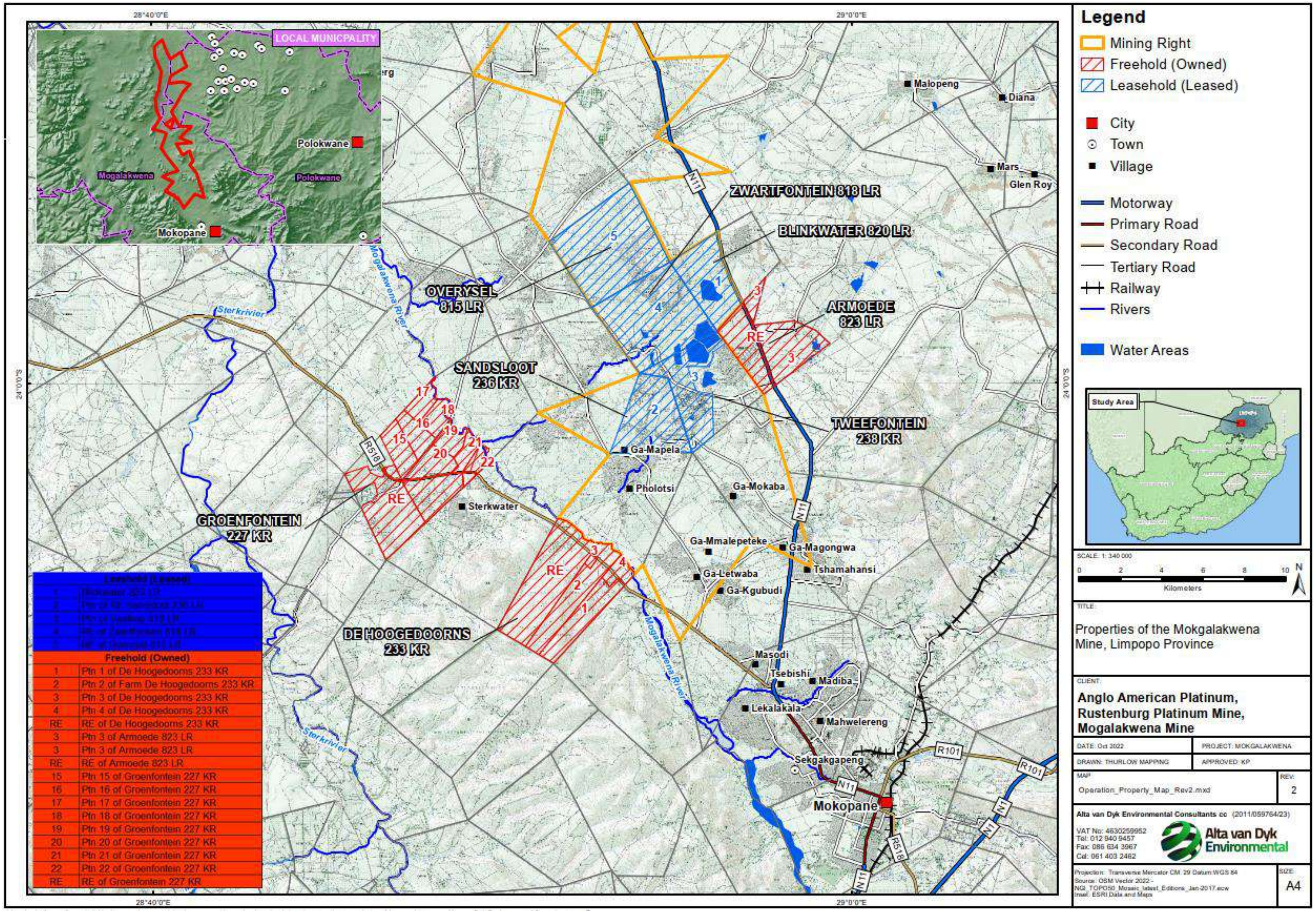

Figure 2-4: Surface and Mineral Rights Area (AAP, 2022)

2.4.1 Properties associated with the Wellfields[6]

MM currently operates three wellfields (PPL, Blinkwater and Commandodrift wellfields) to obtain potable water for use on the mine. The PPL wellfield abstraction boreholes fall within the mining lease area of MM.

The Commandodrift wellfield (located on the farms Commando Drift 228 KR, Molendraai 811 LR, and Moordkopje 813 LR) and the abstraction boreholes of the Blinkwater wellfield (located on the farm Rietfontein 240 KR and Blinkwater 244 KR) are located outside the mining lease area of Mogalakwena Mine.

Table 2-5: Wellfield Property Information

Farm Name	Wellfield	Owner
Rietfontein 240 KR	Blinkwater	National Government of the Republic of South Africa
Molendraai 811 LR	Commandodrift	
Moordkopje 813 LR		
Commandodrift 228 KR		

2.4.2 Groenfontein Farm

MM's Groenfontein farm is home to the mine sponsored Agricultural Incubator and Environmental training centre. The training centre focuses on surrounding villages and offers courses in permaculture and cattle management to neighbouring communities. The farm is supported by a multi-purpose environmental training centre that is also used to host external events and an eco-schools programme. For the youth, it offers a sustainable development course linked to the international eco-school's programme. Building on the success of the training centre, an agricultural incubator was established on Groenfontein farm in October 2014. The incubator offers a combination of farming education, hands-on training and infrastructure to help farmers launch new agricultural businesses on their own or communal land. The Incubator focuses on the development of black owned agricultural businesses and also assists these businesses with access to markets.

Table 2-6: Groenfontein Property Information (SRK, 2019)

Farm Name	Portion Number	Owner
Groenfontein 227 KR	Ptn 3	Rustenburg Platinum Mines Ltd

2.5 DEVELOPMENT SETBACK LINE

The Development setback means a setback line defined or adopted by the competent authority and the Development site means the boundary and extent of development works and infrastructure.

The Mineral Rights Area (Mining Rights boundary indicated in yellow below) for the MM is defined as the Development Setback Line. The Development Setback Line is indicated in Figure 2-5 .

[6] *SRK, 2019. Mogalakwena Mine Expansion Project. Environmental Impact Assessment Report and Amended Environmental Management Programme Report. LP30/5/1/2/2/50 MR.*

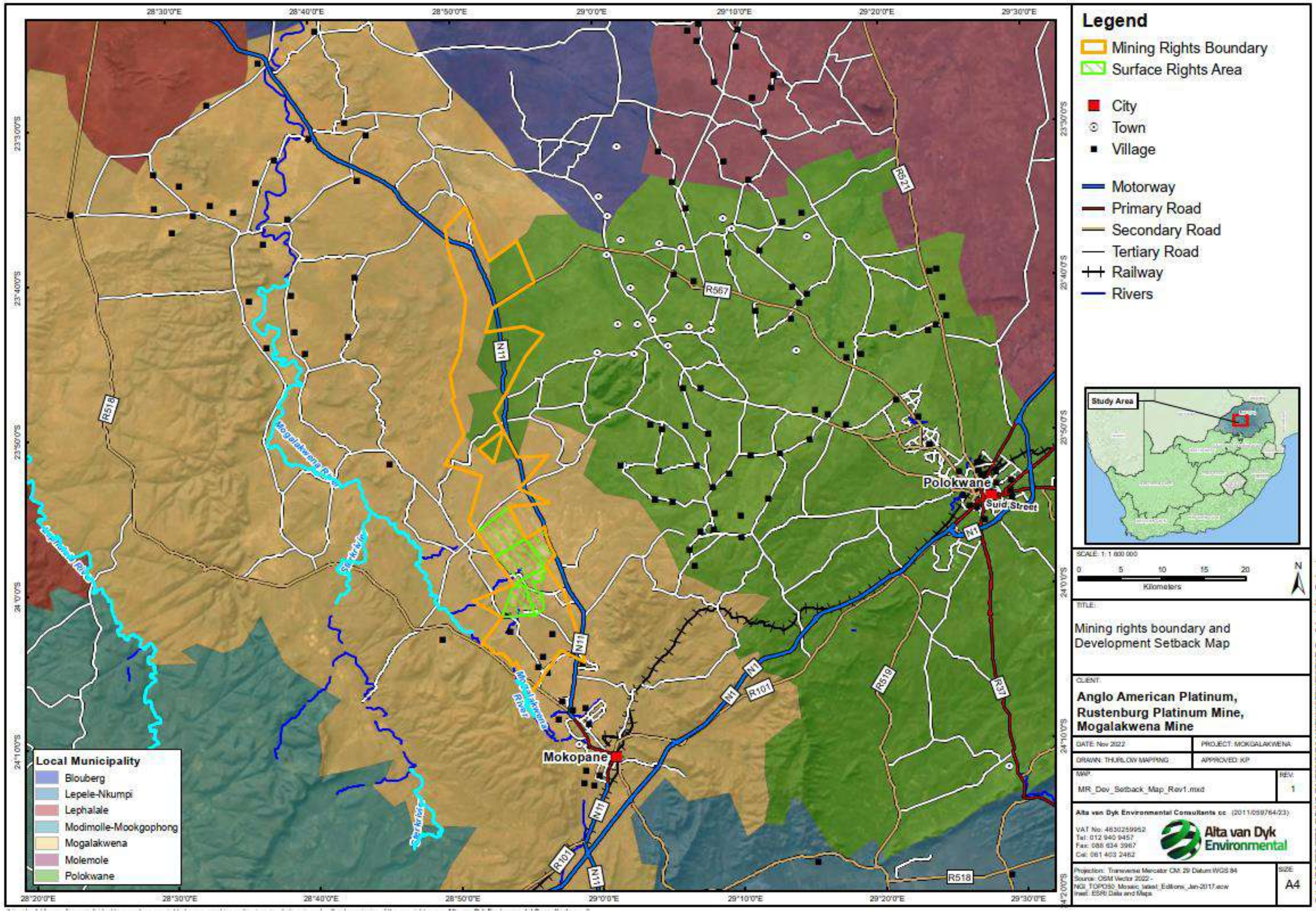

Figure 2-5: Development Setback Line / Mineral Rights Area

MOGALAKWENA COMPLEX

EXISTING OPERATIONS

3 EXISTING OPEN PIT OPERATIONS AND ASSOCIATED INFRASTRUCTURE APPROVALS

3.1 ACCESS TO THE MOGALAKWENA MINE COMPLEX

The MM lease area covers approximately 51.05 km^2 and stretches over approximately 8 km from east to west and approximately 13 km from north to south and has been operational since 1993. To the east of MM lies the National N11 highway.

Main access to MM is via the N11 district road which passes the mine approximately 5km to the east. Access to the mine was approved as part of the 1996 EMPr[7].

The access road from the Bakenberg Road crosses the Mohlosane River for which approval of a bridge was granted in 2017. Details of this approval is provided in Table 3-1 and Figure 3-1.

Table 3-1: Mohlosane Bridge River Crossing[8]

Component	Extent	Co-ordinates	
Mohlosane Bridge	5,025 Ha Length – 3,35km	23^{0}59’09.21 S	28^{0}53’58.93 E
		23^{0}59’59.366 S	28^{0}57’44.771 E
		24^{0}3’46.1 S	28^{0}58’27.539 E

Note

This 2017 Environmental Authorisation for the Mohlosane Bridge allows for the approval of the following listed activities in terms of EIA Regulations R. 983 of 2014.:

- Activity 12(iii) – Any activity including the development of bridges exceeding 100 square metres in size.
- Activity 56 – Activity that include the widening of a road by more than 6 metres or lengthening of a road by more than 1 kilometre – (i) Where the existing reserve is wider than 13,5 metres, or (ii) Where no reserve exist, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.

Figure 3-1: Mohlosane Bridge Crossing

In addition to the above, MM holds multiple internal roads for the successful operation of all activities on site.

[7] *SRK, 1996. Potgietersrust Platinums Limited. Environmental management Programme Report. Report No 223405.*
[8] *Department of Mineral Resources, 2017. Environmental Authorisation. Reference LP30/5/1/2/3/2/1/(050) EM.*

3.2 MINING

Mining of the orebody is currently by open pit methods whereby material is extracted (drill, blast, load, and haul) in vertical benches to create a large open excavation. Benches are mined from top to bottom and are accessed by means of haul roads in the hanging and footwall to connect multiple benches to surface entry and exit points.

Material is moved by means of truck and shovel to the processing plants, stockpiles, and waste rock dumps along a network of constructed surface roadways. These haul roads are gravel and are sprayed with a commercial dust suppressant according to a detailed schedule.

The walls of an open pit excavation are mined at the maximum allowable slope angle achievable within the specified geotechnical constraints, and berm-offsets are created between benches to reduce the potential risk of rock falls along the overall slope. The final shape of the excavation is determined by the overall economics of the exploitation process and is generally subdivided into three-dimensional phases expanding the open pit to maximise the potential net present value of the mine within specified constraints.

Current mining areas comprise five open pits: Sandsloot, Zwartfontein, Mogalakwena South, North, and Central. Pit depths vary from 30m to 260m.[9][10]. The Sandsloot River has been diverted around the Sandsloot Pit so as to allow for the development of the Sandsloot Pit[11].

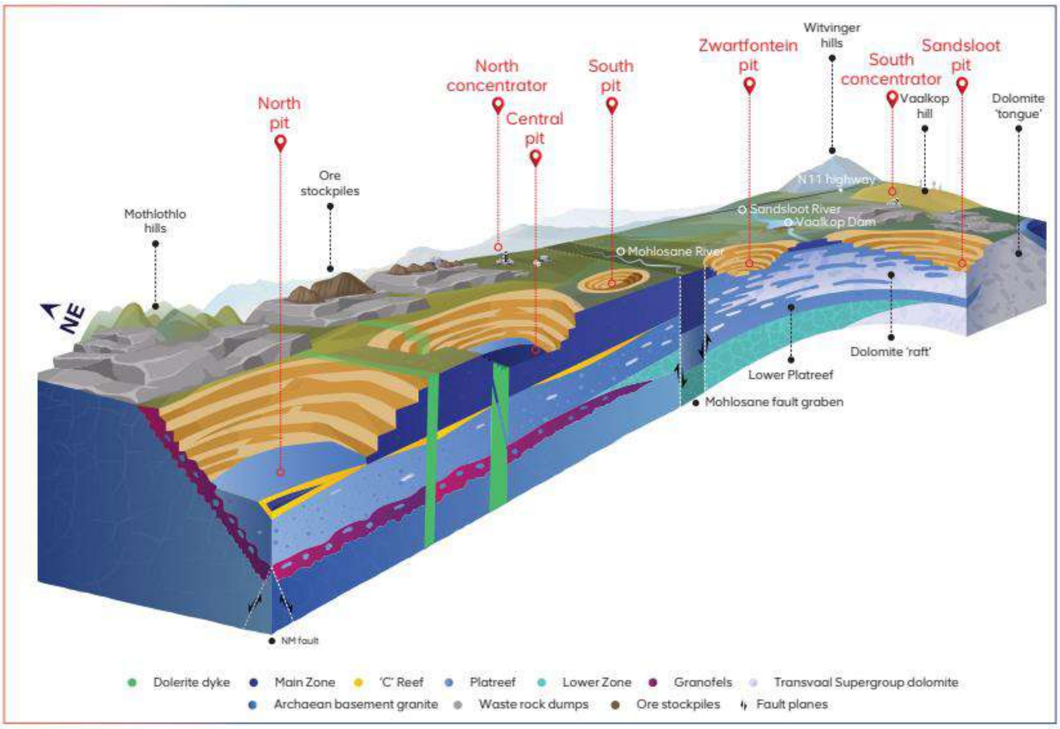

Figure 3-2: Schematic Diagram of the Bushveld Complex in MM Complex Area (Northern Limb) (James Winch, 2021.

Mining allows for the development of the North, South and Central Pits into a single large pit (Super Pit) as per Figure 3-4.

[9] *Department: Minerals and Energy, 2003. Approval of Addendum to the Environmental Management Programme submitted in terms of Section 39 of the Minerals act, 1991 (Act 50 of 1991) for Potgietersrus North Mine, Potgietersrus Platinum Mine. Reference 6/2/2/160.*

[10] *Department: Minerals and Energy, 2002. Approval of the Environmental Management Programme submitted in terms of Section 39 of the Minerals Act, 1991 (Act 50 of 1991), for the Zwartfontein South Project at Potgietersrus Platinum Limited (PPRUST), Reference: 6/2/2/160.*

[11] *Limpopo Provincial Government, 2013. Environmental Authorisation for the proposed diversion of Groot Sandsloot River at Anglo American Mogalakwena Mine on the Farm Sandsloot 236 KR within Mogalakwena Local Municipality of Waterberg District. Reference: 12/1/9/3-W12.*

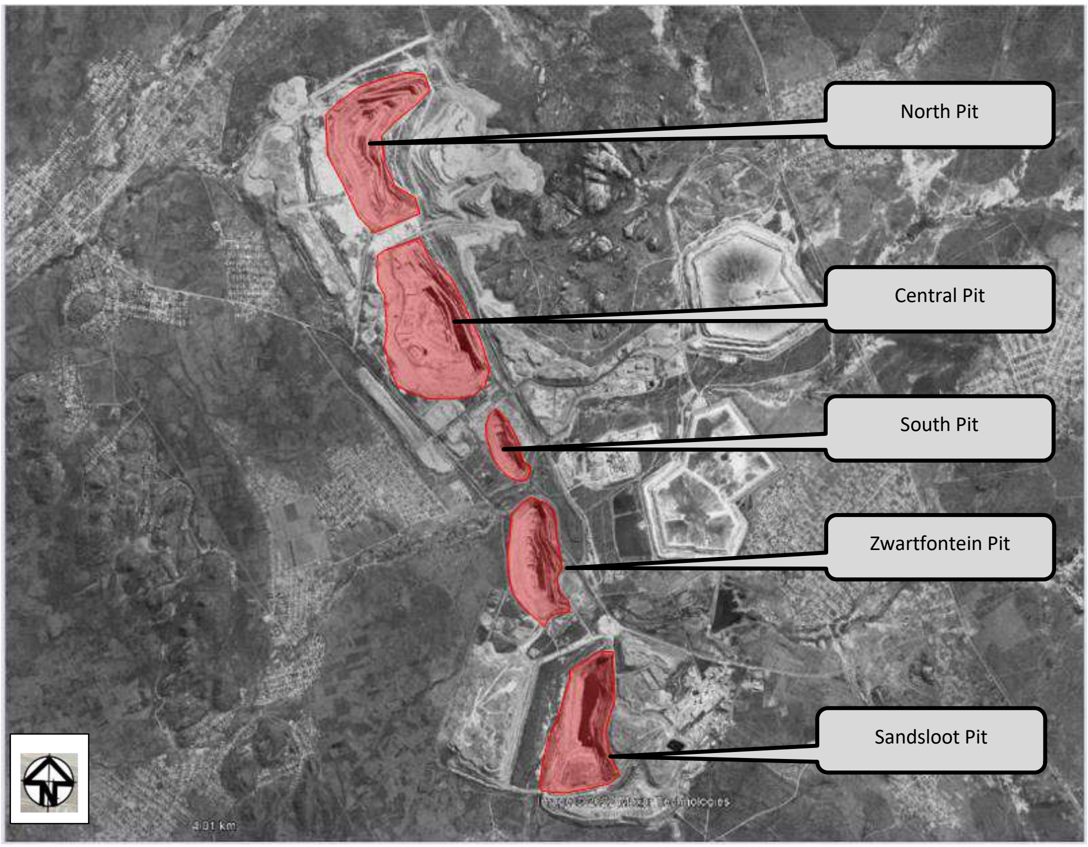

Figure 3-3: Existing Open Pit Mining Operations at Mogalakwena Complex

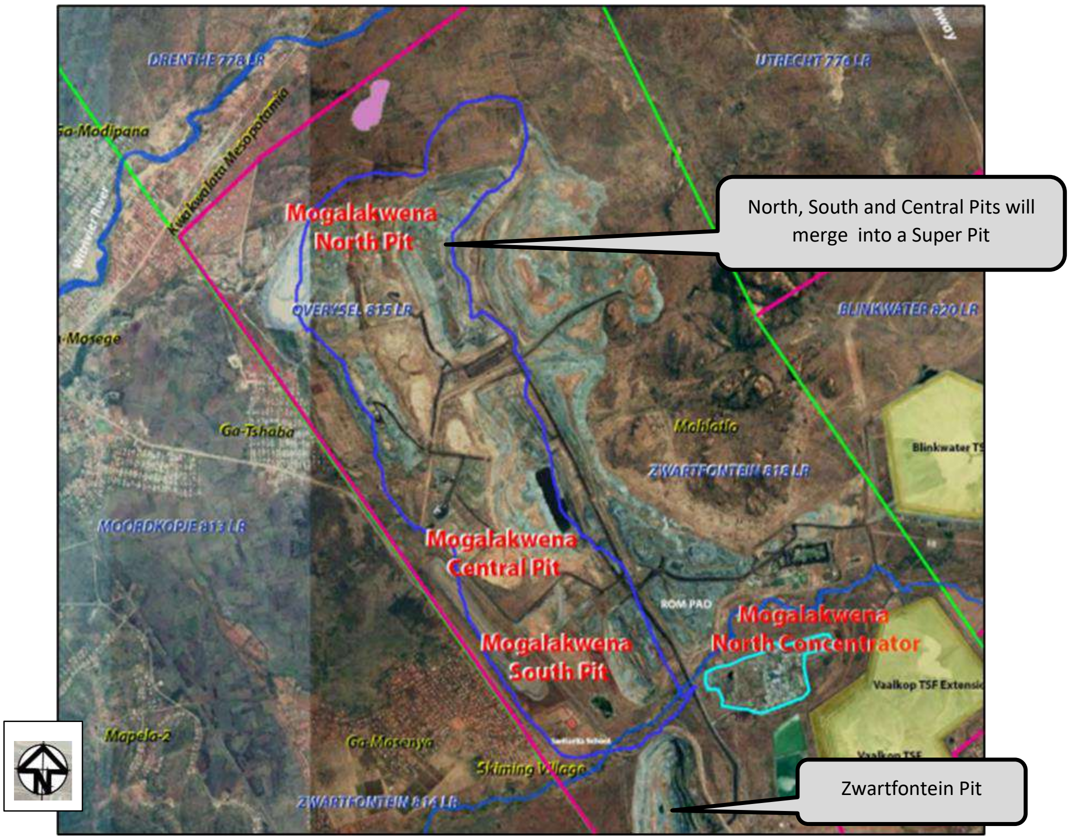

Figure 3-4: Development of the Super Pit (AAP, 2020)

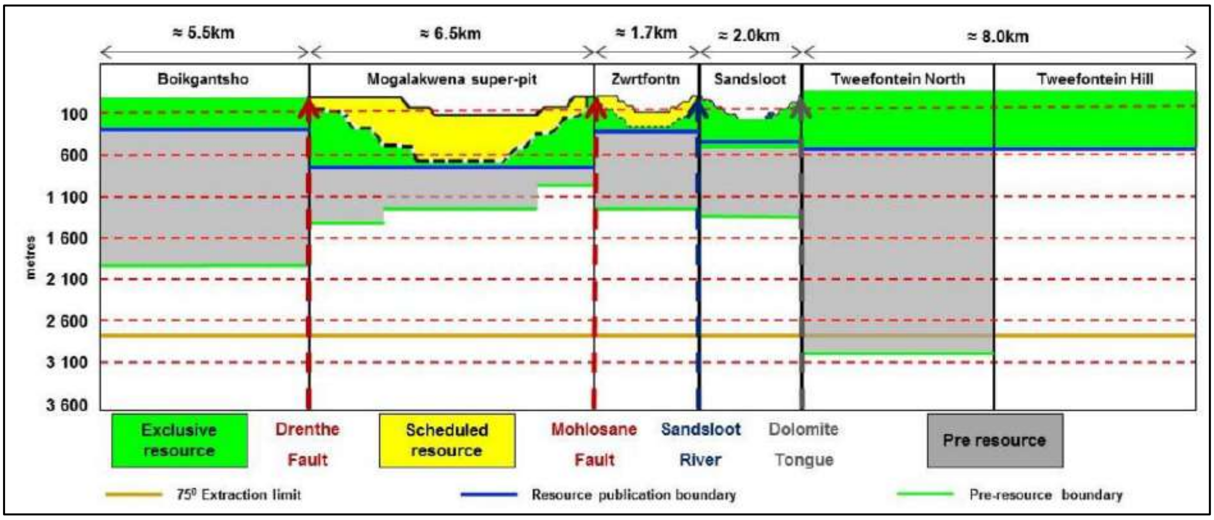

Figure 3-5: Resource Endowment (AAP, 2016)[12]

Waste rock from the open pit areas is placed in proximity to the open pit activities in dedicated Waste Rock Disposal Facilities. With the exception of Zwartfontein and Sandsloot Pits (which will be utilised for anthropogenic aquifer development), the open pits at MM Complex will remain at closure as final voids.

Table 3-2 provides for the total tonnes mined for the MM Complex for the period 2018 to 2022.

Table 3-2: Operational metrics

Metrics	2022	2021	2020	2019	2018
Total tonnes mined	84,674 kt	86, 801 kt	80,870 kt	81,315 kt	89,062 kt
Ore tonnes mined	16,101 kt	11,950 kt	14,050 kt	14,282 kt	18,060 kt
Waste	68,572 kt	74,851 kt	66,821 kt	67,033 kt	71,002 kt
Tonnes milled	13,682 kt	14,203 kt	13,531 kt	13,710 kt	13,775 kt
Stripping / waste ratio	4.3	6.3	4.8	4.7	3.9

3.3 PROCESSING

Prior to processing, bulk ore sorting is used to significantly reduce energy and water consumption on mine through unlocking production capacity through early rejection of waste or unwanted material, thereby increasing the grade of the ore and reducing the volume that is transported to the processing plant or concentrator. The Bulk ore sorter uses composition-sensing technology to detect the concentration of elements of interest, as well as the amount of waste in the material being transported for processing. This reduces overall cost per tonne produced along with a decrease in wet tailings volumes, water consumption and energy use.

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[12] *Anglo American Platinum Limited, 2016. Anglo American Platinum: Mogalakwena Mine Site Visit https://www.angloamericanplatinum.com/~/media/Files/A/Anglo-American-Group/Platinum/investor-presentations/2016/investors-day-ver29.pdf*

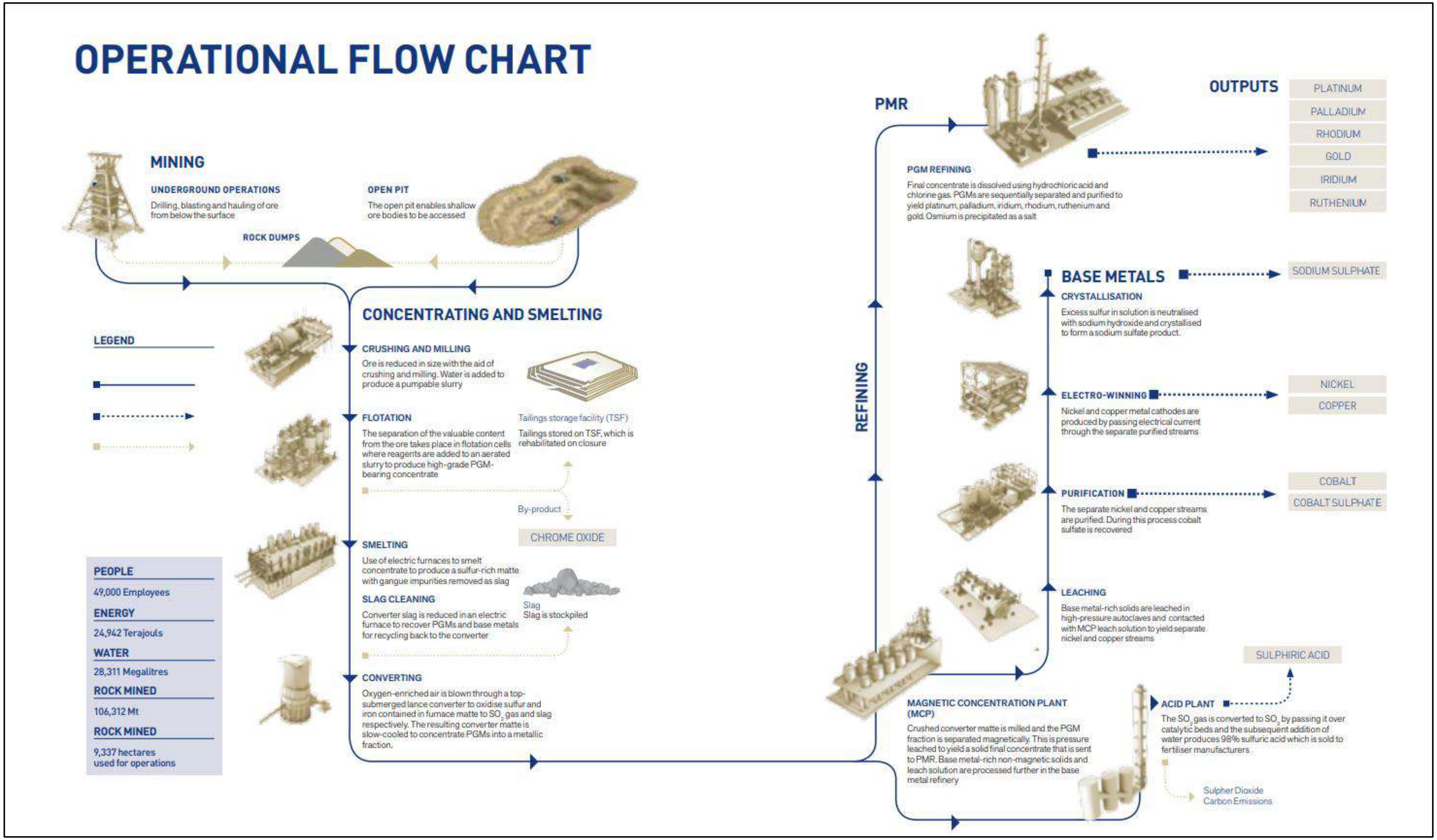

Figure 3-6: Operational Flow Chart (AAP, 2021)

The mine is currently processing, on average 13 Mtpa (based on 2018 and 2019 figures) through the existing North and South concentrators. The South Concentrator (MSC), with a current milling capacity of 4.2 Mtpa, may be considered for decommissioning once the Third Concentrator (M3C)[13] is commissioned in 2030. With the M3C, Mogalakwena Complex will reach a milling capacity of 21.3 Mtpa. Approval for the construction of the M3C was granted in 2021. The M3C will have a milling capacity of 12 Mtpa whilst the North Concentrator will be maintained at 9.3 Mtpa.

The Operational Flow Chart supporting both mining and processing is indicated in Figure 3-6. The processing activities at the Mogalakwena Complex is briefly discussed within this section. Some ore is also processed at the Sibanye-Stillwater Baobab Concentrator which is located approximately 90km offsite. The Platinum Group Metals (PGMs) are extracted from the ore in the form of a concentrate that is transported to the AAP Polokwane Smelter for smelting to produce furnace matte. The matte then undergoes an acid converting process at the Waterval Smelter Complex in Rustenburg, where after it is initially refined at the Base Metals Refinery (BMR) and refined to final product at the Precious Metals Refinery (PMR).

3.3.1 Flotation

The separation of the valuable content from the ore takes place in flotation cells where reagents are added to an aerated slurry to produce high-grade PGM-bearing concentrate.

3.3.2 Smelting

Use of electric furnaces to smelt concentrate to produce a sulfur-rich matte with gangue impurities removed as slag.

3.3.3 Slag Cleaning

Converted slag is reduced in an electric furnace to recover PGMs and base metals for recycling back to the converter.

3.3.4 Converting

Oxygen-enriched air is blown through a top submerged lance converter to oxidise sulfur and iron contained in furnace matte to SO2 gas and slag respectively. The resulting converter matte is slow-cooled to concentrate PGMs into metallic fraction.

3.3.5 Magnetic Concentration Plant (MCP)

Crushed converter matte is milled and the PGM fraction is separated magnetically. This is pressure leached to yield a solid final concentrate that is sent to PMR. Base metal-rich non-magnetic solids and leach solution are processed further in the base metal refinery.

3.3.6 Acid Plant

The SO_2 gas is converted to SO_3 by passing it over catalytic beds and the subsequent addition of water produces 98% sulfuric acid which is sold to fertiliser manufacturers.

3.3.7 Leaching

Base metal-rich solids are leached in high-pressure autoclaves and contact with MCP leach solution to yield separate nickel and copper streams.

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[13] *Department of Mineral Resources and Energy, 2020. Integrated Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as Amended (NEMA) and National Environmental Management: Waste Act, 2008 (Act 59 of 2008) as Amended (NEMWA), and the Environmental Impact Assessment (EIA) Regulations, 2014 for the Expansion of the existing mine operations and the additional infrastructure to improve production capacity on the remaining Extent of Portion 0 of the Farm Blinkwater 820 LR and Portions 0 of the Farms Overysel 815 LR, Zwartfontein 818 LR, Vaalkop 819 LR and Sandsloot 236 KR, situated within Mogalakwena Local Municipality in the Magisterial District of Waterberg: Limpopo Region. Reference LP/30/5/1/2/3/2/1(050)EM.*

3.3.8 Purification

The separate nickel and copper streams are purified. During this process cobalt sulfate is recovered.

3.3.9 Electro-winning

Nickel and copper metal cathodes are produced by passing electrical current through the separate purified stream.

3.3.10 Crystallisation

Excess sulfur in solution is neutralised with sodium hydroxide and crystallised to form a sodium sulfate product.

3.3.11 PGM Refining

Final concentrate is dissolved using hydrochloric acid and chlorine gas. PGMs are sequentially separated and purified to yield platinum, palladium, iridium, rhodium, ruthenium, and gold. Osmium is precipitated as a salt.

Figure 3-7: Locality of the Three Concentrator Plants at the Mogalakwena Complex. The Third Concentrator still need to be constructed.

3.4 WATER SUPPLY

3.4.1 Potable Water Supply

Potable water is obtained from the Commandodrift (currently not in use), Potgietersrust Platinum Limited (PPL) (1.95 ML/d) and Blinkwater (0.8 ML/d) wellfields, totalling a permissible abstraction volume of 2.75 ML/d. The abstraction of groundwater at these wellfields has been authorised by the Department of Water and Sanitation (DWS) under Mogalakwena Complex's Water Use Licence (WUL) (reference number 27059655).

Additional boreholes situated on the mine site have been authorised for abstraction and potable water use under the new WUL (No. 14/A61G/GICABJ/5053). These boreholes are in addition to the wellfield boreholes that are authorised under the original WUL.

Majority of the wellfield water is used for domestic purposes and only a small percentage is used in the process at Mogalakwena South Concentrator as a back-up supply. The locality of the wellfields is indicated in Figure 3-8.

Potable water treatment is limited to softening into two softeners each with a capacity of 70 m^3/hr to a maximum of 80 m^3/hr. Softening involves the addition of sodium chloride and subsequent ion exchange. The water softening tanks are located within the plant area.

The current concentrators are the net consumers of water i.e., requires fresh water source as top-up water due to the requirement for high quality water for reagent make-up, have inherent losses across the Tailings Storage Facilities (TSFs) resulting mainly from evaporation and interstitial lock-up, evaporation from the concentrator unit processes (mills, floatation cells, thickeners etc), and the requirement for potable water for human consumption and ablutions.

The Third Concentrator (M3C) (not yet constructed) has been designed to receive 100% of the recovered water from the TSFs in an effort to reduce the consumption of imported potable water as far as possible.

Numerous potable water pipelines are located within the mine complex for the distribution of potable water to the various operational areas.

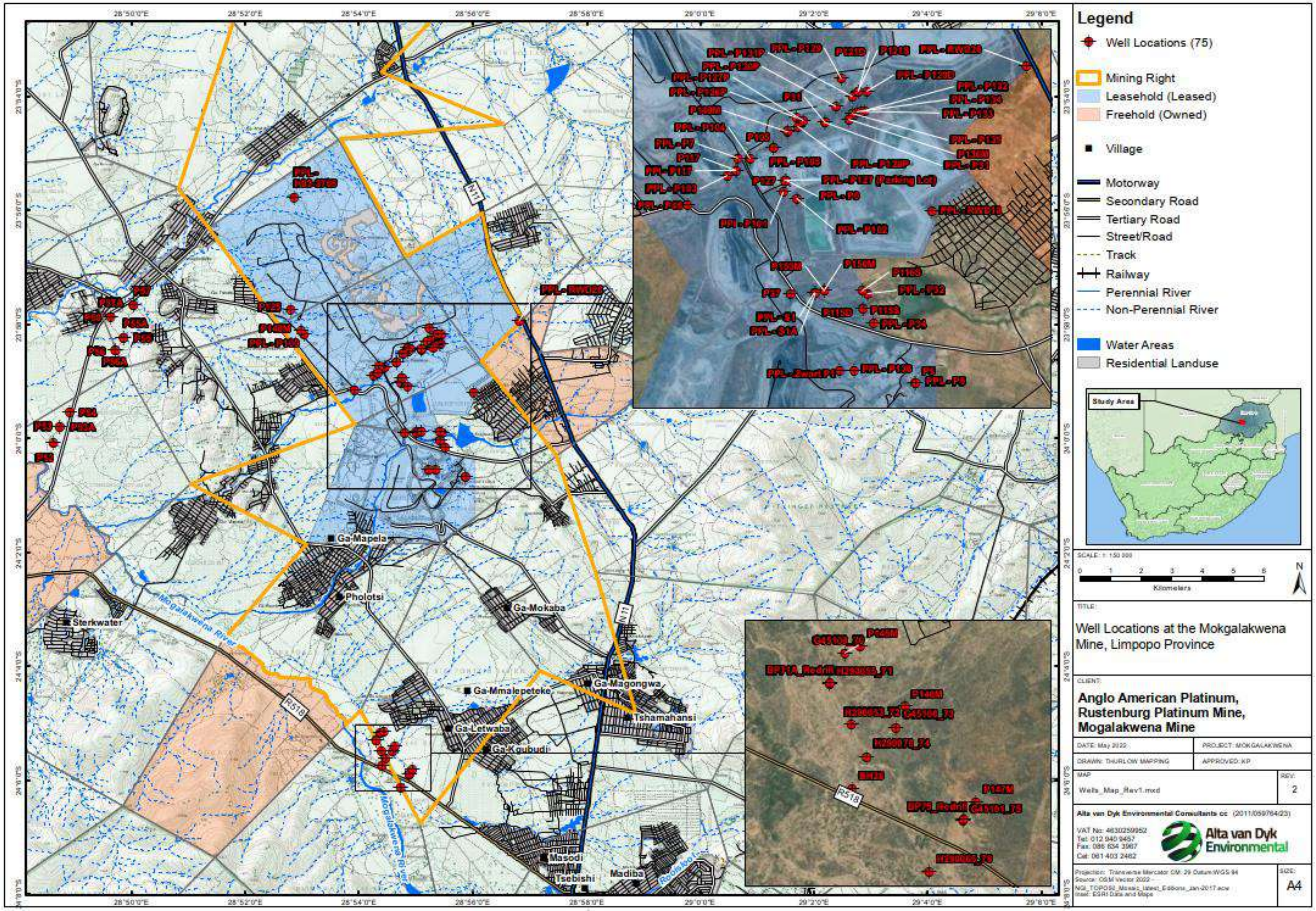

Figure 3-8: Potable Water Wellfields (Delta-H, 2022)

3.4.2 Process Water

The consumption of process water (in order of highest to lowest) is summarised as follows:

- Mill circuit dilution water;
- General dilution water across the concentrator;
- Spray water from screens and flotation cell launders;
- Flushing and hosing water; and
- General sump top-up water.

Process water is obtained from:

- Treated sewage effluent (TSE) from the Mogalakwena North and South Concentrator Waste Water Treatment Works (WWTWs) and the contractors camp WWTW;
- Off-site Infrastructure - Mokopane (up to 6 Mℓ/d is authorized) and Polokwane (up to 20 Mℓ/d is authorized) municipal Treated Sewage Effluent (TSE). The pipeline routes are indicated in Figure 3-9 and Figure 3-10;
    - Mokopane Waste Water Treatment Works
        - WUL Number 16/2/7/A600/D3/X/1 dated 25 April 2003 issued to Mogalakwena Municipality allowing for the provision of the Treated Sewage Effluent to Mogalakwena Mine.
    - The TSE is pumped to Dam 1160, via a pipeline system.
- Fissure water and rainwater collected from active pit dewatering authorised through the current WUL;
    - A pipeline system has been constructed to transfer excess water from the opencast pits to Dam 1160 and the Tailings Storage Facilities Return Water Dams and RWD extension. Refer to Table 3-4 for the pipeline details.
- Return water from the TSFs which are collected within the Return Water Dams (RWD's);
    - The return water from the TSF's is returned to the concentrator for use as top-up water.
    - The quality of the return water from the Blinkwater and Vaalkop TSF's in terms of water chemistry and suspended solids renders the water adequate for most services that are supplied the process water inventory at the concentrator.

Contaminated stormwater runoff collected from various on-mine areas in dirty water containment facilities i.e., stormwater dams and sumps. Refer to Table 3-5 for the details with regards to all containment facilities on site also authorised through the current WUL.

Figure 3-9: Treated Sewage Effluent Pipeline Route from Polokwane WWTW to Dam 1160 on mine (Pipeline in white)

Figure 3-10: Treated Sewage Effluent Pipeline Route from Mokopane WWTW to Dam 1160 on mine (SMEC, 2020) (Pipeline in green)

Process water is stored in the following facilities:

Table 3-3: Process Water Storage Facilities

Facility	Capacity	Coordinates
TK17	10 000 m^3	
TK16/25 Closed Tank	5 000 m^3	23^{0}59'35.95" S 28^{0}54'58.15" E
Dam 1160[14] Rockfill Storage Dam	310 ML (excluding 1 m freeboard)	24^{0}00'55.80" S 28^{0}55'25.58" E

Note:

The 17 km above ground pipeline with a diameter of 450mm and a pumping capacity of 1000 litres per second, constructed in support of transferring water from the open pits were approved on 9 March 2015[15] in terms of EIA Regulations R.544 of 2010, as follows:

- *Activity 9 – The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or stormwater with an internal diameter of 0,36 metres or more, or with a peak throughput of 120 litres per second or more, excluding where such facilities or infrastructure are for the bulk transportation of water, sewage or storm water drainage inside a road reserve, or where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.*

This pipeline runs parallel with the existing service roads and haul roads and cross the Sandsloot River on existing roads and culverts protected by earth berms.

Table 3-4: Transfer Pipeline - transferring water from the open pits to existing storage dam (Dewatering Pipeline)[16]

Anglo American Platinum Limited –MM Pit Dewatering Pipeline				
Alternative S1	Point	Distance (m) between points	Coordinates	
			Latitude (S)	Longitude (E)
Portion 0 of the farm Sandsloot 238 KR	Starting Point – A	0	24° 0' 62.085"	28° 55'23 944."
	Point-B	250	24° 0' 47.656"	28° 55' 19.667"
	Point-D	750	24° 0' 57.972"	28° 55' 7.675"
	Point-E	100	24° 0' 56.977"	28° 55' 6.643."
	Point-G	1600	24° 1' 6.316"	28°54' 55.919"
	Point-L	2760	24° 0' 34.535"	28° 54' 57.225"
	Point-P	3760	24° 0' 15.069"	28° 54' 55.192"
	Point-Q	4000	24° 0' 7.669"	28° 54' 45.99"
	Point-R	4250	24° 0' 8.958"	28° 54' 45.429"
	Point-V	4750	23° 59' 47.341"	28° 54' 30.198"
	Point-W	5000	23° 59' 41.292"	28° 54' 28.677"
	Point-X	5250	23° 59' 39.834"	28° 54' 29.584"
	Point-Z	5750	23° 59' 30.375"	28° 54' 29.676"
	Point-AA	6000	23° 59' 25.66"	28° 54' 40.539"
	Point-AB	6250	23° 59' 15.627"	28° 54' 39.87"
	Point-AC	6500	23° 59' 8.996"	28° 54' 34.771"
	Point-AD	6750	23° 59' 2.69"	28° 54' 30.532"
	Point-AE	7000	23° 58' 55.626"	28° 54' 28.581"
	Point-AF	7250	23° 58' 47.869"	28° 54' 22.923"
	Point-AG	7500	23° 58' 39.394"	28° 54' 18.16"
	Point-AH	7750	23° 58' 37.421"	28° 54' 20.341"
	Point-AI	8000	23° 58' 30.761"	28° 54' 15.21"
	Point-AJ	8250	23° 58' 23.755"	28° 54' 10.463"
	Point-AK	8500	23° 58' 17.114"	28° 54' 5.766"
	Point-AL	8750	23° 58' 0.762"	28° 54' 1.442"
	Point-AM	9000	23° 58' 1.795"	28° 54' 57.983"
	Point-AN	9250	23° 57' 54.486"	28° 53' 54.022"

[14] *Design Report and Drawing SRK 238126/3.*

[15] *Department of Economic Development, Environment and Tourism, 2015. Erratum: Environmental Authorisation for the proposed construction of a 17km pipeline at Mogalakwena Mine on Portion 0 of the farm Sandsloot 236 KR within Mogalakwena Local municipality of Waterberg District. Reference 12/1/9/1-W92.*

[16] *Department of Economic Development, Environment and Tourism, 2014. Erratum: Environmental Authorisation for the proposed construction of a 17km pipeline at Mogalakwena Mine on Portion 0 of the farm Sandsloot 236 KR within Mogalakwena Local municipality of Waterberg District. Reference 12/1/9/1-W92.*

Anglo American Platinum Limited –MM Pit Dewatering Pipeline				
Alternative S1	**Point**	**Distance (m) between points**	**Coordinates**	
			Latitude (S)	**Longitude (E)**
	Point-AO	9500	23° 57' 47.2''	28° 53' 50.316''
	Point-AP	9750	23° 57' 39.952''	28° 53' 46.383''
	Point-AQ	10000	23° 57' 32.512''	28° 53' 42.343''
	Point-AR	10250	23° 57' 25.699''	28° 53' 38.524''
	Point-AS	10500	23° 57' 18.358''	28° 53' 34.135''
	Point-AT	10750	23° 57' 11.398''	28° 53' 29.505''
	Point-AU	11000	23° 57' 4.565.''	28° 53' 25.156''
	Point-AV	11250	23° 57' 57.014''	28° 53' 21.044''
	Point-AW	11500	23° 57' 50.251''	28° 53' 17.633''
	Point-AX	11750	23° 57' 51.439''	28° 53' 17.732''
	Point-AY	12000	23° 57' 46.363''	28° 53' 9.789''
	Point-AZ	12250	23° 57' 36.886''	28° 53' 4.209''

The following existing and proposed (already approved) dams are located on site:

Table 3-5: On-site Water Storage Facilities (J&W, 2021)[17]

Status	Dam	Capacity (m^3)	Full Supply Area (m^2)	Catchment Area (m^2)	Maximum Draw Down Rate (l/s)
Existing	Dam 1160 Rockfill Dam	372 056	38 570	0	As defined by concentrator requirements
	Return Water Dam (RWD)	451 371	206 770	182 900	
	Return Water Dam Extension (RWDExt)	377 921	96 010	83 000	
	PCD North Concentrator*	64 245		700 000	100
	SWS Dam South Concentrator Run-off Dam	14 400	7 200	65 300	60
	SP Dam South Concentrator Stormwater Dam	4 800	3 100	163 900	60
	PCD Heli Run-off from Offices and Workshops	17 076	5 110	530 000	120
	PCD Truck Run-off from Offices and Workshops and overflow from washbay silt trap	3 386	1 720	19 000	60
	PCD NN Runoff water from a portion of the WRD on site	60 134	36 310	455 950	60
In Construction	Buffer Dam	1 500 000 Class C Liner 7.8m wall height	252 000	0	As defined by concentrator requirements

* *PCD NC will be moved and upgraded to accommodate the Mogalakwena Third Concentrator*

[17] *Jones and Wagener, 2022. Anglo American. Mogalakwena Mine Water balance. Mogalakwena Third Concentrator Feasibility Study Calibration and Scenario Water balance Report. Report No: JW280/21/176-Rev3.*

3.5 ELECTRICITY SUPPLY

Electricity to the mine is supplied by Eskom via an electricity distribution network. Numerous transmission lines are located within the mine complex for the distribution of electricity to the various operational areas.

3.6 MINERAL RESIDUE MANAGEMENT

In terms of the National Environmental Management: Waste Act, 2002 (59/2008) waste is defined as (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act which may derive from waste from mineral excavations, wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals and wastes from physical and chemical processing of metalliferous minerals.

Schedule 3 states the following (Refer to Table 3-6):

- ''*Hazardous waste'' means "any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics 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*".
- The Act further define "*Residue Stockpile*" 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*".

The National Environmental Management: Waste Act, 2002 (59/2008), National Norms and Standards for the storage of waste has been used in the classification of the mineral residue on site to confirm the most appropriate barrier systems supporting the design requirements. The tailings material has been classified as a Type 3 waste material and the waste rock material has been declassified as a Type 4 material to be used on site for terracing and construction purposes[18].

Standard SANS 10234:2019 (Edition-2) was published through the South Africa Bureau of Standards on December 17, 2019. This Standard supersedes Standards: SANS 10265 edition-1 of 1999 and SANS 10234 edition-1.01 of 2008. This Standard is aligned with the 4th revision of the UN GHS Purple book and is cross referenced in the: National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) and National Health Act, 2003 (Act No. 61 of 2003). This Standard is mandated by the South Africa Department of Environment Affairs and Department of Health. This waste classification holds no bearing on the disposal of the waste and the assessment for disposal as per the Waste Management and Classification Regulations Norms and Standards 635 and 636 and must be determined in the event that the waste stream is to be disposed of.

As specified in SANS 10234 type and degree of risks that chemical compounds in different physical states (i.e., solid, liquid or gas) pose to human health and the environment. Waste classification according to SANS 10234 (based on the Global Harmonised System) indicates physical, health and environmental hazards. AAP has classified their mineral residue waste streams in accordance with SANS 10234 / GHS Classification System as general waste[19].

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[18] *Itasca Africa & Itasca Denver, 2019. Mogalakwena Mine Geochemical Characterisation and Waste Classification. Report No SA128.*
[19] *Zantow, 2015. Waste Classification Report for Anglo American Platinum Waste Streams. Report No 142-ZANSRK-2015.*

Table 3-6: Mine Residue Waste (NEM:WA, 2008 as amended) – Schedule 3

Residue from Stockpiles / Deposits		**Waste present at the Mogalakwena Complex**
1. Wastes resulting from exploration, mining, quarrying and physical and chemical treatment of minerals	(a) waste from mineral excavation	• Waste Rock
	(b) waste from physical and chemical processing of metalliferous minerals	• Tailings, Slag
	(d) waste from drilling muds and other drilling operations	

3.6.1 Coarse Mine Residue Management – Waste Rock Disposal Facilities

The Mogalakwena Complex has five (5) existing Waste Rock Disposal Facilities (WRD) namely W01, W07, RS3, East WRD (W020), and West WRD (W02). The WRD Facilities are situated within the MM Mining Right and Surface Right Area.

Table 3-7: Coarse Mine Residue Management Facilities (NEM:WA, 2008 as amended)

WRD Facility	**Property Description**	**Approved Footprint Areas (ha)**	**Undulating Design Height[20]**	**Property Owner**
WRD01	Portion 0 Farm Zwartfontein 818 LR	42.28	82	Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela Traditional Authority MM holds a surface lease over the property. MM is the Mining Rights Holder.
East WRD (WRD020)	Portion 0 Farm Overysel 875 LR	84.32	175	
West WRD (WRD02)	Portion 0 Farm Overysel 875 LR	196	95	
WRD07	Portion 0 Farm Sandsloot 236 KR	1027	82	Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela and Mokopane Traditional Authority MM holds a surface lease over the property. MM is the Mining Rights Holder.
	Portion 0 Farm Vaalkop 819 LR			Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela Traditional Authority MM holds a surface lease over the property. MM is the Mining Rights Holder
RS3	Portion 0 Farm Sandsloot 236 KR	385	109	Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela and Mokopane Traditional Authority MM holds a surface lease over the property. MM is the Mining Rights Holder.

Table 3-8 allows for the outer perimeter coordinates of the approved existing Waste Rock Disposal Facilities and Figure 3-11 provides for the locality of these various facilities on site.

Table 3-8: Outer Co-ordinates of the Waste Rock Disposal Facilities

Waste Rock Disposal Facilities	**Latitude[21]**	**Longitude**
W07	24^{0}01’19.13	28^{0}54’21.96
	24^{0}01’04.43	28^{0}55’07.54
	24^{0}01’20.76	28^{0}55’29.18
	24^{0}01’31.24	28^{0}54’41.02
RS3	24^{0}00’10.99	28^{0}53’47.50

[20] *All WRDs have a current approval height of 60m which differs from the Design Height.*
[21] *Water Use Licence No: 07/A61G/ABCGIJ/9887 dated 4 December 2020.*

	24⁰00'18.10	28⁰54'20.25
	24⁰00'58.25	28⁰53'30.70
	24⁰01'14.55	28⁰54'03.71
W01	24⁰00'21.75	28⁰55'23.59
	24⁰00'15.14	28⁰55'32.36
	24⁰00'29.14	28⁰55'18.22
	24⁰00'22.84	28⁰54'57.98
W020 (East WRD) inclusive of the Eastern Bund	23⁰56'01.05	28⁰53'34.12
	23⁰55'58.10	28⁰54'15.58
	23⁰57'37.78	28⁰55'23.18
	23⁰58'38.83	28⁰54'23.49
W02 (West WRD) inclusive of the Western Bund	23⁰58'59.17	28⁰53'25.27
	23⁰58'50.17	28⁰53'34.31
	23⁰56'26.55	28⁰51'49.91
	23⁰56'17.07	28⁰52'16.57

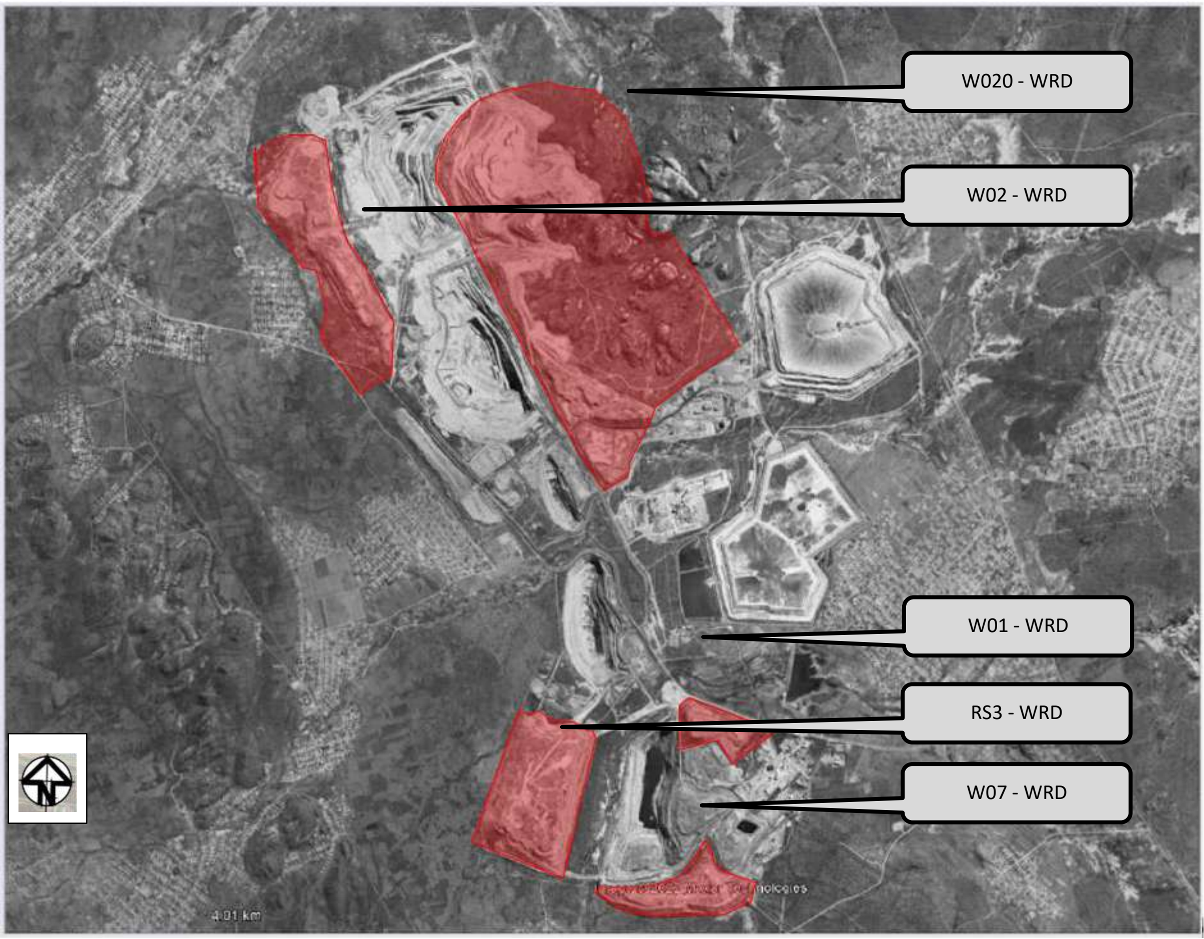

Figure 3-11: Existing Waste Rock Disposal Facilities

Waste Rock Disposal Facilities approved but not yet constructed include the North Waste Rock Disposal Area and the Witrivier Waste Rock Disposal Area as indicated in Table 3-9.

Table 3-9: Waste Rock Disposal facilities still to be constructed.

WRD Facility	Property Description	Approved Footprint Areas (ha)	Disposal Volume	Undulating Design Height	Property Owner
North Waste Rock Disposal Facility[22] (including a dedicated ore stockpile portion)	Portion 0 Overysel 815 LR	210 inclusive of associated haul roads	21 000 000 m^3/a	60m with 15m benches	Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela Traditional Authority MM holds a surface lease over the property. MM is the Mining Rights Holder.
Witrivier [23][24]Waste Rock Disposal facility with 40m access road	Witrivier 777 LR Drenthe 778 LR Overysel 815 LR	316			Held in Trust by the National Government of the Republic of South Africa on behalf of the Mapela Traditional Authority

Facility	Latitude	Longitude
North Waste Rock Disposal Facility	23^{0}55’59.51” S	28^{0}51’52.68” E
	23^{0}55’10.14” S	28^{0}53’10.18” E
	23^{0}55’48.18” S	28^{0}53’12.97” E
	23^{0}56’22.43” S	28^{0}52’03.73” E
Witrivier Waste Rock Disposal Facility	23^{0}53’54.49” S	28^{0}52’53.98” E

Note:

The 2017 EMP Amendment and Environmental Authorisation allows for the following listed activities in terms of EIA Regulations 2010:

- EIA Regulations R. 544 of 2010
  - *Activity 11(xi) – the construction of infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse, measured from the edge of the watercourse, excluding where such construction will occur behind the development setback lime.*
  - *Activity 19(l) – The infilling or deposition of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, shells, shell grit, pebbles or rock of more than 5 cubic from a watercourse;*
  - *Activity 22(l) – The construction of a road, outside unban areas with a reserve wider than 13,5 metres.*
- EIA Regulations R. 545 of 2010
  - *Activity 15 – Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more*.
- EIA Regulations R. 546 of 2010
  - *Activity 14 – The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation except where such removal of vegetation is required for (1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes (2) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental management: waste Act, 2008 9Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list (3) the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010.*

The 2017 EMP has been consolidated into the approved 2020 EMP.

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[22] *Department of Mineral Resources and Energy, 2020. Integrated Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as Amended (NEMA) and National Environmental Management: Waste Act, 2008 (Act 59 of 2008) as Amended (NEMWA), and the Environmental Impact Assessment (EIA) Regulations, 2014 for the Expansion of the existing mine operations and the additional infrastructure to improve production capacity on the remaining Extent of Portion 0 of the Farm Blinkwater 820 LR and Portions 0 of the Farms Overysel 815 LR, Zwartfontein 818 LR, Vaalkop 819 LR and Sandsloot 236 KR, situated within Mogalakwena Local Municipality in the Magisterial District of Waterberg: Limpopo Region. Reference LP/30/5/1/2/3/2/1(050)EM.*

[23] *Department of Economic Development, Environment and Tourism, 2015. Environmental Authorisation for the proposed Anglo American Platinum Mogalakwena Mine – Drenthe and Witrivier Infill Drilling and waste Rock Dump Project on the Remaining Portion and Portion 1 of the Farm Witrivier 777 LR, Farm Drenthe 778 LR and Farm Overysel 816 LR within Mogalakwena Local Municipal Area of Waterberg District. Reference 12/1/9/2-W61.*

[24] *Department of Mineral Resources, 2017. Amendment of Environmental Authorisation in terms of the national Environmental management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment 9EIA) Regulations, on the Farms Overysel 815 LR, Drenthe 788 LR and Witrivier 777 LR situated in the magisterial District of Mogalakwena: Limpopo Region. Reference LP30/5/1/3/2/1(050)EM.*

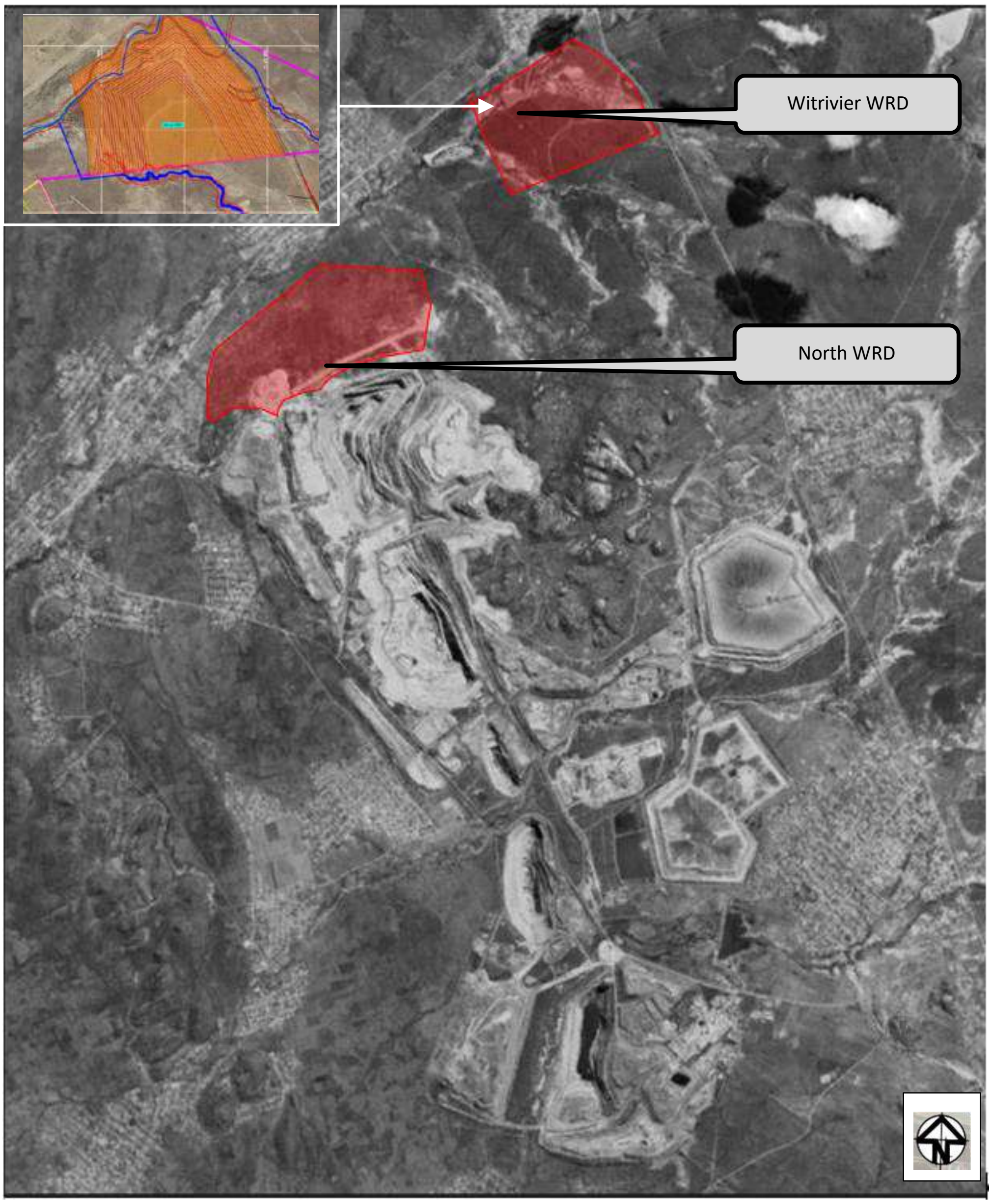

Figure 3-12: Waste Disposal Facilities still to be constructed

3.6.2 Fine Mine Residue Management – Tailings Storage Facilities (TSFs)

Final tailings from the concentrator plants are pumped to the Tailings Storage Facilities as a slurry, with an SG range of 1.49 t/m^3 to 1.59 t/m^3 (average density of 1.54 t/m^3), which is equivalent to a solids content of 48.7% to 54.9% by mass (average 51.9% solids by mass). This implies a moisture content by mass of 51.3% to 45.1 % (average 48.1%), based on the average solid density of 3.10 t/m^3. By volume this is equivalent to a water content of 76.4% to 71.6% (average 74.0%).

Numerous mine residue management facility associated pipelines are located within the mine complex for the management of mine residue material to and from the various operational areas.

The Vaalkop and Blinkwater TSF are indicated in Figure 3-13.

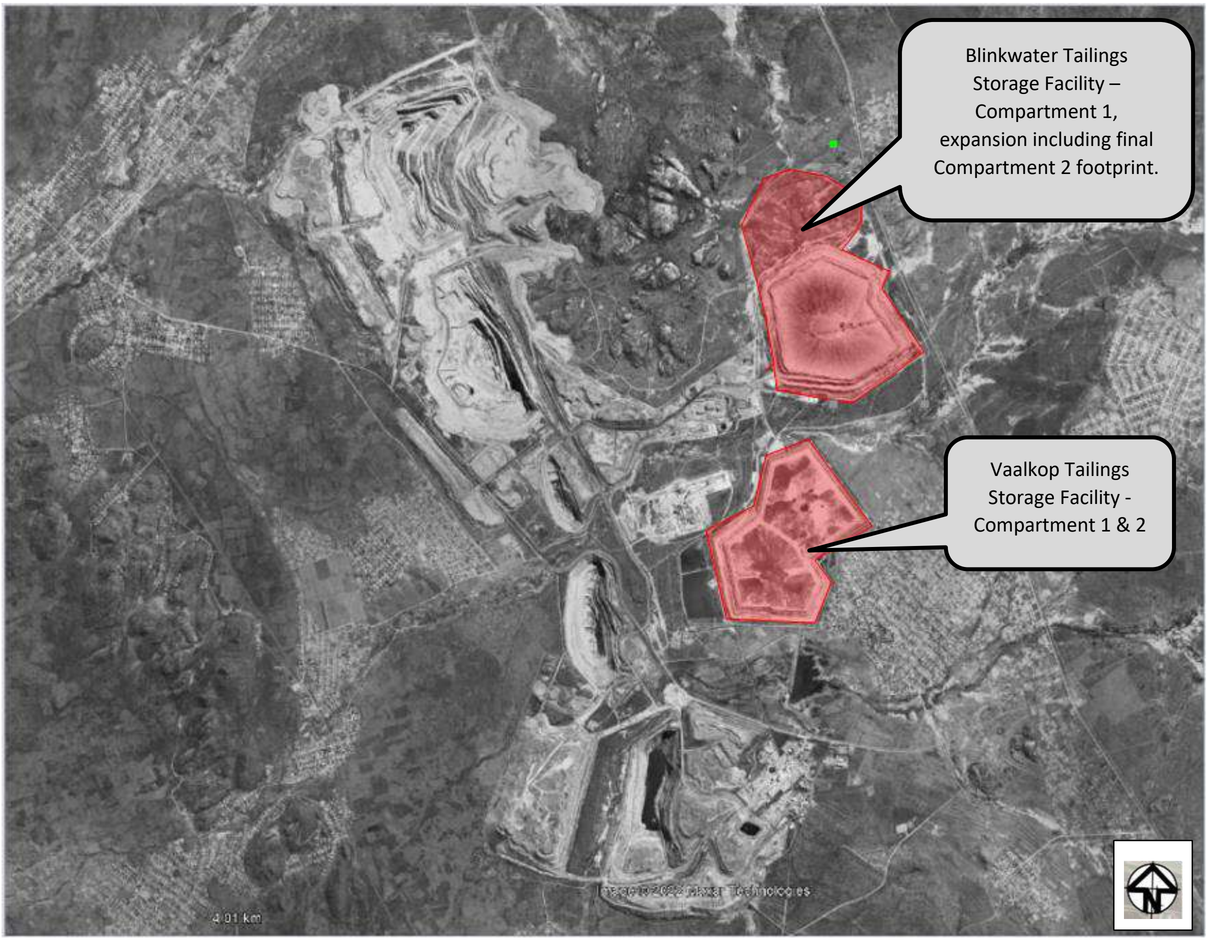

Figure 3-13: Vaalkop and Blinkwater Tailings Storage Facilities

3.6.2.1 Vaalkop Tailings Storage Facility (currently under Care and Maintenance)

The development of the Vaalkop Tailings Storage Facility Compartment 1 was approved in 1992[25] and formed part of the 1996 EMP documentation. Vaalkop Tailings Storage Facility Compartment 2 (Extension) was approved in 2001/2.

Table 3-10: Vaalkop TSF[26]

Aspect	Description
VAALKOP TAILINGS STORAGE FACILITY (Compartment 1)	
Commissioning Date	1993
Footprint Area	150 ha
Final Height at Closure	42m 1 182 mamsl
Rate of deposition	Historical - 375 000 TPM
Life of Tailings Dam	Dormant – Deposition stopped July 2021
Safe side slope angle at maximum height	1:3
Type of deposition	Conventional Spigot Deposition
VAALKOP TSF EXTENSION (Compartment 2)	
Commissioning Date	1995
Footprint Area	120 Ha

[25] *Chief Inspector of Mines, Pietersburg, 1992. Slimes Dam Approval (MINREG 5.13.1) Reference I.M.PB 37/1/7. Mining Licence 13/97 reference MR/Pt/PPL/4 dated 6 October 1997.*

[26] *SRK, 2001. Anglo Platinum Limited. Addendum to the Environmental Management Programme Report for the Extension of the Tailings Dam at Potgietersrus Platinum Limited. Report 271433/2.*

Final Height at Closure	45m 1 180 mamsl
Rate of deposition	Historical - Max 425 000 tpm
Life of Tailings Dam	Dormant – deposition stopped December 2021
Safe side slope angle at maximum height	1:3
Type of deposition	Conventional Spigot Deposition

2018 full footprint area – 2 281 300 m^2
2020 starting basin area – 1 709 598 m^2
Expected decommissioning Date - 2042

Table 3-11: Vaalkop Tailings Storage Facility

Component	Farm	Latitude	Longitude
Tailings Storage Facility[27] 150 ha Compartment 1 1 909 200 tons per annum (tpa) dry tonnes	Zwartfontein 818 LR Vaalkop 819 LR	‘	28°55’26.76” E
		23°58’59.41” S	28°55’07.25” E
		23°59’33.74” S	28°55’15.32” E
		23°59’35.15” S	28°55’54.57” E
		23°59’16.88” S	28°56’03.20” E
		23°59’07.63” S	28°55’55.73” E
Tailings Storage Facility Compartment 2 (Expansion)[28] 120 ha 2 532 000 dry tpa 45 m height Compartment 2		23°58’46.94” S	28°55’26.76” E
		23°58’52.76” S	28°56’19.86” E
		23°58’21.00” S	28°55’52.35” E
		23°58’27.43” S	28°55’33.18” E
		23°59’07.63” S	28°55’55.73” E
Return Water Dam 350 000 m^3 excluding freeboard		23°59’12.08” S	28°55’07.47” E
		23°59’14.33” S	28°54’55.60” E
		23°59’32.16” S	28°54’58.33” E
		23°59’31.75” S	28°54’55.41” E
Return Water Dam Extension		23°59’12.08” S	28°55’11.47” E
		23°59’05.34” S	28°54’54.68” E
		23°58’59.06” S	28°55’04.28” E
		23°59’14.33” S	28°54’55.60” E

[27] *SRK, 1996. Potgietersrust Platinums Limited. Environmental Management programme Report. Report No 223405.*
[28] *Department: Minerals and Energy, 2001. Approval of Addendum to Environmental management Programme submitted in terms of Section 39 of the Minerals Act, 1991 (Act 50 of 1991), report for the extension to the tailings dam at Potgietersrus Platinum Limited. Reference: 6/2/2/160.*

Figure 3-14: Vaalkop Tailings Storage Facility

3.6.2.2 Blinkwater Tailings Storage Facility

The Blinkwater Tailings Storage Facility Compartment 1 was approved for an area of 270 Ha (~2008/9). The facility is located on the farms Blinkwater 820LR and Zwartfontein 818LR.

The expansion to this facility was approved in 2015[29][30] allowing for an additional 166 Ha to be developed with a capacity of 44 million m^3 and a height of 49m. The approval allows for the development of a Return Water Dam as well as a southern attenuation dam with a footprint area of approximately 8,5 ha and a capacity of 161 000m^3 and a dam wall height of 6,5m. As an alternative to the southern attenuation dam, allowance is made for the excess water to be transferred via a 2,6km, 1,2m diameter pipeline from the existing Vaalkop Return Water Dam system.

Table 3-12: Blinkwater Tailings Storage Facility

Component	Farm	Latitude	Longitude
Tailings Storage Facility	Blinkwater 820 LR Zwartfontein 818 LR	23⁰58'51.78"	28⁰55'48.12"
Tailings Storage Facility Expansion			
Southern Attenuation Dam		23⁰58'6.83"	28⁰55'42.20"
Blinkwater Tailings Storage Facility – Compartment 2[31]	Blinkwater 820 LR	23⁰56'46.19" S	28⁰55'55.28" E

[29] *Limpopo Department of Economic development, Environment and Tourism, 2015. Environmental Authorisation for the proposed expansion of Blinkwater Tailings Storage facility and new Southern Attenuation Dam at the existing Mogalakwena Mine on the farms Blinkwater 820LR and Zwartfontein 818LR within Mogalakwena Local Municipality of Waterberg District. Reference 12/1/9/2-W82.*

[30] *Department of Mineral resources, 2017. Amendment of Environmental Authorisation in terms of the National Environmental Management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment (EIA) regulations, on the farms Blinkwater 820LR and Zwartfontein 818LR situated in the magisterial district of Mogalakwena: Limpopo Region. LP30/5/1/3/2/1(0500EM.*

[31] *Department of Mineral Resources and Energy, 2020. Integrated Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as Amended (NEMA) and National Environmental Management: Waste Act, 2008 (Act 59 of 2008) as Amended (NEMWA), and the Environmental Impact Assessment (EIA) Regulations, 2014 for the Expansion of the existing mine operations and the additional infrastructure to improve*

Note:

The 2015 Environmental Authorisation in support of the approval of the Expansion allowed for the following activities:

- EIA Regulations R. 544 of 2010
    - Activity 9 – The construction of facilities or infrastructure exceeding 1000 meters in length for *the bulk transportation of water, sewage or storm water with an internal diameter of 0,36 metres or more with a throughput of 120 litres per second or more – excluding where such facilities are for bulk transportation of water, sewage or storm water or storm water drainage inside the road reserve; or where such construction will occur within urban areas but further than 32 metres from a water course, measured from the edge of the water course;*
    - *Activity 11(xl) – The construction of infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, excluding where such construction occurs behind a development setback line.*
    - *Activity 18(i) – The infilling or deposition of any material of kore than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, shells, shell grit, pebbles or rock of more than 5 cubic metres from a watercourse;*
    - *Activity 22(ll) – The construction of a road, outside urban areas where no reserve exists where the road is wider than 8 metres.*
- EIA regulations R. 545 of 2010
    - *Activity 15 – Physical alteration of undeveloped, vacant, or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for linear development activities; or agriculture or afforestation where activity 16 in the Schedule will apply;*
    - *Activity 19 – the construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.*
- EIA Regulations R. 546 of 2010
    - *Activity 14- the clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for (1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority or afforestation purposes*.

The 2015 EMP has been consolidated into the approved 2020 EMP.

Expected Decommissioning date – September 2032

Table 3-13: Blinkwater Tailings Complex - Compartment 1 and Expansion (2015)

Blinkwater 1 Compartment (Incl Silt Trap)	**Description**
Area of Disposal	270 Ha
Volume Disposal	1 000 000 dry tonnes per month
Final Height	60m
Expansion (2015 approval)	**Description**
Volume Disposal	2 532 000 dry tpa 44 Million m^3
Final Height	49m (2015 approval)
Area	166Ha
Southern Attenuation Dam	**Description**
Volume	161 000 m^3
Wall height	6.5m
Footprint Area	8.5 Ha

In 2018[32] approval was granted (no specific listing was triggered) for the development of an in-line Scavenger Tailings Plant located between their existing Mogalakwena North Concentrator (MNC) and Blinkwater 1 Tailings Storage Facility to extract residual platinum group metals (PGMs) from the wet tailings generated at the MNC, which is transported via an existing pipeline system, prior to the deposition of the tailings to the Blinkwater 1 TSF allowing for the following infrastructure:

- Tailings Scavenger Plant
- Offices and Parking Area

production capacity on the remaining Extent of Portion 0 of the Farm Blinkwater 820 LR and Portions 0 of the Farms Overysel 815 LR, Zwartfontein 818 LR, Vaalkop 819 LR and Sandsloot 236 KR, situated within Mogalakwena Local Municipality in the Magisterial District of Waterberg: Limpopo Region. Reference LP/30/5/1/2/3/2/1(050)EM.

[32] *Department of Mineral Resources, 2018. Amendment of an Environmental Authorisation in terms of the National Environmental management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment (EIA) Regulations, 2014 in respect of the proposed construction of the Tailings Scavenger Plant (TSP) on the farm Zwartfontein 818 LR situated in the Waterberg Municipality: Limpopo. Reference No: LP30/5/1/2/3/2//1/(050) EM.*

- Transformer bay;
- Workshop Area; and
- Weigh Bridge

The Blinkwater Expansion area was extended in 2020 to accommodate a larger footprint area and height (Compartment 2). Compartment 2 is approved at a design maximum height of 1232 mamsl (67m). Refer to Table 3-14 for the 2020 approval summary.

Table 3-14: Blinkwater Tailings Dam - Compartment 2 (SRK, 2020)

Blinkwater 2 Compartment (2020)	Description
Slurry density (t/m^3)	1.45
Solids concentration (%)	46
In-situ dry density (t/m^3)	1.7
BW2 TSF tailings surface basin area	1,628,783 m^2
BW2 TSF total surface area (tailings and waste rock impoundment)	2,345,047 m^2
BW2 TSF slope geometry	1(v) in 2.4 (h) overall slope
BW2 TSF's return water	Conveyed to the Buffer Dam
Construction method	Downstream rock impoundment similar to Blinkwater 1 TSF
Design factor safety	1.5
Volume Disposal	32 000 000 m^3/annum
Footprint Area	2 345 047 m^2 excl stormwater infrastructure 180 Ha
Final height	67m

Water recovered from the Blinkwater TSF will report to the Buffer Dam (currently under construction), from where the water will be distributed to the MNC, MSC and M3C (still to be constructed) by dedicated return water pumps for each operation.

3.6.3 Run-of-Mine Stockpiles[33]

Several ore stockpiles and oxidised ore stockpiles are located at various points on the mining site.

- Low-grade Material (LLG)
- High-Low Grade material (HLG)
- Oxidised Ore
- Ore Pebble Stockpile[34]
    - Allowance for the placement of additional ore pebbles in close proximity to the North Concentrator Area where the ore pebbles from South Concentrator will be placed for further processing.
        - Area of approximately 3 000 m^2 (0,3 Ha) between the existing crusher and North Concentrator Plant – 20 000 tons. Area to be used as a back-up stockpile area for when and if the crusher feeding ore to the North Concentrator plant is off-line due to shut down and maintenance purposes.

[33] *Department: Minerals and Energy, 2005. Approval of the Addendum to the Environmental management programme, for creation of three ore stockpiles and relocation of old disused tailings dam, the Farms Zwartfontein 818 LR and Overysel 815 LR, District of Mokopane, Potgietersrus Platinum Mine. Reference: 6/2/2/160.*

[34] *Department of Mineral resources, 2018. Amendment of an issued Environmental Authorisation (Part 1) for Anglo American Platinum Limited – Rustenburg Platinum Mines: Mogalakwena Mine Section in terms of Regulation 29(a) of the Environmental Impact Assessment, 2014 9EIA Regulation) as amended: GNR No. 326 on the Remaining Extent of the farm Zwartfontein 818 LR, situated within Mogalakwena Local Municipality: Limpopo Province. Reference LP30/5/1/2/3/2/1(00050)EM.*

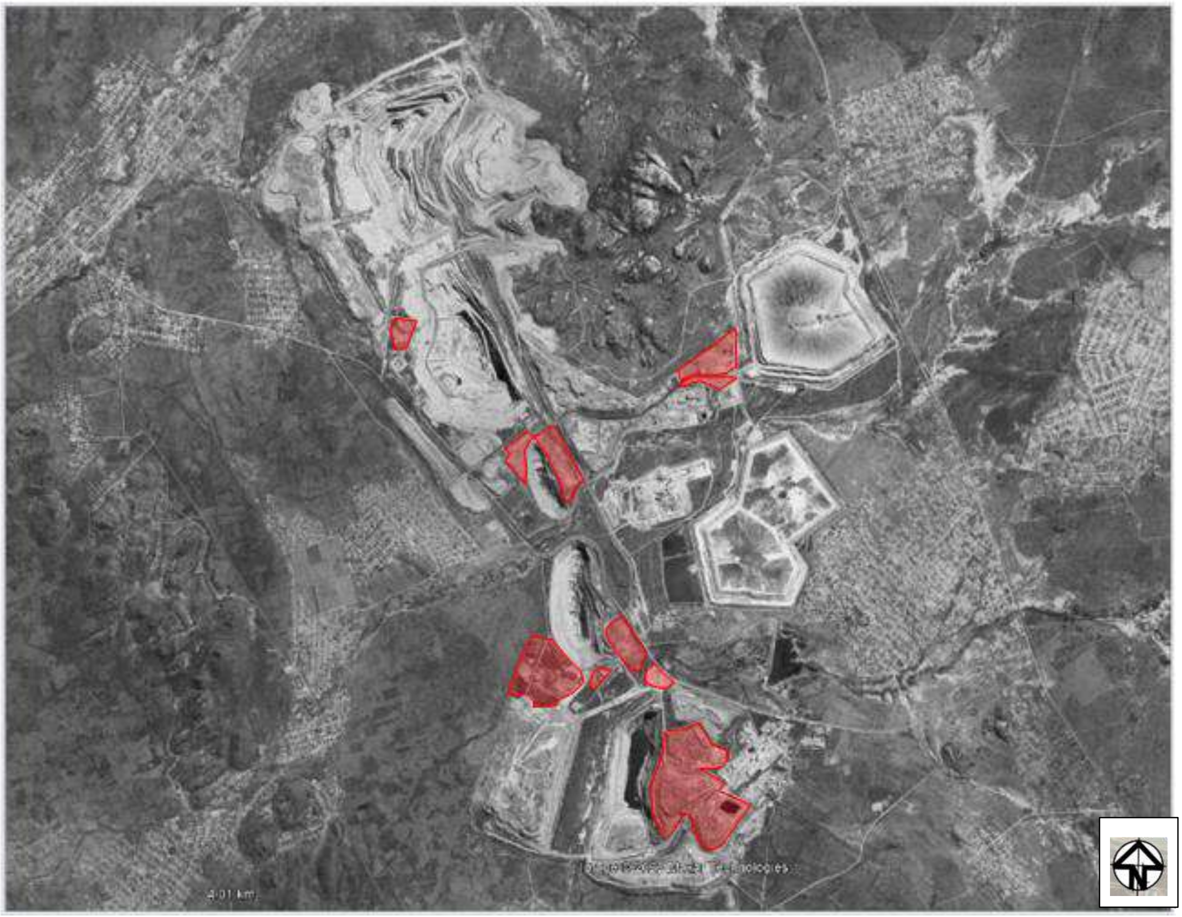

Figure 3-15: Existing Ore Stockpile Areas

Figure 3-16: Pebble Stockpile Area (SRK, 2017)

3.7 WORKSHOPS AND STORES

The mine complex and concentrator complexes include infrastructure such as change houses, stores, offices, boardrooms, workshops, training centres, clinic, security offices, fuel/lube bays, green/conservation areas, dispatch and other supporting buildings, and clean and dirty water segregation systems.

3.8 DIRTY WATER CONTAINMENT FACILITIES

Table 3-15 provides for the dirty water containment facilities at the Mogalakwena Complex. All these facilities are approved under the Consolidated 2020 EMPr and approved 2021 Water Use Licence.

Table 3-15: Dirty Water Containment Facilities at Mogalakwena Complex (SRK, 2020)

Storage facility	Capacity	Description
Mining		
PCD NN	~82 000 m^3	Stores stormwater runoff from the WRD at North pit. Water is pumped to RWD and reused in the process.
Effluent water storage tanks North, Central & Zwartfontein (ZFT)	~548 m^3 each	Tanks store water from the open pits for use in dust suppression on haul and mine roads.
Landfill site dirty water dam	~11,704 m^3	Captures and stores stormwater runoff from the landfill site. The water is used for soil rehabilitation.
Dirty Water Dam at Class B Waste Site	~5 800 m^3	Captures and stores stormwater runoff from the Class B waste Site
North Concentrator		
Effluent water storage dam PCD-NC	~64 245 m^3	Stores excess plant water and plant stormwater. Water is reused within the plant.
Effluent water storage tanks Zinc Dam Washbay	~586 m^3	Stores wastewater from MNC for use as vehicle washing water.
RWD Extension	~377 920 m^3 [35]	Stores Blinkwater 1 TSF supernatant water for reuse in the MNC processes.
South Concentrator		
Dam 1160	~374 Ml (excludes a freeboard height of 2 meters/69 Ml)	Receives treated effluent from Polokwane and Mokopane Sewage works, water from the open pits and water from RWD. Supplies water to both concentrators for process use.
Effluent water storage tanks (Erichsen dams)	~507 m^3	Receives water from pits to be used for dust suppression on haul roads.
Return Water Dam	424 289 m^3 [35]	Stores Vaalkop and Extension TSF supernatant water for re-use in the MSC process.
SWS (Storm Water South)	~ 14 400m^3	Captures spillage and stormwater from the MSC which is returned to the process.
SP Dam	~11 720 m^3	Captures spillage and stormwater from the MSC which is returned to the process.
OS-2 (Old) (no longer in use)	~4,096 m^3	The OS dams hold water contaminated with hydrocarbons from the workshops until these can be skimmed off the surface of the water.
OS-2 new	~17,500 m^3	

Note that the facilities as summarised in Table 3-5 are also considered dirty water containment facilities on site.

[35] *Jones & Wagener, 2022. Mogalakwena Mine Water Balance. Mogalakwena Third Concentrator Feasibility Study Calibration and Scenario Water balance Report. Report No: JW280/21/176-Rev3.*

3.9 SEWAGE TREATMENT

MM has three waterborne sewage systems, one at South Concentrator, one at North Concentrator and one associated with the Contractor's Camp. All these facilities are approved under the Consolidated EMPr and approved Water Use Licence.

3.9.1 South Concentrator WWTW

The South Concentrator Waste Water Treatment Works (WWTW) is located on the farm Vaalkop 819LR.

This plant was designed for a capacity serving a maximum of 1000 people with a hydraulic loading of 120 m^3/day. Treated effluent from the system is pumped into the process water system for re-use. The sewage works have the following design parameters:

Table 3-16: Design specifications of the South Concentrator WWTW[36]

COORDINATES		
Co-ordinates of the plant locality	S 24⁰00'24.44"	E 28⁰55'30.72"
PLANT CAPACITY		
Specified Population	1 000	
Specified hydraulic loading (120 l/c/d)	120 m^3/d maximum	
Organic loading (65 gBOD/c/d)	65 kg BOD/d	
INLET WORKS		
Average Flow	5,0 m^3/h	
Peak Flow (peak factor = 3,5)	17,5 m^3/h	
Number of bar screens	2	
Raw sewage sump capacity	10 m^3	
Raw sewage pump capacity at 1 bar	20 m^3/h	
AERATION TANK		
Number of tanks	2	
Diameter of Tank	8,6m	
Volume at 3,6m water depth	209 m^3	
Retention period	41 h	
Organic loading	65 kgBOD/d	
Oxygen requirements	195 kg/d	
Oxygen input over 20 h	9,75 kg/h	
Power absorbed at 1,6 kg O_2/kWh	6,1 kW	
Installed Power	7,5 kW	
CHLORINATION		
Diameter of contact tank	5,4 m	
Volume of tank at 1,85 water depth	42 m^3	
Retention period at 80 m^3/h discharge	30 minutes	
Chlorine requirements at 5 mg/l	0,6 kg/d	
Capacity of chlorination dosing pump	6,0 l/h	
Capacity of solution tank	70 litre	

[36] *SRK, 1996. Potgieterus Platinum Mines Environmental Management Programme Report, Report Reference 223405*

Figure 3-17: South Concentrator WWTW

3.9.2 North Concentrator WWTW

The North Concentrator Waste Water Treatment Works is located on the farm Zwartfontein 818 LR.

This plant was designed for a capacity serving a maximum of 3000 people with a hydraulic loading of 1 450 m^3/day.

During the 2020 regulatory process, the North Concentrator WWTW was upgraded with the installation of additional modules to the existing package plant.

Treated effluent from the system is pumped into the process water system for re-use. The sewage works have the following design parameters:

Table 3-17: Design specifications of the North Concentrator WWTW

COORDINATES		
Co-ordinates of the plant locality	S 23^{0}59'01.1"	E 28^{0}54'45.7"
PLANT CAPACITY		
Specified Population	3 000	
Specified hydraulic loading (120 l/c/d)	1 450 m^3/d maximum	
Organic loading (65 gBOD/c/d)	65 kg BOD/d	

Figure 3-18: North Concentrator WWTW

3.9.3 Contractors Camp WWTW

A Waste Water Treatment Works is located on the farm Zwartfontein 818LR.

This plant was designed for a capacity serving a maximum of 500 people. Treated effluent from the system is pumped into the process water system for re-use as well as for dust suppression. The plant consists of a series of Oxidation Ponds. The treated sewage effluent is pumped via the main pit dewatering pipeline to Dam 1160 and is authorised as part of the Water Use Licence.

The sewage works have the following design parameters:

Table 3-18: Design specifications of the Contractors Camp WWTW

COORDINATES		
Co-ordinates of the plant locality	S 23^{0}57’28.3”	E 28^{0}52’50.8”
POND CAPACITY		
Specified Population	500	
Specified hydraulic loading (120 l/c/d)	78m^3/d maximum	
Organic loading (65 gBOD/c/d)	65 kg BOD/d	
Number of ponds	5	
Liner System	HDPE	

Figure 3-19: Image of the Contractors Camp WWTW

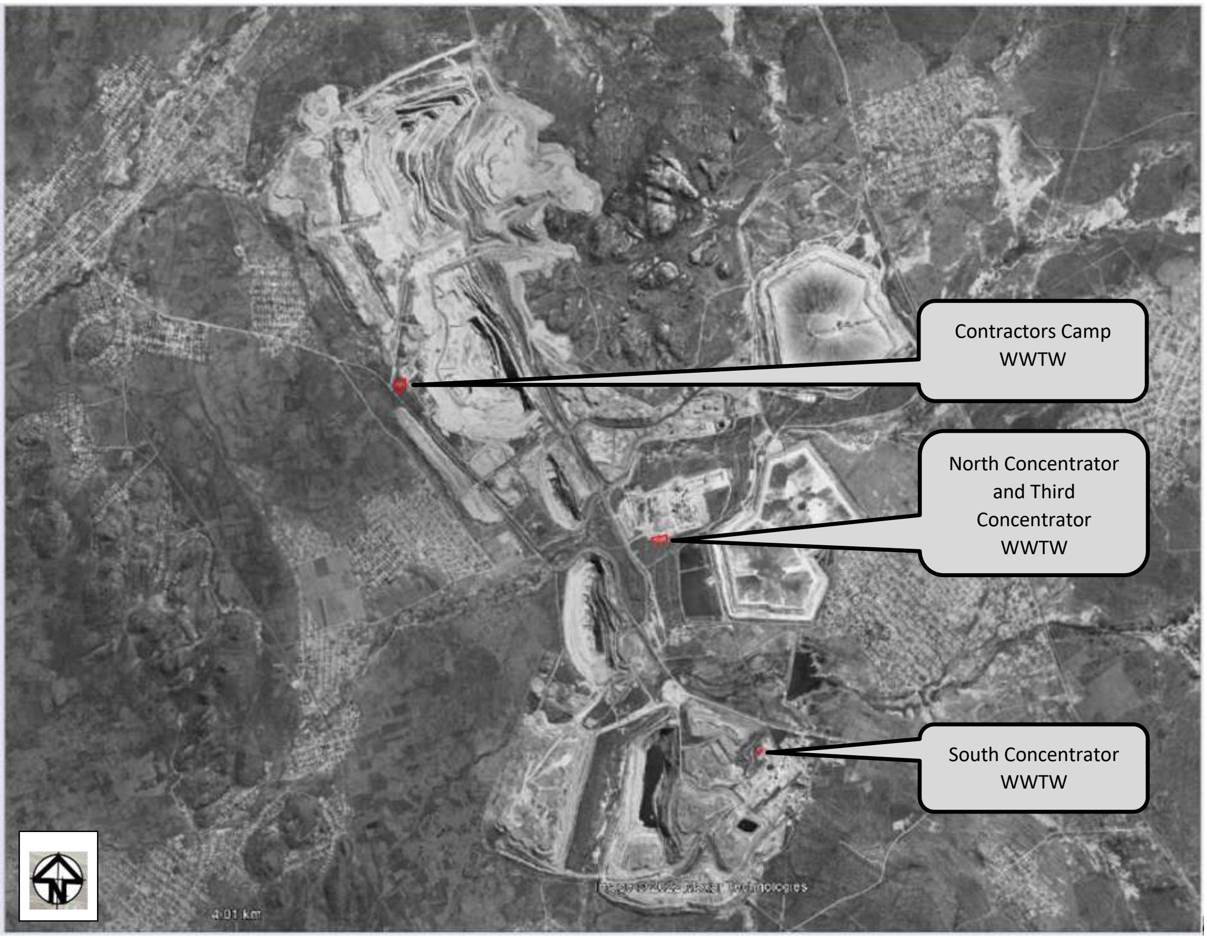

Figure 3-20: Waste Water Treatment Works at the Mogalakwena Operations

3.10 DANGEROUS GOODS MANAGEMENT

3.10.1 Explosives Magazine

The development of the Explosives Magazine is approved, and a further expansion was approved in 2018.

Table 3-19: Explosives Magazine

Component	Farm Portions	Latitude	Longitude
3 (Three) Magazines Combined capacity – 142.56 m^3	Zwartfontein 818 LR	23^{0}58'32.80 S	28^{0}53'45.20" E
Explosives Depot 2,18 ha		23^{0}57'20.14" S	28^{0}52'33.77" E

Note

An expansion to the explosives Depot was approved in 2018[37] in terms of EIA R. 983 in 2014 allowing for the development of an additional 2,18 hectares. The following listed activities were approved:

- *Activity 12(iii) – The expansion of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such facility will be expanded by more than 80 cubic metres.*

[37] *Department of Mineral resources, 2018. Environmental Authorisation in terms of the national Environmental management Act, 1998 (NEMA), as amended, and the Environmental Impact Assessment (EIA) Regulations, 2014 in respect of mining activities in respect of the proposed explosives Depot Expansion on the farm Overysel 815 LR situated in the Waterberg Municipality, Limpopo. Reference LP30/5/1/2/3/2/1(050)EM.*

The 2018 EMP has been consolidated into the approved 2020 EMP.

Figure 3-21: Explosives Depot

3.10.2 Emulsion Silos

The following existing Emulsion Silos are operational on site.

Table 3-20: Emulsion Silo's[38]

Component	Farm Portions	Latitude	Longitude
12 (twelve) Emulsion Silos* Combined capacity – 114 m^3	Zwartfontein 818 LR	23⁰58’32.80 S	28⁰53’45.20” E
2 (two) Gassing Rooms (sodium nitrate mixing area)	Zwartfontein 818 LR		
2 (Two) Ammonium Nitrate Porous Prill (ANPP) Combined Capacity of 100 m^3	Sandsloot 236 KR	24⁰01’14.9” S	28⁰55’27.5” E

Note

The 2014 Environmental Authorisation allows for the approval of the following listed activities in terms of EIA Regulations R. 544 of 2010 in support of the above:

- *Activity 13 – The construction of facilities or infrastructure for the storage, or storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.*
- *Activity 42 – The expansion of facilities for the storage, or storage and handling, of dangerous goods, where the capacity of such storage facility will be expanded by 80 cubic metres or more*

The 2014 EMP has been consolidated into the approved 2020 EMP.

**Six emulsion silos were relocated from the farm Sandsloot, and six new ones were erected in terms of the Environmental Authorisation granted in 2014.*

[38] *Department of Economic Development, Environment and Tourism, 2014. Environmental Authorisation for the proposed relocation of six (6) emulsion silos at Mogalakwena Platinum Mine on the farms Sandsloot 236 KR and Zwartfontein 818 LR within Mogalakwena Local Municipality of Waterberg District. Reference 12/1//9/1-W58.*

3.10.3 Fuel Depot

The fuel depot[39] consists of:

- Four (4) diesel storage tanks, each with a capacity of 58 m^3, with a combined capacity of 232 m^3;
- A 26 m^3 10W Oil Tank;
- A 26 m^3 15W40 Motor Oil Tank;
- A 10 m^3 Tellus 46 Oil Tank;
- Eight (8) 70 m^3 diesel storage tanks;
- Transfer pumps
- A washbay
- A bulk loading and off-loading area;
- An interceptor separator for the recovery of oil;
- Service Bay Area 1 and 2;
- A service workshop with a roof structure and spoon drain leading to a sand trap; and
- A green building with store area

An image of the Fuel Depot is indicated in Figure 3-22 and the co-ordinates in Table 3-21.

Figure 3-22: Fuel Depot

In addition to the above-mentioned authorised fuel depots, mobile refuelling stations are utilised in-pit.

Table 3-21: Fuel Depot

Component	Farm Portions	Latitude	Longitude
Fuel Depot Capacity – 884 m^3	Sandsloot 236 KR	23^{0}57'52.98 S	28^{0}52'54.07" E

Note:

The 2015[40] Environmental Authorisation allows for the approval of the following listed activities in terms of EIA Regulations R. 544 of 2010 in support of the above:

- *Activity 42 – The expansion of facilities for the storage, or storage and handling, of dangerous goods, where the capacity of such storage facility will be expanded by 80 cubic metres or more.*

The 2015 EMP has been consolidated into the approved 2020 EMP.

[39] *Department of Economic Development, Environment and Tourism, 2013. Environmental Authorisation for the proposed Fuel Depot at Anglo American Mogalakwena Platinum Mine on Stand Number 1 at Fothane Village Mapela on the Farm Sandsloot 236 KR within Mogalakwena Local Municipality of Waterberg District Municipality. Reference: 12/1/9/2-W21.*

[40] *Department of Economic Development, Environment and Tourism, 2015. Environmental Authorisation for the proposed expansion of Fuel Depot for the Anglo American Platinum Limited Mogalakwena Mine on Portion 0 of the farm Sandsloot 236 KR within Mogalakwena Local Municipality of Waterberg District. Reference 12/1/9/1-W84.*

3.10.4 Fuel Storage

MM has authorisation for the storage of dangerous goods on the farm Zwartfontein 818 LR.

Table 3-22: Fuel Storage

Component	Farm Portions
Fuel Storage Tank – Diesel Capacity – 2 x 750 m^3	Zwartfontein 818 LR
Fuel Storage Tank – Petrol Capacity 23 m^3	
Liquid Hydrogen Storage – 800 kg	

3.10.5 Lubricant Storage

MM has authorisation for the storage of dangerous goods on the farm Zwartfontein 818 LR.

Table 3-23: Lubricant Storage

Component	Farm Portions
Permanent Facility - Capacity – 6 x 46 m^3	Zwartfontein 818 LR
Temporary Facility-5-year Life Capacity – 6 x 14 m^3	

3.11 HELICOPTER LANDING AREA

A helipad is situated to the east of the North Mining Area.

3.12 WASTE MANAGEMENT

The original Garbage Disposal Site[41] (MINREG 5.13.1) was approved on 10 May 1994 by the Director Mineral Development, Potgietersrus.

Mogalakwena Complex has an approved Class B (previously G:C:B$^-$) Waste Management Facility in terms of Section 49(1)(a) of the National Environmental Management: Waste Act, 2008, (Act No. 59 of 2008) allowing for disposal, sorting and the treatment of contaminated soil on the farm Zwartfontein 818LR -Licence Number 12/9/11/L621/5 dated 29 July 2015[42]. The outer coordinate of the facility is indicated in Table 3-24. The total area is approximately 2,24 ha[43] in extent.

Table 3-24: Waste Management Facility[44]

Number of corners	Latitude	Longitude
1	29^{0}60’0.02”	26^{0}52’02.76”
2	27^{0}90’5.30”	26^{0}52’39.40”
3	28^{0}14’2.95”	26^{0}52’14.24”
4	26^{0}99’2.52”	26^{0}52’08.10”
5	26^{0}64’3.77”	26^{0}52’53.41”
6	26^{0}46’9.33”	26^{0}52’12.12”
7	26^{0}56’1.22”	26^{0}52’20.83”
8	27^{0}06’1.31”	26^{0}52’67.85”
9	27^{0}34’8.50”	26^{0}52’96.12”
10	28^{0}54’3.24”	26^{0}52’12.36”

[41] *Department of Minerals and Energy, 1994. Approval of the Environmental management Programme submitted in terms of Section 39 of the Minerals Act, 1991 (act 50 of 1991): the Farms Sandsloot 236 KR, Overysel 815 LR, Zwartfontein 818 LR and Tweefontein 238 KR, District of Mokerong. Reference 6/2/2/160.*
[42] *Co-ordinates as per the issued Licence plot incorrectly*
[43] *SRK, 2013. Consolidated Environmental management Programme for Anglo American Platinum – Mogalakwena Mine. Report Number 462905.*
[44] *Department of Environmental Affairs, 2015. Licence Number 12/9/11/L621/5 Class B Waste Disposal facility, Sorting facility and Treatment of contaminated Soil.*

The Licence (12/9/11/L621/5 Class B Waste Disposal facility – Section 3.1) allows for any portion of the site that has been constructed or developed according to Class B containment barrier design in terms of the Regulation 636, National Norms and Standards for Disposal of Waste to landfill, dated 23 August 2013 to be used for the disposal of waste classified for Type 2 waste in accordance with Regulation 634, National Environmental Management Waste Amendment Act, 2014: Waste Classification and Management Regulations, dated 23 August 2013.

3.12.1 Category A: Hazardous Waste

NEM:WA Act 59 of 2008[45] defines hazardous waste types in Schedule 3 Category A of the Act. This section provides definitions of the types of waste streams that may be present at the Mogalakwena Complex.

Table 3-25: Category A Waste Streams - Defined Wastes. (Schedule 3 Defined Wastes) (NEM:WA (Act 59 of 2008))

Category A: Hazardous Waste	
9. Wastes from the Manufacture, Formulation, Supply and Use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks	(a) wastes from MFSU and removal of paint and varnish
	(b) Wastes from MFSU of other coatings (including ceramic materials)
	(c) Waste from MFSU of printing inks
	(d) Waste from MFSU of adhesives and sealants (Including water proofing products)
12. Oil wastes and wastes of liquid fuels (except edible oils)	(a) waste hydraulic oils
	(b) Waste engine, gear and lubricating oils
	(c) Waste insulating and heat transmission oils
	(d) oil/water separator contents
	(e) Waste of liquid fuels
14. Other wastes not specified in the list	(a) Hazardous portion of waste from end-of-life vehicles from different means of transport (including off-road machinery), and wastes from dismantling of end-of-life vehicles and vehicle maintenance
	(b) hazardous portions of waste from electrical and electronic equipment
	(c) Hazardous portions of wastes from off specification batches and un-used products
	(d) Wastes from discarded gasses in pressure containers and discarded chemicals
	(e) Waste from discarded batteries and accumulators
	(f) Waste from transport tank, storage tank and barrel cleaning
	(g) Spent catalysts wastes
	(h) Oxidising substances wastes
	(i) Aqueous liquid waste destined for off-site treatment
	(j) Waste linings and refractories
15. Construction wastes	(a) Waste from bituminous mixtures, coal tar and tar products
	(b) discarded metals (including their alloys)
	(c) waste soil (including excavated soil from contaminated sites, stones and dredging spoil
	(d) Waste from insulating materials and asbestos containing construction material
	(e) Waste from gypsum based construction material
	(f) wastes from construction and demolition
17. Waste from Waste Management Facilities	(i) Wastes from Soil Remediation
1. Waste resulting from Exploration, Mining, Quarrying and physical and	(a) Waste from Mineral Excavation
	(b) Wastes from physical and chemical processing of metalliferous minerals

[45] *National Environmental Management Waste Act, 2008 (Act 59 of 2008) as amended by the National Environmental Laws Amendment Act, 2013 (Act 14 of 2013) dated 24 July 2013 and National Environmental Waste Amendment Act, 2014 (Act 26 of 2014) dated 2 June 2014 – Schedule 3 Defined Wastes.*

chemical treatment of minerals (Residue Deposits and Residue Stockpiles)	(d) Waste from drilling, muds and other drilling operations

MM has the following authorisation:

- Potgietersrust Platinum Limited, Control and Management of General Communal and General Small Waste Disposal Sites, 16/2/7/A600/C27Z3;
- Landfill site (bioremediation site) on Zwartfontein 818 LR (Ref: 12/9/11/L621/5) - 30/09/2014

Schedule 3, Category A waste streams are included in the Waste Management Licence as Listed Activities under Category B.

Note

The Waste Management Licence allows for the following Category B activities as per the gazetted list of waste management activities:

- *Activity 4 – The treatment of hazardous waste in excess of 1 ton per day calculated as monthly average, using any form of treatment excluding the treatment of effluent, wastewater or sewage.*
- *Activity 8 – The disposal of general waste to land covering an area in excess of 200m^2 and with a total capacity exceeding 25 000 tons.*
- *Activity 10 – 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)*

Hazardous waste is sorted at designated salvage areas at both the North and South Concentrators before being taken to a registered facility off site, for further re-use, recycling, and processing. AAP strives towards zero waste to landfill and ensures off-takes and/or further treatment of waste streams as far as practically possible before disposal is considered.

The mine temporarily stores hazardous waste and salvageable items which contain hazardous substances in containers in a demarcated enclosed area on the site (less than 10 tonnes per day). The hazardous waste comprises of fluorescent tubes, laboratory effluent and soil contaminated with fuel or chemicals, and totals a maximum of 150 cubic metres per annum. Hazardous waste is taken to a licenced hazardous waste management facility for recycling, treatment and remediation.

The temporary storage of hazardous waste is located at the southern side of the salvage yard and is bordered by the Dirty Water Dam (DWD).

3.12.2 Category B: General Waste

NEM:WA Act 59 of 2008[46] defines general waste types in Schedule 3 Category B of the Act. This section provides definitions of the types of waste streams that may be present at the Mogalakwena Complex.

Table 3-26: Category B Waste Streams - Defined Wastes. (Schedule 3 Defined Wastes) (NEM:WA (Act 59 of 2008))

Category B: General Waste	
7. Oil wastes and wastes of liquid fuels	(a) Oil wastes not otherwise specified in Category A
8. Other wastes not specified in the list	(a) Wastes from end-of-life vehicles from different means of transport (including off-road machinery), and wastes from dismantling of end-of-life vehicles and vehicle maintenance not otherwise specified in Category A
	(b) Wastes from electrical and electronic equipment not otherwise specified in Category A

[46] *National Environmental Management Waste Act, 2008 (Act 59 of 2008) as amended by the National Environmental Laws Amendment Act, 2013 (Act 14 of 2013) dated 24 July 2013 and National Environmental Waste Amendment Act, 2014 (Act 26 of 2014) dated 2 June 2014 – Schedule 3 Defined Wastes.*

	(c) Wastes from off specification batches and un-used products not otherwise specified in Category A
9. Food wastes	(a) Wastes from kitchens and restaurant facilities
11. Building and demolition wastes	(a) Discarded concrete, bricks, tiles, and ceramics
	(b) discarded wood, glass, and plastic
	(c) discarded metals
	(d) discarded soil, stones and dredging spoil
	(e) other discarded building and demolition wastes
12. Domestic waste	(a) Garden and park wastes
	(b) municipal waste
	(c) food waste
13. Inert waste	(a) Discarded concrete, bricks, tiles, and ceramics
	(b) discarded glass
	(c) Discarded soil, stones and dredging soil

Schedule 3, Category B waste streams are included in the Waste Management Licence as Listed Activities under Category A.

Note:

The Waste Management Licence allows for the following Category A activities as per the gazetted list of waste management activities:

- *Activity 2 - The sorting, shredding, grinding, crushing, screening or bailing of general waste at a facility that has an operational area in excess of 1000m^2.*
- *Activity 3 - The recycling of general waste at a facility that has an operational area in excess of 500 m^2, excluding recycling that takes place as an integral part of an internal manufacturing process within the same premises.*
- *Activity 12 – The construction of facilities for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).*

Anglo American Platinum has achieved its strategy of Zero Waste to Landfill.

- Waste Sorting Area
  - Waste is sorted at a waste sorting area located on the eastern side of the temporary storage of hazardous waste area.
- Scrap Metal
  - Scrap metals is sorted at the salvage yard. The recoverable metals are re-used by the mine and the non-recoverable metal is transported by contractors for recycling and re-use and sale. Scrap metals is therefore not disposed of at the waste site.
- Stockpiling
  - A designated area is located in the southern side of the Bioremediation site, immediately west of the waste cells and is used for the stockpiling of sand. The sand stockpile is used for emergency coverage of hazardous waste. The stockpile generated from the digging of the dumping trench is located in the eastern side of the trenches. Those stockpiles are used as stormwater berm and reused as covering of waste materials.
- Soil Remediation
  - The North mining waste site also includes a substantial area for soil remediation as well as a stormwater dam to collect dirty water runoff generated on the waste site. The purpose of this site is to remediate soils that have been polluted with hydrocarbons elsewhere on the mining footprint area. The treated contaminated soil will be used to cover waste at the landfill and for rehabilitation purposes at the TSFs and WRDs after it has been classified as suitable for the purpose.

- Salvage Yard
    - A salvage yard is located in the northwestern side of the waste site, right at the end of the road that enters the site. The size of the salvage yard is approximately 1.6ha. Waste metal and machine parts are stored here on a temporary basis.
- Industrial Waste
    - Industrial waste that cannot be salvaged or returned to suppliers for recycling is temporarily stored in a designated area within the waste management site before it is treated off-site at a licenced waste management facility.
    - All scrap metal is separated from the other general waste at the waste disposal site, and this is sold to scrap metal dealers. Used oil is returned to suppliers for recycling or to subcontractors. Industrial waste that cannot be salvaged or returned to suppliers for recycling is sorted at designated salvage areas at both the North and South Concentrators before being removed off-site by the Waste Contractor. All metal, conveyor belts, electrical cable and redundant equipment are sold for scrap. Used oil is returned to suppliers for recycling by the Waste Contractor.

3.12.3 Waste Tyres[47]

All waste tyres are taken to a licensed Waste Tyre Storage Area on WRD WO7.

Waste Tyres are downsized into rubber chips and metal on site and are then taken to a licensed Waste Tyre Processing Facility within the storage area as approved by the Waste Bureau.

MM has the following authorisations:

- Waste Management Licence; Mokopane Platinum Mine, Waste Tyre Storage Facility Licence No 12/4/10 – A/4/W2, Limpopo Department of Environmental Affairs and Tourism - 09/05/2012.
- Waste Management Licence variation; Mokopane Platinum Mine, Waste Tyre Storage Facility Licence No 12/4/10/8-A/2/W1-A2, Limpopo Department of Economic Development, Environment & Tourism - 23/09/2015.

3.13 RIVER DIVERSION

The Groot Sandsloot (Pholotsi) River has been approved for a diversion to allow for the continued mining of the Sandsloot Pit towards the western and northern sides as per Figure 3-23. The diversion will be situated between a WRD to the west and the Sandsloot pit to the east. A minimum distance of 30 m will separate the WRD from the diversion to cater for the WRD water management infrastructure and a minimum distance of 50 m together with a flood protection and safety berm will separate the diversion from the Sandsloot pit. The river diversion will be approximately 2.8 km in length.

[47] *Department of Environmental Affairs, 2017. Approval of the stockpile abatement plan for Mogalakwena Mine submitted to the Minister for consideration in terms of Part 3(8) of the Waste Tyre Regulations, 2009. Reference 14/11/14/3/1.*

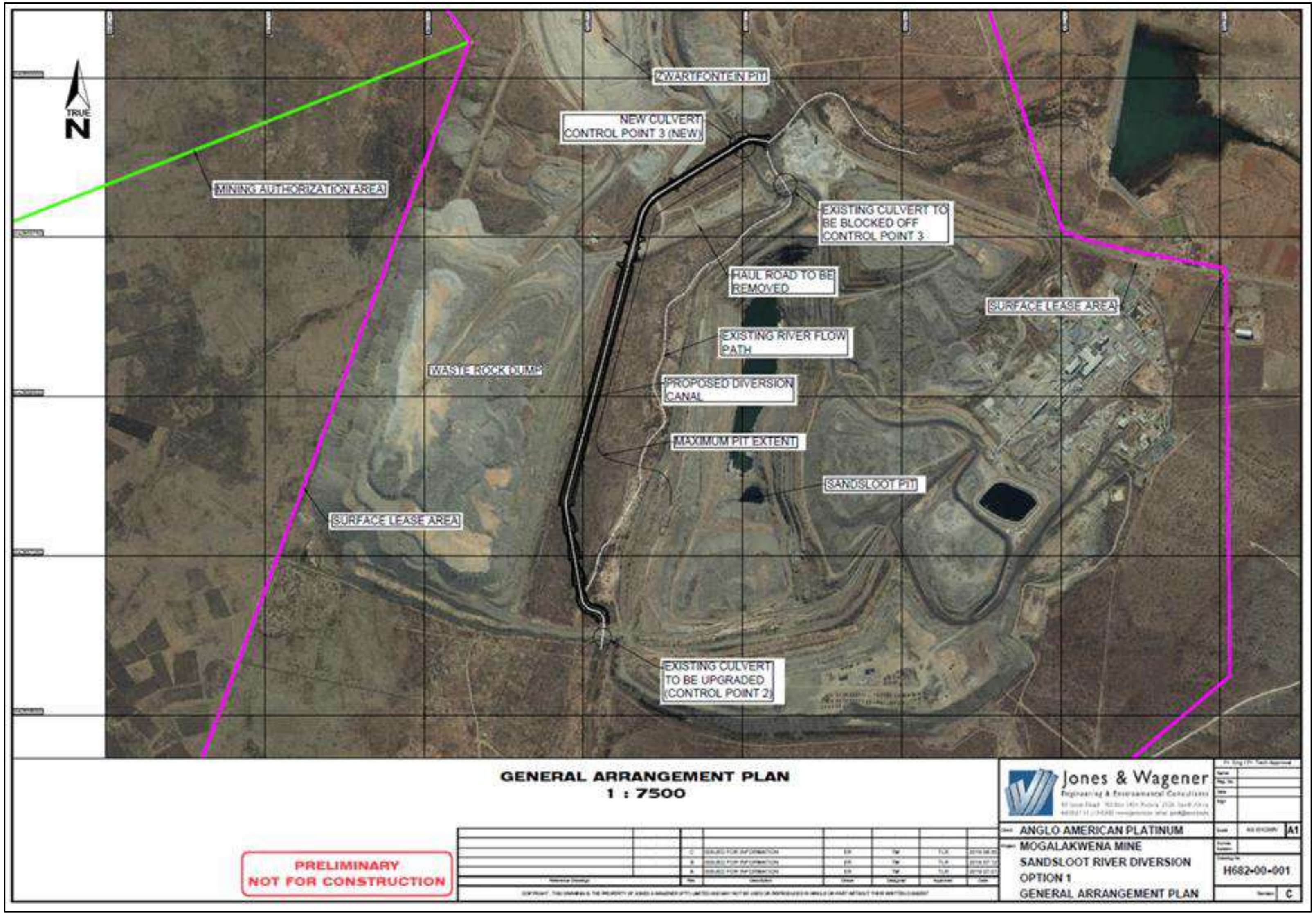

Figure 3-23: Diversion of the Sandsloot River (SRK, 2020)

3.14 ZERO EMISSIONS HAULAGE SOLUTION

Anglo American has signed a binding agreement with First Mode Holdinh Inc (''First Mode'') to combine Anglo American's NuGen™ Zero Emissions Haulage Solution (ZEHS) with First Mode, the specialist engineering technology company that partnered with Anglo American to develop the NuGen™ (ZEHS) (the "Transaction").

The ZEHS includes:

- The conversion of ultra-class haulage trucks to supply the truck haulage fleet at the MM and supporting infrastructure such as a workshop to retrofit the trucks.
- Hydrogen Production Facility (subject to a separate environmental authorisation):
- Hydrogen production
- Hydrogen liquefaction and storage
- Utilities (cooling water, nitrogen, instrument air, fire water, etc.)
- Export system
- Liquid hydrogen transport
- Support infrastructure for the production facility power transmission, water supply and return.
- Hydrogen refuelling stations
- Liquefaction plant at the current Proof of Concept
- A Staging area.

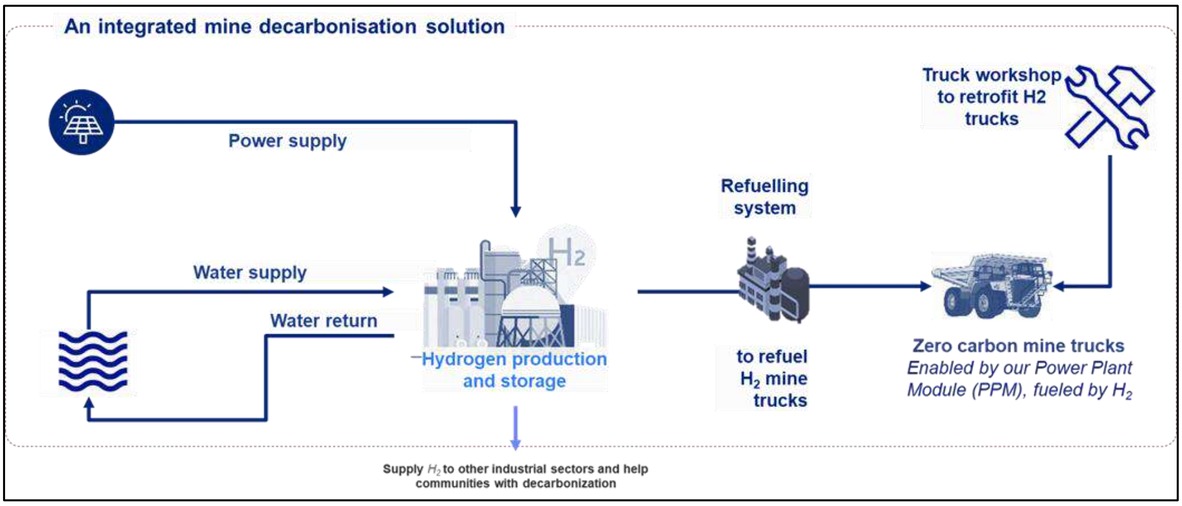

Figure 3-24: Schematic diagram of the Hydrogen Supply Chain Process (Hydrogen Production Facility Process)

3.14.1 Existing ZEHS Proof of Concept

On 4 February 2020 MM applied for Environmental Authorization in the form of a Regulation 29 amendment for the Pilot (Proof of Concept) ZEHS located adjacent MM's waste/bioremediation site on Portion 0 of Erf No. 818 Zwartfontein. This project included the development of a hydrogen production, refuelling system and retrofitting and field testing of a hydrogen powered ultra-class mine haul truck which utilizes a hybrid fuel cell and battery power module. The project also has a 616KW Photo Voltaic (PV) Plant. This project was centered around a small-scale (proof of concept) version of a planned full-scale phase roll-out, intended for implementation should the Pilot project prove to be successful. This project was approved on 17 March 2020 and subsequently rolled out on site.

The project was designed for the generation of 1000 kg/day of gaseous hydrogen with a total storage of 800 kg at 550 bar. The figure below depicts the location of the currently active ZEHS on site.

3.14.2 Hydrogen Production Facility on site

On 4 February 2020 MM applied for Environmental Authorization in the form of a Regulation 29 for the Pilot (Proof of Concept) Hydrogen Production Facility located adjacent MM's waste/bioremediation site on Portion 0 of Erf No. 818 Zwartfontein. This project includes the development of a hydrogen production, refueling system and retrofitting and field testing of a hydrogen powered ultra-class mine haul truck which utilises a hybrid fuel cell and battery power module. The project also has a 616KW Photo Voltaic (PV) Plant (330 kWh). This project was centered around a small-scale (proof of concept) version of a planned full-scale phase roll-out, intended for implementation should the Pilot project proof to be successful. This project was approved on 17 March 2020 and subsequently rolled out on site.

The project allowed for the generation of a 1000 kg hydrogen (at the Hydrogen Production Facility) and storage of 800 kg. The figure below depicts the location of the currently active Hydrogen Pilot Production Facility on site.

Figure 3-25: Existing Pilot Hydrogen Production Facility

MOGALAKWENA COMPLEX

FUTURE PROJECT DESCRIPTION

4 FUTURE OPERATIONS

4.1 SANDSLOOT COMBINATION MINING – OPEN PIT AND UNDERGROUND MINING PROJECT

The AAP Resource Development Plan (RDP), a strategic planning process, identified five (5) different possible underground mining exploration areas (Zones) over the 19 km strike of MM. These five (5) underground mining exploration areas / Zones include:

- **Sandsloot (SST) – Zone 1 (Refer to** Figure 4-3 **for the Master Layout Plan)**
- Mogalakwena South (MGS) – Zone 2
- Zwartfontein (ZWF) – Zone 3
- Mogalakwena North (MGN) – Zone 4
- Tweefontein (TWF) – Zone 5

These future underground mining operations are proposed/explored beneath the existing open pits at **Sandsloot**, Zwartfontein, Mogalakwena South and Mogalakwena North. The Sandsloot underground operations could be the initial production phase of a long-term development that could deliver up to 25 Mtpa peak production in the late 2030s, with an expected mine life of more than 76 years. The initial Sandsloot underground mine life, based on the findings of the Pre-Feasibility A Study, is expected to be between 30-40 years. The figure below depicts the location of these five (5) zones in relation to the MM Layout.

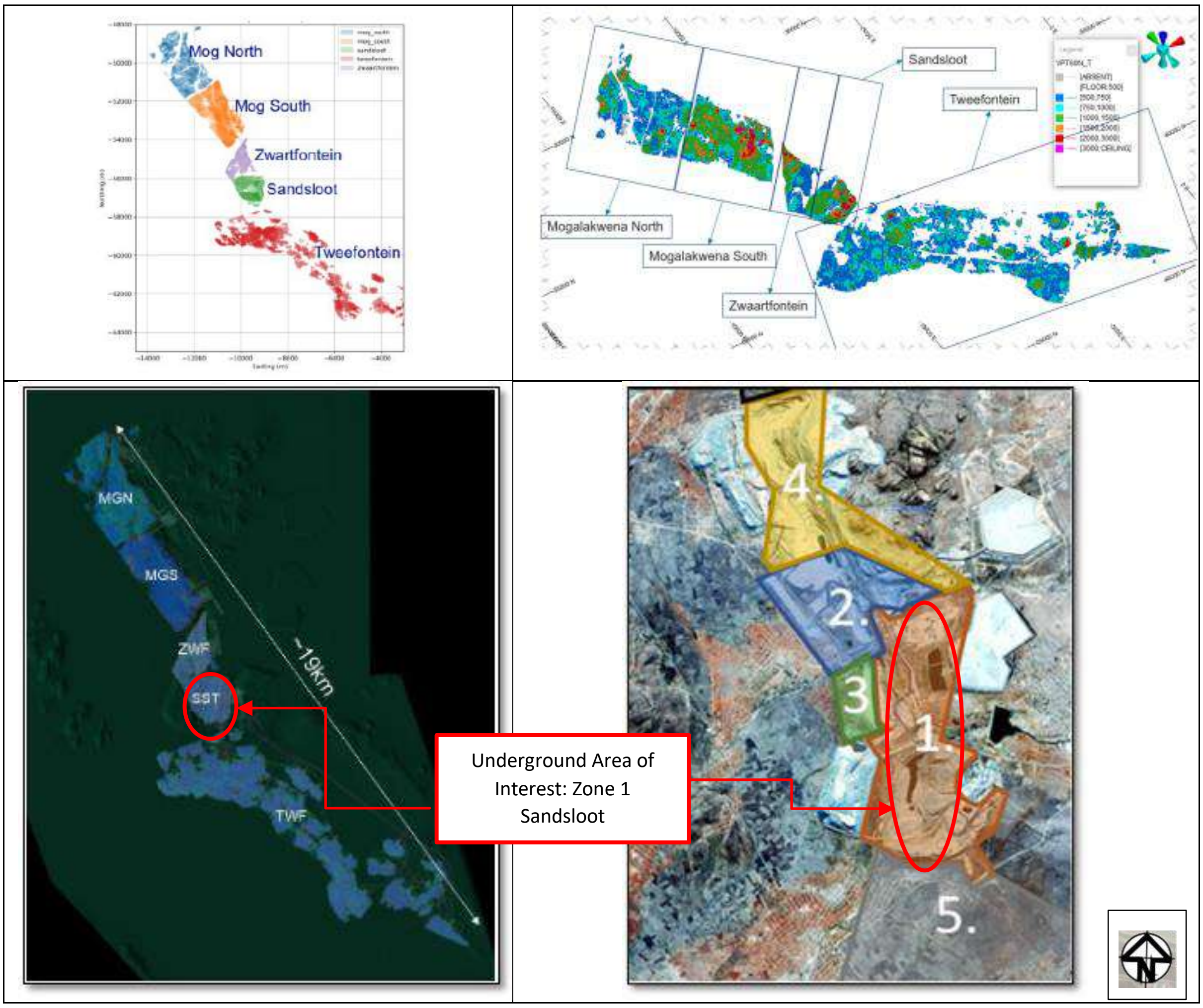

Figure 4-1: Five Mogalakwena Underground Mining Areas / Zones

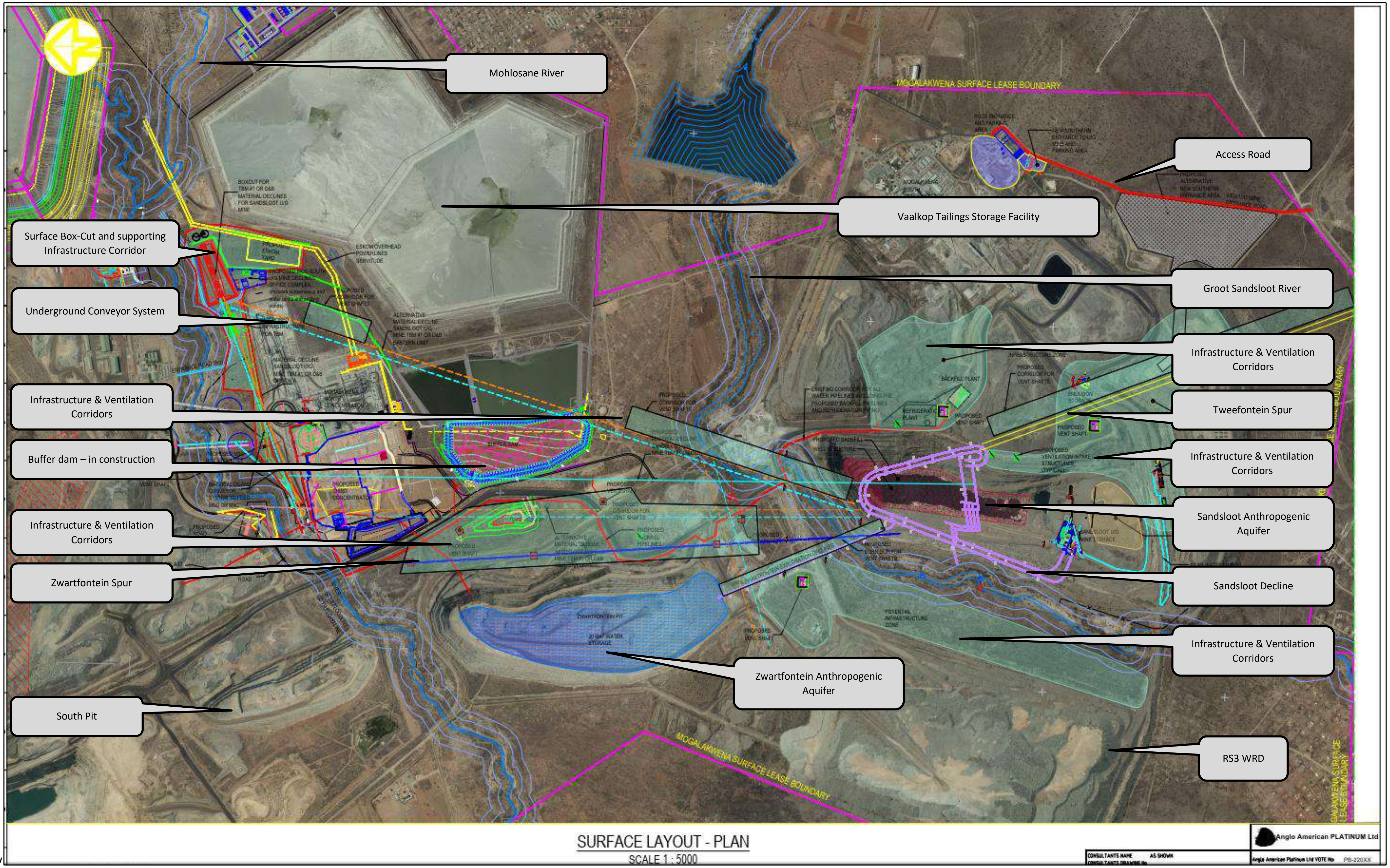

Figure 4-2: Master Layout Map - Sandsloot Underground Mine (Zone 1)(AAP, 2023)

4.1.1 SANDSLOOT UNDERGROUND MINING (ZONE 1)

As per MM long term strategy, the mine intends to exploit the Sandsloot– Zone 1 resources deeper than the current open pit horizons by changing the current mining method from an open pit mining process to an underground mining process which will extend the Life of Mine (LoM).

The Sandsloot underground operations is likely to produce up to 6 Mtpa (Sandsloot Zone 1) with average head grades in the range of 5 to 6 g/t 4 PGE, following the ramp up periods.

The production ramp up period for Sandsloot Underground is expected to take approximately four years following the mine development phase of three years.

The Sandsloot underground mine will be developed in two Phases. Namely Phase 1 (A, B & C) (Exploration Declines & Trial Mining) and Phase 2 (Mine Development).

Sandsloot Underground mine Exploration Declines Phase 1 (A&B) has already been approved by the Department of Mineral Resources (DMRE) and commenced in 2022, Phase 1 (C) is estimated to commence in 2024 and Phase 2 (Mine Development) which has not yet been submitted for approval (this application) is estimated to commence in ~2024.

- Phase 1: Exploration Declines
    - Phase A: Q1 2022 – Q4 2023 (indicative timeframe) - advance Mineral Resource definition
    - Phase B: Q2 2023 – end 2024 (indicative timeframe) - additional decline development, bulk ore sample, raise boring and potentially trial stope mining
    - Phase C: Potential trial stope mining
- Phase 2: Mine Development
    - 2024 (indicative timeframe) - ~ up to 6 Mtpa of ore at steady state

Due to the overall thickness and geometry of the orebody, Long-hole Open Stoping (Transverse (TLHOS) and Longitudinal (LLHOS)) methods were identified as the preferable mining method with drift and fill and cut and fill in the narrower areas of the orebody. Mine development is planned as an "*top down*" approach (mining access commencing from the top level moving down) with mine production mining "bottom up" from selected production levels.

A crown pillar will be maintained between the underground operations and the open pit area to prevent any risks associated with surface failures and water inundation.

The mine will commence using proven diesel and hydraulic-electric equipment and transition to industry leading automated mechanized mining fleets (as the technology becomes available). For example, battery electric vehicle technology could be deployed to reduce emissions once technology is available and proven.

4.1.1.1 Phase 1: Exploration Decline & Trial Mining

Phase 1 development includes the development of an exploration decline to create an initial underground exploration corridor and platform from the existing Sandsloot Pit, to then serve with a long-term function enabling safe and efficient mine access and as a future infrastructure corridor.

Phase 1 allows for a combined development methodology of mechanised drill and blast development and continuous cutting Mobile Tunnel Borer Machine (MTB).

Phase 1 is divided into Phase A, B and C sub-phases where:

- Phase A establishing an exploration decline (initial drill platform) for Sandsloot underground and an exploration corridor along the strike of the ore body.
- Phase B extends the exploration decline to the ore body to obtain bulk ore sampling, and undertake trial mining: and
- Phase C allows for trial mining

The figures below depict the Exploration Declines as well as the Mobile Tunnel Borer Machine (MTB) utilised as part of the mechanised methodology used.

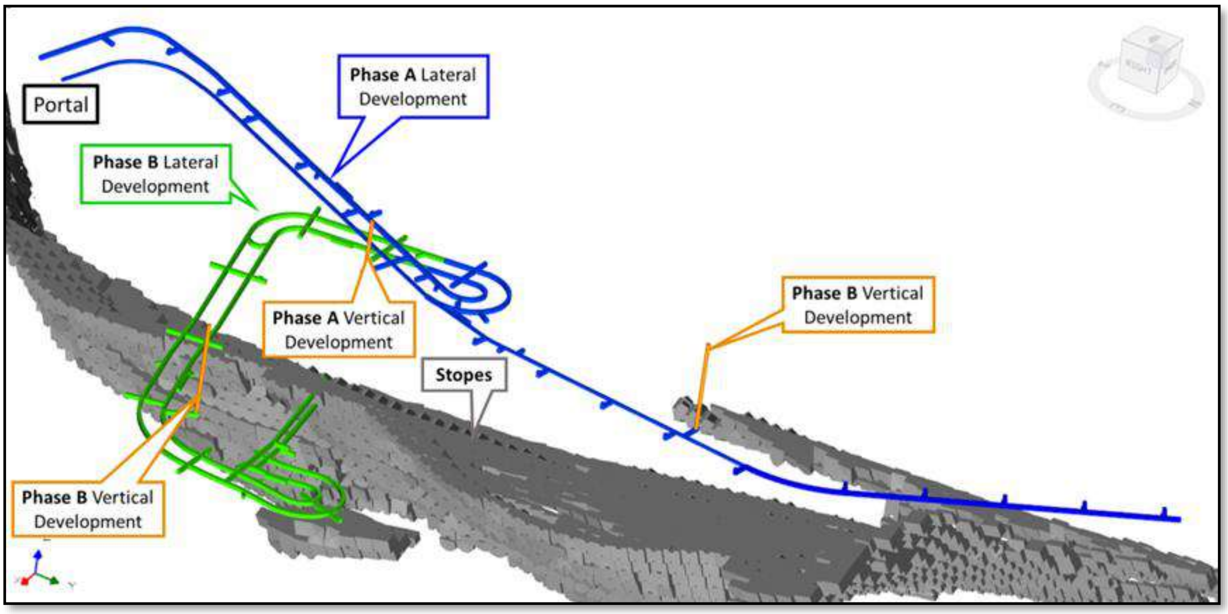

Figure 4-3: Sandsloot Underground: Mobile Tunnel Borer Machine (MTB) & Drill and Blast

Additional facilities constructed to support Phase 1A development included: offices, change houses, lamp rooms, mobile equipment workshops, potable water treatment plant, sewage treatment plant / tank, water supply borehole, emulsion silo's, power supply substation and car park.

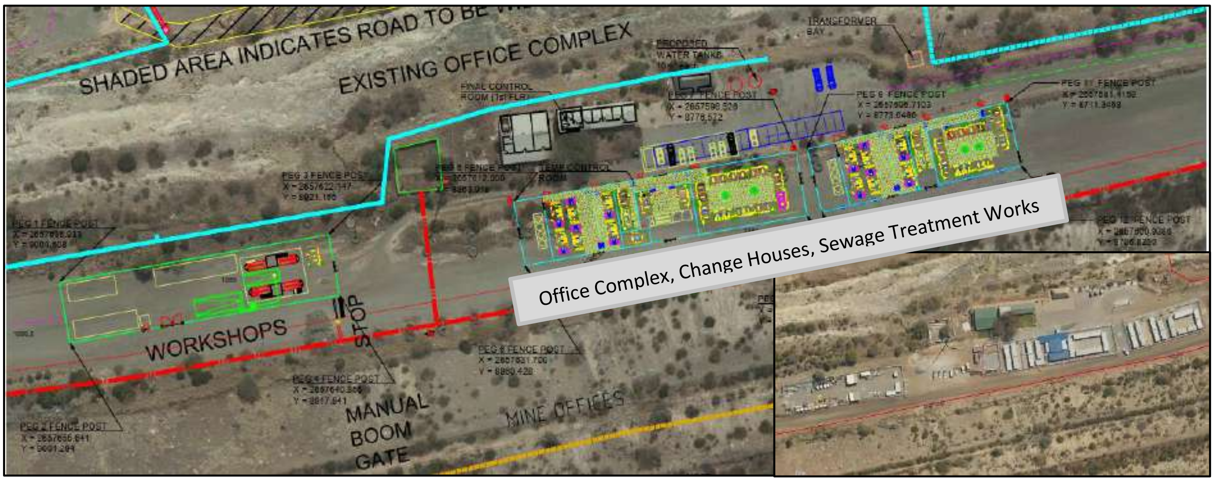

Figure 4-4: Offices and Workshop Areas at the Sandsloot Exploration Decline

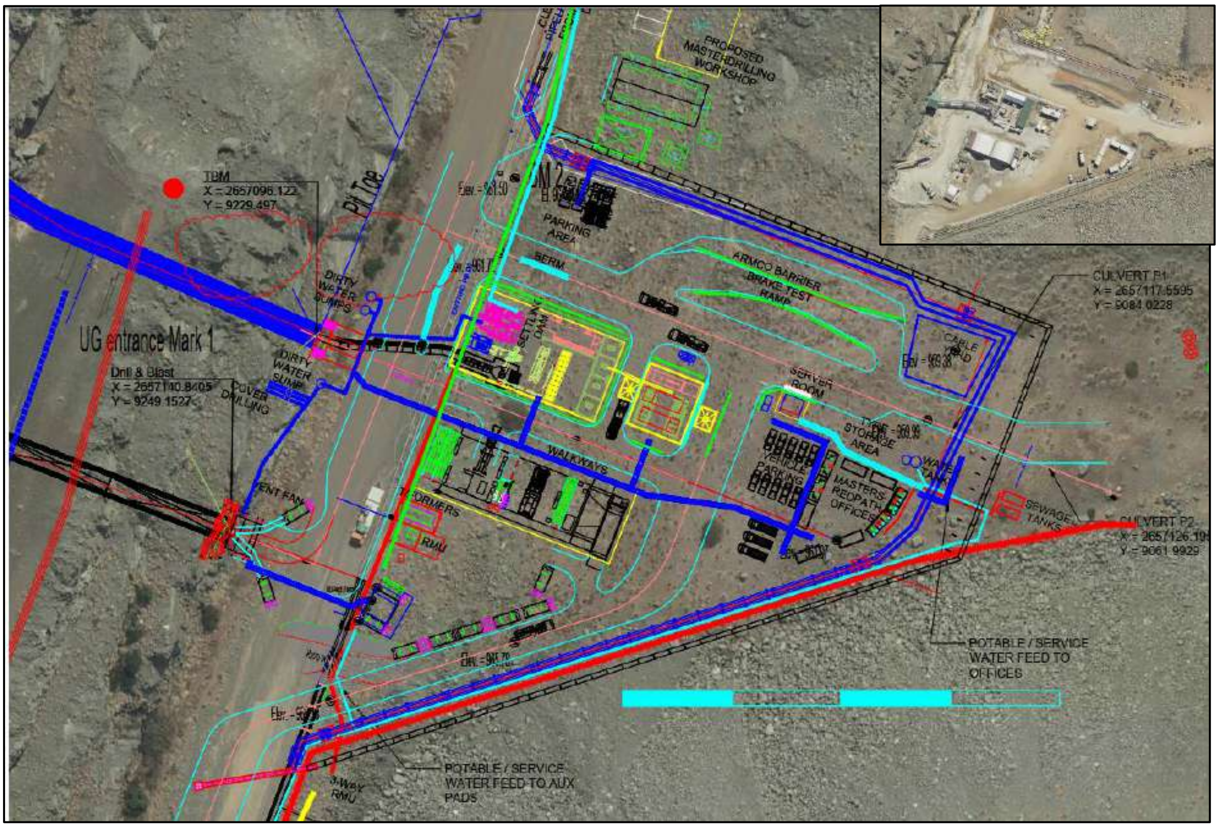

Figure 4-5: Sandsloot Underground: Phase A&B Exploration Decline Infrastructure

4.1.1.1 Phase 2: Mine Development

Sandsloot underground mine development will be undertaken as part of this phase (planned to commence in 2024(indicative timeframe)). This current authorisation process therefore addresses this phase of the project.

4.1.1.1.1 Box Cut Development (Part of this Regulatory Process)

A Box-Cut[48,49,50,51,52,53] (which constitutes a single rectangular cut made in the surface of the earth to supply a secure and safe entrance as access to the underground mine) will be developed north of the existing North Concentrator (MNC).

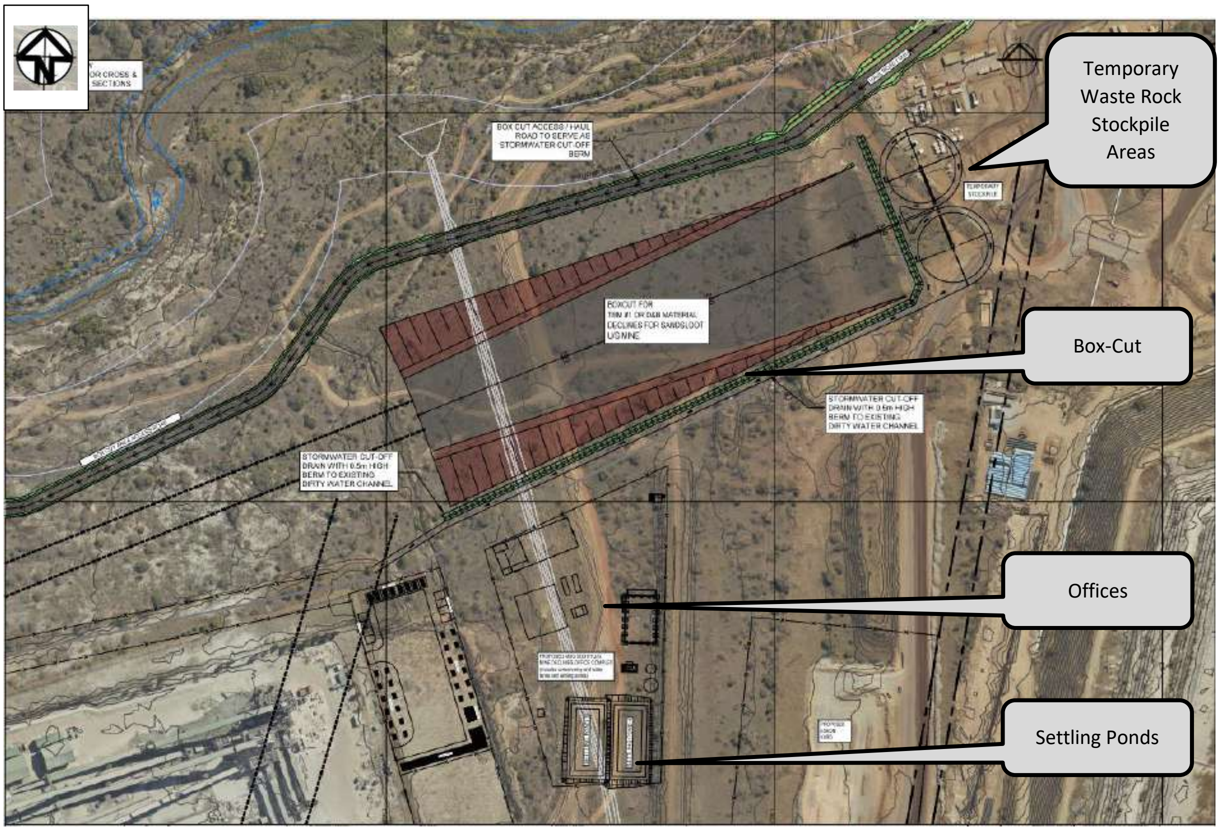

Figure 4-6: Box-cut Area - 42m (depth), 2 x 20m tunnels +10m in-between (50m wide bottom of cut)

As part of the Box Cut development a Construction Laydown Area, underground Office Complex[54,55,56,57] and Eskom Yard will be required (within the same area). These areas will consist of the following surface infrastructure:

- Settling Ponds (Pollution Control Dams (PCDs))[58,59]
- Stores
- Raw/Fire Water Tanks
- Fixed Plant Workshops
- Emergency Generator; and
- Road Access

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[48] *NEMA 1998 GN983 as amended - Listing 1 Activity 12*
[49] *NWA 1998: S21(c&i) Water Use*
[50] *NEMA 1998 GN983 as amended - Listing 1 Activity 19*
[51] *NWA 1998: S21() Water Use*
[52] *NEMA 1998 GN983 as amended - Listing 1 Activity 27*
[53] *NWA 1998 GN704 – Regulation 4(c) Exemption*
[54] *NEMA 1998 GN983 as amended - Listing 1 Activity 27*
[55] *NEMA 1998 GN983 as amended - Listing 1 Activity 12*
[56] *NEMA 1998 GN983 as amended - Listing 1 Activity 19*
[57] *NEMA 1998 GN984 as amended - Listing 2 Activity 15*
[58] *NWA 1998: S21(g) Water Use*
[59] *NWA 1998 GN704 – Regulation 10(1)(b) exemption*

- Temporary Waste Rock Stockpiles (two)[60,61,62,63,64]
- Diesel Storage and Dispensing Tank[65,66]
- Offices (inclusive of conservancy tanks)
- Eskom Yard

The table below summarises in detail the proposed supporting infrastructure for the Box Cut Area, Construction Laydown Area, and Office Complex planned adjacent to the MNC.

Table 4-1: Summary of the Supporting Infrastructure adjacent to the MNC

Activity	Description	Volume	Co-ordinates – outer area boundary	Estimated Time
Development of ***Box-cut Area*** adjacent to the MNC	Removal of Box-Cut Excavation Material Material to be placed in the northern corner of the Zwartfontein Pit in support of the development of the Anthropogenic Aquifer or on a permitted waste rock dump	4.1Mm^3 material to be removed ~ 9 Ha including civils	23^{0}58’25.38 S 28^{0}54’53.29” E 23^{0}58’36.29 S 28^{0}54’56.33” E 23^{0}58’13.62 S 28^{0}55’32.25” E 23^{0}58’25.30 S 28^{0}55’37.92” E To be finalised during the EIA process	Estimated Development Timeframe ~2024
Box-cut ***Construction Laydown Area*** adjacent to the MNC	Construction Laydown Area located to the east of the Box-cut Area adjacent to the MNC	~ 2 Ha		
Settling Ponds within the footprint area of the Construction Laydown Area (adjacent to the MNC).	These settling ponds will be located within the footprint area of the Construction Laydown Area (adjacent to the MNC). As part of the temporary infrastructure to support the Box Cut Development containerised steel tanks and drizit unit will be utilised.	Temporary Tanks: ~80 m^3 Permanent Ponds: Size still to be determined through the Hydrology Study in support of Stormwater Management Currently estimated at ~500 m^3.		
Raw / Fire Water Tanks within the footprint area of the Construction Laydown Area (adjacent to the MNC).	The Fire water Tanks will be located within the Construction Laydown Area which will be located adjacent to the MNC	PFS – A study estimated: Raw Water: ~500 m^3/day Fire Water: ~400 m^3/day		
Stores within the initial footprint area of the Construction Laydown Area (adjacent to the MNC) and will	The Stores will be located within the Construction Laydown Area	N/A – the stores will store service equipment for maintenance for the fire/raw water tanks and underground		

[60] *NWA 1998: S21(g) Water Use*
[61] *NEM:WA 2008 GN921 as amended – Category B Activity 8*
[62] *NEM:WA 2008 GN921 as amended – Category B Activity 10*
[63] *NEM:WA 2008 GN921 as amended – Category B Activity 11*
[64] *NWA 1998 GN704 – Regulation 4(a) Exemption*
[65] *NEMA 1998 GN983 as amended - Listing 1 Activity 14*
[66] *NEMA 1998 GN983 as amended - Listing 3 Activity 10*

remain during the operational phase of the project.		material handling conveyor system		
<u>Diesel Storage and Dispensing Tank</u> within the footprint area of the Construction Laydown Area (adjacent to the MNC).	Diesel Storage Tank (Transtank Type)	110 kℓ (110 m^3)		
<u>Two Temporary Waste Rock Stockpiles</u> adjacent to the Box-cut	Temporary Waste Rock Stockpiles to transfer ore to haul trucks for processing	~5 000 m^3 each		
<u>Eskom Yard</u>	Eskom Yard between MNC & Vaalkop TSF Compartment 2	~4 Ha	$23^0$58’35.75 S	$28^0$55’27.42” E

4.1.1.1.2 Trial Mining and Underground Mine Development (This Regulatory Process)

4.1.1.1.2.1 Trial Mining

Phase 1 – Phase C allows for trial mining phase where stope and development ore will be extracted while confirming the operability of the mining method.

4.1.1.1.2.2 Underground Mine Development (Phase 2)

The Sandsloot Underground mine development[67,68,69] would be either through drill and blast and/or mechanized and automated through the [70]utilisation of the MTB or a Tunnel Boring Machine. The primary mining method will be long-hole open stoping (traverse and longitudinal) with drift and fill and cut and fill in the narrower areas of the orebody.

The initial underground mine fleet will consist of, but not limited to drilling machines, ground support machines, load haul dump (LHD) units, articulated haulage trucks, a combination of battery electrical and diesel vehicles, utility vehicles, light vehicles, cutting equipment, and the MTB and and/or Tunnel Boring Machines.

The ore mined would be delivered to surface for rehandle to the concentrators up to 3Mtpa for the first ~3 – 4yrs. Existing haul roads of the Sandsloot pit will be used as well as other existing surface roads outside the pit perimeter to gain access to the MSC and MNC. Ore will be trucked from underground to the MSC or MNC for the initial years of the mine, until the material handling declines have been developed and equipped. Ore would temporarily stockpiled on existing waste rock facilities within the Sandsloot open pit as well as on surface on dedicated stockpile areas as to enable rehandling of the material from underground to surface haulage fleets.

Once the underground incline conveyor[70,71] system has been developed, the ore will be conveyed from underground for handling to the MNC or M3C to steady state production of 6Mtpa.

<u>Exploration Declines and levels</u>

Twin declines with an opening of approximately 6.0 x 5.5 m accessing the orebody from the Sandsloot pit on the hangingwall (West) are being developed during the Exploration Decline Phase A. Footwall hangingwall

[67] NWA 1998: S21(c&i) Water Use
[68] NWA 1998 GN704 – Regulation 4(b) Exemption
[69] NWA 1998: S21(a&j) Water Use
[70] NWA 1998: S21(c&i) Water Use
[71] NWA 1998 GN704 – Regulation 4(b) Exemption

development could be advanced using a combination of Tunnel Boring Machines, MTB Mobile Tunnel Borers and/or drill and blast methods. Underground ventilation systems, ore passes, and other vertical raises would be developed using raiseboring, shaft boring or longhole methods up to 5m diameter.

An exploration level access, to gain more orebody knowledge, is proposed from the Sandsloot Orebody south to the Tweefontein underground mine development using a twin tunnel system of up to 12 m diameter opening. Figure 4-7 depicts the Tweefontein Exploration decline.

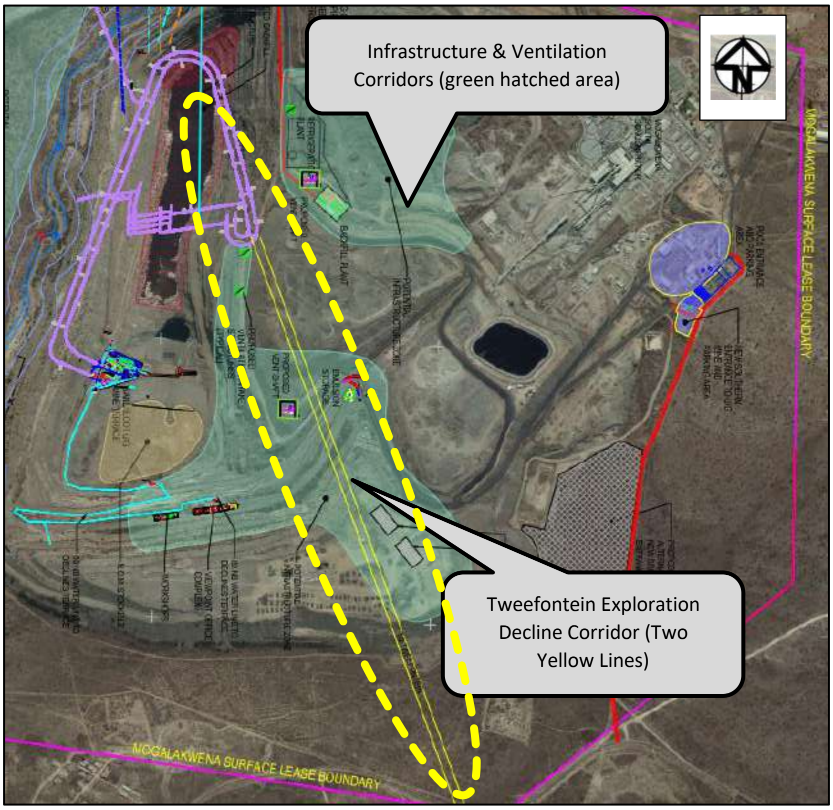

Figure 4-7: Tweefontein Exploration Decline Corridor (Tweefontein Spur)

Exploration declines to gain more orebody knowledge of the proposed Zwartfontein and Mogalakwena South underground mine development[72,73] are planned with a twin decline access of up to 12 x 12 m opening extending from the Sandsloot decline across the Zwartfontein deposit toward the Mogalakwena South project area. This decline is presented in Figure 4-8.

[72] *NWA 1998: S21(c&i) Water Use*
[73] *NWA 1998 GN704 – Regulation 4(b) Exemption*

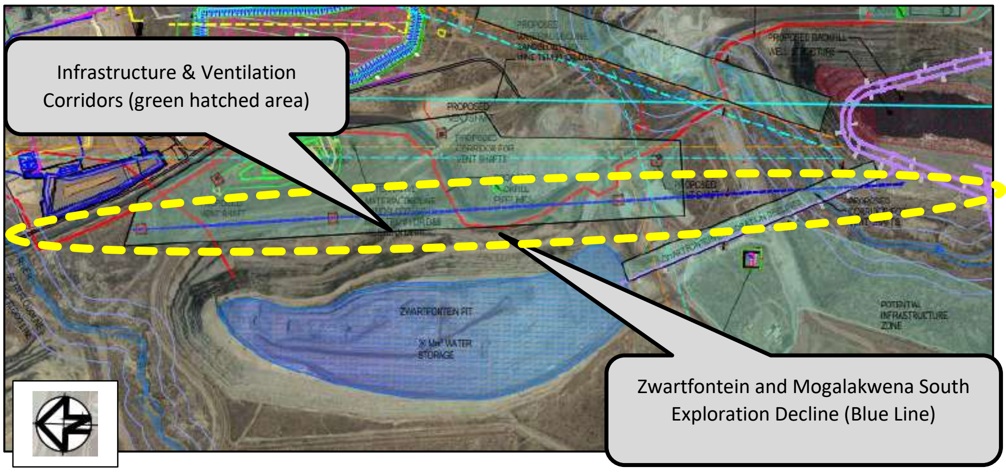

Figure 4-8: Zwartfontein and Mogalakwena South Exploration decline (Zwartfontein Spur)

The Sandsloot block is a near-vertical ore body, and it will be mined to produce up to 6 Mtpa to a maximum depth of ~1,000 m below surface. The reef has a strike length of ~1.4km, an average thickness of ~67m at a slope of ~40^0. The initial life of mine for the Sandsloot mining block is approximately ~49 years. Figure 4-9 provides a schematic diagram in support of the Sandsloot underground mine development.

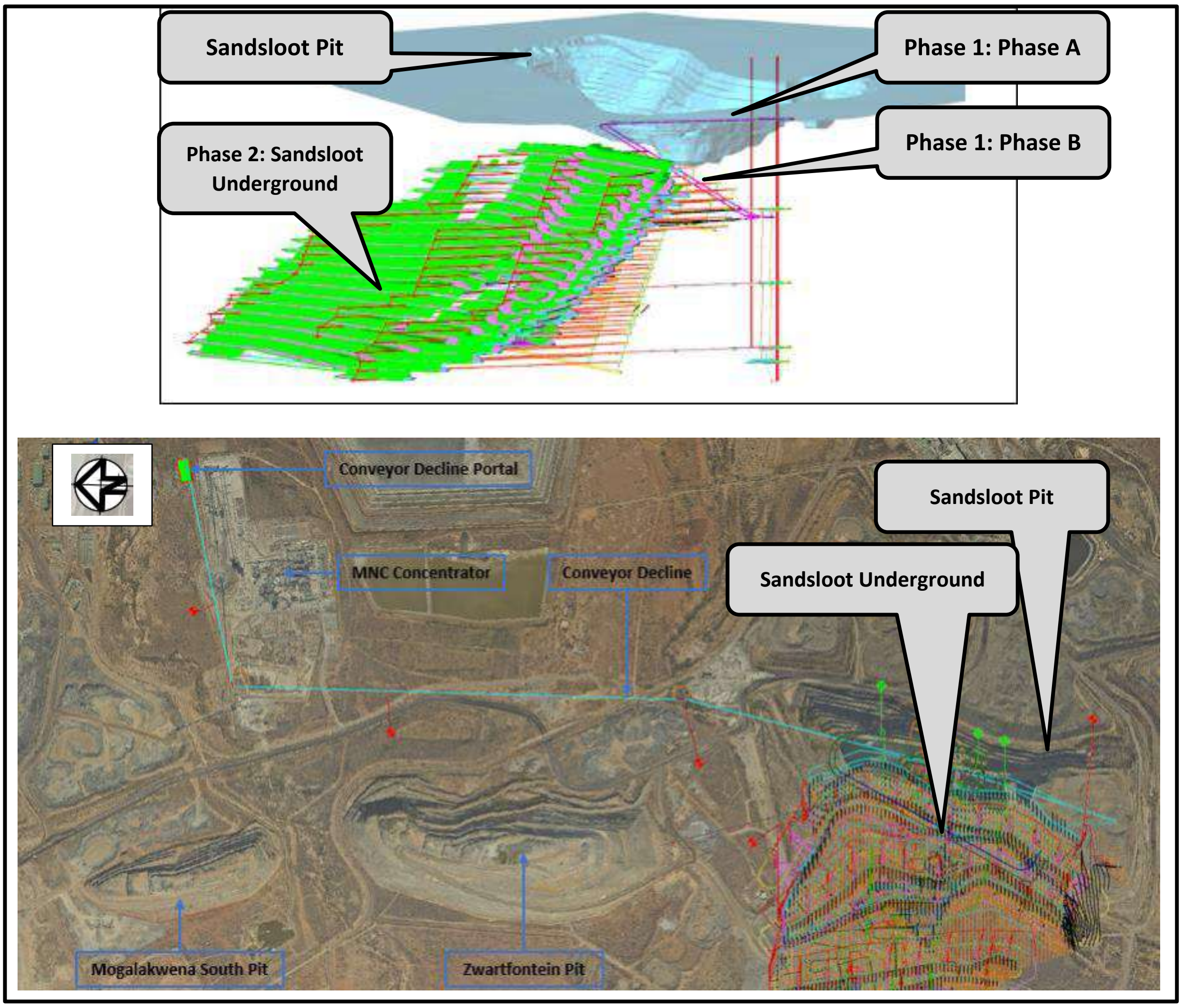

Figure 4-9: Combined Open Pit and Underground Operations

4.1.1.2 Underground Workings – Dewatering

In order to keep the underground working dry for the safe continuation of underground mining activities, dewatering of the underground workings[74] will be throughout the LoM.

The following supporting infrastructure will be required to support the dewatering strategy:

- Dewatering Boreholes in line with the underground spatial development (extent of the underground development in relation to the surface as mining develops over time) to allow for the active dewatering of the underground operations.
- Associated pipelines (~2km DN ≤500mm diameter each) to be connected to existing infrastructure (within the dewatering pipeline corridors) for pumping of water for reuse on site / in process.
    - Dewatered water will be pumped to the settling pond[75] located on the terrace prior to being pumped through existing infrastructure for reuse on site / in process.

[74] NWA 1998: S21(a&j) Water Use
[75] NWA 1998: S21(g) Water Use

4.1.2 UNDERGROUND SUPPORTING INFRASTRUCTURE

4.1.2.1 Underground Conveyor System

A twin conveyor decline (~12m x ~12m) (from the proposed Box Cut (as discussed above) to the underground crusher stations) will be developed for the transportation of ore material (mill feed) from underground. The declines will also provide a second means of egress and form part of the ventilation system for the operations.

The figure below depicts the underground conveyor system route alternatives considered in relation to existing MM surface infrastructure. Alternative 1 and Alternative 2 show the expected outer bounds of the potential underground conveyor alignment with the final alignment to be confirmed following further field investigation and design work is undertaken. The solid light blue line (Alternative 1) annotated as "*preferred alternative*" is the current expected alignment, however this is subject to change.

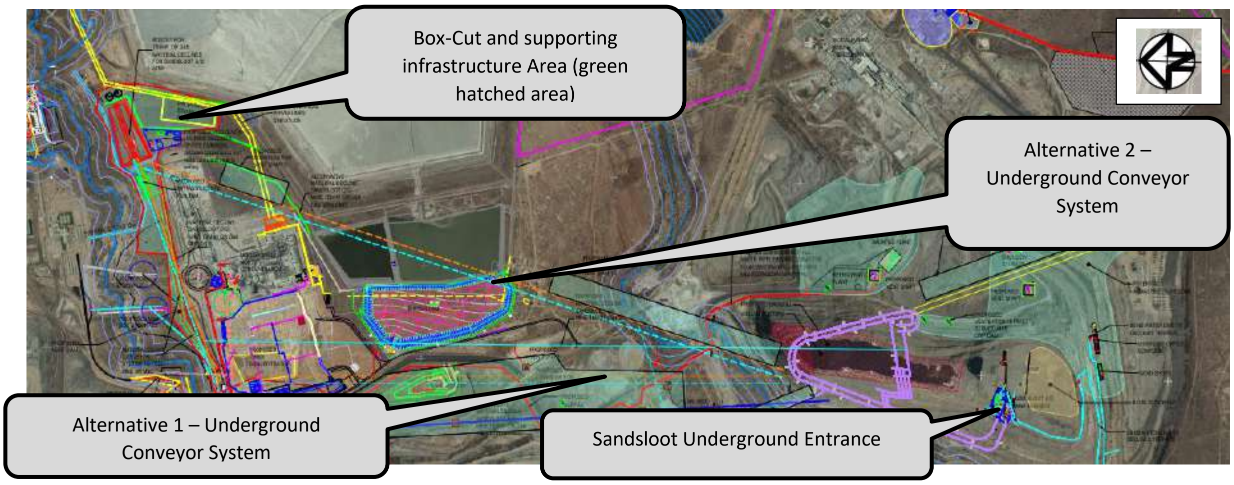

Figure 4-10: Sandsloot Underground Conveyor System Route Alternatives

The ore (mill feed) will be trucked or conveyed from the underground workings to the exploration decline portals, located in the existing Sandsloot open pit, and then transported to the existing concentrators.

Once the underground crushers are installed, the ore (mill feed) will be trucked or conveyed from the underground workings through the conveyor decline(s) to the MNC, with the exploration decline used to access MSC as required.

A silo[76] will be constructed to the north of the North Concentrator main stockpile area for ore surge capacity before being transferred to the concentrators.

[76] NEM:WA 2008 GN921 as amended – Category C Activity 1

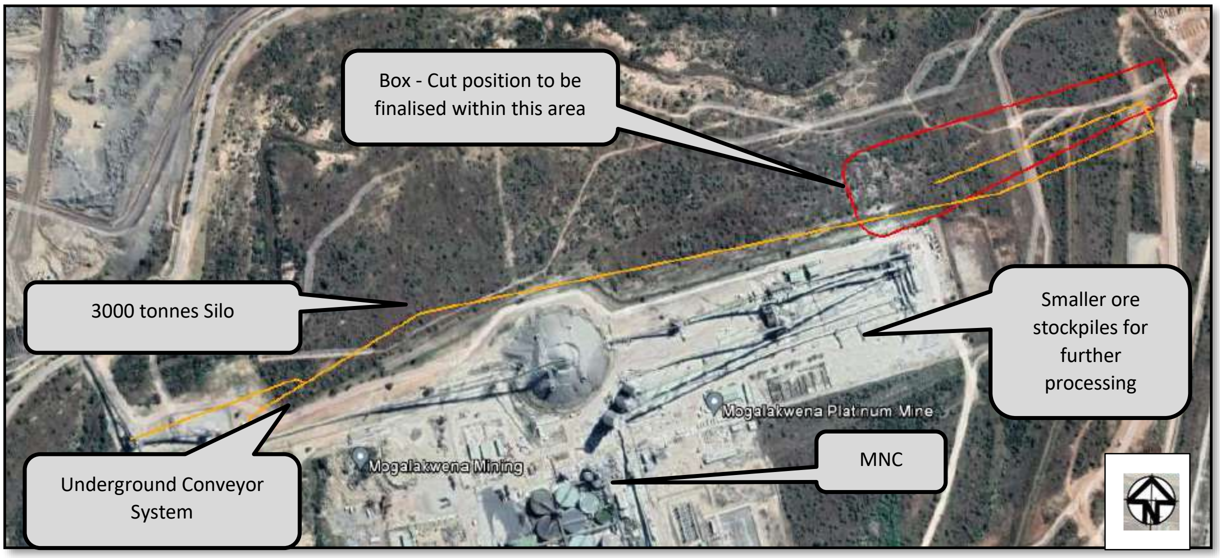

Figure 4-11: Sandsloot Underground Conveyor System Route to M3C[77,78,79,80]

4.1.2.2 Waste Rock

Waste Rock material produced during the development phase of the Sandsloot underground mine and exploration declines to Zwartfontein and Tweefontein Spurs will be handled in the following manner on site:

- Two temporary waste rock stockpiles at the Box-cut area;
- Disposal onto existing already approved Waste Rock Disposal Facilities
- Utilisation as an alternative material for various projects/processes such as roads, ramps, dams, embankments, impoundment, gabion walls, anthropogenic aquifers, terraces and backfilling development.
- The operation will transport mine waste from the underground workings to in-pit or surface waste rock dumps via the declines over the life of the mine. The volume of waste rock material will be in excess of ~30Mt for the LoM.

Refer to Section 4.3 for the development of the anthropogenic aquifer as well as Section 4.5 for the management of waste rock material on the Waste Rock Disposal Facilities in support of continual open pit operations and the development of the underground mining operations.

4.1.2.3 Run-of-Mine Ore Stockpile

A Run-of-Mine (RoM) ore stockpile[81] will be developed at the southern end of the Sandsloot Pit on top of an existing filled terraced area. This RoM stockpile will cover an area of approximately 15 ha and will allow for the placement of a 100 kt (50 000 m^3) of RoM (~approximately 20 days of stockpile material at approximately 2Mtpa). The stockpile will be constructed onto an area already previously utilised for waste rock disposal that will have development waste placed in the area to create the footprint for the ore stockpile. The RoM stockpile will be located on the upper waste terrace in the Sandsloot pit that will be traffic compacted and dozed to create a safe working platform for the stockpile and construction laydown area. RoM material will be reclaimed from the stockpile and transported by surface fleet to the MSC primary crusher where it will be further processed until such time as the underground conveyor system has been constructed.

[77]NEM:WA 2008 GN921 as amended Category B Activity 8
[78]NEM:WA 2008 GN921 as amended Category B Activity 10
[79]NEM:WA 2008 GN921 as amended Category B Activity 11
[80]NWA 1998: S21(g) Water Use
[81]*NWA 1998: S21(g) Water Use*

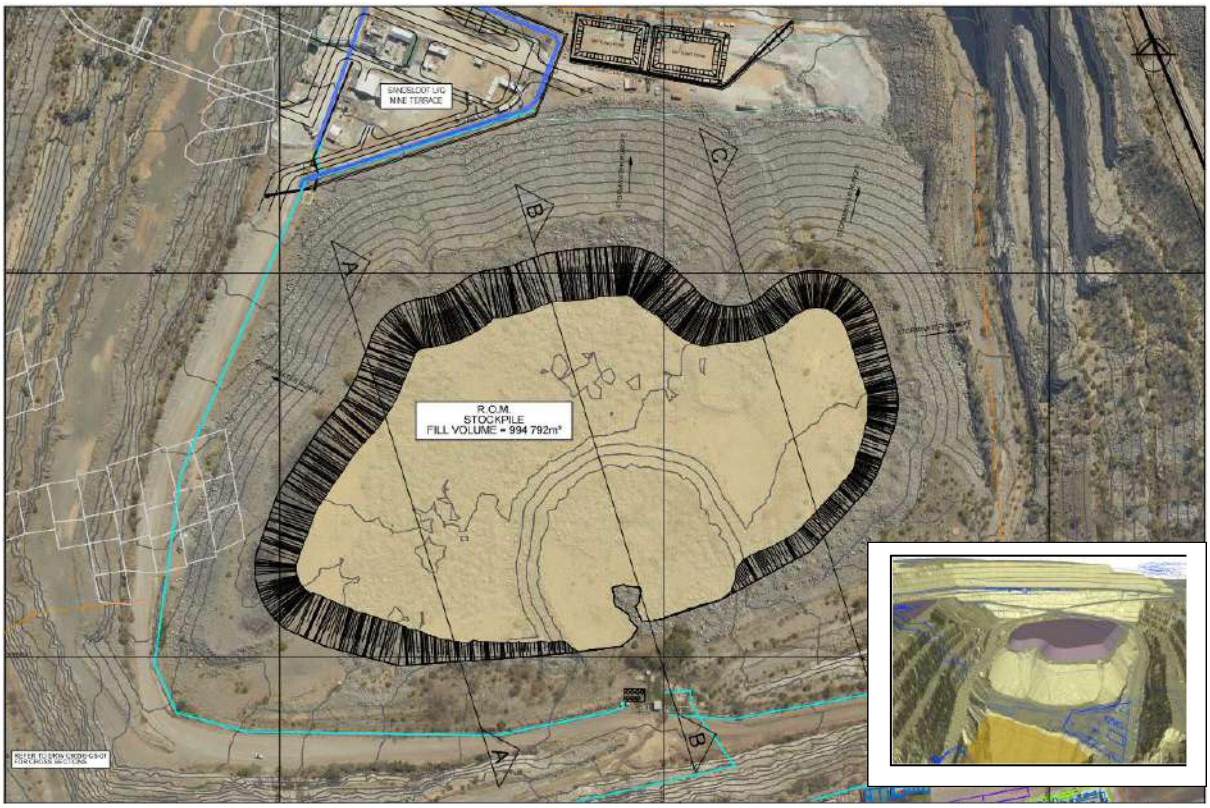

Figure 4-12: New Proposed RoM Ore Stockpile

Table 4-2: Locality of the Run-of-Mine Stockpile supporting the Sandsloot Underground Development

Activity	Description	Volume / Area	Co-ordinates – outer area boundary To be finalised during the EIA process	
Run-of-Mine (RoM) Stockpile Area	This stockpile will be located on top of an area where waste rock material has been deposited. This stockpile supports the initial ore from the development of the exploration decline prior to the completion of the underground conveyor system	~50 000 m³/a ~15 Ha 994 792 m³	24⁰01'03.84" S 28⁰54'35.24" E	24⁰01'02.80" S 28⁰54'45.86" E
				
			24⁰01'13.02" S 28⁰54'32.56" E	24⁰01'09.15" S 28⁰54'47.42" E

4.1.2.4 Paste Backfill Plant & associated pipelines

A new proposed Paste Backfill Plant (~≤1Ha) (to prepare cemented tailings paste backfill for the Sandsloot underground mine) will be constructed east of Sandsloot pit on an area previously utilised for the stockpiling of waste rock. A portion of this existing stockpile will be levelled for the construction of the Paste Backfill Plant and the distribution pipelines. The pipeline routes will be finalised during the Impact Assessment phase of the project as part of this regulatory process.

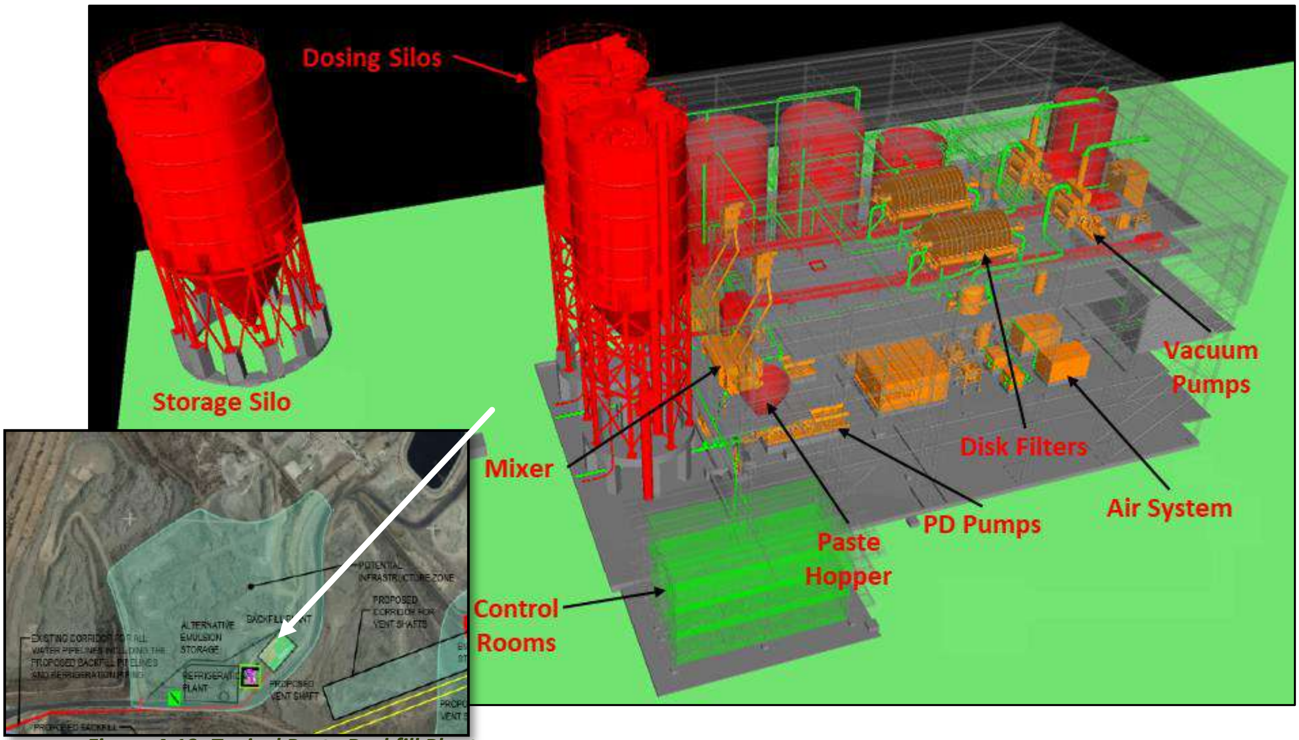

Figure 4-13: Typical Paste Backfill Plant

The following pipelines are anticipated to support the backfill plant[82, 83, 84,85]:

- Tailings pipeline of approximately. 6 km in length (HDPE OD ~500 - 600 mm) from MNC to the Paste Backfill Plant alongside the existing internal roads;
  - Pipeline to convey tailings for preparation of the backfill cemented paste.
- Dirty Water pipeline of approximately 6 km in length (HDPE OD ~400 - 500 mm) from Return Water Dam to new Paste Backfill Plant alongside the existing internal roads.
  - Pipeline will convey return water and undersize material, to mix with tailings for cemented paste.
- Dirty water pipeline of approximately 6 km in length (HDPE OD ~400 - 600 mm) from the Paste Backfill Plant to the MNC alongside the existing internal roads
  - This pipeline to return slimes generated at the Plant to the MNC to be disposed of onto a TSF.
- Paste backfill operating pipelines (two) (HDPE OD ~200 mm) to underground areas
  - Pipeline to convey cemented paste for backfilling of underground voids.

Cemented paste for backfilling could be prepared at a production rate and strength required to support the mining operations. The deslimed tailings could be prepared from the whole tailings stream, by removal of part of the ultra-fines (employing a hydrocyclone circuit in the backfill plant). Key properties of the deslimed tailings are indicated in Table 4-3.

Table 4-3: Backfill Material Properties[86]

Parameter	Deslimed Tailings
Source	MNC and M3C tailings thickener feed
-20 micron content	~15 -~30%
Filtration Type	Vacuum filtration
Percentage of Solids	~70 – ~80%

[82] NEMA 1998 GN983 as amended - Listing 1 Activity 10
[83] NEMA 1998 GN983 as amended - Listing 1 Activity 12
[84] NEMA 1998 GN983 as amended - Listing 1 Activity 19
[85] NWA 1998: S21(c&i) Water Use
[86] Paterson & Cooke, 2021. Mogalakwena Sandsloot Backfill Plant – Preliminary Feasibility Study. P&C Project No.: MOG-11-2839

Binder content	3 - 6 %

4.1.2.4.1 Benefits / Advantages

Paste backfill could be used to maximise extraction of the orebody and could allow for the formation of a cemented paste that can be utilized to backfill the mined-out areas of the underground mine allowing for successive areas to be mined safely (by ensuring regional and stope support). The cemented paste could also allow for safe and stable long-term stabilization of tailings as support underground. In addition, a large portion of tailings generated, which could have reported to the TSF, can now be diverted to the tailings backfill plant thereby prolonging the life of the TSF which has multiple benefits.

Figure 4-14: New Proposed Tailings Paste Backfill Plant and associated pipeline

The locality of the Tailings Paste Backfill Plant is indicated in Table 4-4.

Table 4-4: Locality of the Tailings Paste Backfill Plant and supporting pipeline system

Activity	Description	Volume / Area	Estimated Co-ordinates	
Tailings Paste Backfill	Development of a Tailings Paste Backfill Plant	~766 m³/h	24⁰00'39.58" S	28⁰55'01.51" E
				
	Paste Backfill Pipeline servitude crossing of the Groot Sandsloot River (supporting the pipelines to and from the MNC to the Tailings Paste Backfill Plant)	~60 m – use of the existing road crossing area	24⁰00'07.94" S 28⁰54'48.11" E	24⁰00'07.33" S 28⁰54'50.08" E
				

4.1.2.5 Potable Water Treatment Plant

A water treatment plant will be located adjacent to the Sandsloot underground mine offices to treat borehole water and other raw water to achieve potable water requirements.

The total additional potable water requirement to support the Sandsloot Exploration Decline as well as the Sandsloot underground operations is ~300 m^3/day. Addition future boreholes[87,88,89] are proposed to be developed as to support the project and its required water demand. These borehole locations have not yet been determined and will only be finalized during the impact assessment phase of this regulatory process. The infrastructure at the wellfields will be upgraded to meet the Sandsloot underground mine requirement and existing pipelines will be utilized.

Pipeline with a capacity threshold trigger of ≥120 l/s and a diameter of ≥0.36 m may be constructed from existing on-site infrastructure to the water treatment plant[90,91,92,93,94,95]. The potable water will be stored in reservoirs[96] to be located at the water treatment plan. Additional pipelines with a capacity threshold trigger of ≥120 l/s and a diameter of ≥0.36 m may be constructed from the reservoir to the underground surface infrastructure areas. The water treatment plant will have a design capacity to allow for the treatment of ~300 m^3/day of water. The treatment plant allows for final chlorination.

4.1.2.6 Refrigeration Plant

As mining progresses deeper underground, atmospheric temperature rises and the need for cooling increases. The refrigeration plant allows for refrigerated (cooled) surface air to be pumped and ventilated throughout the underground working to cool off underground equipment and ensure workers safety. This process is achieved via the ventilation shafts.

A new proposed Refrigeration Plant (~1.9 Ha) will be constructed east of Sandsloot pit on an area already previously utilized for the stockpiling of waste rock on site. A portion of this existing stockpile will be levelled for the construction of the Refrigeration Plant.

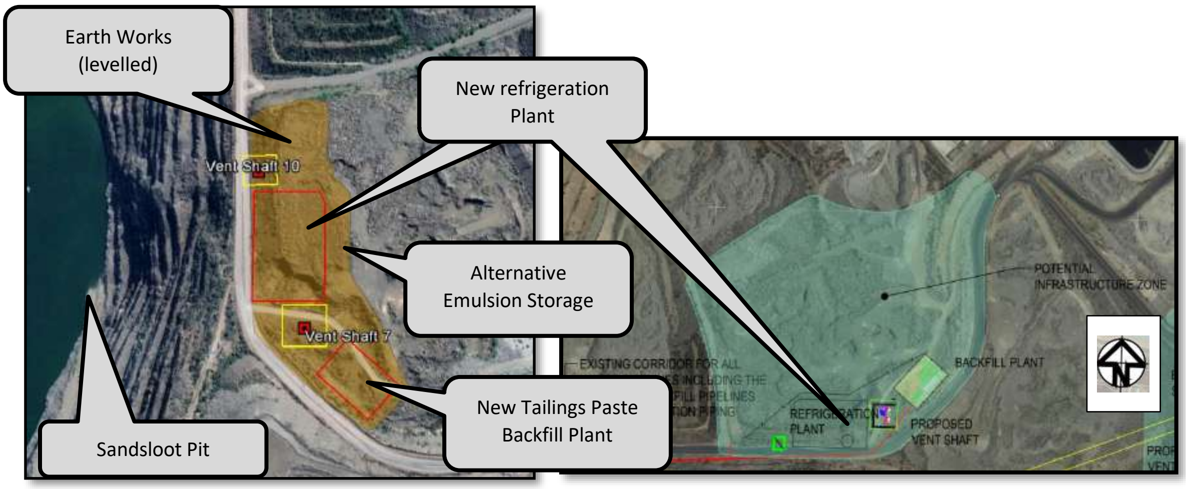

Figure 4-15: New Proposed Refrigeration Plant

The locality of the refrigeration plant is indicated in Table 4-5. This includes the refrigeration plant supporting the Sandsloot Underground Mine, Zwartfontein Spur and Twin Connections to Tweefontein.

[87]*NWA 1998: S21(a) Water Use*
[88]*NWA 1998: S21(c&i) Water Use*
[89]*NEMA 1998 GN985 as amended - Listing 3 Activity 14*
[90]*NEMA 1998 GN983 as amended - Listing 1 Activity 9*
[91]*NEMA 1998 GN983 as amended - Listing 1 Activity 12*
[92]*NEMA 1998 GN983 as amended - Listing 1 Activity 19*
[93]*NEMA 1998 GN985 as amended - Listing 3 Activity 12*
[94]*NWA 1998: S21(c&i) Water Use*
[95]*NEMA 1998 GN985 as amended - Listing 3 Activity 14*
[96]*NEMA 1998 GN985 as amended - Listing 3 Activity 2*

Table 4-5: Locality of the refrigeration plant

Activity	Description	Volume / Area	Co-ordinates – outer area boundary Co-ordinates	
Refrigeration Plant	To be located on the western area of the existing RoM Low Grade Ore Stockpile Area (Figure 4-14)	~2,5 Ha	24°00’29.16” S 28°54’56.15” E	24°00’29.82” S 28°55’00.24” E
				
			24°00’35.79” S 28°55’00.17” E	24°00’35.70” S 28°54’56.05” E

The refrigeration plant generally consists of a compressor, a condenser, flow control device and an evaporator.

The picture below depicts a typical refrigeration plant design.

Figure 4-16: Typical refrigeration Plant Design

Refrigerated water for the ventilation shaft intakes will be conveyed via the following pipelines[97,98,99,100,101,102,103] (within the existing dewatering pipeline corridors):

- Buried pipelines to supply each intake with 130ℓ/s of refrigerated water. Pipelines might have a capacity threshold trigger of ≥120 l/s and a diameter of ≥0.36 m. Pipeline routes, lengths and final diameters will be confirmed during the impact assessment phase of this regulatory process.
- Raw water supply pipeline to refrigeration plant (to supply 1,080ℓ/s). Pipelines might have a capacity threshold trigger of ≥120 l/s and a diameter of ≥0.36 m. Pipeline routes, lengths and final diameters will be confirmed during the impact assessment phase of this regulatory process.

4.1.2.7 Ventilation Shaft Areas

A minimum of twelve (12) new ventilation shafts (vertical passages excavated by raise bore drilling) from the underground mine development that allows for fresh surface air to circulate underground) are proposed on site

[97] *NEMA 1998 GN983 as amended - Listing 1 Activity 9*
[98] *NEMA 1998 GN983 as amended - Listing 1 Activity 12*
[99] *NEMA 1998 GN983 as amended - Listing 1 Activity 19*
[100] *NEMA 1998 GN985 as amended - Listing 3 Activity 12*
[101] *NEMA 1998 GN985 as amended - Listing 3 Activity 14*
[102] *NWA 1998: S21(c&i) Water Use*
[103] *NWA 1998 GN704 – Regulation 4(a) Exemption*

to support and service the Sandsloot underground mining operation, Zwartfontein Spur and Tweefontein Twin Connection.

Permanent and temporary surface fans will be located on each of the exhaust ventilation raises. These facilities will include suitable concrete foundations, electrical equipment, remote start devices, lighting, security, and signage. These will be sited within designated corridors[104,105,106,107,108,109,110] that coincide with the underground and exploration development areas and final placement will take into consideration surface infrastructure, geology, and environmental factors.

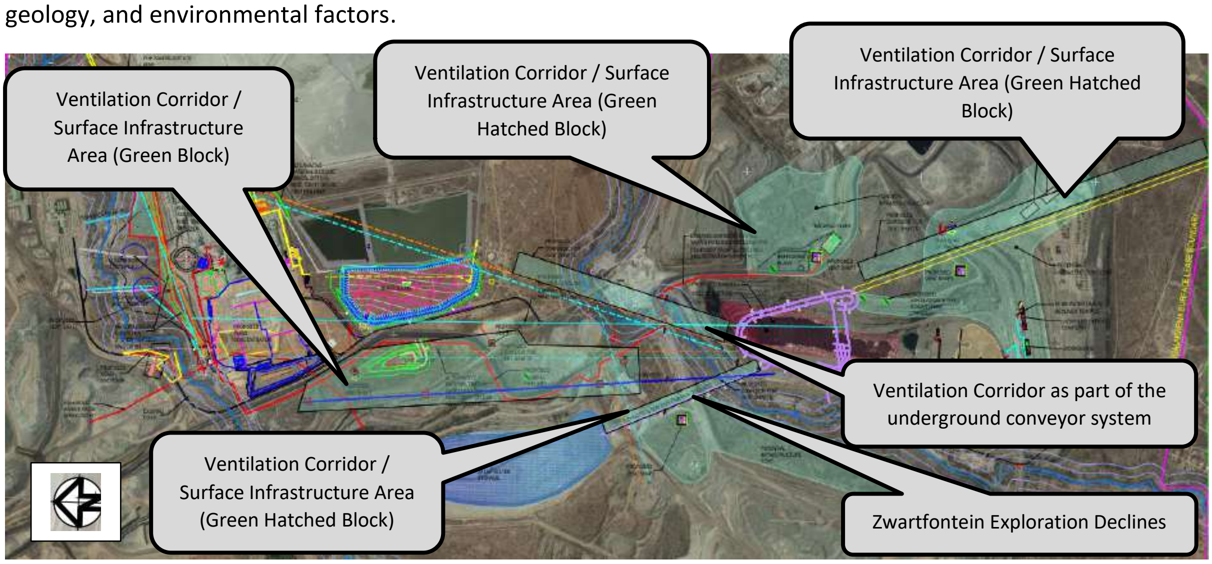

Figure 4-17: Ventilation Shaft Corridors

Each ventilation shaft development will consist of an estimated development footprint area of ≥0,02 Ha.

The picture below depicts a typical upcast ventilation shaft configuration (surface infrastructure).

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[104] *NEMA 1998 GN983 as amended - Listing 1 Activity 12*
[105] *NEMA 1998 GN983 as amended - Listing 1 Activity 19*
[106] *NEMA 1998 GN983 as amended - Listing 1 Activity 27*
[107] *NEMA 1998 GN984 as amended - Listing 2 Activity 15*
[108] *NEMA 1998 GN985 as amended - Listing 3 Activity 12*
[109] *NEMA 1998 GN985 as amended - Listing 3 Activity 14*
[110] *NWA 1998: S21(c&i) Water Use*

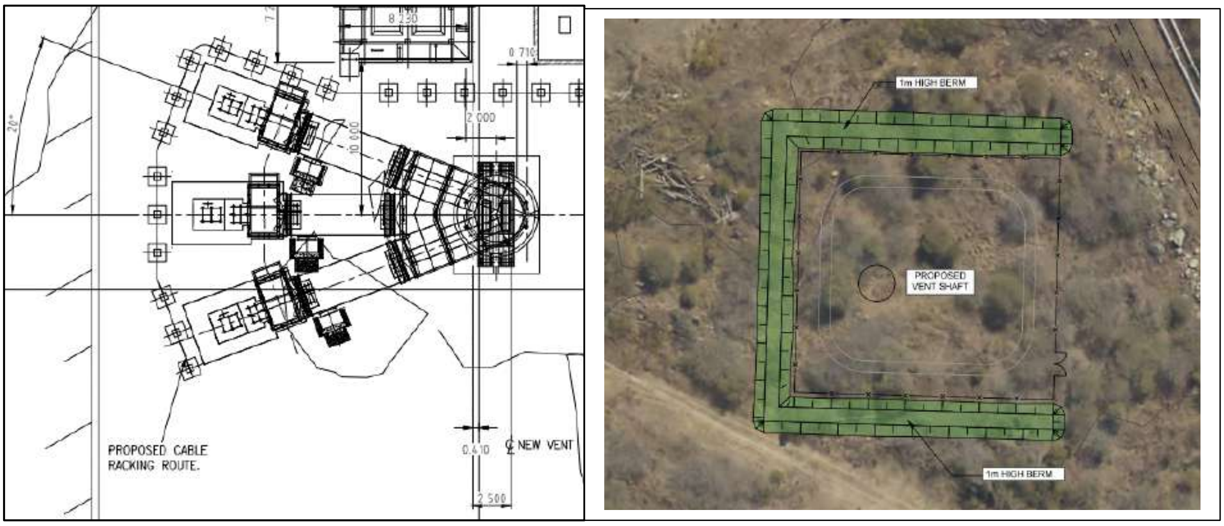

Figure 4-18: Typical Upcast ventilation Shaft Configuration (Raisebore)

4.1.2.8 Power Supply and Distribution

Two new 132kV transmission lines from the Borutho Eskom Substation will provide power to the extended PPrust North substation as part of the approved M3C project. These two new transmission lines will be authorised by Eskom as part of a separate environmental authorization process.

Power will initially be transmitted via new overhead lines from the M3C (extended PPrust North) substation to the Sandsloot underground workings and surface infrastructure (up until ~2026).

The interim utilization of the M3C substation will allow for the development of a dedicated 22 km 33 kV ring power distribution system and new Eskom Yard (Sandsloot Point of Distribution (POD) substation) to support the Sandsloot Underground Operation.

This power distribution system will supply the Sandsloot Underground through a 33 kV powerline which will be stepped down to 11 kV to supply the supporting Sandsloot Underground Surface Infrastructure.

Transformers will also form part of the underground distribution system.

The figure below (Figure 4-19) provides a schematic representation of the Sandsloot Underground Distribution System to Surface Infrastructure.

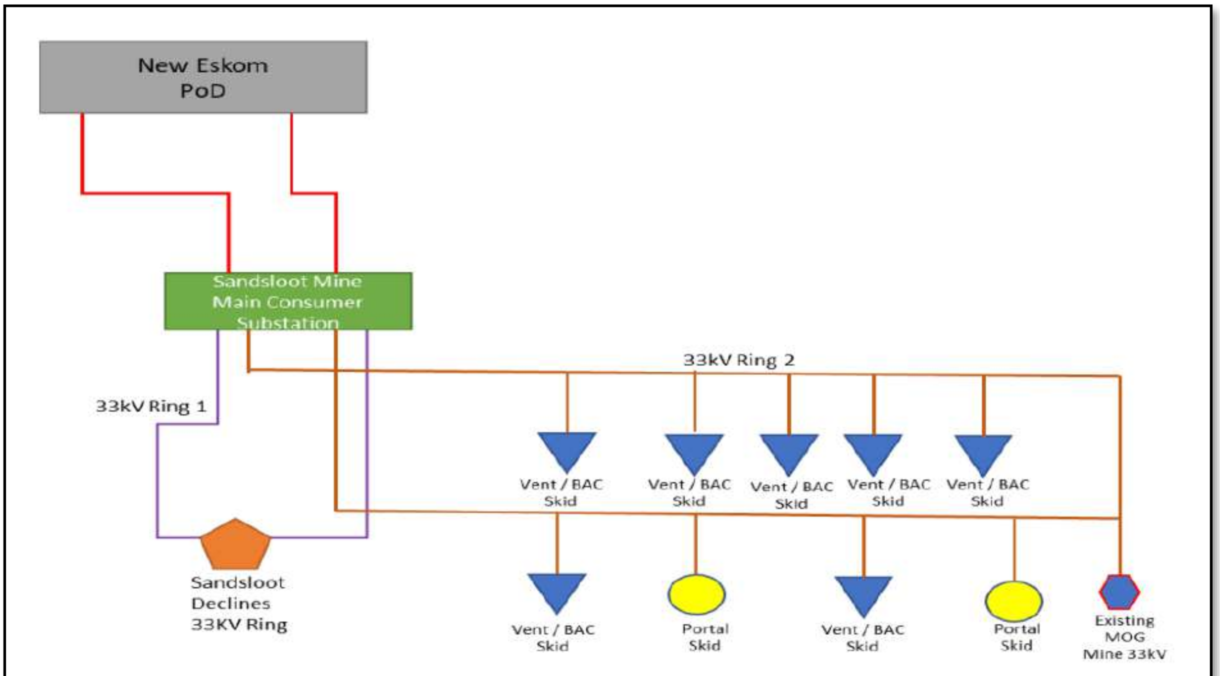

Figure 2: Sketch 2 - Sandsloot 33kV distribution

Figure 4-19: Sandsloot Underground Power Distribution System

The section below highlights the additional power transmission lines that will be required in support of the underground mine development areas.

As per Figure 4-20, refer to Table 4-6 for the proposed two new 22 kV Transmission Lines.

Table 4-6: Additional 22 kV, 830m Transmission Line

Activity	Description	Volume / Area	Co-ordinates	
New Overhead Powerlines	Located in close proximity of the Groot Sandsloot River – within the floodline	22kV[111,112,113,114,115] ~830 m Linear activity	24°00’57.80” S 28°54’22.09” E	24°00’58.36” S 28°54’23.50” E
			24°01’14.86” S 28°54’17.79” E	24°01’16.73” S 28°54’17.65” E
			24°01’21.41” S 28°54’21.74” E	
				

[111] NEMA 1998 GN983 as amended - Listing 1 Activity 12
[112] NEMA 1998 GN983 as amended - Listing 1 Activity 19
[113] NEMA 1998 GN985 as amended - Listing 3 Activity 12
[114] NEMA 1998 GN985 as amended - Listing 3 Activity 14
[115] NWA 1998: S21(c&i) Water Use

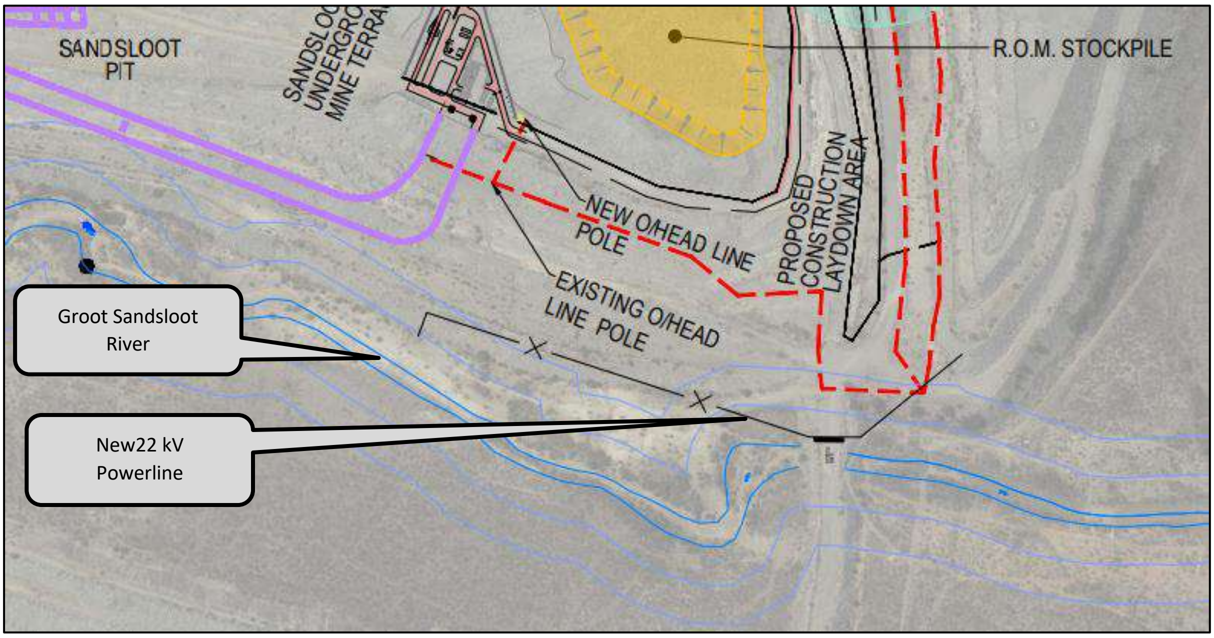

Figure 4-20: New 22 kV 830m Transmission Line

As per Figure 4-21, refer to Table 4-7 for the proposed two new 22 kV Transmission Lines.

Table 4-7: New 1.2km and 1.5 km, 22 kV Transmission Lines[116,117,118]

Activity	Description	Volume / Area	Estimated Co-ordinates Subject to final design	
New Overhead Powerlines	Located between the future Bulk Ore Sorting Stockpile areas near the M3C and the Mohlosane River – within the 1:50yr floodline 	22 kV ~1.5 km Linear activity	23^{0}58’31.09” S 28^{0}55’08.21” E	23^{0}58’26.90” S 28^{0}55’07.24” E
			23^{0}58’23.13” S 28^{0}55’01.67” E	23^{0}58’21.92” S 28^{0}54’57.11” E
			23^{0}58’25.61” S 28^{0}54’53.11” E	23^{0}58’24.99” S 28^{0}54’50.72” E
			23^{0}58’26.59” S 28^{0}54’46.77” E	23^{0}58’32.13” S 28^{0}54’46.12” E
			23^{0}58’37.07” S 28^{0}54’42.74” E	23^{0}58’39.21” S 28^{0}54’38.17” E
			23^{0}58’40.63” S 28^{0}54’34.27” E	
	From the Box-cut Area to the M3C 	22 kV ~1.2 km Linear Activity	23^{0}58’30.01” S 28^{0}55’12.99” E	23^{0}58’34.58” S 28^{0}54’49.94” E
			23^{0}58’33.68” S 28^{0}54’49.74” E	23^{0}58’34.03” S 28^{0}54’48.20” E
			23^{0}58’35.00” S 28^{0}54’48.57” E	23^{0}58’40.29” S 28^{0}54’39.29” E
			23^{0}58’41.44” S 28^{0}54’37.28” E	23^{0}58’41.88” S 28^{0}54’35.60” E
			23^{0}58’42.98” S 28^{0}54’34.83” E	

[116] NEMA 1998 GN983 as amended - Listing 1 Activity 12
[117] NEMA 1998 GN983 as amended - Listing 1 Activity 19
[118] NWA 1998: S21(c&i) Water Use

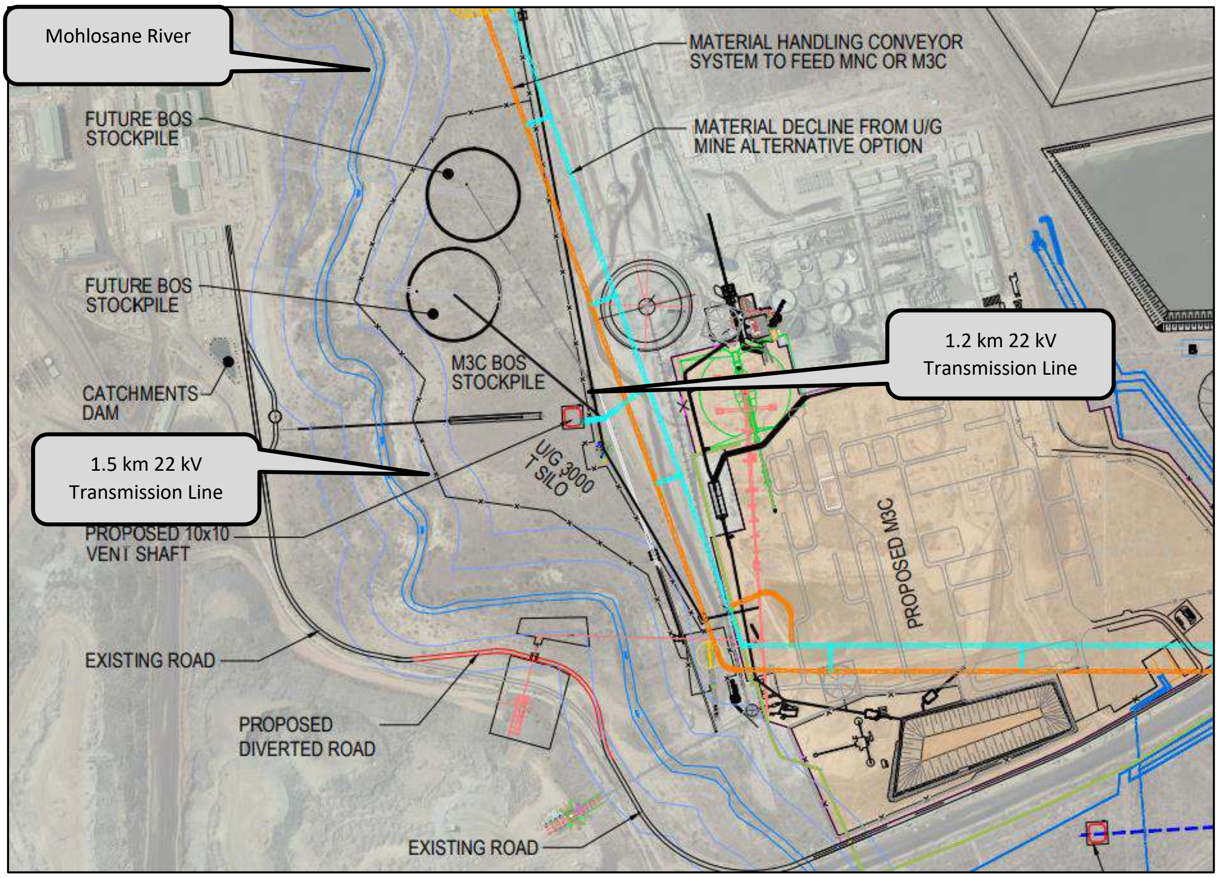

Figure 4-21: New 1.5 km and 1.2 km, 22 kV Transmission Lines

As per Figure 4-22, refer to Table 4-8 for the proposed two new 33 kV Transmission Lines.

Table 4-8: New 22km, 33kV Transmission Line[119,120,121,122,123,124]

Activity	Description	Volume / Area	Estimated Co-ordinates Subject to final design	
New Overhead Powerline 1	Located between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the Mogalakwena South Concentrator 	33kV ~22km Linear activity	24°00’38.98” S 28°55’39.50” E	24°00’39.55” S 28°55’38.90” E
			24°00’40.53” S 28°55’39.89” E	24°00’51.16” S 28°55’28.58” E
			24°00’52.34” S 28°55’35.10” E	24°00’53.92” S 28°55’35.48” E
			24°01’12.84” S 28°55’20.55” E	24°01’14.43” S 28°55’15.55” E
			24°01’13.08” S 28°55’12.79” E	24°01’03.22” S 28°55’07.00” E
			24°01’15.45” S 28°54’59.18” E	24°01’19.66” S 28°54’20.56” E
			24°01’14.83” S 28°54’20.92” E	24°01’14.83” S 28°54’25.31” E
			24°01’12.10” S 28°54’25.30” E	24°01’10.85” S 28°54’27.16” E
			24°01’10.73” S 28°54’29.84” E	

119 NEMA 1998 GN983 as amended - Listing 1 Activity 11
120 NEMA 1998 GN983 as amended - Listing 1 Activity 12
121 NEMA 1998 GN983 as amended - Listing 1 Activity 19
122 NEMA 1998 GN985 as amended - Listing 3 Activity 12
123 NEMA 1998 GN985 as amended - Listing 3 Activity 14
124 NWA 1998: S21(c&i) Water Use

New Overhead Powerline 2	Located from the proposed new transformer yard south of the Sandsloot Pit towards the Sandsloot Underground Entrance 		24^{0}01’12.03” S 28^{0}54’55.03” E	24^{0}01’13.38” S 28^{0}54’50.49” E
			24^{0}01’09.91” S 28^{0}54’49.31” E	24^{0}00’59.95” S 28^{0}54’48.43” E
New Overhead Powerline 3	Running from the Sandsloot Underground Mine Entrance to the west of the Sandsloot Pit 		24^{0}00’58.54” S 28^{0}54’45.64” E	24^{0}00’57.87” S 28^{0}54’36.28” E
			24^{0}00’39.81” S 28^{0}54’39.39” E	24^{0}00’21.92” S 28^{0}54’36.89” E
			24^{0}00’09.17” S 28^{0}54’52.43” E	24^{0}00’07.40” S 28^{0}54’49.87” E
			24^{0}00’08.89” S 28^{0}54’45.91” E	

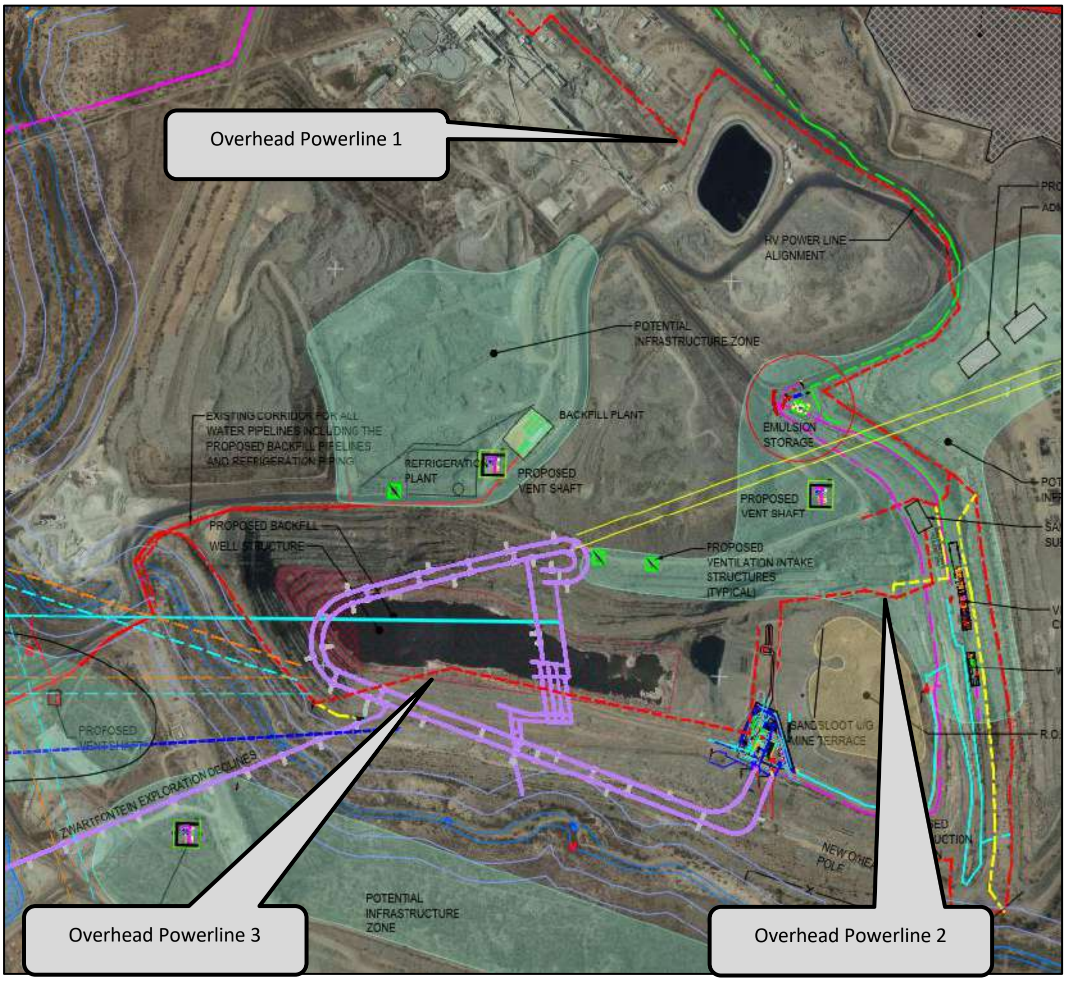

Figure 4-22: New 33 kV, 22 km Transmission Line

4.1.2.9 Workshop Areas

Workshops are used to maintain and service vehicles and machinery used on site. The below-mentioned workshop areas are envisioned to support the Sandsloot Underground Mine development.

- An additional Surface Mobile Equipment Workshop
- An additional Surface Fixed Plant Workshop
- An additional Surface Warehouse Facility
- Underground Workshops

Surface location of the various surface workshops are indicated in Figure 4-23 and include:

- An area on the existing Waste Rock Disposal Facility (W07) South of Sandsloot Pit.
- An area at the new Southern Entrance Complex[125,126]
- An area adjacent to the new Tailings Paste Backfill Plant and associated surface infrastructure; and
- An area within the MM Opencast Offices and mining entrance area.

In terms of the proposed Underground Workshops – these will be located underground on each tramming loop level and near the underground crushing station. Crib rooms will be located underground as required. Ancillary underground facilities will be supported by surface infrastructure. All workshops will be equipped with oil/water separators.

[125] *NEMA 1998 GN983 as amended - Listing 1 Activity 27*
[126] *NEMA 1998 GN985 as amended - Listing 1 Activity 12*

In terms of maintenance, repairs and refurbishments to be undertaken on site to support the Sandsloot Underground Project:

- The additional proposed on surface workshops will be utilized to undertake service intervals and equipment refurbishment in support of the Sandsloot underground project that cannot be performed in the underground workshops.
- The mobile equipment workshops located on the underground decline portal terrace and adjacent to the underground mine offices on surface near the existing Sandsloot open pit, constructed as part of the Exploration Decline Construction will be retained for use during the mining phase (Phase 2).
- Fixed Plant components for the crushers and conveyor system will be repaired in an existing workshop adjacent to the new box cut and MNC.
- The existing mobile equipment workshops located at the MSC will be utilized for major refurbishment activities.
- The existing onsite component rebuild workshops can be / will be utilized.

Table 4-9: Workshop Areas

Activity	**Description**	**Estimated Centre Co-ordinates of area indicated – subject to final design**	
Workshop Areas	Area 1	24^{0}00’32.80” S	28^{0}55’07.31” E
	Area 2	24^{0}00’35.45” S	28^{0}55’50.16” E
	Area 3	24^{0}01’17.01” S	28^{0}54’41.61” E
	Area 4	24^{0}01’17.01” S	28^{0}55’12.44” E
	Area 5	24^{0}01’38.33” S	28^{0}55’39.39” E

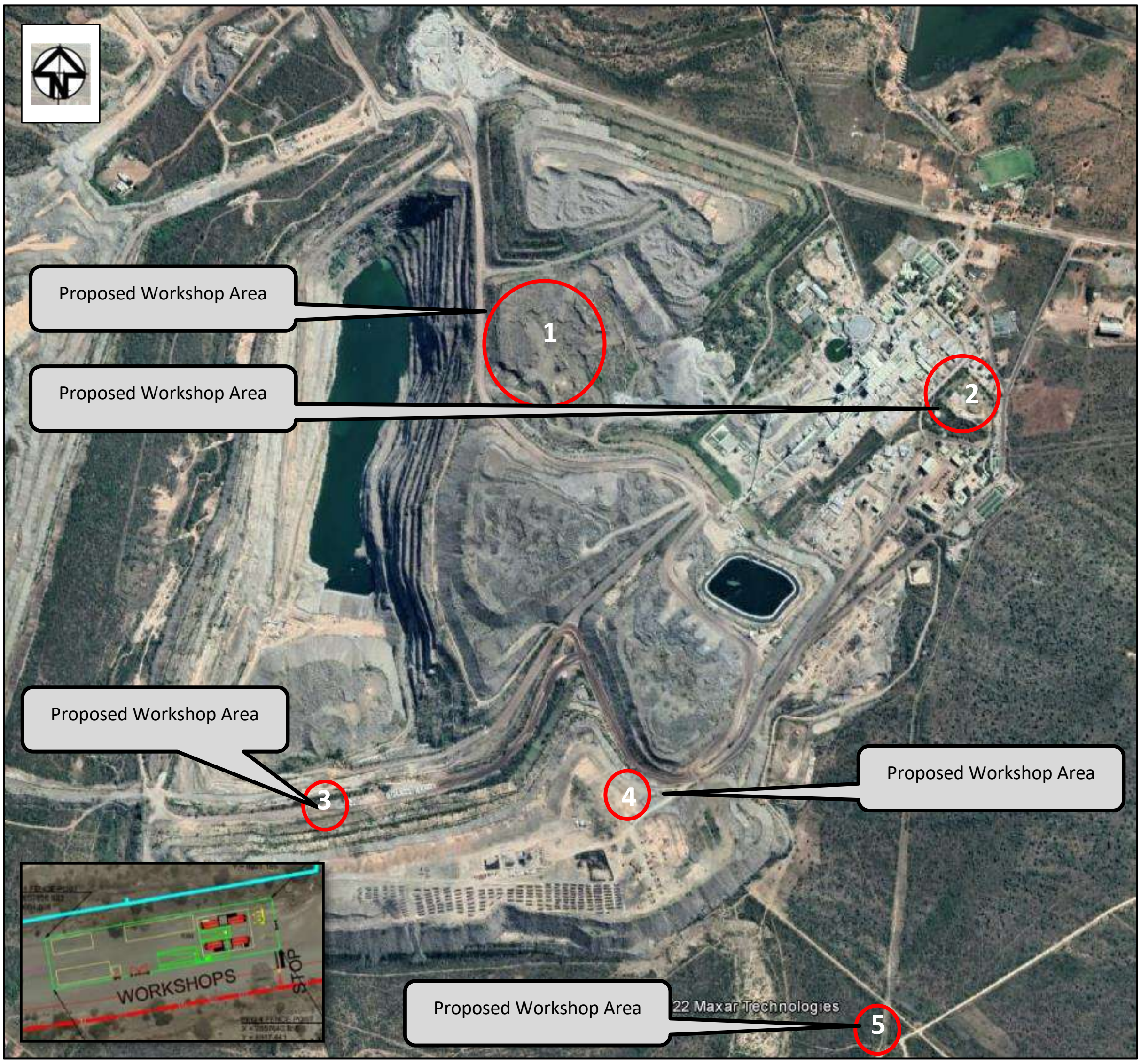

Figure 4-23: New Workshop Areas

4.1.2.10 Office areas, Administration / Training Facilities and Change house

A workforce of between ~1,300 and ~1,700 people will be required for Sandsloot underground operation with crews working according to rosters that will be determined and linked to continuous operation (24 hours per day, 7 days per week). The future workforce will consist of existing open pit operation employees and new employees and will be made up of various levels of skills and expertise.

4.1.2.10.1 Administration Building & Training Building

The existing administration buildings at the underground mine offices to the south of the Sandsloot pit that was constructed for the exploration decline (Phase 1) will be utilised to house management and technical personnel during the development and operations.

These existing administration buildings will be upgraded and supported with an additional administration and training building constructed on the waste dump to the south of the Sandsloot open pit to cater for the additional workforce.

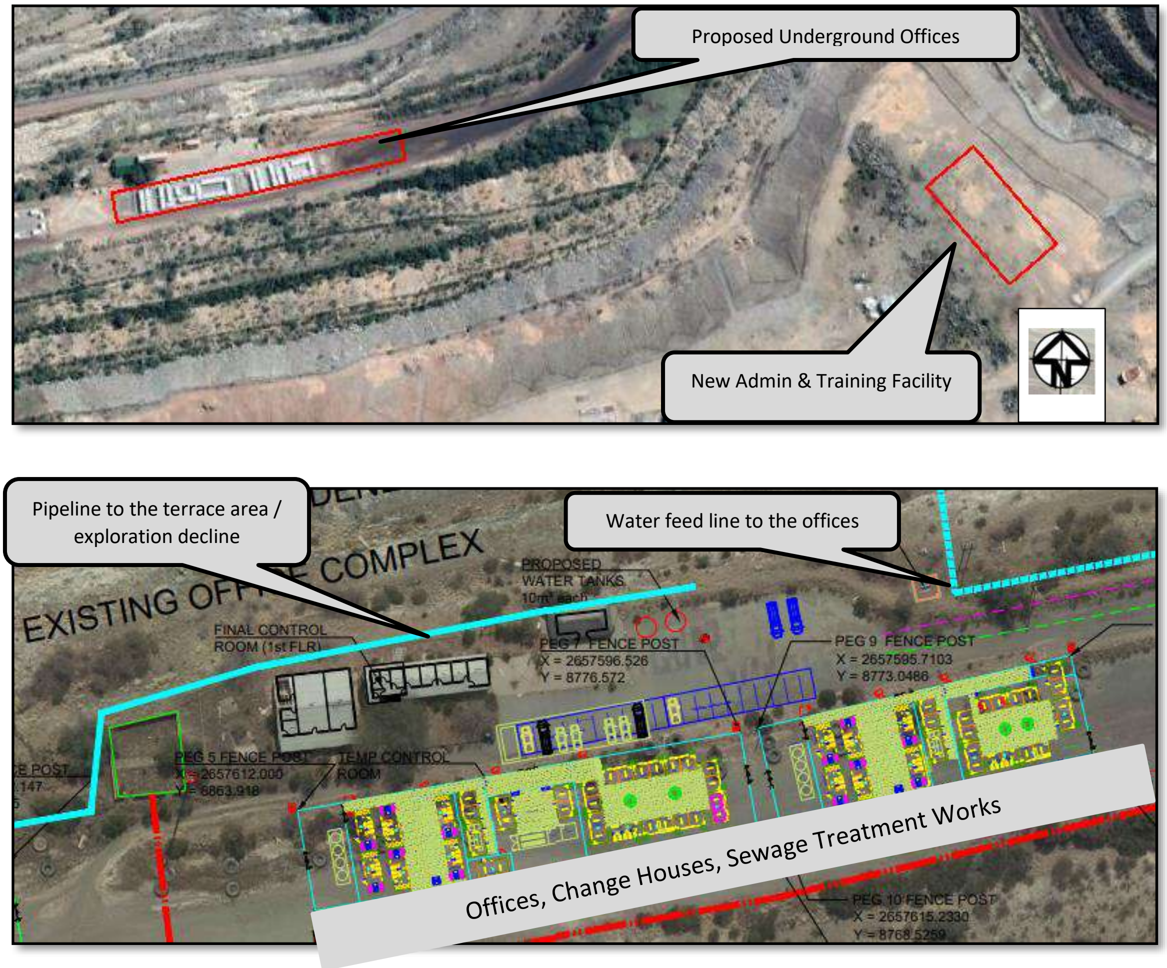

Figure 4-24: New proposed Office Areas, Admin and Training Facility

4.1.2.10.1 Lamp Room and Change House

A new lamp room and change house will be constructed at the underground mine offices. The existing Exploration decline offices will be upgraded to accommodate the underground mining workforce.

4.1.2.1 Construction Laydown Areas and Potential Infrastructure Corridors

The following Construction laydown areas have been identified in support of the Sandsloot Underground Mine Development:

- Construction Laydown Area at the proposed Sandsloot Box Cut as detailed in Section 4.1.1.1.1
- Construction Laydown Area within the potential infrastructure zones

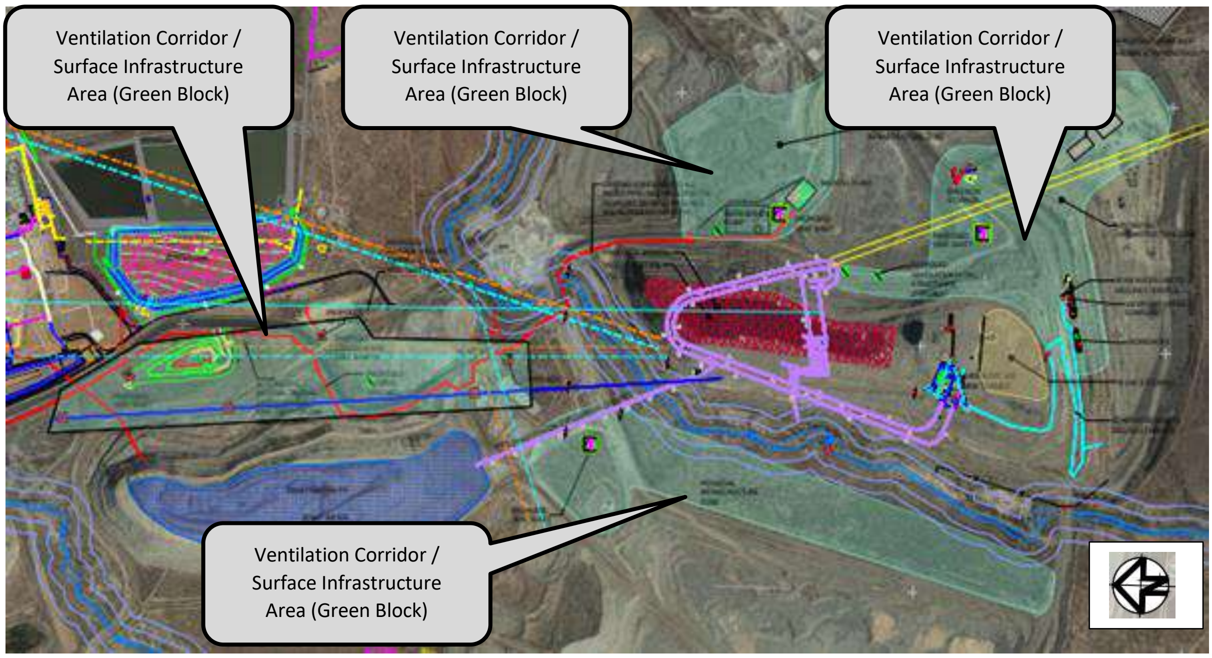

Figure 4-25: Construction Laydown Areas and Potential Infrastructure Zones

This Surface Infrastructure Corridor will allow for the development of mining related infrastructure to support the Sandsloot Underground Mining Project.

4.1.2.2 Access Roads and Internal Road Infrastructure

The following road infrastructure (existing and new) is envisioned to support the development of the Sandsloot Underground Mine:

- The Sandsloot Underground Mine will be accessed from the main access gate at the South Concentrator on the entrance road to the existing Sandsloot Office Complex.
- Light vehicles surface roads will be constructed to connect the surface infrastructure to the existing internal MM road network.
- The Sandsloot pit southern access road will be upgraded to trafficable width[127] for surface haulage trucks including the removal/ relocation of adjacent pipelines.
- The Sandsloot pit northern access road will be upgraded to trafficable width[128] for surface haulage trucks. This upgrade will result in existing pipelines within the vicinity being rerouted.
- The diversion[129][130][131][132] of a portion of the existing entrance road[133] to the main mine offices as to allow for the construction of a 2nd crusher and loading area. The road diversion will cross the Mohlosane River.
- A new entrance road (~8 m) and haul road (~12 m)[134] will be constructed north of the proposed new Sandsloot Box Cut[135][136]. This road will cross the Mohlosane River[137][138][139].

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[127] NEMA 1998 GN983 as amended - Listing 1- Activity 56
[128] NEMA 1998 GN983 as amended - Listing 1- Activity 56
[129] NWA 1998: S21(c&i) Water Use
[130] NEMA 1998 GN985 as amended - Listing 3 - Activity 12 & 14
[131] NEMA 1998 GN984 as amended - Listing 2 Activity 15
[132] NEMA 1998 GN983 as amended - Listing 1- Activity 12 & 27
[133] NEMA 1998 GN983 as amended - Listing 1 - Activity 19 & 24
[134] NEMA 1998 GN983 as amended - Listing 1 Activity 24
[135] NEMA 1998 GN983 as amended - Listing 1 Activity 27
[136] NEMA 1998 GN984 as amended - Listing 2 Activity 15
[137] NEMA 1998 GN983 as amended - Listing 1 Activity 19
[138] NWA 1998: S21(c&i) Water Use
[139] NWA 1998 GN704 – Regulation 5 Exemption

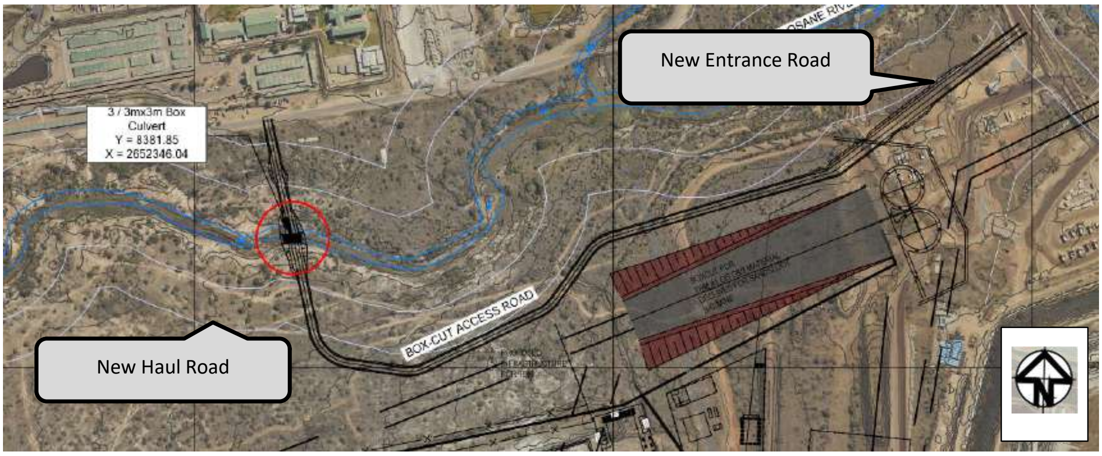

Figure 4-26: New Entrance and Haul Road

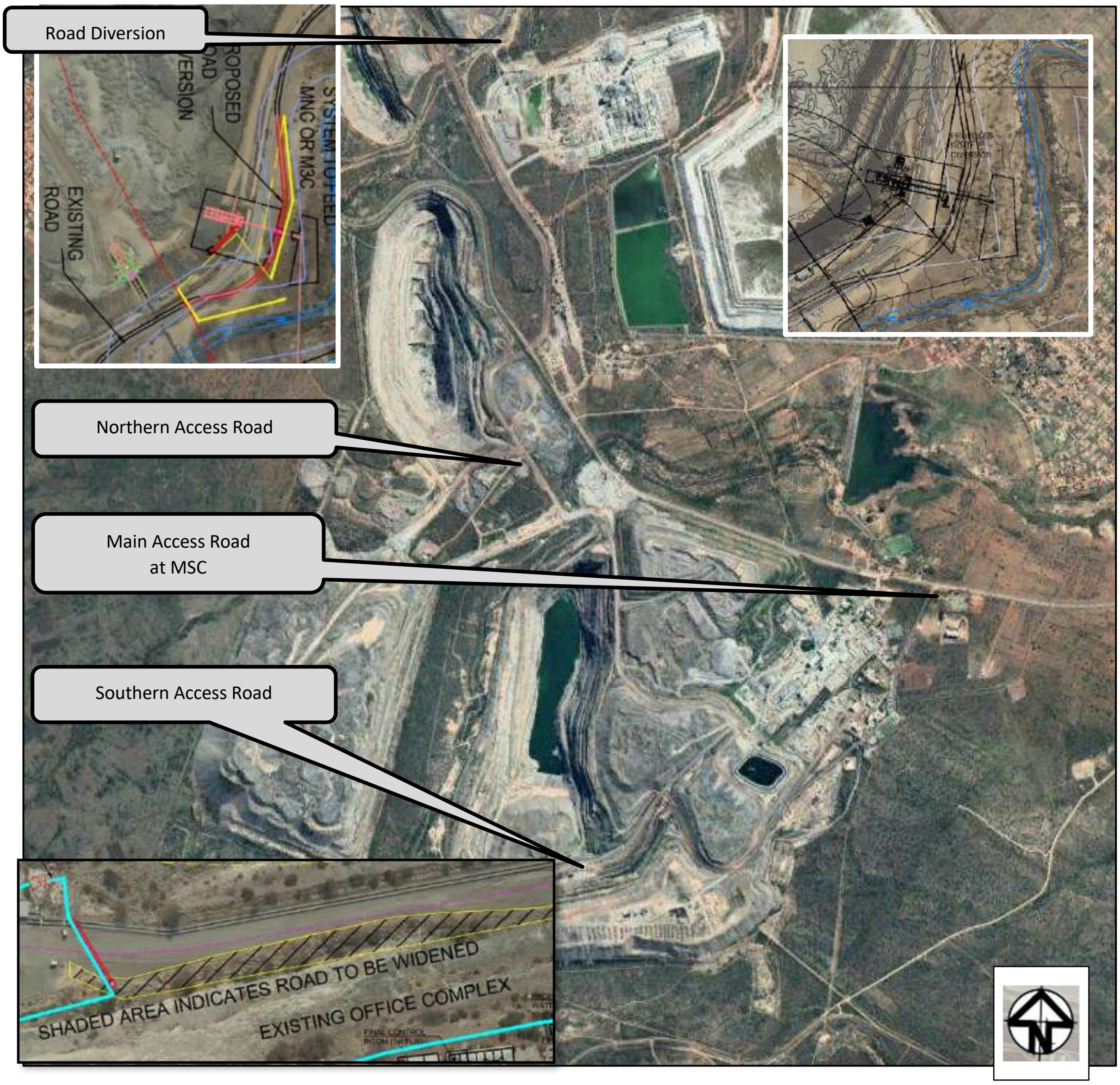

Figure 4-27: Access Road and Internal Road Infrastructure

A new southern entrance to the MM site (specifically the Sandsloot Underground Mine Surface Infrastructure) is planned as per Figure 4-28. This new southern entrance will be located between the southern Sandsloot waste rock dump (W07) and the sealed public road or upgraded facilities adjacent to the existing Mogalakwena site entrance to the south of MSC.

The new facility / upgraded facility will consist of additional parking areas, access gates, offices and personnel turnstiles.

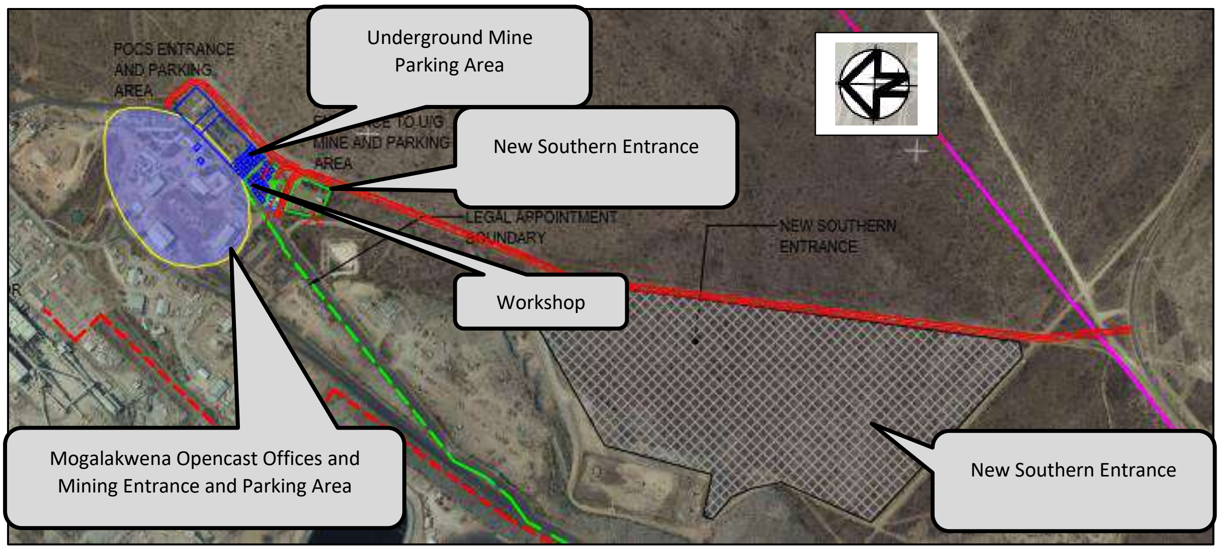

Figure 4-28: Proposed New Southern Entrance – Alternative 1 and 2

The locality of the new southern entrance is indicated in Figure 4-28 and Table 4-10.

Table 4-10: New Southern Entrance

Activity	Description	Volume / Area	Co-ordinates	
New Southern Entrance	Located on the southern boundary of the mine surface lease area 	~25 Ha	24^{0}01’06.705” S 28^{0}55’39.62” E	24^{0}01’07.48” S 28^{0}55’43.66” E
			24^{0}01’35.36” S 28^{0}55’39.39” E	24^{0}01’26.70” S 28^{0}55’28.05” E
			24^{0}01’16.91” S 28^{0}55’28.67” E	

4.1.2.3 Waste Rock

Waste Rock material produced during the development phase of the Sandsloot underground mine and exploration declines to Zwartfontein and Tweefontein Spurs will be handled in the following manner on site:

- Disposal onto existing already approved Waste Rock Disposal Facilities
- Utilisation as an alternative material for various components such as roads, ramps, dams, embankments, impoundments, gabion walls, anthropogenic aquifers, terraces, and backfilling development[140].

[140] *NWA 1998 GN704 – Regulation 5 Exemption*

4.1.2.4 Additional Supporting Components

The development of the underground mining project will be supported by existing infrastructure on surface that already supports the open pit operations. These include, but are not limited to the following:

- Sewerage will be treated through the construction of a new Waste Water Treatment Work (WWTW) at the Sandsloot Underground operations to accommodate ~3 000 people.
- It is anticipated that the current Waste Water Treatment Works at the South Concentrator will be able to accommodate the load, however allowance has been made for the upgrade of this Works[141], if required.
- General and hazardous waste will be managed on site as per the existing waste management practices (Refer to Section 3.12 of this report).
- Concrete to support the underground mine activities will be trucked from the existing surface batch plant to the underground workings; and
- Additional compressed air plants will be located on surface and underground.
- Settling Ponds

Figure 4-29: Settling Ponds at the Sandsloot Underground Decline Area

[141] *NEMA 1998 GN985 as amended - Listing 3 Activity 57*

Figure 4-30: Sewage Treatment Plant at Sandsloot Decline Offices

4.1.2.5 Dangerous Goods Storage[142,143,144]

The following Dangerous Good storage has been identified to support the Sandsloot Underground Mine Development:

- Diesel Storage and Dispensing Tank (~100 kℓ) at the proposed Sandsloot Box Cut (pipelines will be constructed as to convey diesel to the underground mine fuel bay's)
- Emulsion Storage Area[145,146] as per Figure 4-31. The estimated storage volume is ≥80 m^3. The Emulsion will be trucked/pumped from the surface storage to the underground workings.
- Fuel to support the underground machinery will be trucked/pumped from existing surface storage tanks to the underground workings.
- Although the existing surface explosives magazine area will be utilised additional underground magazines will be constructed.

The pipelines for the transportation of dangerous goods from storage facilities to required areas will be finalise as part of the impact assessment phase of this regulatory process as it relates to length, diameter and routes.

[142] NEMA 1998 GN984 as amended – Listing 2 Activity 7
[143] NEMA 1998 GN983 as amended - Listing 1 Activity 12
[144] NEMA 1998 GN983 as amended - Listing 1 Activity 19
[145] NEMA 1998 GN983 as amended - Listing 1 Activity 14
[146] NEMA 1998 GN985 as amended - Listing 3 Activity 10

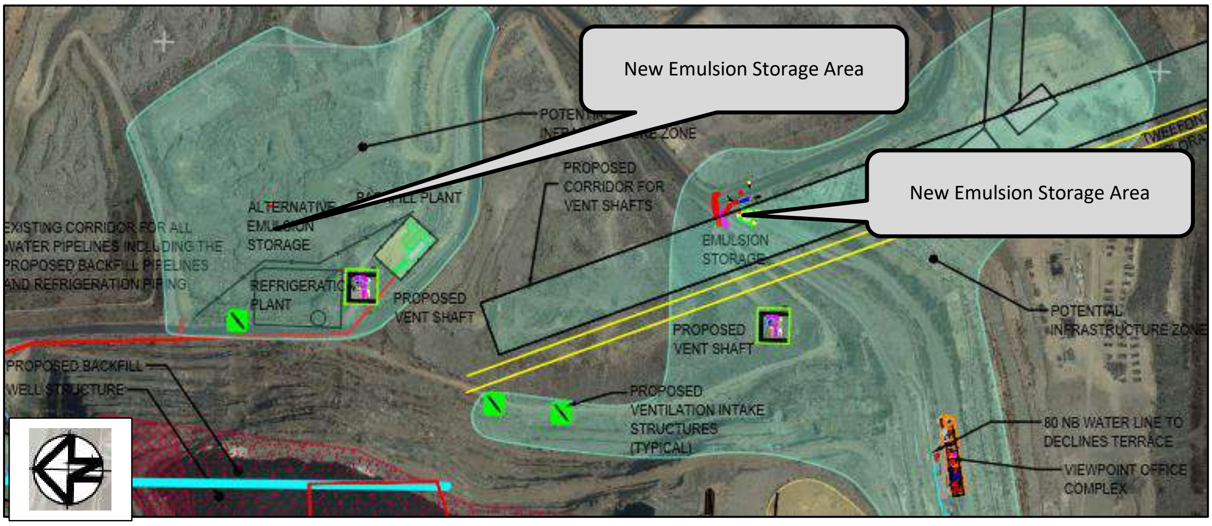

Figure 4-31: Additional Emulsion Storage Area

4.2 OPEN PIT DEVELOPMENT

Current MM mining areas comprise of five open pits: Sandsloot, Zwartfontein, Mogalakwena South, North and Central. All current existing MM operations is based on an open pit mining method. Refer to Figure 3-2.

Strategic mine planning regarding final pit limits, development sequence and configuration of pit stages, and overall production rates has been determined utilising COMET and Deswik LHS mine planning software.

The MM open pit mine design criteria is driven by the following considerations:

- Selection of feasible economic pit shells.
- Geotechnical design.
- Inclusion of strategic mining performance aspects, including P101 (P101 mining is essentially using equipment and mining at industry leading rates/targets. i.e., Optimization of mining performance),
- The primary equipment which informs the minimum mining width, ramp widths, switchback configurations, and other design elements. The primary mining equipment refers to the production drilling fleet, loading fleet (rope and face shovels, and wheel loaders), and primary haulage fleet which are the trucks;
- Design reconciliation is undertaken to ensure that pit designs match the optimisation outcomes to within acceptable limits of between 2% to 5% of material contained.

The pushbacks / cuts considered for the LoM Production schedule are as follows (Refer to Figure 4-32):

Table 4-11: Life of Mine Production Schedule - Planned Pushbacks

Tweefontein	Zwartfontein Pit
• Cut 1,2,3,4	• **Cut 06 (with commencement estimated in 2027)**
SUPER PIT	
South Pit	**Central Pit**
• Cut 07 (Current) • Cut 11 (with commencement estimated in 2024) • Cut 12 (with commencement estimated in 2027) • Cut 13 (with commencement estimated in 2029) • Cut 14 (with commencement estimated in 2032) • Cut 15 (with commencement estimated in 2037) • Cut 16 (with commencement estimated in 2044)	• Cut 08 (Current) • Cut 09 Part A (Current) • Cut 09 Part B (with commencement estimated in December 2022)
North Pit	

• Cut 06 (Current) • Cut 10 Part A (January 2022) • Cut 10 Part B (with commencement estimated in December 2022) • Cut 17 (with commencement estimated in 2039) • Cut 18 (with commencement estimated in 2047) • Cut 19 (with commencement estimated in 2049) • Cut 20 (with commencement estimated in 2054) • Cut 21 (with commencement estimated in 2055) • Cut 22 (with commencement estimated in 2061) • Cut 23 (with commencement estimated in 2061)

4.2.1 Approved and Current Pushbacks

The following pushbacks/cuts are currently approved and in progress on site:

Table 4-12: Current Active Pushbacks

South Pit	Central Pit
• Cut 07	• Cut 8 • Cut 9 Part A • Cut 9 Part B
North Pit	
• Cut 6 • Cut 10 Part A ○ North, South, and Central Pits are currently stand-alone pits. As the bridges between them gets mined, the three pits will merge into a single large "super pit". This will be achieved through firstly mining Cut 10 Part A to bridge the distance between Central and North Pit. • Cut 10 Part B	

4.2.2 Planned Future Pushbacks - Zwartfontein Pit (This Regulatory Process)

The following final pushback is being considered in line with the LoM Production schedule as part of this regulatory process:

- **Zwartfontein Pit:** To allow for final open cut / optimised shell extent, one last pushback/cut is planned for the Zwartfontein Pit together with an access road. This final pushback will traverse the farms Zwartfontein 818LR, Vaalkop 819LR and Sandsloot 236KR.

The figure below provides a schematic diagram of the future planned pushback on MM in line with the LoM Production schedule. Waste rock generated through the mining process will be accommodated on existing and new Waste Rock Disposal Facilities on site.

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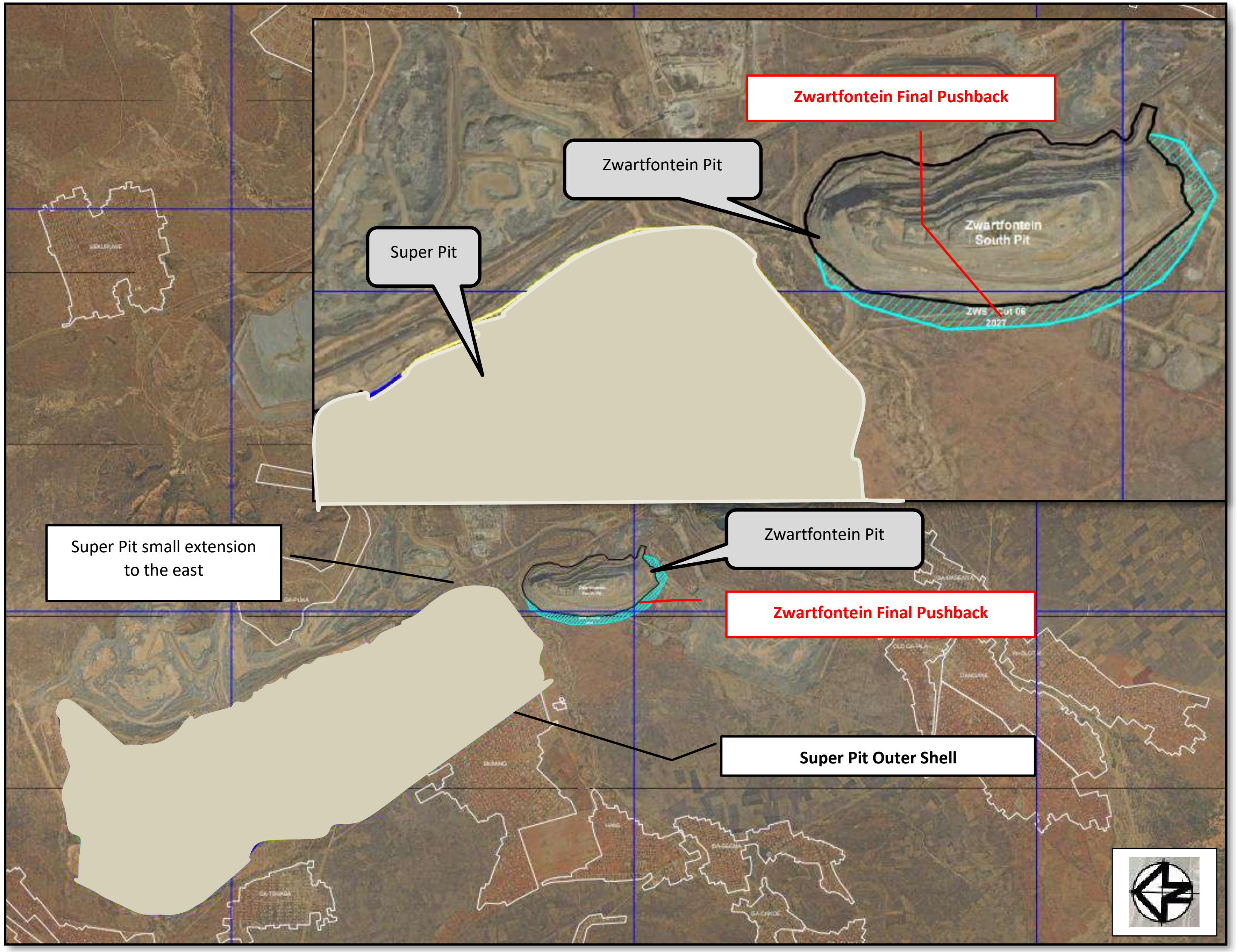

Figure 4-32: Schematic Diagram of the planned future Open Pit Zwartfontein Open Pit Pushbacks (Christie Nel, 2022)

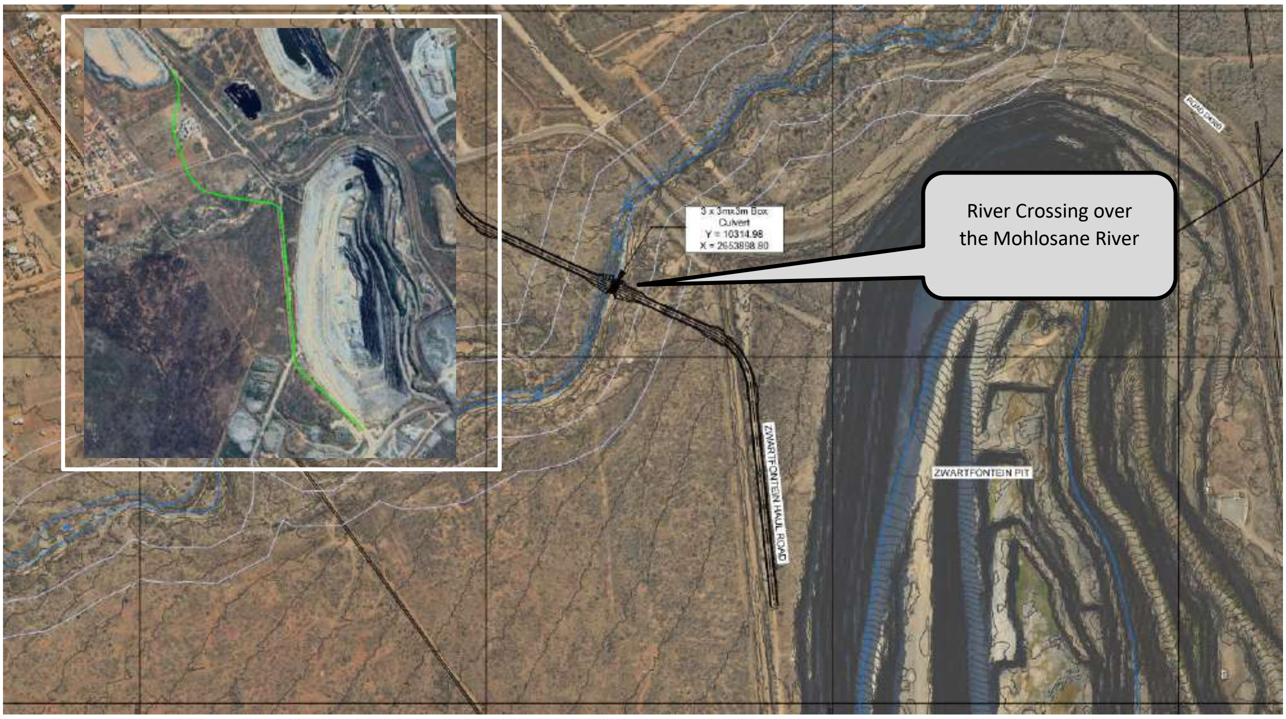

Figure 4-33: Zwartfontein Pit Access Road[147]

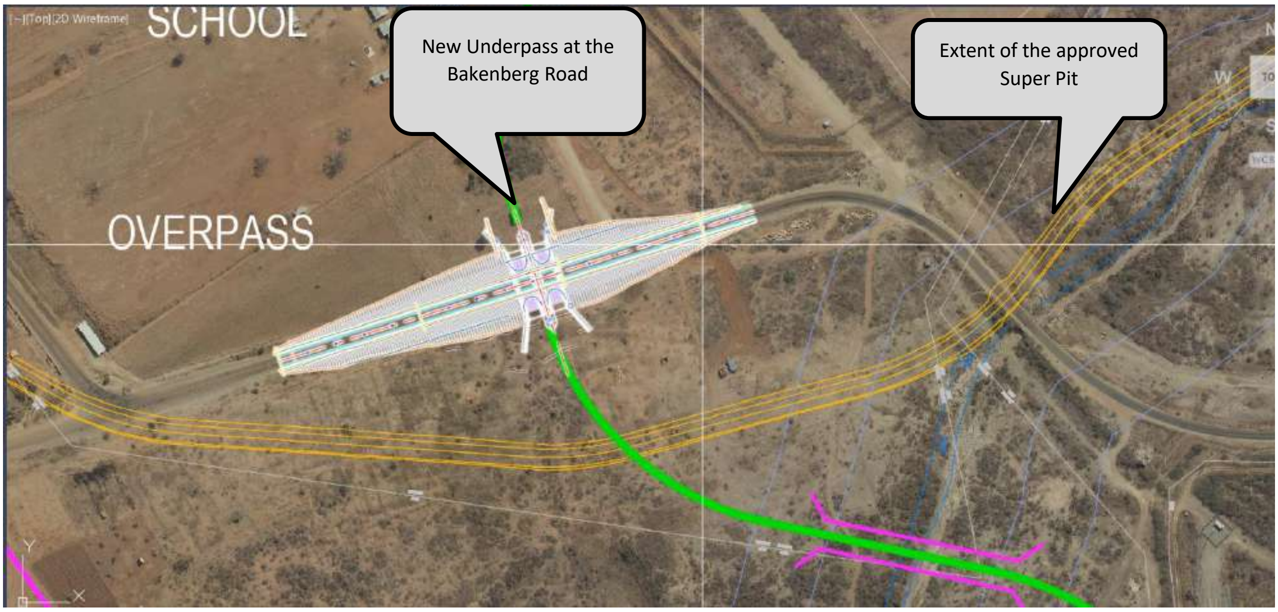

Figure 4-34: Underpass at the Bakenberg Road[148][149]

4.3 ANTHROPOGENIC AQUIFER DEVELOPMENT PROJECT

Current mining areas comprise of five open pits namely Sandsloot, Zwartfontein, Mogalakwena South, North and Central, with pit depths varying from 30m to 260m.

In 2021 - 2022 AAP MM investigated the potential development of manmade Anthropogenic Aquifers within the existing Sandsloot and Zwartfontein Open Pits (Ptn 0 of Erf No. 818 Zwartfontein, Ptn 0 of Erf 819 Vaalkop and

[147] NWA 1988: S21 (c&i) Water Use
[148] NEMA 1998 GN984 as amended – Listing 2 Activity 27
[149] NEMA 1998 GN983 as amended - Listing 1- Activity 19

Ptn 0 of Erf No. 236 Sandsloot) as a water storage solution for the site (water security), with the benefit of naturally improving the stored water quality.

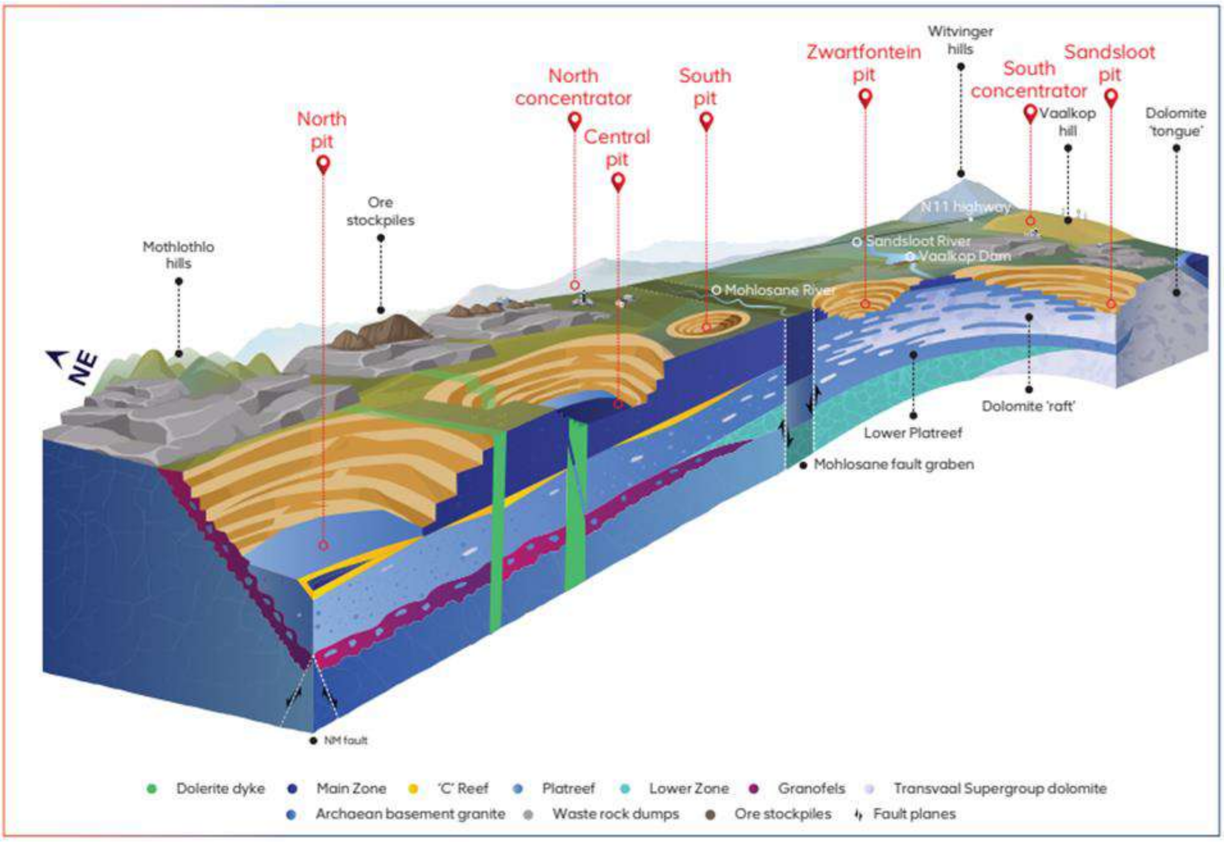

Figure 4-35: Schematic Diagram of the location of the manmade Anthropogenic Aquifer Development Project within the existing MM Zwartfontein and Sandsloot Pits (James Winch, 2021)

4.3.1 Anthropogenic Aquifer Development

An artificial Anthropogenic Aquifer refers to a manmade structure which consists of an unsaturated rock formation, saturated with water for the purpose of water storage[150] below surface and water quality improvement. The Anthropogenic Aquifer allows for the stored water to utilise the natural attenuation process of the manmade aquifer to improve water quality by reacting with minerals and organic matter for the biodegradation of contaminants that degrade slowly.

This manmade structure will be constructed utilising Waste Rock[151,152,153,154,155,156,157] for the unsaturated rock formation, with strategic placement thereof into the pit allowing for abstraction wells/penstocks that will allow access points for the syphoning of water for re-use on site as well for the continuation of water storage in pit through a recharge point.

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[150] *NEMA 1998: GN983 as amended - Listing 1 Activity 13*
[151] *NEMA 1998: GN984 as amended - Listing 2 Activity 6*
[152] *NWA 1988: S21 (g) Water Use*
[153] *NWA 1998 GN704 - Regulation 4(c) Exemption*
[154] *NWA 1998 GN704 - Regulation 5 Exemption*
[155] *NEM:WA 2008 GN921 as amended – Category B Activity 8*
[156] *NEM:WA 2008 GN921 as amended – Category B Activity 10*
[157] *NEM:WA 2008 GN1140 – Category B Activity 11*

New pipelines will be constructed from these abstraction wells/penstocks for the re-use of this water on site[158,159,160,161,162,163]. The final route of the pipeline will be confirmed during the EIA phase of the project but is estimated to be within threshold trigger limits.

The table below provides the volumetric requirements of waste rock material to be utilised for the development of the manmade Anthropogenic Aquifer.

Table 4-13: Waste material to be utilised in-pit to develop the manmade Anthropogenic Aquifers (subject to change)

Pit Area	Estimated Tonnes of waste rock material required (rounded)	Estimated Volume of waste rock material required
Sandsloot Pit	~120 M tonnes	~20 Mm^3
Zwartfontein Pit	~170 M tonnes	~70 Mm^3

The figure below represents a Schematic Diagram of a manmade Anthropogenic Aquifer.

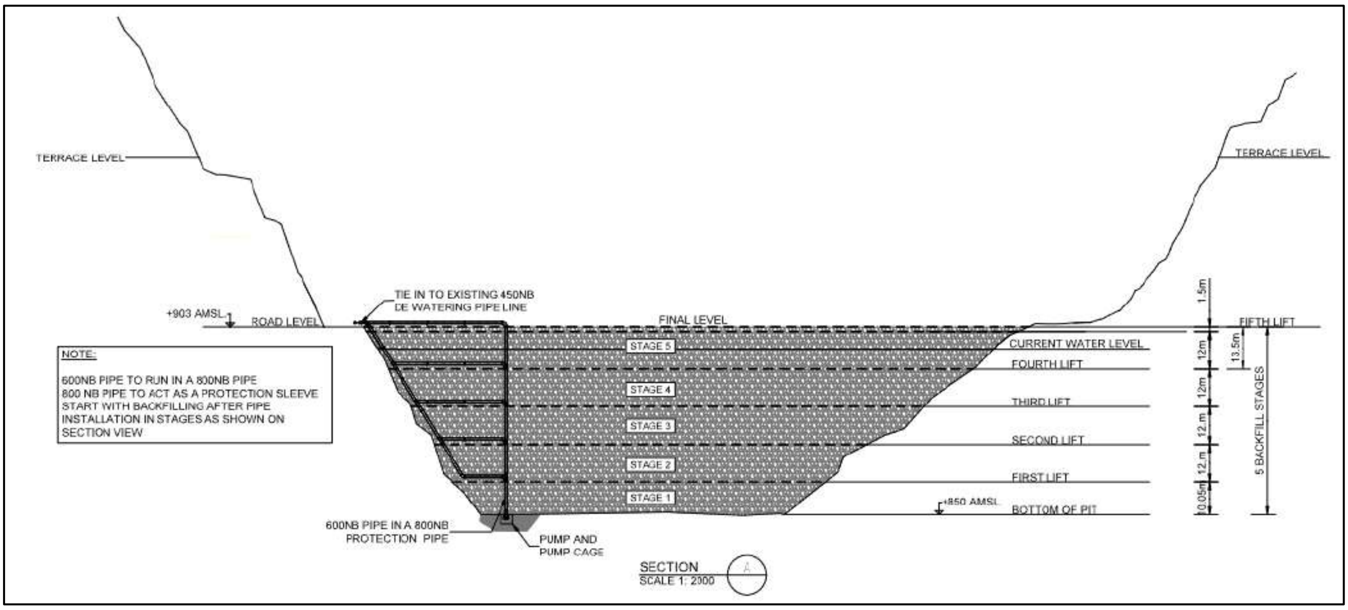

Figure 4-36: Schematic Diagram of a manmade Anthropogenic Aquifer

4.3.2 Suitability of utilizing the Open Pits for Anthropogenic Aquifers Development

In 2021, AAP MM, through Itasca Denver (Pty) Ltd, investigated the possibility of whether the Merensky Reef and/or the UG 2 reefs of the Rustenburg Layered Suite (RLS) are suitable for the development of water storage reservoirs (as to determine the possibility for the establishment of a manmade Anthropogenic Aquifer developed with the use of waste rock material).

This 2021 investigation used the 2021 Itasca Groundwater Flow Model to predict:

- The pit-lake water level of the pits as they are filled (to approved Water Use Licence Storage Volumes); and

[158] *NEMA 1998: GN983 as amended - Listing 1 Activity 10*
[159] *NEMA 1998: GN983 as amended - Listing 1 Activity 12*
[160] *NEMA 1998: GN983 as amended - Listing 1 Activity 19*
[161] *NEMA 1998: GN985 as amended - Listing 3 Activity 14*
[162] *NWA 1988: S21 (c&i) Water Use*
[163] *NWA 1998 GN704 - Regulation 4(a) Exemption*

- The water-balance, including the potential groundwater inflow and groundwater outflow, evaporation and precipitation associated with the infilling of the pits for water storage.

It was concluded from this investigation that; it is anticipated for the pit-lake water level to quickly rise during the initial infilling period after which the pit-lake level will slowly decrease (short-term occurrence at 50 - 500 m^3/day) as a result of a negative net inflow into the pit lake (larger hydraulic gradient from the pit lake to the groundwater system). Groundwater outflow will thereafter decrease to negligible amounts (1m^3/day) within a few months after the initial infilling period after which the primary component of outflow from the pit lake is anticipated through net evaporation from the pit-lake surface (ranging from approximately 1,875 to 1,975 m^3/day), making the open pits suitable for water storage reservoirs.

4.3.3 Water Security in terms of the manmade Anthropogenic Aquifers Development

Sandsloot and Zwartfontein Pits are already individually licenced for both water storage (S21(g)) and the removal (S21(j)) of fissure water) (Water Use Licence Reference No 07/A61G/ABCGIJ/9887 dated 4 December 2020) in terms of the National Water Act (Act 36 of 1998)) and will now require authorisation for the use of waste rock material within the pits for the develop of the manmade anthropogenic aquifers over time. Table 4-14 summarises the approved S21(g) and S21(j) components linked to the Sandsloot and Zwartfontein Pits.

Table 4-14: Licenced Uses: Open Pit Water Storage - Licence No 07/A61G/ABCGIJ/9887 dated 4 December 2020

Area	Activity	Licenced Storage Volume Section 21(g)	Licenced Dewatering Volume Section 21(j)
Sandsloot Pit	Section 21(g) and (j)	23 989 400 m^3	804 632 m^3/a
Zwartfontein Pit	Section 21(g) and (j)	21 524 445 m^3	1 845 892 m^3/a

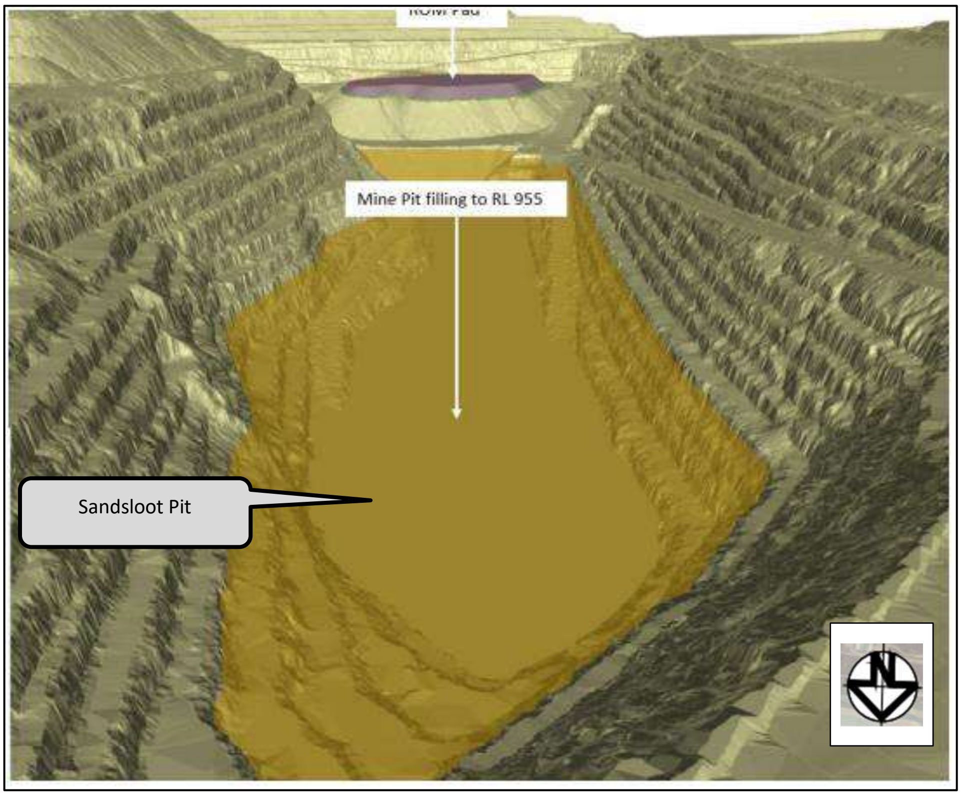

Figure 4-37: Pictorial representation of the Sandsloot Anthropogenetic Aquifer Development

4.4 STORMWATER MANAGEMENT INFRASTRUCTURE PROJECT

Surface water runoff across the operation presents a flooding and contaminant transport risk, as well as an opportunity for water collection, and storage for future operational use.

As required by all mines in South Africa, MM strives towards zero-discharge on site. This is aimed at ensuring that GN704 regulations as it relates to Regulation 6 and 7 of the Act as gazetted in the National Water Act (Act 36 of 1998) are adhered to and that all contaminated water on site is contained within suitable containment facilities designed to ensure a zero release to the environment.

In order to remain compliant to the GN704 Regulations (maintain this zero-discharge environmental status of the operation) as well as to protect the operational pits from flooding, a North-west Pollution Control Dam – Navada Dam and associated diversions are proposed (diversions bordering Waste Rock Disposal Facilities) as to divert and store runoff water from the mine site, particularly from the waste rock disposal facilities during times of high rainfall.

The proposed infrastructure to support this project will include a:

- North-West Pollution Control Dam (Navada Dam) [164],[165],[166]
- Storm Water Conveyance Infrastructure (Diversion channels/pipelines/tunnels/canals)
- Pumping system capable of delivering water to the existing Return Water Dam
- Access roads

4.4.1 Stormwater Management Infrastructure Location

4.4.1.1 Pollution Control Dam (Navada Dam)

The North-west Pollution Control Dam – Navada Dam will be located on Portion 0 of Erf No. 815 Overysel.[167,168,169,170,171] The facility will be bordering the Waste Rock Disposal Facility W02 (located East of W02) and the Mesopotamia Community (located west of North-west Pollution Control Dam – Navada Dam).

The design will meet the requirements of GN704 – Regulation 6(d) - design, construct, maintain and operate any dirty water system at the mine or activity so that it is not likely to spill into any clean water system more than once in 50 years (i.e., minimum legislative requirement)[172]. Detailed designs will be developed to support the Water Use Licence Application component and requirements as set out under the National Water Act (Act 36 of 1998).

Following a probabilistic water balance assessment undertaken by Jones and Wagner (Pty) Ltd (JAWS) in 2021, it was concluded that a North-west Pollution Control Dam – Navada Dam with a capacity of 1,700 Mℓ will be required to meet the needs of the project. This is summarised in the table below.

Table 4-15: Proposed Stormwater Control Dam Design Criteria

Facility Name	Storage Capacity	Area of Disturbance
North-west Pollution Control Dam – Navada Dam	1 700 000 (m^3) / 1700 Mℓ	~10 Ha (Excluding access road)

[164] *NEMA 1998: GN984 as amended - Listing 2 Activity 6*
[165] *NWA 1998 GN704 - Regulation 5 Exemption*
[166] *NWA 1998 S21 (g) Water Use*
[167] *NEMA 1998: GN983 as amended - Listing 1 Activity 12*
[168] *NEMA 1998: GN983 as amended - Listing 1 Activity 19*
[169] *NEMA 1998: GN983 as amended - Listing 1 Activity 27*
[170] *NWA 1998 S21 (c&i) Water Use*
[171] *NWA 1998 GN704 – Regulation 4 (a) Exemption*
[172] *NEMA 1998: GN984 as amended - Listing 2 Activity 16*

In addition to the probabilistic water balance assessment undertaken by Jones and Wagner (Pty) Ltd (JAWS) in 2021, an option analysis was undertaken on possible conceptual design layouts within the proposed area allocated for the Pollution Control Dam. Figure 4-41 highlights the layout for the Pollution Control Dam.

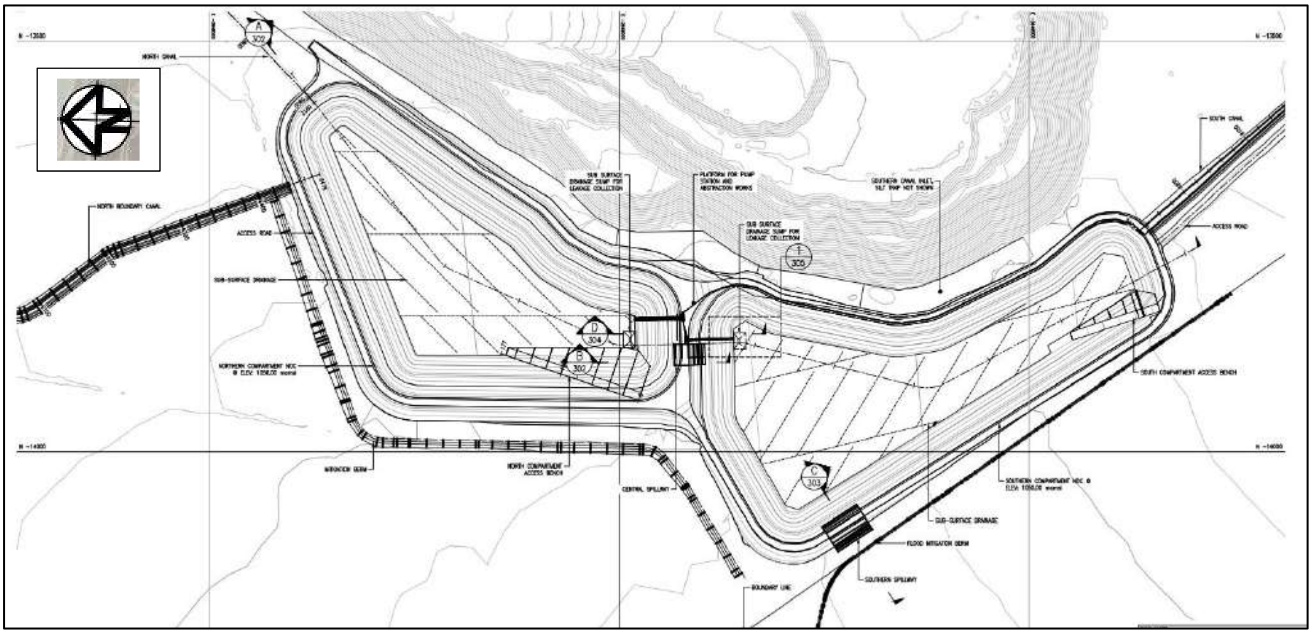

Figure 4-38: Pollution Control Dan – Navada Dam Layout

4.4.1.2 Diversion Channels

The stormwater diversion channels/pipelines/tunnels/canals will be located on Portion 0 of Erf No. 815 Overysel, Portion 1 of Erf No. 818 Zwartfontein, Portion 0 of Erf No. 236 Uyenvallei and Portion 0 of Erf No. 819 in Vaalkop[173,174]. The infrastructure will mainly be bordering the Waste Rock Disposal Facilities on site (Existing and new).

This storm water conveyance infrastructure[175,176,177] will be constructed alongside the:

- North of (bordering) the W02 Waste Rock Disposal Area
- Underneath the North Waste Rock Disposal Area
- West of (bordering) the W02 Waste Rock Disposal Area
- West of Central Pit, Adjacent to the Bakenberg Road
- East of (bordering) Central Pit
- South of (bordering) South Pit
- East of (bordering) South Pit
- East of (bordering) W020 Waste Rock Disposal Area
- West of (bordering) W020 Waste Rock Disposal Area, adjacent to South Pit
- Between the South Pit and the stockpiles areas north of the North Concentrator

[173] NEMA 1998: GN983 as amended - Listing 1 Activity 12
[174] NEMA 1998: GN983 as amended - Listing 1 Activity 19
[175] NEMA 1998: GN983 as amended - Listing 1 Activity 9
[176] NWA 1998 S21 (c&i) Water Use
[177] NWA 1998 GN704 – Regulation 4 (a) Exemption

4.4.2 Water Collection, Pumping System and Water Utilization

4.4.2.1 Water Collection

4.4.2.1.1 Stormwater Diversion Channel

Storm Water Conveyance Infrastructure in the form of diversion channels/pipelines/tunnels/canals will be constructed as to collect runoff from most of the mining area inclusive of the north-east, eastern and western waste rock disposal areas and the area east of North Pit Waste Rock Disposal Area (with in-dump bench channels).

The diversion channels/pipelines/tunnels/canals will route the collected water to the North-west Pollution Control Dam – Navada Dam for re-use.[178]

The diversion channels will also act as a conveyor to transfer water pumped from the active dewatering scheme (all mining pits) to the North-west Pollution Control Dam – Navada Dam. The active dewatering volumes will act as a baseflow to the facility.

Figure 4-39: Canals and Berms in support of Stormwater Management

4.4.2.1.2 Waste Rock Disposal Area Underdrainage

During high intensity rainfall events, seepage from the Waste Rock Disposal areas flow through the highwall and poses a risk to slope stability. This water must be intercepted due to the safety risk it poses.

As part of the engineering measures proposed for the seepage interception from the Waste Rock Disposal areas; Toe Drainage Systems will be incorporated within the Waste Rock Disposal Area designs to connect with the stormwater diversion channel. The collection of the intercepted seepage through the underdrainage will be

[178] *NWA 1998 S21 (a) Water Use*

conveyed by a sub-surface drainage system /trenches/ drainage gallery around the waste rock disposal areas and integrated with the stormwater diversion channel for conveyance to the North-west Pollution Control Dam – Navada Dam

4.4.2.1.3 Interception and Pumping System

As part of other MM site initiatives to be realized on site, allowance will also be made for the interception of shallow seepage from the Waste Rock Disposal Facilities areas by means of an Interception and Pumping system.

The collection of the intercepted seepage through the Interception and Pumping system will be conveyed by a sub-surface drainage system /trenches/ drainage gallery around the waste rock disposal areas and integrated with the stormwater diversion channel for conveyance to the North-west Pollution Control Dam – Navada Dam

4.4.2.2 Pumping System

The pumping system proposed as part of the North-west Pollution Control Dam – Navada Dam will connect to the existing "export dewatering pipeline system"[179] and will follow the same servitude as the diversion channel system due to space constraints on site. The pumping system will be developed to a capability of delivering between 10 – 30ML/day water to the Return Water Dam.

Figure 4-40: Pumping System

4.4.2.3 Water Utilisation

The water collected from the diversion channels into this proposed Storm Water Control Dam will be pumped to the existing Return Water Dam (RWD) to supplement the water supply to the North (MNC) and Third (M3C) Concentrators and maintain the dams operating levels for discharge management (zero-discharge).

[179] *NEMA 1998: GN983 as amended - Listing 1 Activity 45*

4.4.3 Access Road

Site access to the North-west Pollution Control Dam – Navada Dam will be required in the form of a new Access Road[180,181] to be constructed.

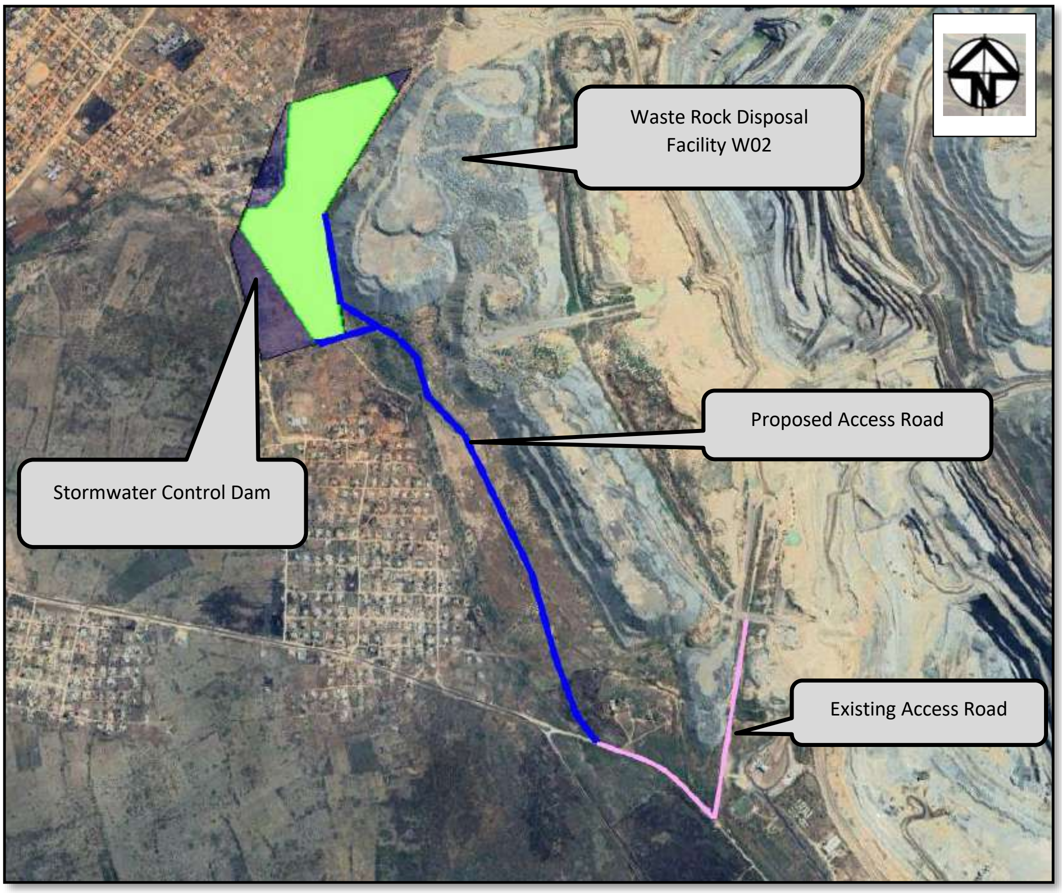

Figure 4-41: Proposed New Access Road the Pollution Control Dam (Navada Dam)

4.5 EXISTING WASTE ROCK DISPOSAL FACILTY IN LINE WITH NEW DEPOSITION STARTEGY

4.5.1 Existing Waste Rock Disposal Areas

The MM Complex currently has five (5) existing/operational approved Waste Rock Disposal (WRD) Areas namely W01, W07, RS3, W020 (East) and W02 (West).

In terms of timelines: WRD W01 and WRD W07 were approved to a height of 60m in the 1997 permitting run and EMPr approval; WRD RS3 was approved to a height of 60m within the 2001 permitting run and EMPr approval and WRD W020 (East) and WRD WRD020 (West) were both approved to a height of 175m and 95m respectively in the 2003 permitting run and EMPr approval.

Although the approved design heights of WRD020 (East) and WRD WRD02 (West) were 175m and 95m respectively, the approved 2003 EMPr had erroneously reflected their final heights as being 60m in text in the EMPr document. These errors were unfortunately carried over in August 2020, when the Department of Mineral

[180] *NEMA 1998: GN983 as amended - Listing 1 Activity 24*
[181] *NWA 1998 GN704 - Regulation 5 Exemption*

Resources and Energy (DMRE) approved MM's Consolidated EMPr. This consolidated EMPr included the existing operations as previously approved as well as the Mogalakwena Expansion Project while consolidating previously approved EMPr's into a single programme.

The waste rock disposal heights for WRD Facilities W01, W07 and RS3 current exceed 60 m.

This prompted MM to undertake a Regulation 31 Amendment Application process in 2022 as to:

- Correct WRD WRD020 (East) and WRD WRD02 (West) heights to 175m and 95m respectively in line with what was previously approved by the DMRE (Reference: LP 30/5/1/2/3/2/1 (050) EM); and
- Approve new heights for WRD W01, W07 and RS3 to the current average undulating (including peaks and troughs) height of each of the facilities.

The table below summarises the changes that were applied for within the 2022 Regulation 31 application as it relates to the existing WRD heights and deposition strategy. The DMRE refused the Regulation 31 Application on 2 March 2023. The process is currently in an appeal period.

Table 4-16: Regulation 31 Amendment on Existing MM WRD's

Waste Rock Disposal Facility	Approved Undulating Heights	Approved Footprint Areas (ha)	Regulation 31 Amended (new approved) undulating heights	Regulation 31 Amended (new approved) footprint area (ha)
W01	60	42.28	82	~42.28
W07	60	84.32	82	~84.32
RS3	60	195.64	109	~195.64
W020 (East)	175	1027	175 (R31 correction)	~1027
W02 (West)	95	385	95 (R31 correction)	~385

4.6 NORTH WASTE ROCK DISPOSAL FACILITY PHASE 3 PROJECT

In 2019 an application was made to the Department of Mineral Resources and Energy (DMRE) for an Environmental Authorisation (EA) in terms of the National Environmental Management Act (Act 107 of 1998)(NEMA) and a Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA) for, amongst other mining related activities and infrastructure, a new Waste Rock Disposal Facility, to be known as the North Waste Rock Dump (NWRD), and an ore stockpile and associated infrastructure at MM on Ptn 0 of Erf No.815 Overysel.

In addition to the application for an EA and WML, a Water Use Licence Application (WULA) was submitted to the Department of Water and Sanitation (DWS) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for water uses associated with the NWRD, ore stockpile and associated infrastructure.

MM received an integrated (NEMA and NEM:WA) EA (LP30/5/1/2/3/2/1 (050) EM) and a WUL during 2020 for the activities and water uses associated with the NWRD, ore stockpile area and associated infrastructure, amongst other mining related activities and infrastructure.

Subsequent to the approval of the North Waste Rock Disposal Facility (NWRD) and ore stockpile areas, MM determined that the ore stockpile area would no longer be required. With the ore stockpile area becoming available MM proposed to extend the recently approved footprint of the NWRD (Table 4-17) and to allow for a buffer area around an identified wetland area. The reconfigured NWRD Facility has not yet been constructed.

Table 4-17: North Waste Rock Disposal Facility

	Authorised NWRD - 2020	Reconfigured NWRD (Still to be approved) - 2022
Volume	21 000 000 m³ per annum (21 Mt)	
Area	210 ha (NWRD + Ore Stockpile Area)	128 ha (including access roads and water management infrastructure, Reconfigured to accommodate the 500m Wetland Buffer Zone
Design Height	1130 mamsl (75m)	

The reconfigured NWRD footprint area is indicated in Figure 4-42.

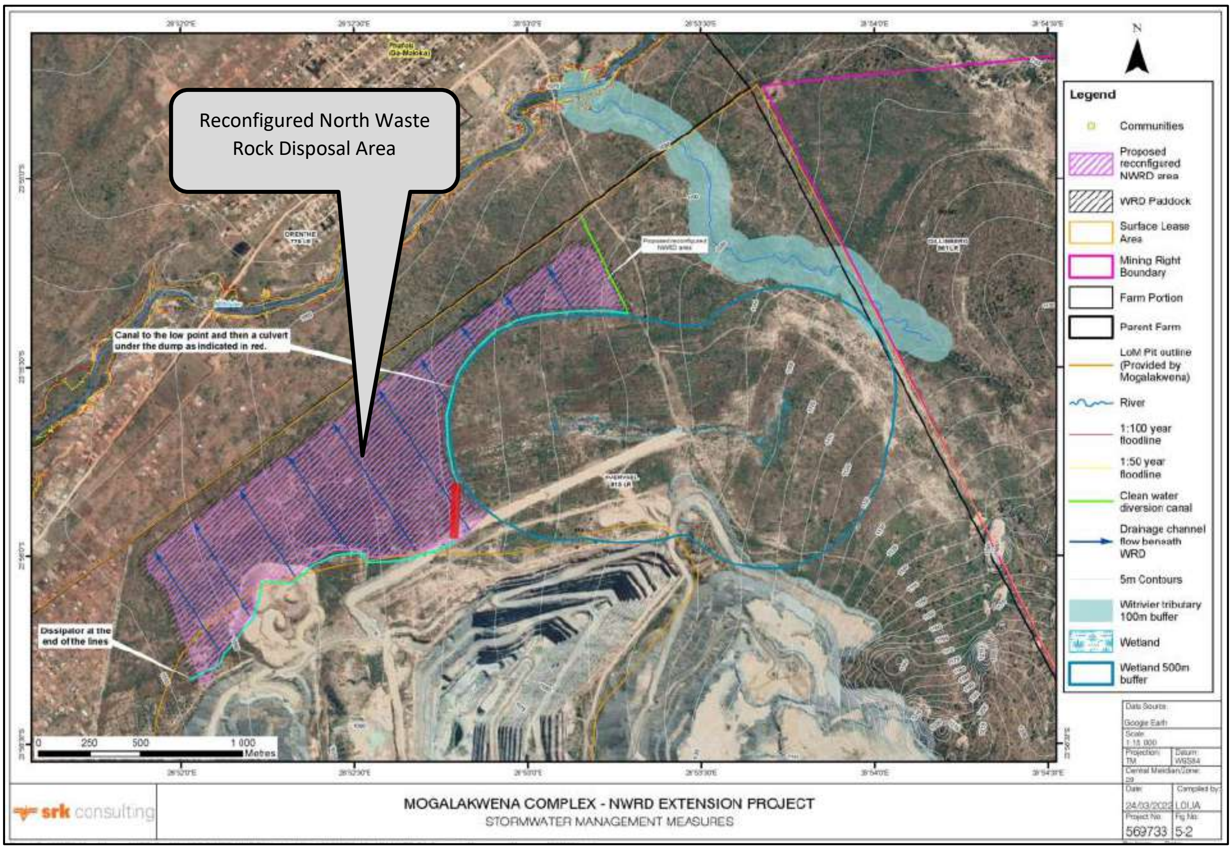

Figure 4-42: Reconfigured footprint area of the North Waste Rock Disposal Facility (SRK, 2022)

In order to accommodate additional waste rock material on site, the NWRD Facility will need to be further extended with an additional area of approximately 80 ha[182,183,184,185,186,187] (the total area of the extended NWRD will include the previously authorised NWRD as indicated in Table 4-17) as indicated in Figure 4-42 (indicated in purple hatching).

[182] *NEMA 1998: GN983 as amended - Listing 1 - Activity 12 & 19*
[183] *NEMA 1998: GN984 as amended - Listing 2 - Activity 6 & 15*
[184] *NWA 1998 S21 (c&i) Water Use*
[185] *NWA 1998 S21 (g) Water Use*
[186] *NWA 1998 GN704 – Regulation 4 (a) Exemption*
[187] *NEM:WA 2008 GN921 as amended – Category B - Activity 8, 10 & 11*

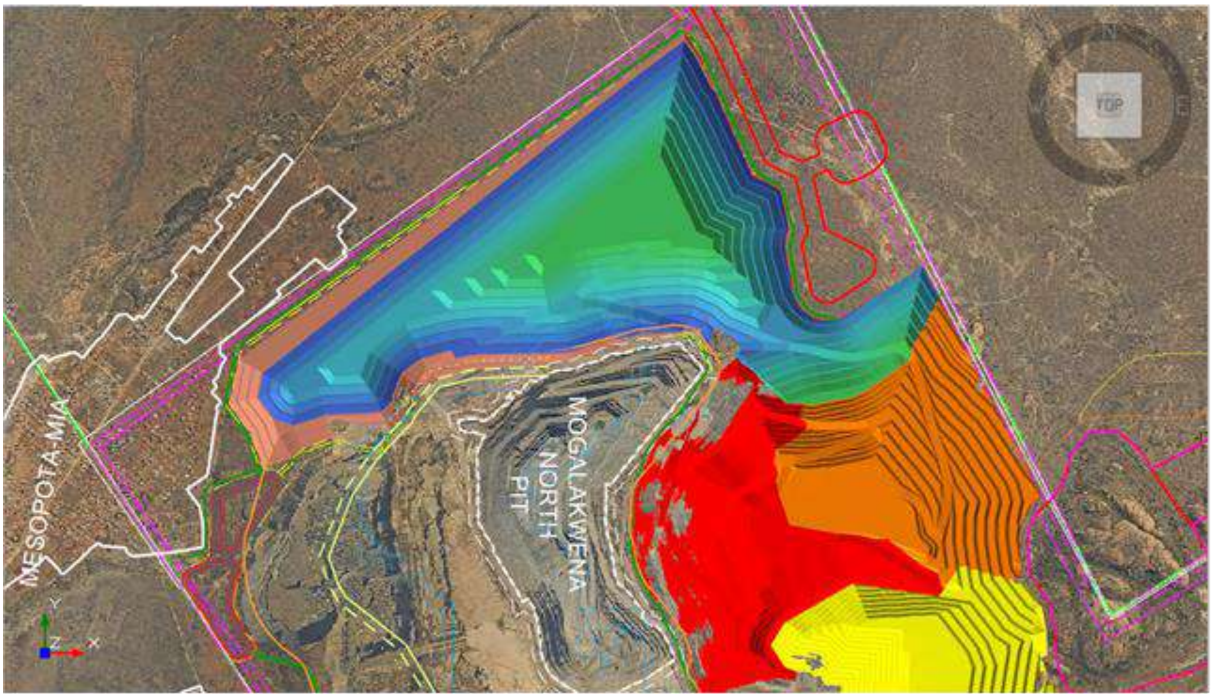

Figure 4-43 provides for the Phase 3 development of the North Waste Rock dump as part of this Regulatory process.

In addition to the above, MM is also aiming at amending the deposition strategy of the originally approved NWRD Facility (Ptn 0 of Erf No.815 Overysel) as to allow for the implementation of new design height[188,189,190] and footprint area in line with the Life of Asset Mine Plan (LOAP) for the operation. This amendment will accommodate additional material disposal onto the existing approved 210 ha area of the facility. The new deposition strategy will allow for additional storage of 500 Mt Waste Rock on site as part of Phase 3 of the North Waste Rock Disposal Facility;

- Extent of Phase 3 WRD - ~422 ha including bund D, E, F, G and the triangle north east of the North East Waste Rock Disposal Facility;
- Height - ~200 m;
- Access road[191,192,193,194] -

The North Waste Rock Disposal Facility Phase 3 allows for the further development following areas in terms of the Life of Asset Mine Plan:

- Bund 213-D
- Bund 213 E
- Bund 213-F
- Bund 213-G

[188] NEMA 1998: GN983 as amended - Listing 1 Activity 34
[189] NWA 1998 S21 (g) Water Use
[190] NEM:WA 2008 GN921 as amended – Category A Activity 10 & 13
[191] NEMA 1998: GN983 as amended - Listing 1 Activity 12, 24 & 27
[192] NEMA 1998: GN984 as amended - Listing 2 Activity 15 & 17
[193] NWA 1998 S21 (c) & (i) Water Use
[194] NEMA 1998: GN985 as amended - Listing 3 Activity 12 & 14

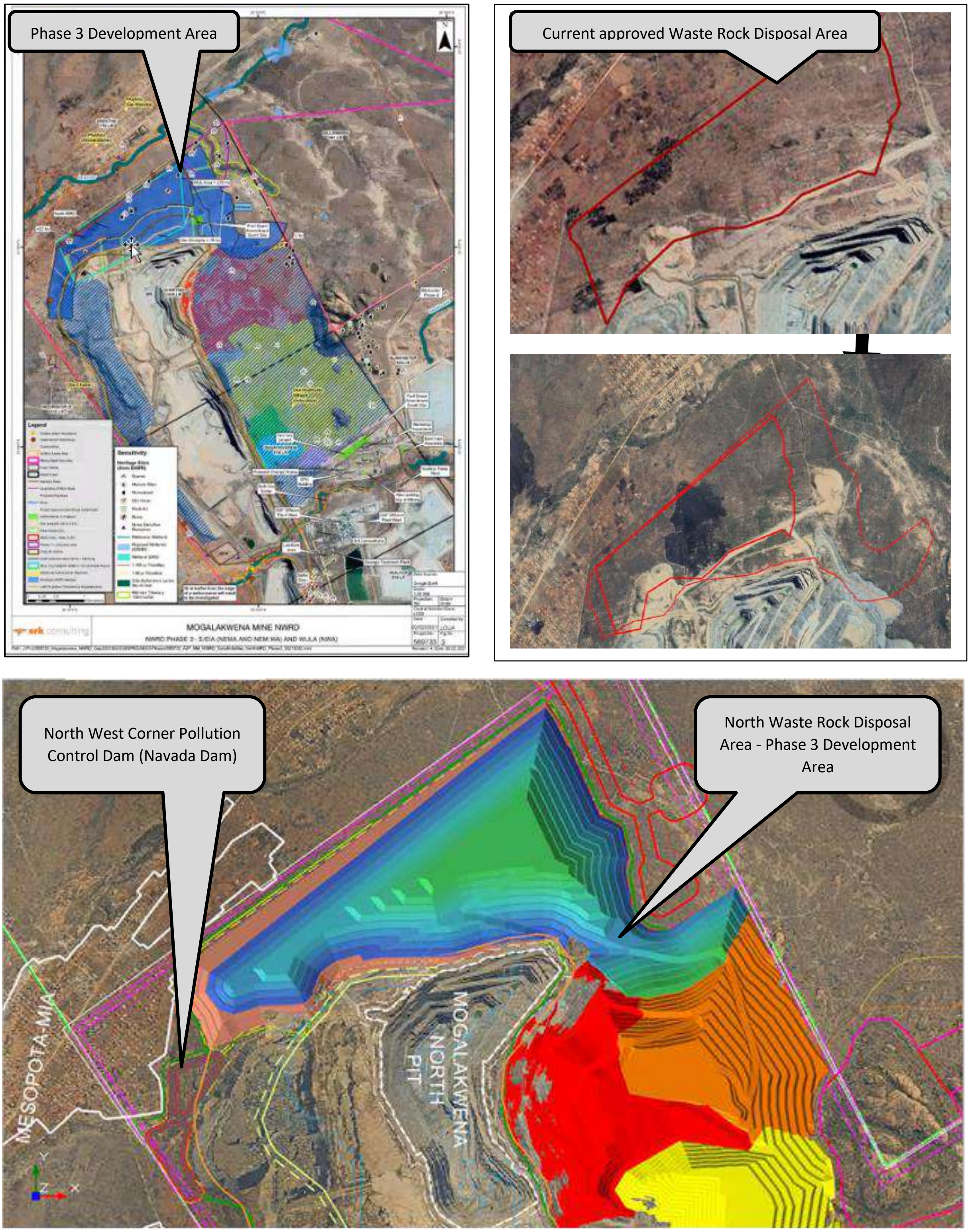

Figure 4-43: Proposed Extension to the North Waste Rock Disposal Facility – Phase 3

Table 4-18: Extension on Existing MM NWRD – Footprint and height changes (Phase 3)

Waste Rock Disposal Facility	Bund Area Reference	Capacity (Mt)	New Design Undulating Heights	New Design Maximum Level	Total Area
North Waste Rock Disposal Facility (Phase 3)	Nth 213-D 213-E 213-F 213-G	550 Mt	+200 m	1 230 mamsl from 1085m floor	422 Ha

- The boundary footprint of the revised NWRD (Design_904) is a combination of the following constraints
  - To the North and to the East
    - 100m offsets to the Mining Authorisation and surface lease boundaries
    - 100m offsets to all graves and cemeteries (including their accesses)
  - To the West
    - 20m offset to the North-west Pollution Control Dam – Navada Dam) and the drainage lines leading into it
  - To the South, the minimum of
    - 50m offset from the existing pit crest
    - 50m offset from the future Cut_19 pit crest (current 'final void')
    - 50m offset from the Revenue Factor 1.0 shell (potential future pit crest)
    - 20m offset to the drainage channel feeding into the PCD

4.7 SUPPORTING INFRASTRUCTURE RELATED TO THE ZERO EMISSIONS HAULAGE SOLUTION

As part of this Integrated Environmental Impact Assessment, MM will authorise supporting infrastructure (water pipelines, powerlines), required for a proposed Hydrogen Production Facility (Production Scale Project) as well as a workshop to retrofit the haul trucks, the refuelling stations to refuel the haul trucks with liquid hydrogen, a staging area in support of the ZEHS and a mobile liquefaction plant at the current PoC area.

4.7.1 Hydrogen Production Facility Process Description

Hydrogen is produced through the electrolysis of water (Proton Exchange Membrane technology to be deployed) which is the process in which water is electro-chemically split into its constituted molecules, Oxygen and Hydrogen. Water will be treated to achieve the water quality required for the efficient running of the electrolysis process. Hydrogen produced leaves the electrolyser stacks as a mixture of water and hydrogen. After the separation of water, humid hydrogen is purified and further dried, quality hydrogen is then processed at the liquefaction plant and stored for transporting.

At the liquefaction plant, hydrogen is significantly cooled and turned into a liquid state and sent to the liquid hydrogen storage. From storage, the liquid hydrogen trailers are filled with liquid hydrogen and then transports liquid hydrogen to the refuelling stations located at strategic locations across the active mining areas. At the refuelling station, liquid hydrogen will be transferred directly from the liquid hydrogen trailers via a refuelling system to the mining truck fuel tank.

4.7.2 Proposed New Hydrogen Production Facility (Production Scale)

MM is currently in the process of investigating a Hydrogen Production Facility (Production Scale Project). A located-on Portion 14 of Erf No. 823 Armoede, adjacent and east of the existing Vaalkop Tailings Storage Facility (TSF) is an option for the placement of this hydrogen facility. The Figure 4-44 below depicts the one of the preferred locations of the new proposed Hydrogen Production Facility in relation to existing MM surface infrastructure.

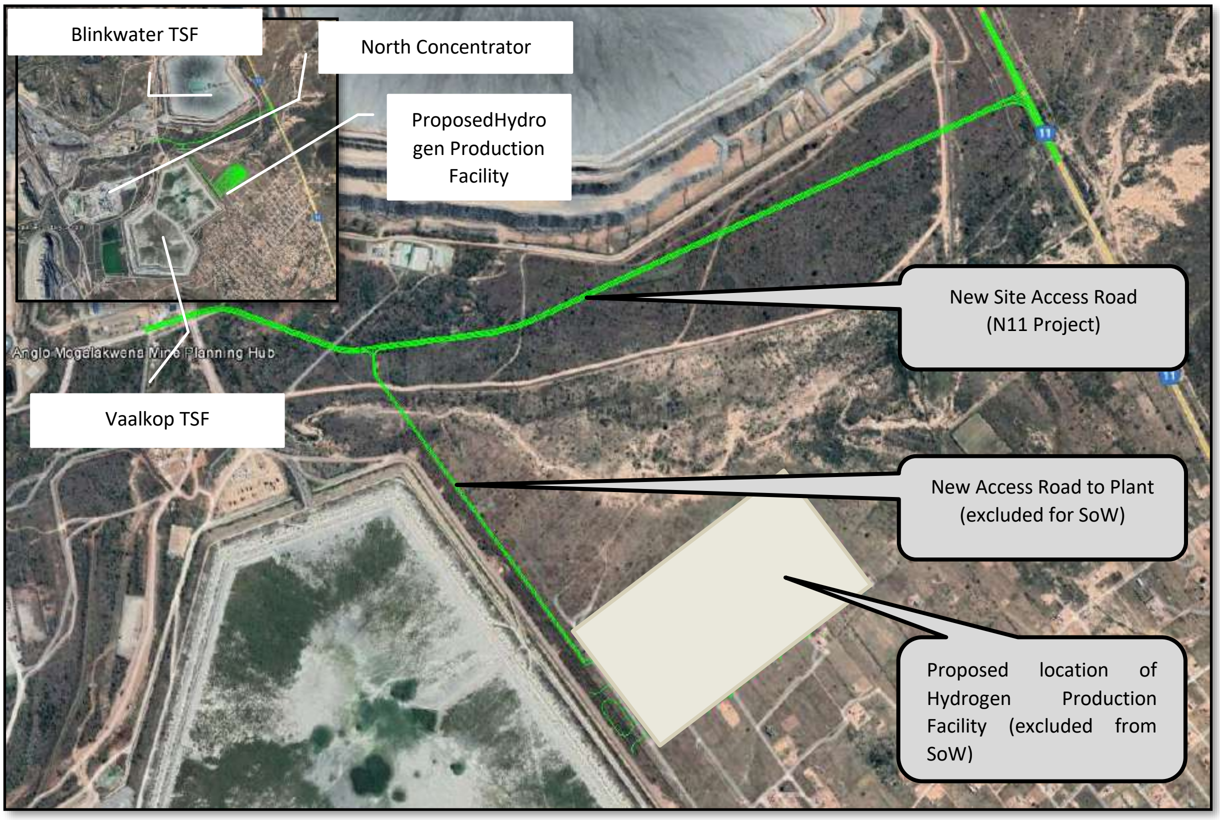

Figure 4-44: Proposed location of New Hydrogen Production Facility

4.7.3 Supporting Infrastructure

To support the ZEHS various supporting infrastructure (to be utilised by the site) will be located within the Mining Rights Area of MM.

4.7.3.1 Water Supply

The proposed Hydrogen Production Facility (located on Portion 14 of Erf No. 823 Armoede (subject to site selection approval) will require a net water consumption of approximately 29 m^3/hour to feed the electrolysis system.

To achieve hydrogen production plant daily production of approximately 29 m^3/hour, 100 m^3/h of process water will be fed to the water treatment plant (via a 3,61km[195] new dirty water pipeline) located at the hydrogen production plant. 20 m^3/day of potable water will be required. Water will be sourced from existing sources such as Treated Sewage Effluent (via Dam 1160) or alternatively from the Sandsloot Pit / dewatering boreholes.

The water treatment plant has a recovery rate of 44% based on the effluent water quality, of which 16m^3/hr (high quality de-mineralised water for the electrolysis) will be fed to the electrolysis system, while the reject water will be pumped via a new 0,73km dirty water pipeline to Vaalkop v-drain. The reject water in the v-drain will gravitate to the existing return water dam located north-west of the Vaalkop Tailings Storage Facility.

[195] *NEMA 1998: GN983 as amended - Listing 1 Activity 46*

The Figure 4-45 below depicts the location of new and proposed water related infrastructure associated with the proposedHydrogen Production Facility.

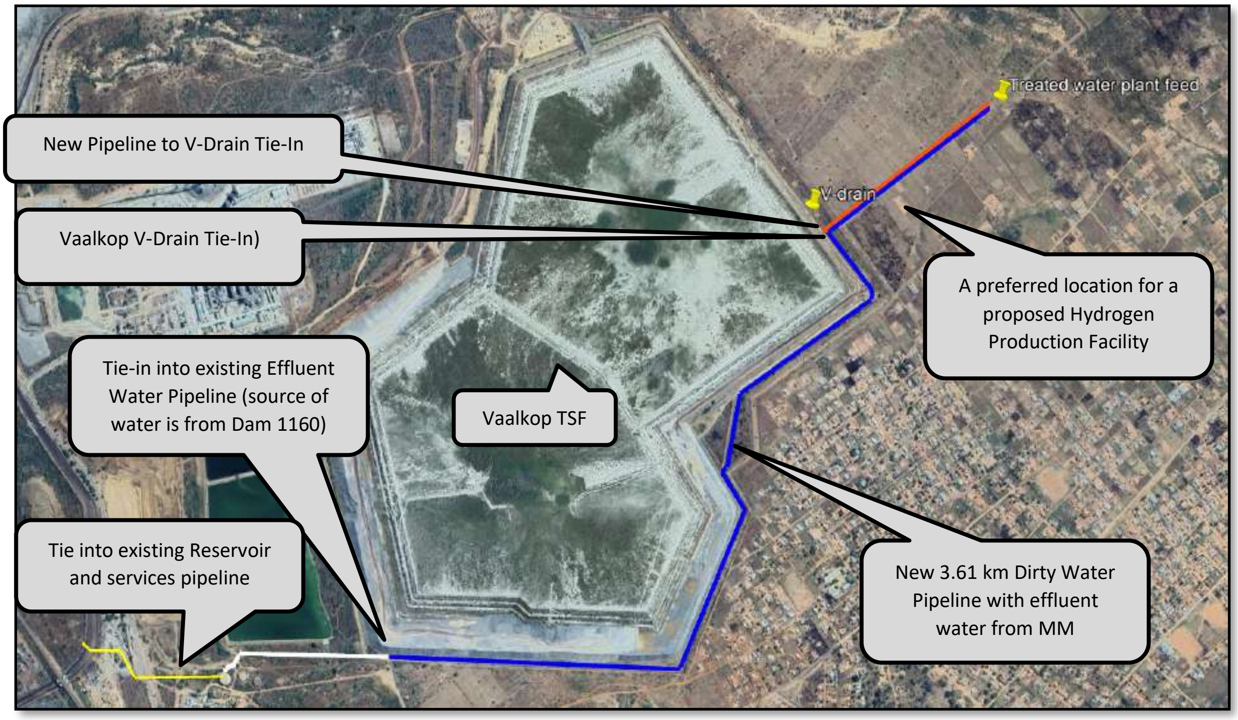

Figure 4-45: Proposed New Water Related Infrastructure associated with the proposed Hydrogen Production Facility

4.7.3.2 Power Supply

Power Supply to support the proposped Hydrogen Production Facility will be sourced from the mine's existing substations via new overhead transmission lines. These existing substations are supplied by the National Grid Infrastructure (Eskom).

Due to the capacity constraints of the National Grid Infrastructure, power supply will be provided to the proposed Hydrogen Production Facility Project in two phases (which have been deemed temporary and permanent in nature).

Phase 1 will allow for a temporary power supply to be provided from the existing Third Concentrator (M3C) substation (already approved and located East of MNC). Phase 1 will consist of a 80 MW 33 kV 2.75 km Overhead Transmission Line[196] to be constructed to the proposed Hydrogen Production Facility alongside the Vaalkop TSF to be utilized until Phase 2 of the power supply project is completed.

Phase 2 will allow for a permanent power supply to be provided from a new Point of Distribution (POD) substation located north of Vaalkop TSF. Phase 2 will consist of a POD substation[197,198,199] and an additional 2 off 80MW, 33kV, 1.84km Overhead Transmission Lines[200,201,202] to be constructed to the proposed Hydrogen Production Facility alongside the Vaalkop TSF. In total the number of overhead lines to the proposed Hydrogen Production Facility will eventually be three, configured as 3 off 80MW, 33kV, 1.84km transmission overhead lines.

196 NEMA 1998: GN983 as amended - Listing 1 Activity 11
197 NEMA 1998: GN983 as amended - Listing 1 Activity 12
198 NEMA 1998: GN983 as amended - Listing 1 Activity 27
199 NWA 1998 S21 (c&i) Water Use
200 NEMA 1998: GN983 as amended - Listing 1 Activity 12
201 NEMA 1998: GN983 as amended - Listing 1 Activity 11
202 NWA 1998 S21 (c&i) Water Use

The figure below depicts the location of new and proposed power supply related infrastructure associated with the proposed Hydrogen Production Facility.

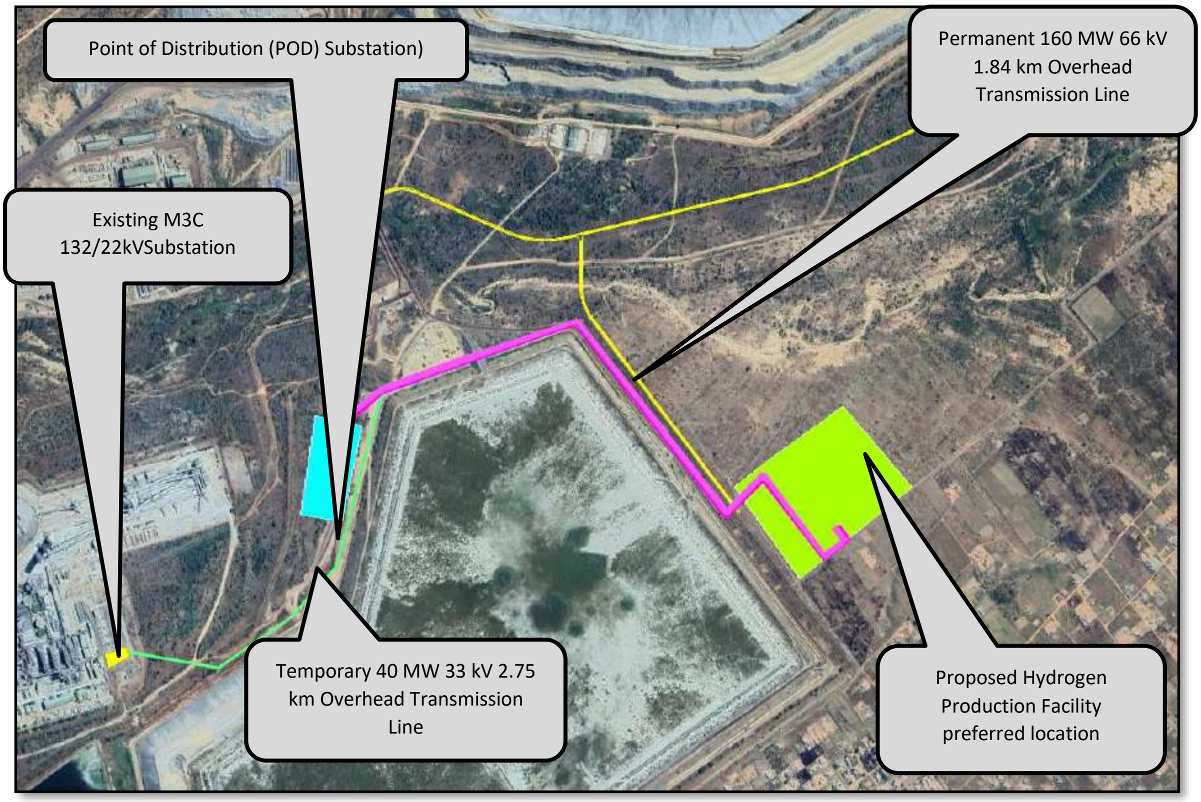

Figure 4-46: Proposed New Power Related Infrastructure associated with the proposed Hydrogen Production Facility

4.7.3.3 Mobile Refueling Points

Liquid Hydrogen Refueling Points will be located on the mining rights area of MM to refuel mine haul trucks. The liquid hydrogen refueling points will ultimately replace the current diesel refueling points that are used for haul trucks.

These mobile refueling points will be continuously filled (storage tanks)[203,204] via a tube trailer (supplied by the export system located at the proposed Hydrogen Production Facility) to allow the mine haul trucks to be filled with the liquid hydrogen for use as an energy source for the on-board fuel cell power system.

These refueling points will be strategically located mobile stations and will move around the site as mining progresses, staying within disturbed areas and outside of no-go zones and sensitive areas.

The figure below depicts the mining area where the refueling stations will be located.

[203] *NEMA 1998: GN984 as amended - Listing 2 Activity 4*
[204] *NEMA 1998: GN985 as amended - Listing 3 Activity 10*

Figure 4-47: Mining area where the mobile refuelling stations will be located

4.7.3.4 Staging Area

The LH2 staging area will be used to buffer and stage LH2 as it comes onto the Mine site. It will serve as a source-agnostic receiving, collecting, and buffering point for LH2 transport operations that is controlled by the Mine. It will be the logistics hub for transporting LH2 throughout the mine, as well as receiving LH2 from off-site sources.

Figure 4-48: Area where the staging area will be situated

4.7.3.5 Liquefaction plant at the POC

The first trucks that arrive, will require a source of liquid hydrogen before the proposed full-scale hydrogen plant is commissioned. A small liquefaction plant will be set up at the POC[205] to liquefy the gas hydrogen generated by the POC to fuel the first trucks.

The POC's normal daily production of GH2 is around 400kg. It could go up to 1000kg per day using storage and or running the POC facility for 24-hour shifts. This would provide enough capacity to operate one LH2 truck in continuous (e.g., 24 hour) operation.

Existing storage at the POC in gaseous form is around 800kg. Two banks of 400kg. One bank can be filled while the other is used for dispensing.

4.7.3.5.1 Storage Estimates

2000kg of LH2 Storage will provide enough storage for testing the continuous operation of the first 3 x LH2 Trucks (60% utilization) for approximately 24 hours. Connection to the PoC can be via the Plug Power gaseous hydrogen dispenser so that the DT74 GH2 Haul Truck can still be refueled or that gas can be sent directly to the Liquefaction facility. There is also an existing connection point on the outlet manifold before the Plug Power connection.

This would then amount to a total gas storage of 78m^3 and liquid storage of 30m^3.

4.7.3.5.2 Plot Area required (PoC)

The minimum space required is in the order of 100m x 100 m if a liquefaction plant is placed at the PoC.

4.7.3.5.3 Power Requirements

The existing power available (+-2MW) will be enough for a small liquefier.

4.7.3.5.4 Heat mass balance for a liquefier

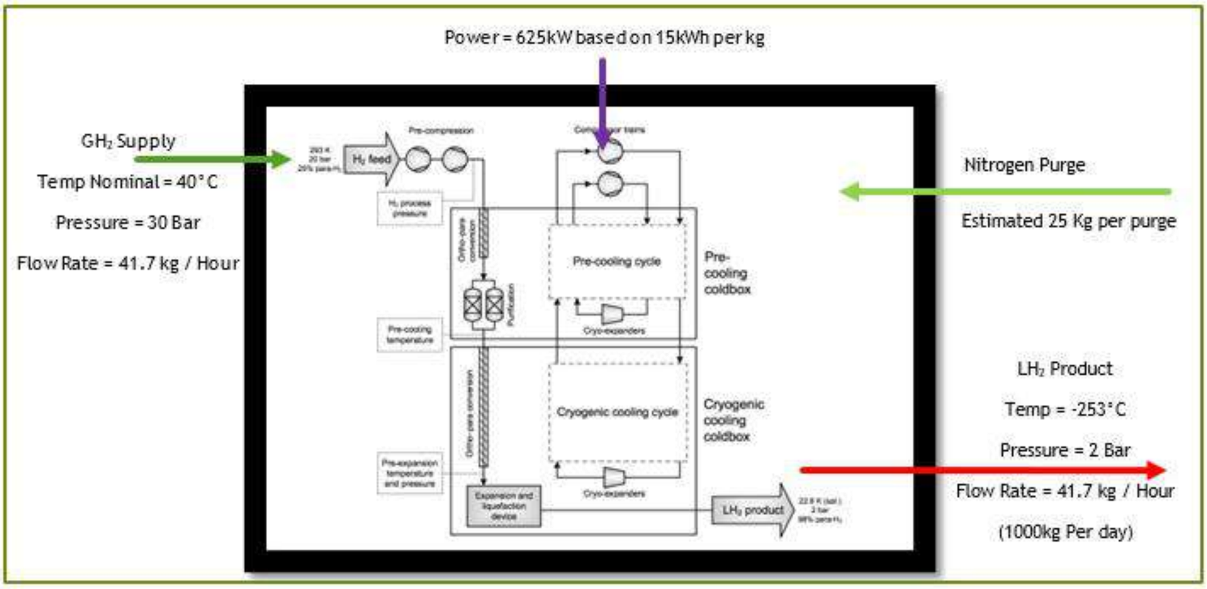

Figure 4-49: Liquefier heat mass balance - steady state

4.7.3.6 Workshop

In addition to the above, a dedicated haul truck workshop area will be constructed next to the existing PoC Hydrogen Production Facility on an already disturbed area.

[205] *As approved by Regulation 29 amendment EA*

It should be noted that some of the 616KW Photo Voltaic Plant will be disassembled and packed away to accommodate the workshop.

4.8 N11 ACCESS ROAD PROJECT

A new ~2.5 km main access road[206,207,208,209,210] to the west of MM is proposed from the existing SANRAL N11 Road.

This proposed road will branch-off from the N11 to follow a route south of the existing MM Blinkwater Tailings Storage Facility (Ptn 0 of Erf No. 818 Zwartfontein and Ptn 0 of Erf No. 820 Blinkwater) to connect to the existing infrastructure at MM (part of this regulatory process).

This new main access road will also provide a future connection point for a new road (to the proposed preferred location of the proposed Hydrogen Production Facility (Production Scale)

The Figure 4-50 below depicts the route to be followed for the new access road allocated in red.

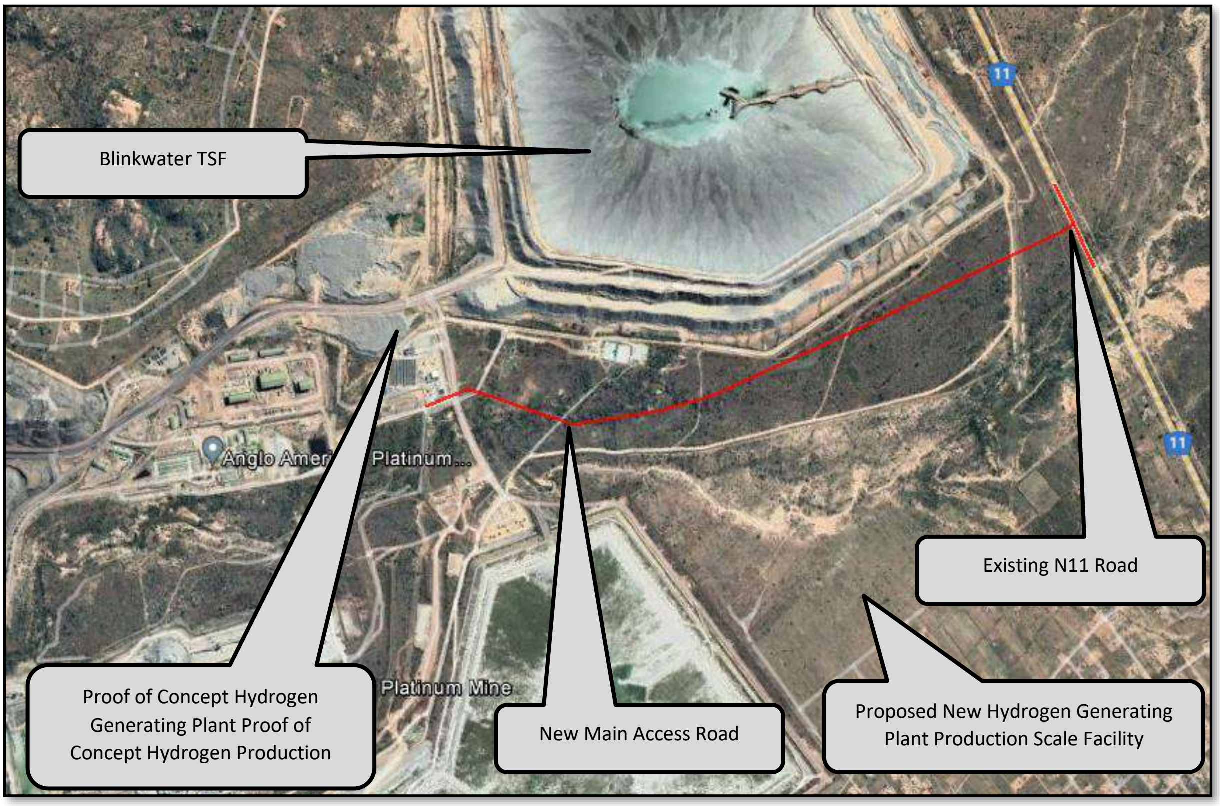

Figure 4-50: New Access Road from existing SANRAL N11 Road

[206] *NEMA 1998: GN983 as amended - Listing 1 Activity 24*
[207] *NEMA 1998: GN983 as amended - Listing 1 Activity 12*
[208] *NEMA 1998: GN983 as amended - Listing 1 Activity 19*
[209] *NWA 1998 S21 (c) & (i) Water Use*
[210] *NWA 1998 GN704 – Regulation 5 Exemption*

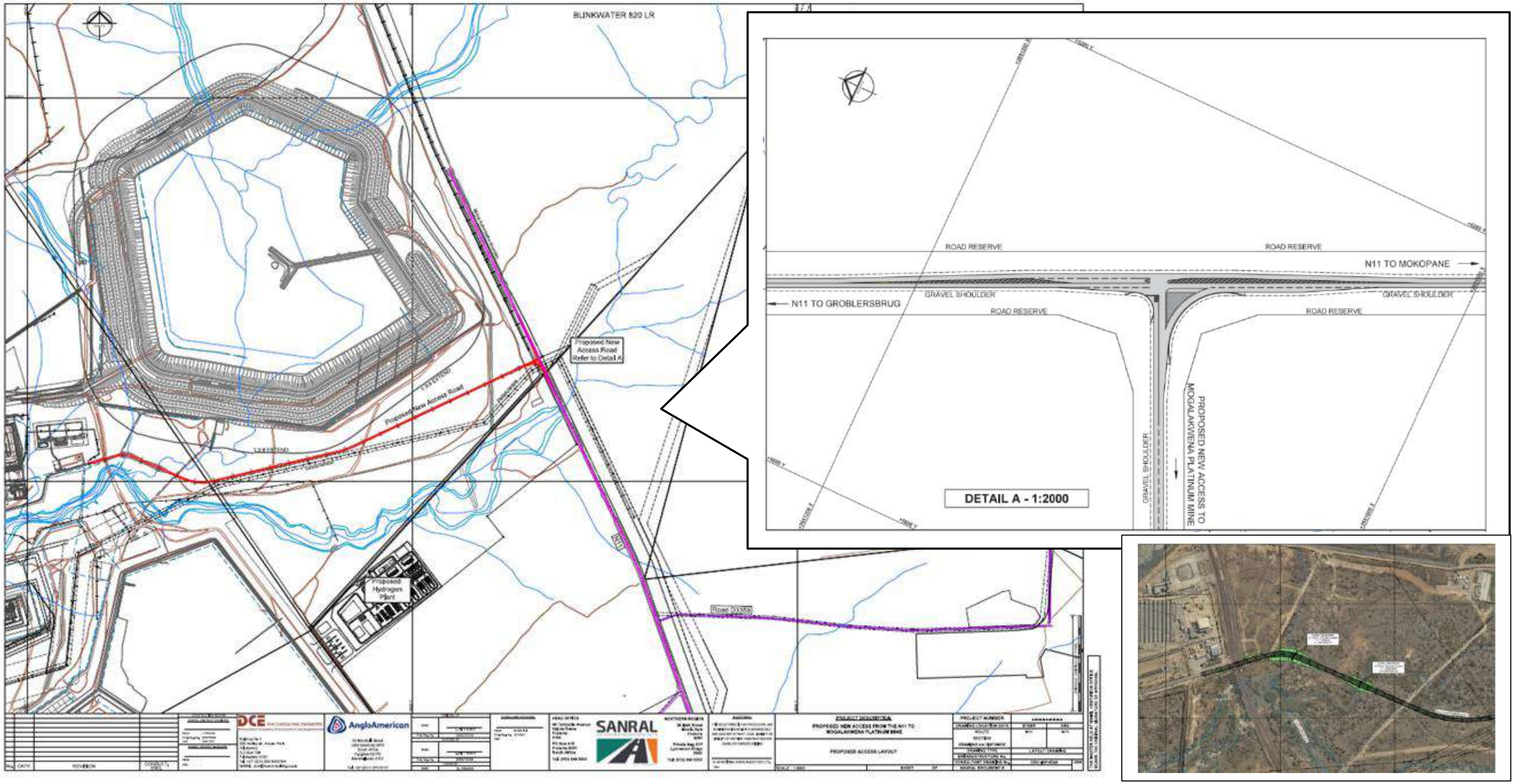

Figure 4-51: New Access Road from existing SANRAL N11 Road

4.9 PERMIT TO INNOVATE PROJECT

AAP innovation-led pathway to sustainable mining includes the Anglo American's (AA) purpose of re-imagining mining to improve people's lives through the AA's FutureSmart Mining™ programme and Sustainable Mine Plan (SMP). It addresses critical challenges of safety, productivity, and the way AAP uses land by reducing its environmental footprint and supporting biodiversity, use of energy, and water in a more sustainable and efficient way that is better harmonised with the needs of MM host communities and society.

The FutureSmart Mining™ programme is aimed at transforming the technology AAP are using across the mining value chain. Permit to Innovate will enable testing and trialling of new technologies efficiently allowing continuous improvement of AAP operation towards more sustainable mining. It is about allowing innovation and new technologies to be tested, trialled and implemented within a designated footprint where the environmental limits will be set for inputs and outputs while ensuring no additional impact to the environment.

In AAP's pursue of continuous improvement through FutureSmart Mining™ which requires agile development and testing of several innovation projects across the mining and processing lifecycle such as crushing, floatation, concentration, material handling etc. This would be a "*plug and play*" and/or modular set up to enable changes in technology. The typical activities are similar to the current approved operational activities, the difference is that these new technologies are to improve these processes by using technologies such as Bulk Ore Sorting, Pre-conditioning Microwave, Coarse Particle Recovery, Hydraulic Dry Stacking, etc. with an objective to address the sustainability challenges impacting the national and local communities such as water, energy and footprint.

MM is proposing three dedicated areas[211,212] at the MSC to support testing of future innovative, new technologies and research. These areas will be dedicated to trail/pilot new technologies within an area that has been authorized to do so in terms of the NEMA by anticipating common NEMA listed activities for the various proposed trail/pilot projects.

- Area 1 northwest of Mogalakwena South Concentrator (~5.3 ha)
    - Ptn 0 of Erf No.819 Vaalkop
        - Considered for the use in support of assembling of components for projects and processes and for PTI projects.
- Area 2 north of Mogalakwena South Concentrator (~3.6 ha)
    - Ptn 0 of Erf No.819 Vaalkop
- Area 3 east of Mogalakwena South Concentrator (~3.8 ha)
    - Ptn 0 of Erf No.819 Vaalkop

Anticipated future supporting infrastructure within these dedicated areas include:

- Infrastructure for the generation of electricity
- Infrastructure for the bulk transport of clean and dirty water.
- Infrastructure for the transmission and distribution of electricity
- Facilities / Infrastructure for the storage of dangerous goods
- Facilities / Infrastructure for the treatment of effluent, wastewater or sewage
- Clearance of vegetation; and
- Storage of residue and reclamation of residue stockpiles/deposits for trial work (temporary)

As part of the envisioned innovative, new technologies and research projects, it is anticipated that the above listed supporting infrastructure can be developed within the dedicated footprint area below the trigger threshold of the requirements for environmental authorization under NEMA.

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[211] *NEMA 1998: GN983 as amended - Listing 1 Activity 27*
[212] *NEMA 1998: GN985 as amended - Listing 3 Activity 12*

As part of this regulatory process, the three dedicated areas will be authorized for the clearance of indigenous vegetation after which each innovative, new technologies and research projects will be rescreened in terms of NEMA, NEM:WA, NWA and NEM:AQA as to determine the specific triggered activities (above threshold) required to support each proposed innovative project - should projects themselves require authorization in terms of national legislation these will be applied for prior to the construction and operation of that specific activity

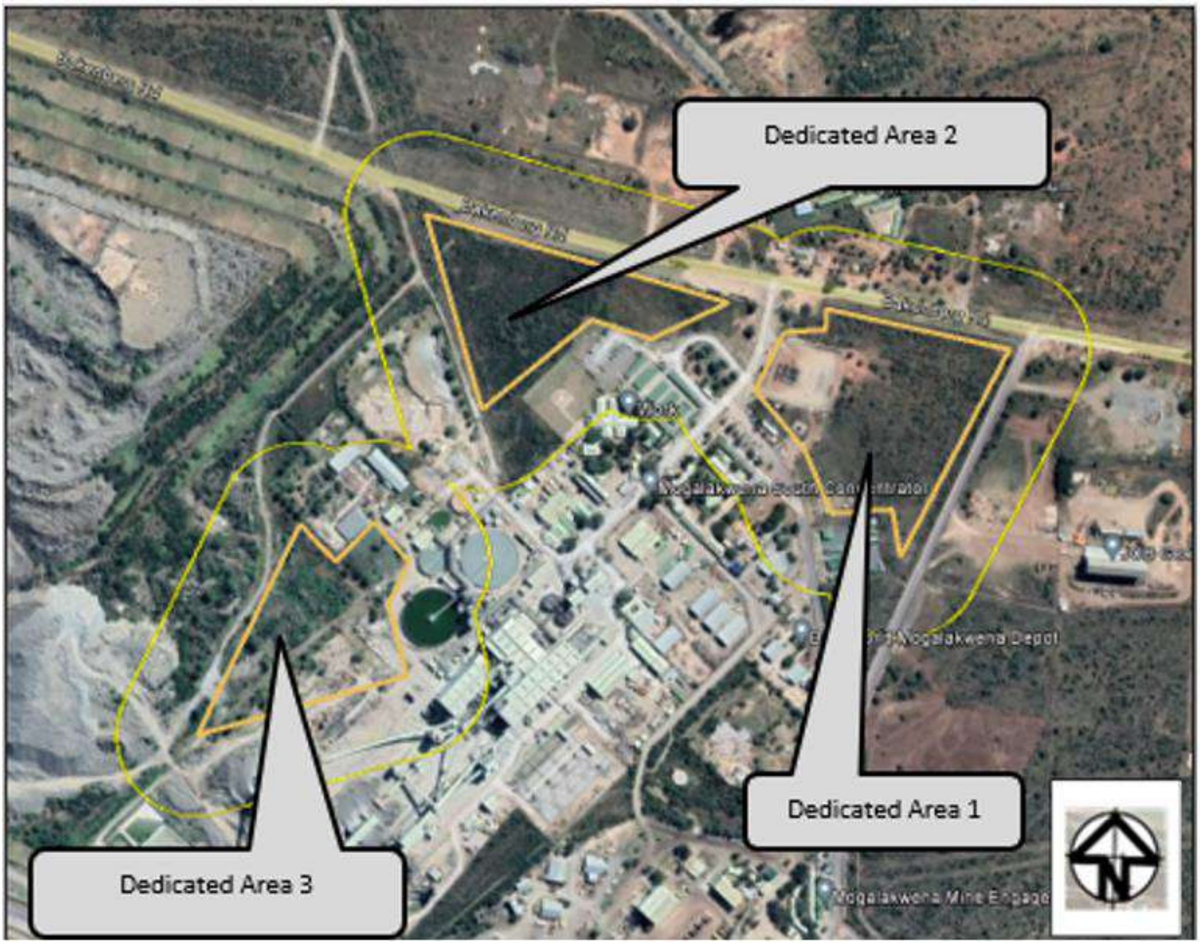


Figure 4-52: Permit to Innovate: Dedicated Trial / Pilot Areas

4.10 LIFE OF MINE

The life-of-mine schedule for MM indicates the current Platreef production planned in the approved life-of-mine plan and includes the projects that have passed the necessary approvals that underpin the Ore Reserve declaration. The anticipated mining is for 76 years and exceeds the current Mining Right expiry date of 2040. An application to extend the Mining Right will be submitted at the appropriate time and there is reasonable expectation that such an extension will not be withheld.

MOGALAKWENA COMPLEX ALTERNATIVES CONSIDERED

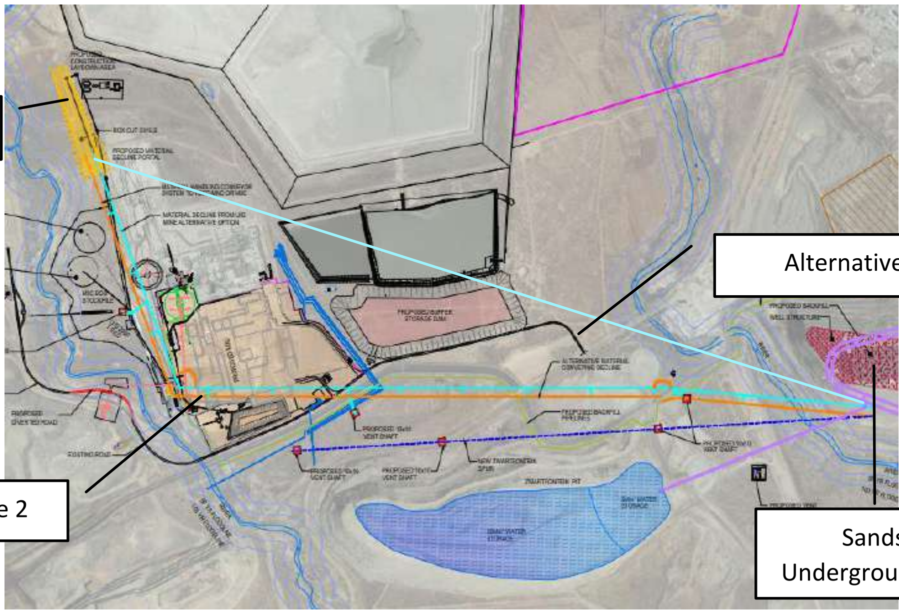
5 ALTERNATIVES CONSIDERED

The identification of alternatives forms an integral part of the EIA process and is required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as well as the National Environmental Management Waste Act, 2004 (NEMWA). Listed below are the alternatives that should be taken into consideration during the decision-making process.

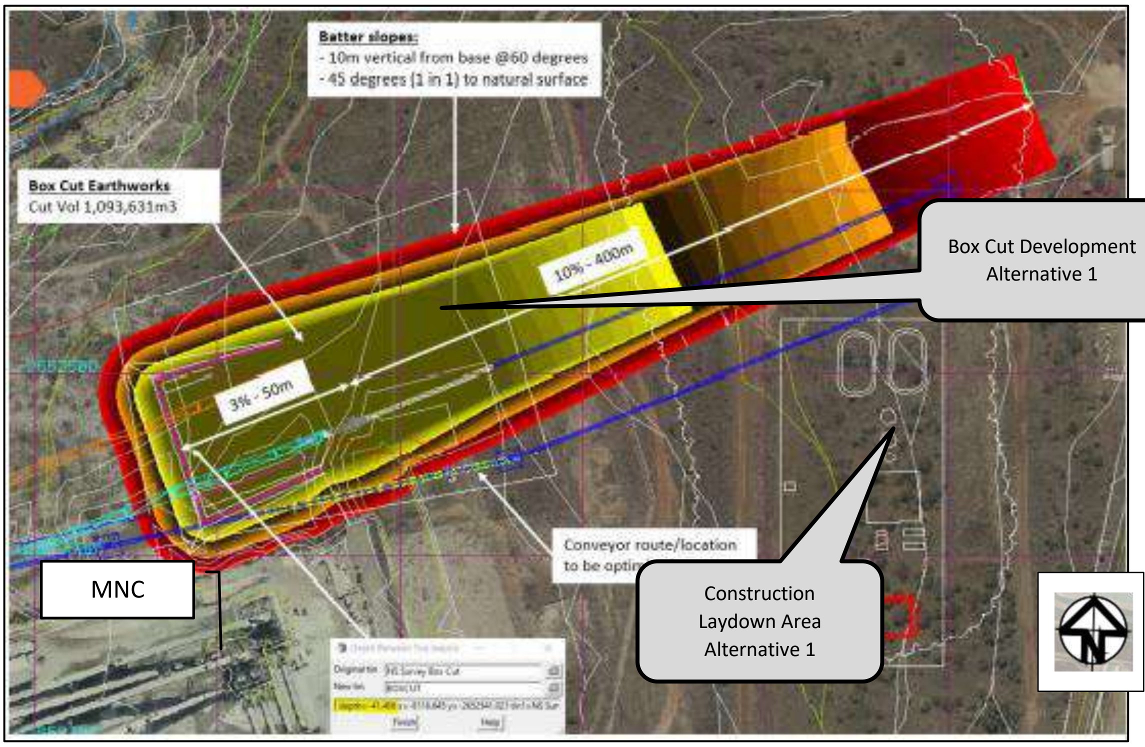
Table 5-1: Alternatives as provided through the NEMA

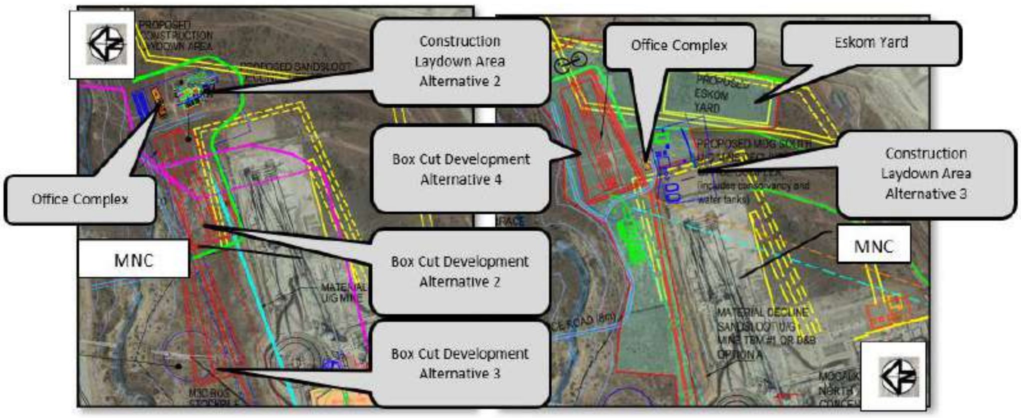
Alternative	Definition
Activity	Refers to alternatives in the nature of the proposed activity. Can be defined as project alternatives.
Location	Refers to alternatives in the location of the proposed activity. This can be considered for the entire proposal or for a component of the proposal. A distinction should be drawn between alternative locations that are geographically separate and alternative locations that are site layout alternatives.
Process	Refers to alternatives in technology and equipment used. The aim of this is to reach the same goal by using different methods or processes.
Demand	This arises when demand for a certain product or service can be met by some alternative means.
Scheduling	Refers to alternatives in sequencing and phasing. Activities can comprise of various components which can be scheduled in different orders or at different timeframes as to produce different impacts.
Input	Refers to alternatives in raw materials or energy sources used in industrial processes.
Routing	Refers to alternatives in linear developments such as power lines, transport and pipeline routes.
Site Layout	Refers to alternatives in spatial configuration of an activity on a particular site.
Scale	Refers to activities that can be broken down into smaller units and undertaken at different scales.
Design	Refers to alternatives in design for aesthetic purposes or different construction materials in an attempt to optimise local benefits and sustainability.

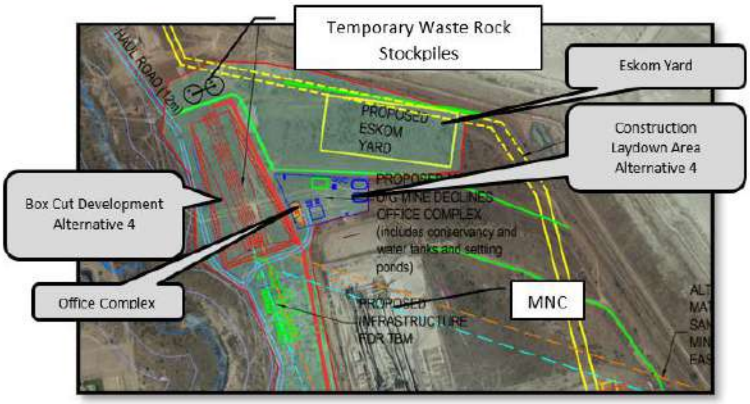
Table 5-2: Alternatives considered for the MM Mining Underground Operation

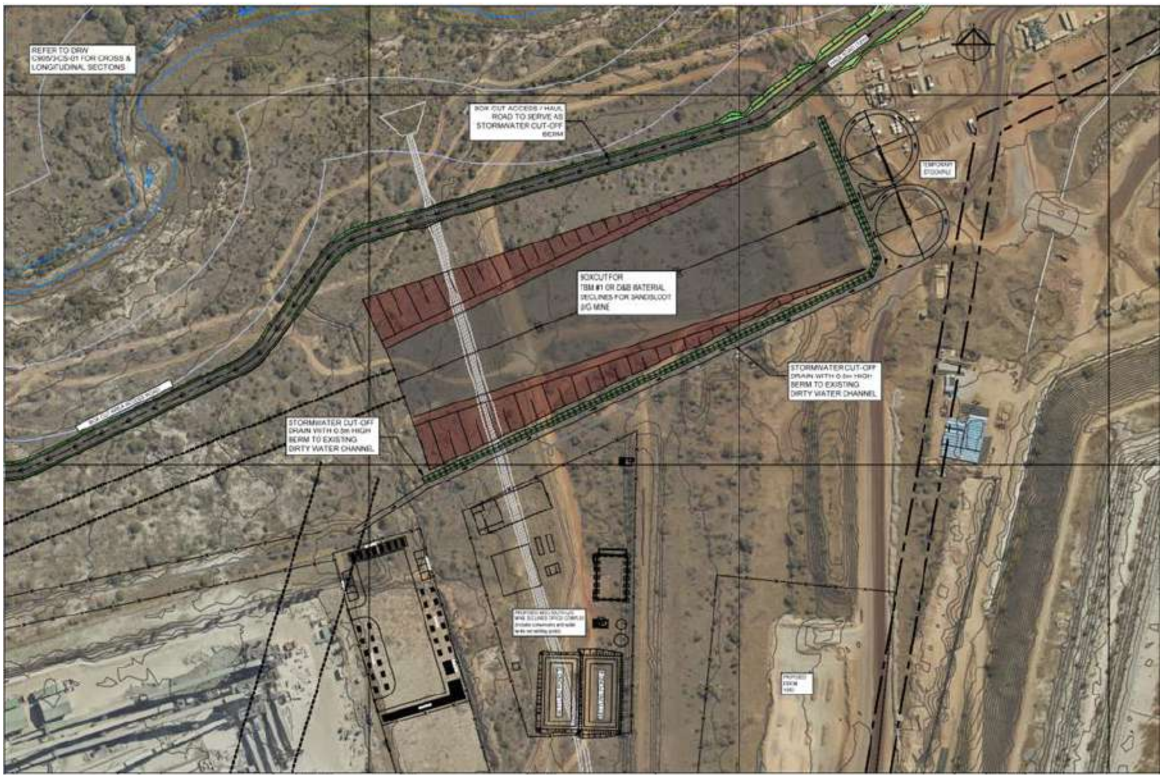
Alternative	Definition
SANDSLOOT UNDERGROUND MINING (ZONE 1)	
Location	Two possible alternative undergrounds routes for the development of the Underground Incline Conveyor (from Sandsloot Underground Mine to the new proposed Box Cut) was envisioned for the project as highlighted below:  Alternative 2 was deemed the preferred route for the transportation of ore material (mill feed) from underground to the M3C. Alternative 1 was deemed to be located too close to the TSF and also the conveyor route will pass underneath both the buffer dam and return water dam.
Locations	Various Box-cut and Laydown alternatives were considered.

Various possible position alternatives were considered for the box cut itself which are indicated in the Figures below. The final position allows for the proposed new underground material handling conveyor system to feed the MNC and M3C during the ramp-up period.





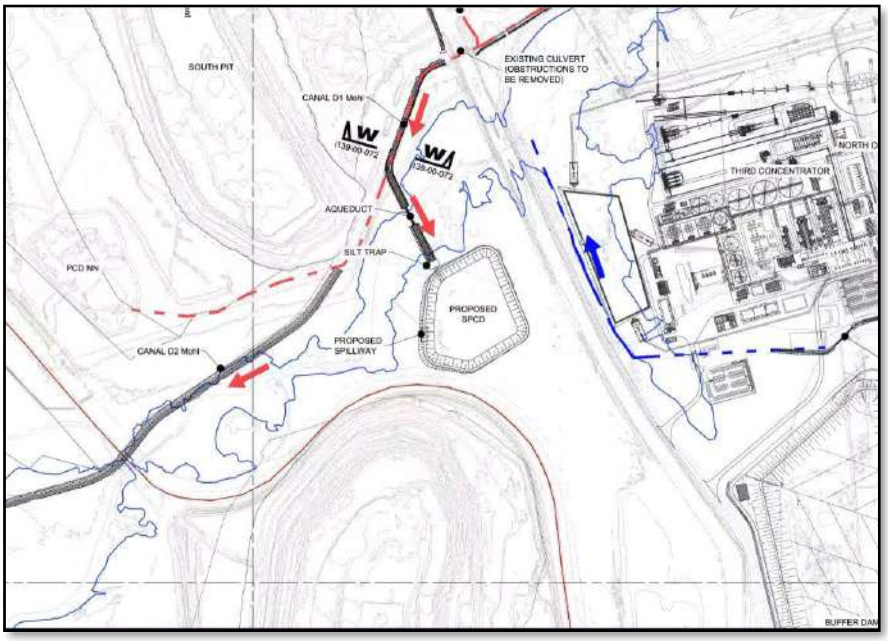


	The preferred alternative is indicated in the Figure below. 
Demand	The development of the Tailings Paste Backfill Plant to support the underground Mine development will allow for the generated tailings to be converted to a cemented paste that can be utilized to backfill the mined-out panels of the underground mine allowing for successive panels to be mined safely (by ensuring regional and stope support). The cemented paste also allows for safe and stable long-term stabilization of tailings underground. This is the preferred alternative for utilising tailings beneficially, versus disposal of the tailings onto a dedicated Tailings Storage Facility (which might result in a bigger facility being required to support the demand).
No Go Alternative	The alternative to not proceed with the underground mine development will result in a lost opportunity to access the deeper resources within MM's Mining Right Area, ultimately shortening the LoM. This will result in a decreased product production and will have a direct result in significant job loss, economic loss and community benefit (Social and Labour Plan) loss.
OPEN PIT DEVELOPMENT (PUSHBACK) PROJECT	
Activity	MM is currently in the process of permitting combination mining on site (Opencast and Underground). Should opencast mining no longer be viable the site will continue to extract minerals within its mining right via an underground mining method.
No Go Alternative	The alternative to not proceed with the optimization of the existing open pits to final shell design/capability will result in a lost opportunity to access the shallow resources within MM's Mining Right Area. This will ultimately result in a financial loss to MM, due to non-mining of a mineral and an overall economic impact due to decreased product production. This alternative will also result in the shortening of MM's LoM which will have a direct result in significant job loss, economic loss and community benefit (Social and Labour Plan) loss.
ANTHROPOGENIC AQUIFER DEVELOPMENT PROJECTS	
No Go Alternative	<u>The use of Waste Rock Material for development:</u> The loss of waste rock usage for alternative purposes on site will ultimately result in the material becoming redundant to the site. This will increase the need for waste rock disposal to disposal areas instead of its beneficial use. <u>Water Demand:</u>

<table>
<tr><td></td><td>The loss of co-storage of waste rock and water within the Sandsloot and Zwartfontein Pits will result in the lost opportunity to:
• Maximise the potential of existing structures/areas within the mine. This can result in additional waste rock disposal areas as well as surface water infrastructure (dams) to accommodate the need of the mine. Additional surface infrastructure can result in additional environmental impacts such as vegetation clearance, community resettlement and construction within close proximity to watercourses.
• To curb evaporation of water on mine's water security supply

Water Quality:
The loss of the potential to store water within a manmade anthropogenic aquifer result in the lost opportunity to utilise the natural attenuation process of the manmade aquifer to improve the stored water quality.</td></tr>
<tr><td colspan="2">STORMWATER MANAGEMENT INFRASTRUCTURE PROJECT</td></tr>
<tr><td>Site Layout</td><td>A preferred location for the North-west Pollution Control Dam – Navada Dam has already been identified by AAP MM. This location is centred around ensuring that the water can collect/be naturally conveyed to the stormwater infrastructure (i.e., gravitationally fed to the lowest point).

A preferred design has been established for the North-west Pollution Control Dam – Navada Dam within this preferred location, however design alternatives (shape) are currently being investigated within the preferred location, based on specialist study outcomes to ensure optimised design.</td></tr>
<tr><td>Location</td><td>Two possible locations for the North-west Pollution Control Dam – Navada Dam were initially investigated with site alternative 1 being located west of M3C, between the South and Zwartfontein Pit, and site alternative 2 being located west of WRD02.

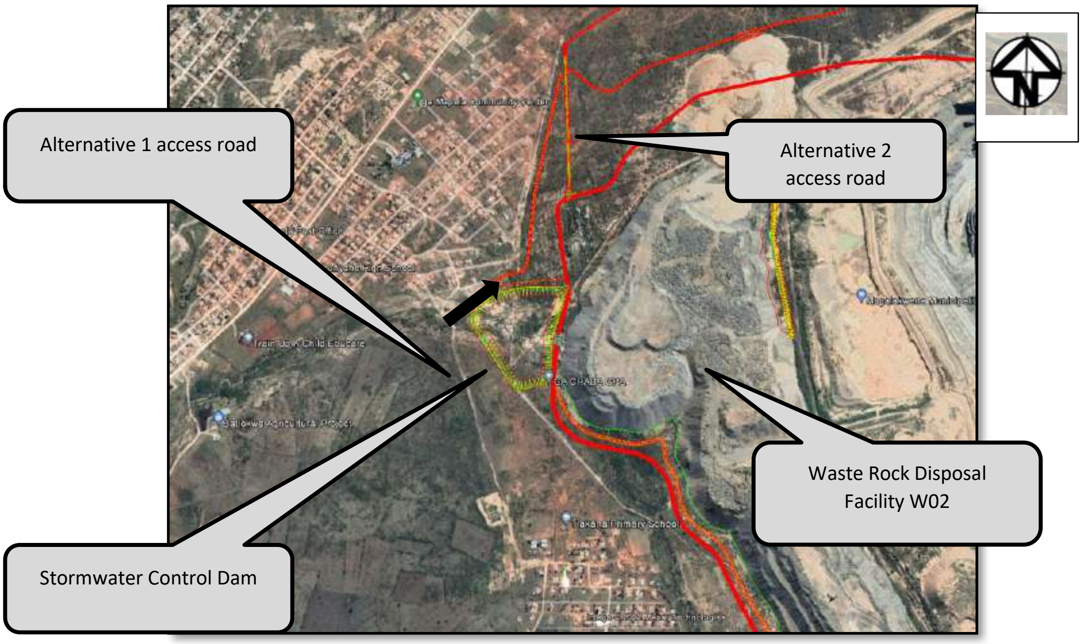


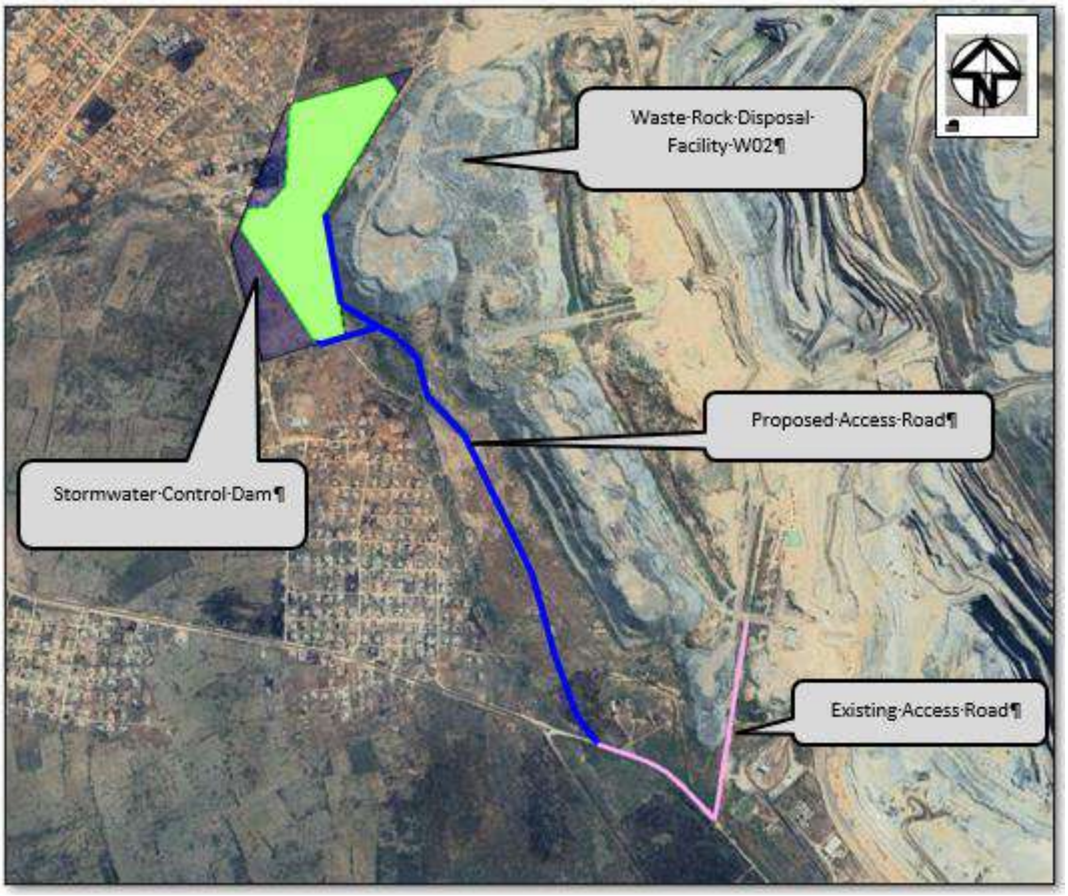
Alternative 1 Location

Alternative 2 Location
Site Alternative 2 was deemed the preferred location for the construction of the North-west Pollution Control Dam – Navada Dam due to its geographical location (i.e., lowest point), and drainage allowable from many different waste rock dumps on site, while Site Alternative 1 was deemed unviable due to its conflicting location with future surface infrastructure planned at MM.
Site Alternative 1 is earmarked for future infrastructure.</td></tr>
</table>

	
No Go Alternative	Should Stormwater Management Infrastructure not be constructed as to support the current mining operations, MM will stay non-compliant to the National Water Act GN704 regulations that clearly stipulate that the mine must prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or by seepage, and must retain or collect such substance or water containing waste for use, re-use, evaporation or for purification and disposal in terms of the Act.
N11 ACCESS ROAD PROJECT	
Route	The best optimised route will be developed in conjunction with any sensitivities brought to light during the specialist site investigations
No Go Alternative	Should the new proposed access road not be permitted, existing MM road infrastructure will be utilised on site. This will ultimately result in a lost opportunity for traffic alleviation with regards to MM operational vehicles. In addition to this, should the new proposed access road not be permitted, it can no longer support access to future projects planned within the area and as such access alternatives will need to be investigated to support future projects.
WASTE ROCK DISPOSAL FACILITY PHASE 3 PROJECT	
Demand	With the development and continuation of mining activities on site, supporting structures, such as waste rock disposal areas, become crucial to the continuation of mining operations. MM has existing areas already demarcated for Waste Rock Disposal as well as ore stockpiling (North of the Mine). With the already approved area no longer being proposed for utilisation for ore stockpiling, the area can be demarcated to address the Waste Rock Disposal demand of the mine. This allows for: • The optimization of land currently available to MM which has already been approved for a similar use (change from ore stockpiling to waste rock disposal). • Maximising the potential of the preferred site be expanding (extending) the existing Waste Rock Disposal area footprint area (which is an are already approved for the use (Disposal)).
Location	There is currently limited footprint area available within MM's current land lease properties. MM considered areas outside of the surface lease, but this will increase the mining footprint area and add to costs as well as increase the carbon footprint due to the haulage of vehicles.
Access Road	Site access to the North-west Pollution Control Dam – Navada Dam will be required in the form of a new Access Road[213,214] to be constructed. Two possible alternative access routes are being considered for this facility: Alternative 1: New Access Road from the East of the North-west Pollution Control Dam – Navada Dam to connect to an informal road constructed and leading from the Mesopotamia Community.

[213] *NEMA 1998: GN983 as amended - Listing 1 Activity 24*
[214] *NWA 1998 GN704 - Regulation 5 Exemption*

<table>
<tr><td></td><td>Alternative 2: New Access Road west of the North-west Pollution Control Dam – Navada Dam within the existing footprint area of the Waste Rock Disposal facility to connect to the existing MM internal roads.


Due to site limitations, it was decided to remain within the mining lease footprint area, and access to the site is from the south along the footprint of the W02 WRD. The Figure below provides details of Alternative 3 (preferred).

</td></tr>
<tr><td>No Go Alternative</td><td>Continuation of mining activities is dependent on Waste Rock Disposal, and should these facilities not be sufficient to meet the site's demand, mining operations will cease resulting in significant job loss, economic loss (local, regional, and national) and community benefit (Social and Labour Plan) loss.</td></tr>
<tr><td colspan="2">SUPPORTING INFRASTRUCTURE RELATED TO THE PROPOSED HYDROGEN PROJECT</td></tr>
</table>

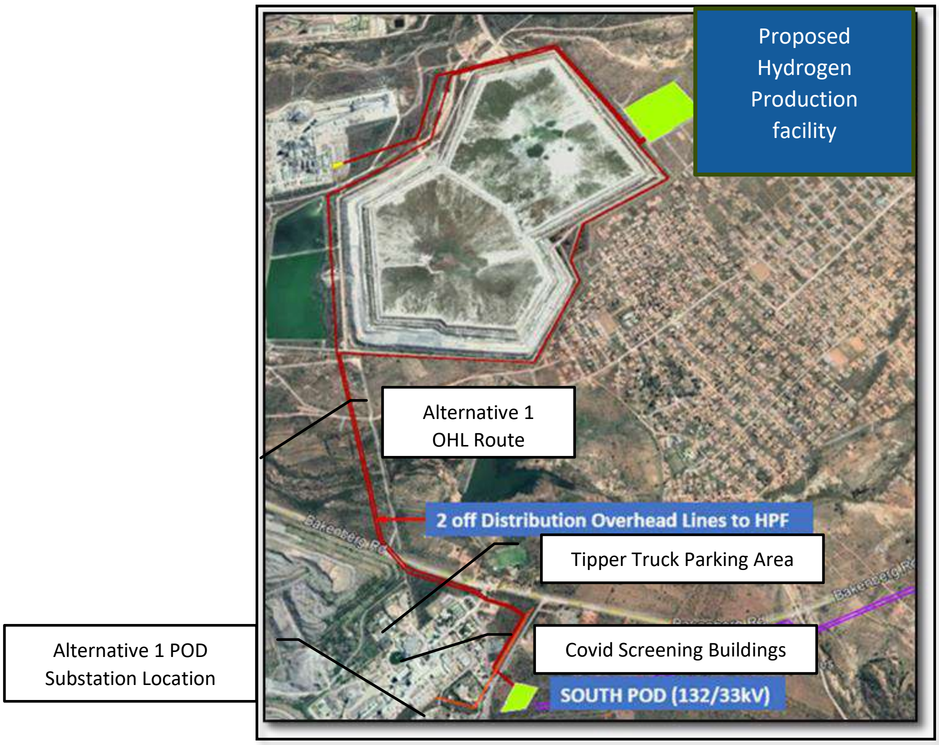
<table>
<tr><td>Process & Input</td><td>The proposed Hydrogen Production Facility Project implements initiatives to reduce the carbon emissions and non-renewable fossil fuel usage on site. This new alternative technology will ultimately generate hydrogen to power trucks on site and will have an estimated reduction of diesel consumption by the site by 5000 litres per truck per day.</td></tr>
<tr><td colspan="2">Permanent Power Supply to support the proposed Hydrogen Production Facility is planned to be sourced from a new proposed Point of Distribution (POD) substation and associated Overhead Transmission Lines</td></tr>
<tr><td>Location</td><td>Two alternative locations in terms of the POD Substation were investigated for the permanent power supply to support the proposed Hydrogen Production Facility.

<u>Alternative 1:</u>
Construction of a POD substation west of Mogalakwena South Concentrator on an already disturbed area (brownfields area).

<u>Alternative 2:</u>
Construction of a POD substation north of Vaalkop TSF on a greenfield area.

Alternative 2 is the preferred option moving forward subject to the approval of the site selection process. This decision relies heavily on the associated overhead transmission lines (and their respective routes) required from the POD substations to the proposed Hydrogen Production Facility (refer below).</td></tr>
<tr><td rowspan="2">Routing</td><td>The overall routing of the overhead transmission lines must be maintained within the current mine lease area of MM</td></tr>
<tr><td>Alternatives in terms of the location of the POD Substation resulted in alternative overhead transmission line routes, to connect from the POD Substation to the proposed Hydrogen Production Facility, being investigated.

<u>Alternative 1:</u>
Linked to the construction of the POD substation proposed west of Mogalakwena South Concentrator on an already disturbed area (brownfields area) and the associated Overhead Transmission Line alongside existing roads and the Vaalkop TSF to the preferred location for the proposed Hydrogen Production Facility.

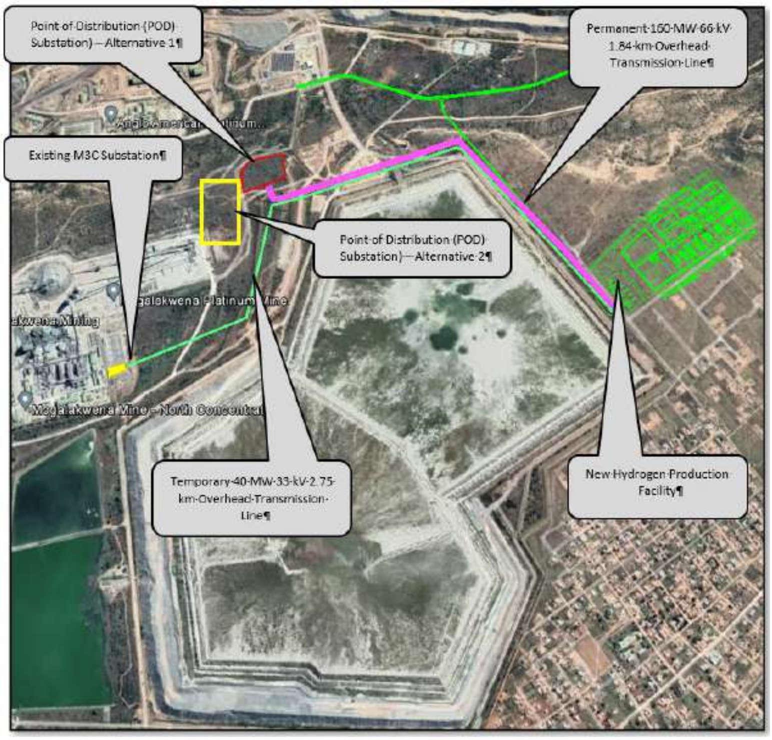


Based on the available servitude space with regards to Alternative 1, portions of the existing Covid Screening Buildings on site will have to be relocated to accommodate for the power supply infrastructure.

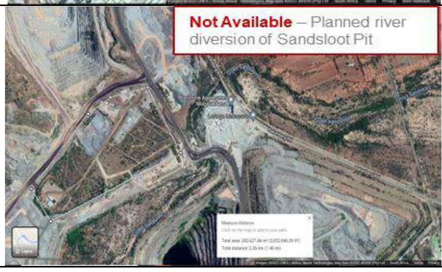
Alternative 1 will also be reticulated above the existing tipper truck parking area. Alternative 1 will require this area to be relocated to accommodate for the power supply infrastructure.

Alternative 1 will require the crossing over a watercourse located north of Bakenberg Road and South of Vaalkop TSF.</td></tr>
</table>

<table>
<tr><td></td><td><u>Alternative 2:</u>
Linked to the construction of a POD substation proposed north of Vaalkop TSF and the Overhead Transmission Lines alongside the Vaalkop TSF to the proposedHydrogen Production Facility.

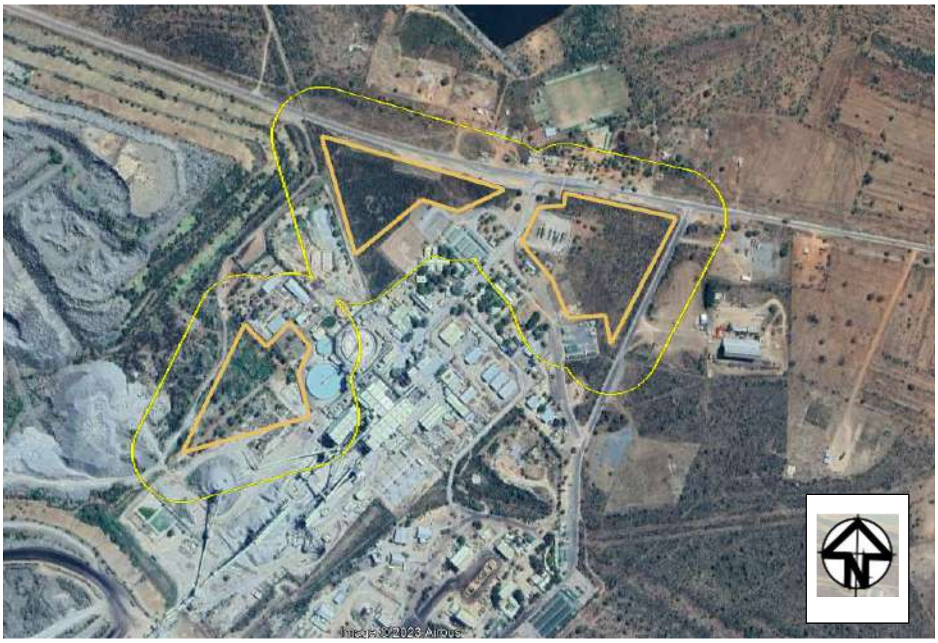
Alternative 2 is the preferred alternative moving forward subject to the approval of the site selection process. This alternative does not require the relocation of existing structures such as the Covid Screening Buildings and Tipper Truck Parking Area. Although located within close proximity to a watercourse, Alternative 2 does not cross over any watercourses on site and allows for the shortest Overhead Transmission Line Route from the POD substation to the proposed Hydrogen Production Facility while minimizing environmental disturbance as a result of re-locating existing buildings.</td></tr>
<tr><td>No Go Alternative</td><td>The proposed Hydrogen Production Facility is dependent on its power supply (to run the electrolysers) and water supply (to produce hydrogen). The alternative to not construct the supporting infrastructure will ultimately result in the cessation of the proposed Hydrogen Production Facility. AAP MM will become reliant on diesel fuel as its main energy source for the trucks on site and the initiative to reduce carbon emissions and non-renewable fossil fuel usage on site will not be realized.</td></tr>
<tr><td colspan="2" align="center">PERMIT TO INNOVATE</td></tr>
<tr><td>Locations</td><td>Alternative locations considered:</td></tr>
</table>



The three supporting potential laydown areas considered include:

- Laydown Area (Area 1) northwest of Mogalakwena South Concentrator (~5.3 ha)
  - Ptn 0 of Erf No.819 Vaalkop
- Laydown Area (Area 2) north of Mogalakwena South Concentrator (~3.6 ha)
  - Ptn 0 of Erf No.819 Vaalkop
- Laydown Area (Area 3) east of Mogalakwena South Concentrator (~3.8 ha)
  - Ptn 0 of Erf No.819 Vaalkop

The Figure below provides the preferred alternative. The preferred alternative was chosen due to the availability of the area as no future development is planned.



MOGALAKWENA COMPLEX

LEGISLATIVE REQUIREMENTS

6 LEGISLATIVE BACKGROUND

6.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT 108 OF 1996)

The Constitution of South Africa compels all to ensure the rights of South African citizens. Section 24 of the constitution states that:

Everyone has the right-

- *to an environment that is not harmful to their health or well-being; and*
- *to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-*
    - *prevent pollution and ecological degradation.*
    - *promote conservation; and*
    - *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*

This right is binding on the state and people, both natural and juristic. Sustainable development is the cornerstone of South Africa's environmental law regime.

In fulfilment of its constitutional mandate to take reasonable legislative measures that give effect to Section 24 of the Constitution, the government has promulgated several environmental laws since 1994. These laws provide a legal framework that embodies internationally recognized legal principles. The principal act governing activities that affect the environment is the National Environmental Management Act, No 107 of 1998 (NEMA) and National Environmental Management: Waste Act, Act 59 of 2008 (NEM:WA) while the principal act governing activities that affect water resources is the National Water Act, Act 36 of 1998 (NWA).

The issuing of authorisations in terms of NEMA, NEM:WA, NWA or any other permits or licence for any aspect of the proposed projects will ensure that the environmental right enshrined in the Constitution contributes to the protection of the biophysical and socio- economic environment. The abovementioned authorisations, permits, or licences will be largely based on the legislation outlined in this Chapter (Chapter 6).

6.2 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT 28 OF 2002) (MPRDA) AS AMENDED ON 21 APRIL 2009

The fundamental principles of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) are:

- Mineral resources are non-renewable.
- Mineral resources belong to the nation and the State is the custodian.
- Protection of the environment for present and future generations to ensure sustainable development of the resources by promoting economic and social development.
- The need to promote local and rural development of communities affected by mining.
- Reformation of the industry to bring about equitable access to the resources and eradicating discriminatory practices; and
- Guaranteeing security of tenure.

The MPRDA sets forth the governing act/legislation to lawfully proceed with the commencement of mining and mining related activities.

6.2.1 Application for a Mining Right

Section 22 (“*Application for Mining Right”)* of the MPRDA addresses mining rights. This section states:

22. *(1) Any person who wishes to apply to the Minister for a mining right must simultaneously apply for an environmental authorisation and must lodge the application –*

(a) At the office of the Regional Manager in whose region the land is situated.
(b) In a prescribed manner; and
(c) Together with the prescribed non-refundable application fee.

(2) The Regional Manager must, within 14 days of receipt of the application accept an application for a mining right if –

(a) The requirements contemplated in subsection (1) are met.
(b) No other person holds a prospecting right, mining right, mining permit or retention permit for the same mineral or land; and
(c) No prior application for a prospecting right, mining right or mining permit or retention permit, has been accepted for the same mineral and land and which remains to be granted or refused.

(3) if the application does not comply with the requirements of this section, the Regional Manager must notify the applicant in writing within 14 days of the receipt of the application.

(4) if the Regional Manager accepts the application, the Regional Manager must, within 14 days from the date of acceptance, notify the applicant in writing –

(a) To submit the relevant environmental reports, as required in terms of Chapter 5 of the National Environmental Management Act, 1998, within 180 days from the date of the notice.
(b) To consult in the prescribed manner with the landowner, lawful occupier and any interested and affected party and include the result of the consultation in the relevant environmental reports.

(5) The Regional Manager must, within 14 days of receipt of the environmental reports and results of the consultation contemplated in subsection (4) and section 40, forward the application to the Minister for Consideration.

Anglo American Platinum holds a converted Mining Right under the Department of Mineral Resources and Energy (DMRE) reference: LP 50 MR, which is valid from 23 July 2010 to 22 July 2040.

The Mining Right covers an area of 37 211 ha. (Which includes the Central Block and Kwanda North Prospecting Rights that are now incorporated into the Mogalakwena Mining Rights) and is situated over the following farms:

Table 6-1: Mineral Rights

Farm Name	Portion Number
Drenthe 778 LR	Portion 0
Gillimberg 861 LR	Portion 0, Remaining Extent
Overysel 815 LR	Portion 0
Zwartfontein 818 LR	Portion 0
Blinkwater 820 LR	Portion 0, Remaining Extent
Sandsloot 236 KR	Portion 0
Vaalkop 819 LR	Portion 0
Knapdaar 234 KR	Portion 0
Tweefontein 238 KR	Portion 2, 2, Remaining Extent
Rietfontein 240 KR	Portion 0

Figure 2-4depicts the AAP MM Mining Rights Area.

6.2.2 Amendment of rights, permits, programmes and plans

Section 102 (“*Amendment of Rights, Permits, Programmes and Plans”)* of the MPRDA addresses amendments to already approved authorisations in terms of mining and mining related activities. This section states:

(1) “A reconnaissance permission, prospecting right, mining right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right, production right, prospecting work programme, exploration work programme, production work programme, **mining work programme, environmental management programme or an environmental authorisation issued in terms of the National Environmental Management Act, 1998,** as the case may be, may not be amended or varied (including by extension of the area covered by it or by the additional of minerals or a shares or seams, mineralised bodies or strata, which are not at the time the subject thereof) without the written consent of the Minister.

To support the various planned projects as well as the conversion from an open pit mining method to combination mining (open pit and underground) an application for the amendment of the approved Mining Works Programme as well as Environmental Management Programme will be submitted for consent of by Minister in terms of Section 102 of the Act to lawfully proceed with the commencement of mining and mining related activities.

6.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998) (NEMA)

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) is the environmental framework legislation promulgated to ensure that the environmental rights contemplated in Section 24 of the Constitution of South Africa (Act 108 of 1996) are realised. NEMA sets out:

- The fundamental principles that need to be incorporated in the environmental decision-making process.
- The principles that are necessary to achieve sustainable development.
- Provides for duty of care to prevent control and rehabilitate the effect of significant pollution and environmental degradation; and
- It allows for the prosecution of environmental crimes.

6.3.1 Application for Environmental Authorisation

In terms of the section 24(5) read with section 44 of the Act, Environmental Impact Assessment (EIA) Regulations have been published that provide a list of activities that may require either a Basic Assessment (BA) or a Scoping and Environmental Impact Assessment process to be followed as to authorise their lawful undertaking. These listed activities have been gazetted as follows.

- Listing Notice 1: Activities requiring a Basic Assessment environmental authorisation process.
  - Government Notice No. 983 in Gazette No. 38282 on 4 December 2014, as amended on 7 April 2017 in Gazette No. 40772 as Government Notice No. 327
- Listing Notice 2: Activities requiring a Scoping and Environmental Impact environmental authorisation process; and
  - Government Notice No. 984 in Gazette No. 38282 on 4 December 2014, as amended on 7 April 2017 in Gazette No. 40772 as Government Notice No. 325
- Listing Notice 3: Activities within certain geographic / sensitive areas requiring a Basic Assessment environmental authorisation process.
  - Government Notice No. 985 in Gazette No. 38282 on 4 December 2014, as amended on 7 April 2017 in Gazette No. 40772 as Government Notice No. 324
- National Environmental Management Act, 1998 (Act No. 107 of 1998), Amendment to the Environmental Impact Assessment Regulations, Listing Notice 1, Listing Notice 2 and Listing Notice 3 of

the Environmental Impact Assessment Regulations, 2014 for activities identified in terms of Section 24(2) and 24D of the National Environmental Management Act, 1998 (Act No 107 of 1998). Gazette Notice 517 No. 40701 dated 11 June 2021.

Table 6-2 records the listed activities triggered and applied for, to support the development of the various MM proposed projects as detailed in Chapter 4.

6.3.2 Approved Environmental Authorisations

The following historical approval documents were consolidated in 2020 into a single EMPr document:

- 2001
    - Department: Minerals and Energy, **2001**. Approval of Addendum to Environmental management Programme submitted in terms of Section 39 of the Minerals Act, 1991 (Act 50 of 1991), report for the extension to the tailings dam at Potgietersrus Platinum Limited. Reference: 6/2/2/160.
- 2002
    - Department: Minerals and Energy, **2002**. Approval of the Environmental Management Programme submitted in terms of Section 39 of the Minerals Act, 1991 (Act 50 of 1991), for the Zwartfontein South Project at Potgietersrus Platinum Limited (PPRUST), Reference: 6/2/2/160.
- 2003
    - Department: Minerals and Energy, **2003**. Approval of Addendum to the Environmental Management Programme submitted in terms of Section 39 of the Minerals act, 1991 (Act 50 of 1991) for Potgietersrus North Mine, Potgietersrus Platinum Mine. Reference 6/2/2/160.
- 2005
    - Department: Minerals and Energy, **2005**. Approval of the Addendum to the Environmental management programme, for creation of three ore stockpiles and relocation of old disused tailings dam, the Farms Zwartfontein 818 LR and Overysel 815 LR, District of Mokopane, Potgietersrus Platinum Mine. Reference: 6/2/2/160.
- 2013
    - Limpopo Provincial Government, **2013**. Environmental Authorisation for the proposed diversion of Groot Sandsloot River at Anglo American Mogalakwena Mine on the Farm Sandsloot 236 KR within Mogalakwena Local Municipality of Waterberg District. Reference: 12/1/9/3-W12.
- 2015
    - Department of Economic Development, Environment and Tourism, **2015**. Erratum: Environmental Authorisation for the proposed construction of a 17km pipeline at Mogalakwena Mine on Portion 0 of the farm Sandsloot 236 KR within Mogalakwena Local municipality of Waterberg District. Reference 12/1/9/1-W92.
    - Limpopo Department of Economic development, Environment and Tourism, **2015**. Environmental Authorisation for the proposed expansion of Blinkwater Tailings Storage facility and new Southern Attenuation Dam at the existing Mogalakwena Mine on the farms Blinkwater 820LR and Zwartfontein 818LR within Mogalakwena Local Municipality of Waterberg District. Reference 12/1/9/2-W82.
    - Department of Economic Development, Environment and Tourism, **2015**. Environmental Authorisation for the proposed Anglo American Platinum Mogalakwena Mine – Drenthe and Witrivier Infill Drilling and waste Rock Dump Project on the Remaining Portion and Portion 1 of the Farm Witrivier 777 LR, Farm Drenthe 778 LR and Farm Overysel 816 LR within Mogalakwena Local Municipal Area of Waterberg District. Reference 12/1/9/2-W61.
    - Department of Economic Development, Environment and Tourism, **2015**. Environmental Authorisation for the proposed expansion of Fuel Depot for the Anglo American Platinum Limited Mogalakwena Mine on Portion 0 of the farm Sandsloot 236 KR within Mogalakwena Local Municipality of Waterberg District. Reference 12/1/9/1-W84.
- 2017
    - Department of Mineral Resources, **2017**. Environmental Authorisation. Reference LP30/5/1/2/3/2/1/(050) EM.
    - Department of Mineral resources, **2017**. Amendment of Environmental Authorisation in terms of the National Environmental management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment (EIA) regulations, on the farms Blinkwater 820LR and Zwartfontein 818LR situated in the magisterial district of Mogalakwena: Limpopo Region. LP30/5/1/3/2/1(0500EM).
    - Department of Mineral Resources, **2017**. Amendment of Environmental Authorisation in terms of the national Environmental management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment (EIA) Regulations, on the Farms Overysel 815 LR, Drenthe 788 LR and Witrivier 777 LR situated in the magisterial District of Mogalakwena: Limpopo Region. Reference LP30/5/1/3/2/1(050)EM.
- 2018
    - Department of Mineral Resources, **2018**. Amendment of an Environmental Authorisation in terms of the National Environmental management Act, 1998 (NEMA) as amended, and the Environmental Impact Assessment (EIA) Regulations, 2014 in respect of the proposed construction of the Tailings Scavenger Plant (TSP) on the farm Zwartfontein 818 LR situated in the Waterberg Municipality: Limpopo. Reference No: LP30/5/1/2/3/2//1/(050) EM.
- 2020

- Department of Mineral Resources and Energy, **2020**. Integrated Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as Amended (NEMA) and National Environmental Management: Waste Act, 2008 (Act 59 of 2008) as Amended (NEMWA), and the Environmental Impact Assessment (EIA) Regulations, 2014 for the Expansion of the existing mine operations and the additional infrastructure to improve production capacity on the remaining Extent of Portion 0 of the Farm Blinkwater 820 LR and Portions 0 of the Farms Overysel 815 LR, Zwartfontein 818 LR, Vaalkop 819 LR and Sandsloot 236 KR, situated within Mogalakwena Local Municipality in the Magisterial District of Waterberg: Limpopo Region. Reference LP/30/5/1/2/3/2/1(050)EM.

Through this application, the approved 2020 Consolidated EMPr will be amended with the inclusion of the new projects (This process) and the EMPr will be updated and consolidated with the 2020 document to become a single document (EMP).

Table 6-2: NEMA - Triggered Listed Activities

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
Listing Notice 1 Activities (Government Notice R 983, as amended in 2017, 2018 and 2021)					
GNR 983	Activity 9	The development of **infrastructure exceeding 1 000 metres** in length for the **bulk transportation of water or storm water—** (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area	Stormwater Management Infrastructure Project	Storm Water Conveyance Infrastructure in the form of diversion channels/pipelines/tunnels/canals/desilting pad supporting North-west Pollution Control Dam – Navada Dam	SWD: ~15 ha with associated Infrastructure
			Sandsloot Underground Project	Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure)	Corridor Width: ~4 m on either side Potable Water Treatment Plant pipelines (from and to various on-site infrastructure) will be greater than 1000m in length. Pipelines from Refrigeration plant to various shaft intake points) will be greater than 1000m in length
				Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)	
			Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	<u>Supporting Water Supply</u>: Dirty (process) water pipeline of 3.61 km to tie into the existing 450 mm effluent water pipeline on site receiving water from Dam 1160 or alternatively from the water supply pipelines located within the services corridor obtaining water from the North-west Pollution Control Dam – Navada Dam or the active dewatering boreholes surrounding the Sandsloot Underground Mine. <u>Effluent Pipeline</u> from hydrogen wastewater treatment works to the Vaalkop v-drain of 0.73 km.	Dirty Water Supply Pipeline: ~5 km Effluent Pipeline: ~0.73 km
GNR 983	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;* *excluding where—* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Dirty Water Pipelines from Sandsloot and Zwartfontein Anthropogenic Aquifer Penstocks to various parts of the mine to convey stored water for use.	Corridor Width: ~4 m on either side Corridor Length: Dirty water pipelines from Sandsloot and Zwartfontein Aquifer penstocks to various parts of the mine will be greater than 1000m in length. Pipeline associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant) will be greater than 1000m in length.
			Sandsloot Underground Project	Pipeline requirements associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant)	
			Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	<u>Supporting Water Supply</u>: Dirty (process) water pipeline of 3.61 km to tie into the existing 450 mm effluent water pipeline on site receiving water from Dam 1160 or alternatively from the water supply pipelines located within the services corridor obtaining water from the North-west Pollution Control Dam – Navada Dam or the active dewatering boreholes surrounding the Sandsloot Underground Mine. <u>Effluent Pipeline</u> from hydrogen wastewater treatment works to the Vaalkop v-drain of 0.73 km.	Dirty Water Supply Pipeline: ~5 km Effluent Pipeline: ~0.73 km
GNR 983	Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more;* *excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is—*	Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	Phase 1: 40 MW 33 kV 2.75 km Overhead Transmission Line (OHL) from M3C to proposed Hydrogen Production Facility Phase 2 of the power supply project is completed. Phase 2: 160 MW 66 kV 1.84 km Overhead Transmission Line from new Point of Distribution (POD) substation to proposed Hydrogen Production Facility	Phase 1 OHL: ~2.75 km Phase 2 OHL: ~1.84 km Corridor - ~ 4 m on either side

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
		(a) temporarily required to allow for maintenance of existing infrastructure; *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development.*	Sandsloot Underground Project	33 kV 22 km transmission line between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the MSC	22km Corridor Width: ~4 m on either side
GNR 983	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;** (b) in front of a development setback; or **(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —** excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.	Waste Rock Disposal Facility Phase 3 Extension Project	~422 ha extension of the WRD for the Phase 3 development will be within close proximity (within / within 32 m) to a watercourse / wetland area.	~422 ha
			N11 Access Road Project	Development of an Access Road (from the existing SANRAL N11 Road) within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River).	Road Length: ~2.5 km 8m wide ~3 Ha
			Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	The Permanent Overhead Transmission Lines will be within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River).	Permanent Overhead Transmission Line: ~1.84 km Corridor - ~4 m on either side
			Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Dirty Water Pipelines from Sandsloot and Zwartfontein Anthropogenic Aquifer Penstocks to various parts of the mine to convey stored water for use will be within close proximity (within / within 32 m) to watercourses located throughout the site.	Corridor Width: ~4 m on either side Corridor Length: Dirty water pipelines from Sandsloot and Zwartfontein Aquifer penstocks to various parts of the mine will be greater than 1000m in length
			Sandsloot Underground Project	Box Cut development will be located within close proximity to watercourse (Mohlosane River) located on site	~9 Ha
				Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure)	Corridor Width: ~4 m on either side Dirty water pipelines from Sandsloot and Zwartfontein Aquifer penstocks to various parts of the mine will be greater than 1000m in length. Pipelines from Refrigeration plant to various shaft intake points) will be greater than 1000m in length. Pipeline associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant) will be greater than 1000m in length. Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings will be greater than 1000m in length.
				Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)	
				Pipeline requirements associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant)	
				Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings will be within close proximity (within / within 32 m) to watercourses located on site	
				22 kV ~830 m transmission line will be within close proximity (within / within 32 m) to watercourses located on site (Groot Sandsloot River)	~830m Corridor - ~4m width on either side

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
				22 kV ~1.5 km transmission line between Bulk Ore Sorting Stockpile areas near the M3C will be within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River)	~1.5 km Corridor - ~4m width on either side
				22 kV ~1.2 km transmission line from Box Cut to M3C will be within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River)	~1.2 km Corridor - ~4m width on either side
				33 kV ~22 km transmission line between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the MSC	~22 km Corridor - ~4m width on either side
				Four Ventilation Corridors / Surface Infrastructure Areas alongside the Mohlosane and Groot Sandsloot Rivers	~200 Ha
				The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area.	
				Construction Laydown Area and Underground Office Complex development within close proximity to watercourse (Mohlosane River) located on site.	Construction Laydown Area: ~2 Ha
			Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m
			Stormwater Management Infrastructure Project	The North-west Pollution Control Dam – Navada Dam and associated infrastructure (diversions channels, desilting pad) will be within close proximity (within / within 32 m) to watercourses located throughout the site.	SWD: ~15 ha with associated Infrastructure
GNR 983	Activity 13	*The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.*	Anthropogenic Aquifer (Sandsloot and Zwartfontein Pits)	Development of the Anthropogenic Aquifer (storage structure that will improve water quality). Sandsloot Anthropogenic Aquifer will hold: 23 989 400 m^3 of water Zwartfontein Anthropogenic Aquifer will hold: 21 524 445 m^3 of water.	Sandsloot Pit: 120 Ha Zwartfontein Pit: 100 Ha
GNR 983	Activity 14	*The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	Sandsloot Underground Project	110 m^3 Diesel Storage and Dispensing Tank at Construction Laydown Area at the Box Cut	Storage Capacity: ~110 m^3 at Construction Laydown Area (~2 Ha)
				Emulsion Storage Area	Storage Capacity: ~80 m^3 Area ~ 3 ha
GNR 983	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**; but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies"	Waste Rock Disposal Facility Phase 3 Project	~422 ha extension of the WRD for the Phase 3 development will be within close proximity (within / within 32 m) to a watercourse / wetland area. More than 10 m^3 of soil will be moved during the placement of the waste rock over the identified watercourse/wetland area.	~422 ha
			N11 Access Road Project	Development of an Access Road (from the existing SANRAL N11 Road) within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River).	Road Length: ~2.5 km ~3 Ha
			Sandsloot Underground Project	Box Cut (with associated infrastructure) development will be located within close proximity to watercourse (Mohlosane River) located on site	~9 Ha
				Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure)	Corridor Width: ~4 m on either side Corridor Length: Dirty water pipelines from Sandsloot and Zwartfontein Aquifer penstocks to various parts of the mine will be greater than 1000m in length. Pipelines from Refrigeration plant to various shaft intake points) will be greater than 1000m in length.
				Pipeline requirements associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant)	
				Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)	
				Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings	

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
					Pipeline associated with the Tailings Paste Backfill Plant (to and from MNC/M3C and Plant) will be greater than 1000m in length. Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings will be
				22 kV ~830 m transmission line will be within close proximity (within / within 32 m) to watercourses located on site (Groot Sandsloot River)	~830m Corridor - ~4m width on either side
				22 kV ~1.5 km transmission line between Bulk Ore Sorting Stockpile areas near the M3C will be within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River)	~1.5 km Corridor- ~4m width on either side
				22 kV ~1.2 km transmission line from Box Cut to M3C will be within close proximity (within / within 32 m) to watercourses located on site (Mohlosane River)	~1.2 km Corridor ~4m width on either side
				33 kV ~22 km transmission line between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the MSC	~22 km Corridor - ~4m width on either side
				Four Ventilation Corridors / Surface Infrastructure Areas	~200 Ha
				The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area. Road will cross the Mohlosane River.	
				A new entrance road and haul road will be constructed north of the proposed new Sandsloot Box Cut. This road will cross the Mohlosane River.	Entrance road ~8 m wide and Haul road ~12 m wide
				Construction Laydown Area (with associated infrastructure) and Underground Office Complex (with associated infrastructure) development within close proximity to watercourse (Mohlosane River) located on site.	Construction Laydown Area: ~2 Ha Underground Office Complex: 1 Ha
			Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m
			Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Dirty Water Pipelines from Sandsloot and Zwartfontein Anthropogenic Aquifer Penstocks to various parts of the mine to convey stored water for use will be within/over watercourses located throughout the site.	Sandsloot Pit: 120 Ha Zwartfontein Pit: 100 Ha
			Stormwater Management Infrastructure Project	More than 10 m³ of soil removal for the construction of the North-west Pollution Control Dam – Navada Dam (SWD) and it associated infrastructure (diversions channels) within/ over watercourse located throughout the site.	SWD: ~15 ha with associated Infrastructure
GNR 983	Activity 21 D	Any Activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of Section 102 of the Mineral and Petroleum Resource Development Act, as well as any other applicable activity contained in this Listing notice or Listing Notice 3 od 2014, required for such amendment.	Sandsloot Underground Project	The development of combination mining with open pit and underground	~6 Mtpa to a maximum depth of ~1,005 m below surface.
GNR 983	Activity 24	The development of a **road**— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the **road is wider than 8 metres**; but excluding a road— (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or	N11 Access Road Project	2.5 km Access Road from the existing SANRAL N11 Road	Road Length: ~2.5 km ~3Ha
			Stormwater Management Infrastructure Project	Access Road to the North-west Pollution Control Dam – Navada Dam	~30 ha
			North Waste Rock Disposal Facility – Phase 3	Access road in support of construction activities	~30 ha
			Sandsloot Underground Project	The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area.	~30 ha

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
		(c) which is 1 kilometre or shorter.		A new entrance road and haul road will be constructed north of the proposed new Sandsloot Box Cut. This road will cross the Mohlosane River.	Entrance road ~8 m wide and haul road ~12 m Reserve of 8m
			Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m
GNR 983	Activity 27	*The **clearance of an area of 1 hectares or more**, but less than 20 hectares **of indigenous vegetation**, except where such clearance of indigenous vegetation is required for—* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	The development of POD substation will clear more than 1 ha of indigenous vegetation (estimated 2.1 ha).	~2.1 ha
			Permit to Innovate – Dedicated trial/pilot areas	Development of the two dedicated areas at the MSC. Laydown Area (Area 2) north of Mogalakwena South Concentrator. Laydown Area (Area 3) east of Mogalakwena South Concentrator.	Area 2: ~3.6 ha Area 3: ~3.8 ha Total: ~8 ha
			North Waste Rock Disposal Facility – Phase	Development of an access road to the North Waste Rock Disposal Facility that may cross the tributary of the Witrivier or alternatively be in close proximity or crossing a delineated wetland area	~30 ha – access road ~422 Ha Footprint area
			Sandsloot Underground Project	Development of Construction Laydown Area (with associated infrastructure), Underground Office Complex (with associated infrastructure) and Eskom Yard (with associated infrastructure) at the Box Cut will clear more than 1 ha of indigenous vegetation	Construction Laydown Area: ~2 Ha Underground Office Complex: Eskom Yard: ~4 Ha
				Four Ventilation Corridors / Surface Infrastructure Corridors will clear more than 1 ha of indigenous vegetation	~200 Ha
				The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area.	
				Workshop Area at the new Southern Entrance Complex	~1 ha
				Box Cut Development (with associated infrastructure) will clear more than 1 ha of indigenous vegetation, inclusive of the two temporary waste rock stockpiles	~9 Ha
				A new entrance road and haul road will be constructed north of the proposed new Sandsloot Box Cut. This road will cross the Mohlosane River.	Entrance road ~8 m wide and Haul road ~12 m Reserve ~ 8m
			Open Pit Mining Development Area	Zwartfontein Final Pushback development Zwartfontein pit - access road allowing for backfilling of waste rock material	~20 Ha Length of Road ~3km Width of Road ~40m
			Stormwater Management Infrastructure Project	The development of the North-west Pollution Control Dam – Navada Dam, associated infrasrtcuture (canals, desilting pad) will clear more than 1 ha of indigenous vegetation (10 ha) and access road.	SWD: ~15 ha with associated Infrastructure
GNR 983	Activity 34	*The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—* *(i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water, or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or* *(iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.*	North Waste Rock Disposal Facility – Phase 3	Amending the deposition strategy of the originally approved NWRD Facility (resulting in new design heights will require a S21(g) licence in terms of the National Water Act (Act 36 of 1998).	422 ha
GNR 983	Activity 45	*The **expansion of infrastructure** for the **bulk transportation of water or storm water** where the existing infrastructure—* *(i) has an internal diameter of 0,36 metres or more; or* *(ii) has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion—* *(aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or*	Stormwater Management Infrastructure Project	Connection (expansion) of the pumping system (supporting North-west Pollution Control Dam – Navada Dam) to the existing "export dewatering pipeline system".	Corridor Width: ~4 m on either side Corridor Length: Pumping system from the stormwater Control Dam to the existing "export dewatering pipeline system "will be

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
		(bb) will occur within an urban area			greater than 1000m in length.
GNR 983	Activity 46	*The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure— (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion— (aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or (bb) will occur within an urban area.*	Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	<u>Supporting Water Supply</u>: Dirty (process) water pipeline of 3.61 km to tie into the existing 450 mm effluent water pipeline on site <u>Effluent Pipeline</u> from hydrogen wastewater treatment works to the Vaalkop v-drain of 0.73 km.	Dirty Water Supply Pipeline: ~3.61 km Effluent Pipeline: ~0.73 km
GNR 983	Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.*	Sandsloot Underground Project	The Sandsloot pit northern access road will be upgraded to trafficable width for surface haulage trucks.	Estimated ~ 8m Reserve with a length greater than 1000m
				The Sandsloot pit southern access road will be upgraded to trafficable width for surface haulage trucks including the removal/ relocation of adjacent pipelines.	Estimated ~ 8m Reserve with a length greater than 1000m
GNR 983	Activity 57	*The expansion and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage where the capacity will be increased by 15 000 cubic metres or more per day and the development footprint will increase by 1 000 square meters or more.*	Sandsloot Underground Project	Upgrade of the existing Wastewater Treatment Works on site (if required) – South Concentrator	The capacity will be increased by more than 15 000 cm^3 and the development footprint will be increased by more than $1000m^2$
Listing Notice 2 Activities (Government Notice R 984 as amended in 2017, 2018 and 2021)					
GNR 984	Activity 4	*The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	Liquid Hydrogen Storage at the five Hydrogen Refuelling Stations	2000kg of LH2 Storage Total gas storage of $78m^3$ and liquid storage of $30m^3$
GNR 984	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, excluding— (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.*	Waste Rock Disposal Facility Phase 3 Extension Project	The development of the Waste Rock Disposal Facility (Phase 3 Extension) will require authorisation in terms of a S21(g) in terms of the National Water Act (Act 36 of 1998).	~422 ha
			Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	The development of the Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits) will require authorisation in terms of a S21(g) and Regulation 5 (GN704) exemption in terms of the National Water Act (Act 36 of 1998). Backfilling of the pits using waste rock material to construct the man-made aquifer	Sandsloot Pit: 111 Ha Zwartfontein Pit: ~73 Ha
			Sandsloot Underground Project	Settling Ponds, with desilting pad at the Sandsloot Exploration Decline terrace Area Settling Ponds, with desilting pad at the Box-Cut Laydown Area Temporary Waste Rock Stockpiles at the Box-cut RoM Stockpile Area	Settling pond at Sandsloot Decline Terrace Volume: $529m^3$ per compartment Footprint: 0.5 ha Settling pond at Boxcut Construction Laydown area Inner Length: 40m Volume: $523m^3$ per compartment Footprint: 0.5 ha RoM Stockpile Area 50 000 m^3/a ~15 Ha 994 792 m^3

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
			Stormwater Management Infrastructure Project	The development of North-west Pollution Control Dam – Navada Dam and associated infrastructure (diversions channels, desilting pad) will require authorisation in terms of a S21 (g) in terms of the National Water Act (Act 36 of 1998).	SWD: ~15 ha with associated Infrastructure
GNR 984	Activity 7	*The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods—* *(i) in gas form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 700 tons per day;* *(ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or* *(iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons per day.*	Sandsloot Underground Project (Mining Sector)	Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings.	Corridor Width: ~4 m on either side Pipelines supporting the transportation of Diesel, Emulsion and Fuel to the underground workings will be greater than 1000m in length.
GNR 984	Activity 15	*The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	Waste Rock Disposal Facility Phase 3 Extension Project	The WRD for the Phase 3 development will require the clearance of more than 20 ha of indigenous vegetation. Access road in support of construction activities	~422 ha
			Sandsloot Underground Project	The Development of the Box Cut, Eskom Yard, Construction Laydown Area and Underground Office Complex at the MNC (with associated infrastructure) will require the clearance of more than 20 ha of indigenous vegetation.	~20 Ha
				Four Ventilation Corridors / Surface Infrastructure Areas	~200 ha
				The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area.	
				A new entrance road and haul road will be constructed north of the proposed new Sandsloot Box Cut. This road will cross the Mohlosane River.	Entrance road ~8 m wide and haul road ~12 m Reserve ~ 8m
			Open Pit Mining Development	Zwartfontein Final Pushback Development Zwartfontein pit - access road allowing for backfilling of waste rock material	~20 Ha Length of Road ~3km Width of Road ~40m
GNR 984	Activity 16	*The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.*	Stormwater Management Infrastructure Project	North-west Pollution Control Dam – Navada Dam with a capacity of 1,700 Mℓ (dam wall of 5 m or more) with a development footprint area of 10 ha and associated Desilting Pad.	SWD: ~15 ha with associated Infrastructure
GNR 984	Activity 17	*Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—* *(a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or* *(b) The primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing;* *but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.*	MM Complex	MM Complex with its associated mining related activities and infrastructure	~4000 ha
GNR 984	Activity 27	*The development of a road-* *(iii) with a reserve wider than 30 metres; or* *(iv) catering for more than one lane of traffic in both directions;* *but excluding a road-* *(a)for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies;* *(b) which is 1 kilometre or shorter; or* *(c) where the entire road falls within an urban area.*	Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m
Listing Notice 3 Activities (Government Notice R 985 as amended in 2017, 2018 and 2021)					
GNR 985	Activity 2	*The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres.* *i. In a protected area identified in terms of NEMPAA, excluding conservancies* *ii. (bb) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of*	Sandsloot Underground Project	Potable Water Treatment Plant - Reservoirs	4 x 250 m^3

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
		the Act and as adopted by the competent authority; *dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority* *or in bioregional plans* *(ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other* *protected area identified in terms of NEMPAA or from the core area of a biosphere reserve*			
GNR 985	Activity 10	*The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.* *Limpopo: i). All areas*	Proposed Hydrogen Production Facility Production Scale Supporting Infrastructure Project	Liquid Hydrogen Storage at the five Hydrogen Refuelling Stations	2000kg of LH2 Storage Total gas storage of $78m^3$ and liquid storage of $30m^3$
			Sandsloot Underground Project	110 m^3 Diesel Storage and Dispensing Tank at Construction Laydown Area at the Box Cut	Storage Capacity: 110 m^3 at Construction Laydown Area (2 Ha)
				Emulsion Storage Area	Storage Capacity: 80 m^3 Area: 3 Ha
GNR 985	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.* *ii. Within critical biodiversity areas identified in bioregional plans*	N11 Access Road	New N11 Access Road development	~2,5km ~3 Ha
			Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m
			Permit to Innovate – Dedicated trial/pilot areas	Development of the two dedicated areas at the MSC. Laydown Area (Area 2) north of Mogalakwena South Concentrator. Laydown Area (Area 3) east of Mogalakwena South Concentrator.	Area 2: 3.6 ha Area 3: 3.8 ha Total: 8 ha
			Sandsloot Underground Project	Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure)	Corridor Width: ~4 m on either side Corridor Length: Potable Water Treatment Plant pipelines (from and to various on-site infrastructure) will be greater than 1000m in length. Pipelines from Refrigeration plant to various shaft intake points) will be greater than 1000m in length
				Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)	
				22 kV 830 m transmission line will be within close proximity (within / within 32 m) to watercourses located on site (Groot Sandsloot River)	~830m Corridor - ~4m width on either side
				33 kV 22 km transmission line between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the MSC	~22 km Corridor - ~4m width on either side
				Workshop Area at the new Southern Entrance Complex	~1 Ha
				Four Ventilation Corridors / Surface Infrastructure Areas	~200Ha
				The diversion of a portion of the existing entrance road to the main mine offices as to allow for the construction of a 2nd crusher and loading area.	
GNR 985	Activity 14	*The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (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; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority*	Sandsloot Underground Project	Water demand boreholes to support the underground mine development within within close proximity (within / within 32 m) to watercourses located throughout the site.	~20Ha
				Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure)	Corridor Width: ~4 m on either side Corridor Length: Potable Water Treatment Plant pipelines (from and to
				Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)	

Applicable Listing Notice	Listed Activity	Listed Activity Description	Applicable Project	Project Activity Description	Extent of Activity
		(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.			various on-site infrastructure) will be greater than 1000m in length. Pipelines from Refrigeration plant to various shaft intake points) will be greater than 1000m in length.
				22 kV 830 m transmission line will be within close proximity (within / within 32 m) to watercourses located on site (Groot Sandsloot River)	~830m Corridor - ~4m wide servitude on either side
				33 kV 22 km transmission line between the Sandsloot Pit and the W07 Waste Rock Disposal Facility alongside internal roads to the MSC	~22km Corridor - ~4m wide servitude on either side
				Four Ventilation Corridors / Surface Infrastructure Corridor Areas	~200 Ha
			Open Pit Mining Development Area	Zwartfontein pit - access road allowing for backfilling of waste rock material	Length of Road ~3km Width of Road ~40m

6.4 NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 (ACT 59 OF 2008) (NEM:WA)

According to the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA), the purpose of the legislation is:

- *To regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.*
- *To provide for institutional arrangements and planning matters*
- *To provide for national norms and standards for regulating the management of waste by all spheres of government*
- *To provide for specific waste management measures*
- *To provide for the licensing and control of waste management activities*
- *To provide for the remediation of contaminated land*
- *To provide for the national waste information system*
- *To provide for compliance and enforcement; and*
- *To provide for matters connected therewith*.

Part 4, Section 19 (1) of NEM:WA states that "*The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment*" and must by notice "indicate whether a waste management licence is required to conduct the activity or, if a waste management licence is not required, the requirements or standards that must be adhered to when conducting the activity."

The Minister has gazetted Waste Management Activities in respect of which a waste management licence is required in terms of Section 19 and 20 of the Act. These listed waste activities have been gazetted as follows:

- Government Notice 921 in Government Gazette 37083 dated 29 November 2013 as amended by:
  - Gazette Notice 633 in Government Gazette dated 25 July 2015.
  - Government Notice No. 1440 dated 25 November 2016 Regulations regarding the planning and management of residue stockpiles and residue deposits:
  - Gazette Notice 242 in Government Gazette 40698 dated 17 March 2017.
  - Gazette Notice 1094 in Government Gazette 41175 dated 11 October 2017.
  - Gazette Notice 1757 in Government Gazette 45907 dated 11 February 2022.

The amended list of waste management activities that have or are likely to have a detrimental effect on the environment are specified and classified in terms of three categories namely, Category A, B and C waste activities under NEMWA. These three categories differentiate waste activities through waste classification (General; Hazardous, Inert), volumes and utilization (Storing, Recycling, Treatment, Disposal, Establishment and Reclamation)

<u>Category A Waste Activities:</u>

The waste activities as listed under this Category is subdivided into the following main headings:

- Storage of waste;
- Recycling or recovery of waste;
- Treatment of waste;
- Disposal of waste; and
- Construction, expansion or decommissioning of facilities and associated structures and infrastructures;
- Residue stockpiles or residue deposits

In terms of Category A (3) *"A person who wishes to commence, undertake, or conduct a waste management activity listed under this Category, must conduct a basic assessment process set out 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 the waste management licence application contemplated in section 45 read with section 20(b) of this Act."*

Category B Waste Activities

The waste activities as listed under this Category is subdivided into the following main headings:

- Storage of hazardous waste;
- Reuse, recycling, or recovery of waste;
- Treatment of waste;
- Disposal of waste on land; and
- Construction of facilities and associated structures and infrastructure.
- Residue stockpiles or residue deposits

In terms of Category B (4) *"A person who wishes to commence, undertake, or conduct a waste management activity listed under this Category, must conduct a scoping and environmental impact reporting process set out 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 waste management licence application completed in section 45 read with section 20(b) of this Act*."

Category C: Waste Activities

The waste activities as listed under this category is subdivided into the following main headings:

- Storage of waste
- Recycling or recovery of waste

In terms of Category C (5) *"A person who wishes to commence, undertake or conduct a waste management activity listed under this Category, must comply with the relevant requirements or standards determined by the Minister listed below-*

(a) Norms and Standards for Storage of Waste, 2013; or
(b) Standards for Extraction, Flaring or Recovery of Landfill Gas, 2013; or
(c) Standards for Scrapping or Recovery of Motor Vehicles, 2013. "

In addition to the above list of waste management activities that have or are likely to have a detrimental effect on the environment, the legislation is read in conjunction with Chapter 2 (Standard Containment Barrier Design, Waste Acceptance and Waste Disposal Requirements) of Government Notice 636 in Government Gazette 36784 dated 23 August 2013 which dictates the appropriate national norms and standards for disposal of waste as to guide facility design development.

6.4.1 Application for Waste Management Licence

Part 4, Section 20 of NEM:WA states that *"no person may commence, undertake or conduct a waste management activity, except in accordance with (a) the requirements or standards determined in terms of section 19(3) for that activity; or (b) a waste management licence issued in respect of that activity, if a licence is required"* by lodging an application with the licencing authority in terms of Chapter 5, Section 45 of the Act.

Chapter 5, Section 44 (1) specifically states that *"For the purposes of issuing a licence for a waste management activity, the licensing authority must as far as practicable in the circumstances co-ordinate or consolidate the application and decision-making processes contemplated in this Chapter with the decision-making process in Chapter 5 of the National Environmental Management Act and other legislation administered by other organs of* *state, without whose authorisation or approval or consent the activity may not commence, or be undertaken or conducted"*

In addition to the above, Chapter 5, Section 44(7) states that "*An integrated licence must be regarded as an integrated environment authorisation contemplated in section 24L of the National Environmental Management Act.*

Section 24L (1) of NEMA specifically states that *"A competent authority empowered under Chapter 5 of NEMA to issue an environmental authorisation and any other authority empowered under a specific environmental management Act may agree to issue an integrated environmental authorisation"* if *"(2)(a) the relevant provisions of this Act and the other law or specific environmental management Act have been complied with; and the environmental authorisation specifies the provisions in terms of which it has been issued; and relevant authority or authorities that have issued it."*

It is AAP MM intent to lodge an integrated (NEMA and NEM:WA) application to the DMRE as part of this regulatory approval process as to approve the listed waste activities associated with the proposed mining and mining related activities for an integrated Environmental and Waste Management Licence.

Table 6-3 records the listed waste activities triggered and applied for, to support the development of the various MM proposed projects as detailed in Chapter 4.

Table 6-3: Listed Waste Activities under NEM:WA to be applied for.

Category	Waste Activity	Waste Activity Description	Project	Activity which requires the Water Use Licence
A	Activity 13	The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in terms of this Schedule.	Waste Rock Disposal Areas to revised deposition strategy resulting in an increase in height & Footprint	Revised Deposition Strategy and expansion of the already approved NWRD footprint area. Total footprint area (phase 1,2 & 3) of ~422Ha and final height of ~200m). NWRD NWRD – Phase 3: ~200m (500 Mt) and 422ha
B	Activity 8	The disposal of general waste to land covering an area in excess of 200m² and with a total capacity exceeding 25 000 tons.	Waste Rock Disposal Facility Phase 3 Extension Project	The development of total footprint area of ~422 ha Waste Rock Disposal Facility onto land
			Sandsloot Underground Project	Temporary Waste Rock Stockpiles at Box Cut (~5000 m³ each)
			Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Development of the Anthropogenic Aquifer (storage structure that will improve water quality) with the use of Waste Rock Material
B	Activity 10	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).	Waste Rock Disposal Facility Phase 3 Extension Project	The development of an ~422 ha Waste Rock Disposal Facility onto land
			Sandsloot Underground Project	Temporary Waste Rock Stockpiles at Box Cut (~5000 m³ each)
			Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Development of the Anthropogenic Aquifer (storage structure that will improve water quality) with the use of Waste Rock Material
B	Activity 11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a	Waste Rock Disposal Facility Phase 3 Extension Project	The development of a 422 ha Waste Rock Disposal Facility onto land
			Sandsloot Underground Project	Temporary Waste Rock Stockpiles at Box Cut (~5000 m³ each)

		mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	Development of the Anthropogenic Aquifer (storage structure that will improve water quality) with the use of Waste Rock Material

6.5 NATIONAL WATER ACT, 1998 (ACT 36 OF 1998) (NWA)

The purpose of the National Water Act (Act No. 36 of 1998) (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed, and controlled. Use of water for mining and related activities is also regulated through regulations that were updated after the promulgation of the NWA (Government Notice GN704 dated 4 June 1999).

Sections 40 and 42 of NWA provides for the responsible authority to request public participation and an assessment of the likely effect of the proposed license for the protection, use, development, conservation, management, and control of the water resource.

The following chapters of the NWA are of importance:

- Chapter 3, Part 4 states that anyone who owns, occupies, controls, or uses land is deemed responsible for taking measures to prevent pollution of water resources.
- Chapter 4 deals with water use regulation.
- Chapter 12 deals with water management in terms of dam safety.
- Section 19 deals with water management at mines in terms of pollution prevention and control.
- Section 21 defines the water uses requiring authorization.
- Section 26 (1) provides for the development of regulations requiring monitoring, measurement and recording as well as the effects to be achieved through management practices prior to discharge or disposal.

6.5.1 Application for a Water Use Licence

Section 21 of the NWA defines 11 consumptive and non-consumptive water uses that require authorisation prior to their commencement / undertaking. The applicable water uses to the project is indicated in bold.

- 21(a): Taking water from a water resource.
- 21(b): Storing water
- **21(c): Impeding or diverting the flow of water in a watercourse.**
- 21(d): Engaging in a stream flow reduction activity.
- 21(e): Engaging in a controlled activity.
- 21(f): Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit.
- **21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.**
- 21(h): Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process.
- **21(i): Altering the bed, banks, course, or characteristics of a watercourse.**
- 21(j): Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
- 21(k): Using water for recreational purposes.

Water uses that are not permissible in terms of Schedule 1 of the NWA need to be authorized under a tiered authorization system as a General Authorization in terms of the General Authorization Regulations as published under section 39 of the NWA or as a Water Use Licence, as provided for in terms of section 21 of the NWA.

The authorization system allows for the "*Reserve*" and provides for public consultation processes in the establishment of strategies and decision making and guarantees the right to appeal against such decision.

Section 27 of the NWA specifies that the following factors regarding water use authorization be taken into consideration:

- The efficient and beneficial use of water in the public interest.
- The socio-economic impact of the decision whether to issue a licence.
- Alignment with the catchment management strategy.
- The impact of the water uses and possible resource directed measures; and.
- Investments made by the applicant in respect of the water use in question.

The NWA introduced the concept of Integrated Water Resource Management (IWRM), comprising all aspects of the water resource, including water quality, water quantity and the aquatic ecosystem quality. The IWRM approach provides for both resources directed, and source directed measures. Resource directed measures aim to protect and manage the receiving environment, whilst source directed measures aim to control the impacts at source.

6.5.1.1 Water Uses to be applied for as part of the proposed mining activities

The table below records the anticipated water uses to be applied for in terms of the NWA to support the various proposed MM mining projects. This application (Water Use Licence Application (WULA) in terms of NWA) will run in parallel with the EIA Process. The project has been loaded on the Department of Water and Sanitation electronic system E-wulaas, reference number WU28647. Proof of submission has been attached to Appendix 6.

Table 6-4: Anticipated Section 21 Water Uses

Section 21 Water Use	Project	Activity which requires the Water Use Licence
(c) Impeding or diverting the flow of water in a watercourse (i) Altering the bed, banks, course or characteristics of a watercourse	Waste Rock Disposal Facility Phase 3 Extension Project	• North Waste Rock Dump and associated storm water management infrastructure, including berm and interception canals will cover four seep wetlands.
	Sandsloot Underground Project	• Pipeline transporting water from Sandsloot Pit and pit dewatering boreholes to Buffer Dam and Zero Emissions Haulage Solutions pipeline. • Pipeline transporting water from Sandsloot Pit to Potable Water Treatment Plant. • Pipeline transporting tailings material to Paste Backfill Plant. • Water supply pipelines supporting Refrigerator Plant crossing Groot Sandsloot River. • Sandsloot Underground Mine development including underground conveyer corridor and Zwartfontein Spur within regulated zone of Groot Sandsloot River • Zwartfontein Exploration decline (spur) underground mine development within regulated zone of the Groot Sandsloot River. • Ventilation Corridor 1 (between Sandsloot Pit and Vaalkop TSF return water dam) crossing Groot Sandsloot River. • Ventilation Corridor 2 (between Zwartfontein and Sandsloot Pits) crossing Groot Sandsloot River. • Access road to Sandsloot Boxcut crosses Mohlosane River. • Dewatering boreholes of fissure water from Sandsloot Underground Mine within floodline of Groot Sandsloot River. • Mine office entrance road re-alignment within floodline of Mohlosane River.

		• Second Crusher and Loading Area within floodline of Mohlosane River.
	N11 Access Road Project	• N11 access road traverses a tributary of the Mohlosane River.
	Open Pit Mining Development Area	• Zwartfontein Pit new haul road crossing Mohlosane River.
	North-west Pollution Control Dam-Navada Dam	• North-west Pollution Control Dam - Navada Dam traverses an unnamed tributary of the Witrivier. • North-west Pollution Control Dam - Navada Dam traverses an ephemeral drainage line. • North-west Pollution Control Dam - Navada Dam services corridor: access road, return water pipeline (to Buffer Dam), canal and berm traverses the unnamed tributary of the Witrivier and an ephemeral drainage line. • Services corridor (pipelines) crossing Mohlosane River: o Pipeline from North-west Pollution Control Dam-Navada Dam to Buffer Dam traverses Mohlosane River. • Pipeline from Navada Dam to Buffer Dam traverses Groot Sandsloot River.
(g): Disposing of waste in a manner which may detrimentally impact on a water resource	Waste Rock Disposal Facility Phase 3 Extension Project	• Disposal of waste rock material from open pits and Sandsloot Underground Mine.
	Sandsloot Underground Project	• Backfilling of Sandsloot Underground Mine with tailings paste from process. • Settling pond at Sandsloot Decline Terrace (Two compartments, Pond 1 and 2) including desilting pad. • Settling pond at Boxcut Construction Laydown area (Two compartments – Pond 3 and 4) including desilting pad. • Backfilling a section of Sandsloot Pit with waste rock material to create a terrace for supporting infrastructure of the Sandsloot Underground Mine project. • Temporary stockpiling of waste rock from Sandsloot Boxcut in two stockpiles. • Stockpiling of ore from Sandsloot Underground Mine operations at Sandsloot Pit. • Ore stockpile for use in North Concentrator.
	Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	• Storage of waste rock material in the Pit to create an anthropogenic aquifer to ensure water security and supply to MM.
	North-west Pollution Control Dam-Navada Dam	• North-west Pollution Control Dam Vavada Dam-Storage of collected rainwater, surface run-off and seepage from the Waste Rock Disposal Areas, dewatering boreholes, and water from pits, with associated desilting pad.

6.5.1.2 Regulations on the use of water for Mining and related activities aimed at the protection of water resources - GN704 dated 4 June 1999

The Minister of Human Settlement, Water and Sanitation (HSWS) is responsible for the protection, use, development, conservation, management, and control of the water resources of South Africa on a sustainable basis.

As such the HSWS has gazetted regulations specifically aimed at the use of water for mining and related activities aimed at the protection of water resources. These requirements prescribed in terms of the regulations must be seen as minimum requirements to fulfil this goal.

In terms of Regulation 3 of the Act the Minister may in writing authorise an exemption from the requirements of regulations 4, 5, 6, 7, 8, 10 or 11 of the Act on his or her own initiative or on application, subject to such conditions as the Minister may determine.

The table below records the anticipated GN704 exemptions required and to be applied for in terms of the NWA to support the various proposed MM mining projects. This application (GN704 Exemption Motivation in terms of NWA) will run in parallel with the EIA and WULA Process.

Table 6-5: GN704 Requirements

GN 704	Condition	Project	Applicability to MM Platinum Mine
4 a	Locate or place any residue deposit, dam, reservoir, together with any associated structure within 1:100 year flood-line or within a horizontal distance of 100 m of a watercourse or borehole, excluding boreholes drilled specifically to monitor the pollution of ground water, or on ground likely to become water-logged, undermined, unstable or cracked	Waste Rock Disposal Facility Phase 3 Extension Project	• The development of the WRD Phase 3 extension project within the regulated zone of a watercourse / wetland area.
		Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	• Dirty Water Pipelines from Sandsloot and Zwartfontein Anthropogenic Aquifer Penstocks to various parts of the mine to convey stored water for use will be within the regulated zone of a watercourse.
		Stormwater Management Infrastructure Project	• The construction of the Storm Water Control Dam and its associated infrastructure (diversions channels, desilting pad) within the regulated zone of a watercourse.
		Sandsloot Underground Project	• Development of the temporary waste rock stockpiles at the Box Cut (5000 m^3 each) • Pipeline requirements associated with the Potable Water Treatment Plant (from and to various on-site infrastructure) • Pipeline requirements associated with the Refrigeration Plant and Ventilation shaft intakes (from Refrigeration plant to various shaft intake points)
4b	Except in relation to a matter contemplated in regulation 10, carry on any underground or opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100 meters from any watercourse or estuary, whichever is the greatest;	Sandsloot Underground Project	• Development of the underground workings within and under regulated zone of a watercourse (Groot Sandsloot River) • Underground conveyor development from Sandsloot to MNC/M3C within regulated zone of a watercourse (Mohlosane River and Groot Sandsloot River).
4 c	No placement or disposal of any residue or substance which causes or is likely to cause pollution of a water resource, in the underground workings or opencast excavation, prospecting diggings, pit or any other excavation.	Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	• Development of the Anthropogenic Aquifer with the use of Waste Rock Material
		Sandsloot Underground Project	• Paste Backfilling into the underground workings

GN 704	Condition	Project	Applicability to MM Platinum Mine
5	May not use any residue or substance which causes or is likely to cause pollution of 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	Anthropogenic Aquifers (Sandsloot and Zwartfontein Pits)	• Development of the Anthropogenic Aquifer (storage structure that will improve water quality) with the use of Waste Rock Material
		N11 Access Road Project	• Development of the new Access Road from the existing SANRAL N11 with alternative material (Waste Rock).
		Sandsloot Underground Project	• Development of the Settling Ponds and associated desilting pad at the Construction Laydown Area at the Box Cut • Use of waste rock material for the construction of berms or gabion walls. • Use of waste rock material for the construction of roads and ramp development. • Use of waste rock material in terracing for areas of development. • Use of waste rock material for construction activities as construction material and infill.
		Open Pit Mining Development Area	• Zwartfontein pit – utilising waste rock material for the construction of an access road allowing for backfilling of waste rock material – river crossing
		Stormwater Management Infrastructure Project	• Development of the Storm Water Control Dam and associated infrastructure (desilting pad) and Access Road with alternative material (Waste Rock) to reduce WRD.
		All mining infrastructure area.	• Implementation of a waste hierarchy as to optimise the reuse of waste rock across the mining operations in support of terracing, bunding, walls, gabions, impoundments, roads and stormwater infrastructure.

6.5.2 Existing Lawful Water Uses

The National Water Act, 1998, defines Existing Lawful Water Use (ELU) as follows:

Section 32 states the following:

(1) An existing lawful water use means a water use—
- *(a) which has-taken place at any time during a period of two years immediately before the date of commencement of this Act, or*
- *(b) which has been declared an existing lawful water use under section 33, and which—*
- *(c) was authorized by or under any law which was in force immediately before the date of commencement of this Act;*
- *(d) is identified as a stream flow reduction activity in section 36(1); or*
- *(e) is identified as a controlled activity in section 37(1).*

(2) the case of—
- *(a) a stream flow reduction activity declared under section 36(1); or*
- *(b) a controlled activity declared under section 38.*

Existing lawful water use means a water use which has taken place at any time during a period of two years immediately before the date of the declaration.

Section 34 of the Act states that a person can continue with an existing lawful water use in terms of the following:

(1) A person. or that person-s successor-in-title, may continue with an existing lawful water use, subject to-
- *(a) any existing conditions or obligations attaching to that use;*
- *(b) its replacement by a licence in terms of this Act: or*

(c) any other limitation or prohibition by or under this Act.

(2) A responsible authority may subject to any regulation made under section 26(1)(c) require the registration of an existing lawful water use.

6.5.2.1 Approved Water Use Licences

Since the commencement of mining, MM operations were supported by various Water Use Licences, where one will supersede a previous one issued by the Department of Water and Sanitation. The Licencing history are as follows:

- Water Use Licence No: 27059655 dated 30 March 2005 superseded by Licence No: 27059655 dated 12 March 2007.
- Water Use Licence No: 14/A61G/GICABJ/5053 dated 2 October 2017.
- Water Use Licence No: 14/A61G/GICABJ/5053 dated 2 October 2017 and Licence No: 27059655 dated 12 March 2007 was superseded by Water Use Licence No: 07/A61G/ABCGIJ/9887 dated 4 December 2020

Note

The following Water Uses are authorised in support of the operations:

- Section 21(a) – Taking of water from a water resource
    - Blinkwater Wellfield – 657 000 m^3/a;
    - Commandodrift Wellfield – 511 000 m^3/a;
    - PPL Wellfield – 1 436 029 m^3/a;
    - Scavenger Boreholes – North Concentrator – 365 000 m^3/a;
    - Dewatering of North Pit for re-use – 6 606 090 m3/a;
    - Dewatering of Central and South Pits combined – 2 337 600 m^3/a;
    - Dewatering of Zwartfontein Pit – 1 845 892 m^3/a;
    - Dewatering of Sandsloot Pit for re-use – 804 632 m^3/a
- Section 21(c) – Impeding or diverting the flow of water in a watercourse and Section 21(i) – Altering the bed, banks, course, or characteristics of a watercourse;
    - Pipeline bridge and service road on Groot Sandsloot River;
    - Northern haul road on Groot Sandsloot River;
    - Groot Sandsloot River Diversion;
    - Haul road bridge over Groot Sandsloot River near Ga-Pila;
    - Bridge crossing the Groot Sandsloot River carrying pipelines and service road;
    - Diversion of Mohlosane drainage line around Blinkwater TSF;
    - Clean water diversion can (east) around Blinkwater TSF;
    - Clean water diversion canal (west) around Blinkwater TSF;
    - Northern and Eastern Boundary Fence;
    - Blinkwater 1 TSF return water pipelines and haul road;
    - Blue tailings return water pipelines 1 nd 2 and haul road;
    - Haul road crossing Mohlosane River close to Blinkwater TSF;
    - Main haul road behind offices and workshops crossing a tributary of the Mohlosane River;
    - Lattice bridge crossing Mohlosane River carrying potable water and tailings pipeline;
    - Potable water pipelines crossing a tributary of the Mohlosane River close to mine offices and workshops;
    - Tar road crossing a tributary of the Mohlosane River near the main offices;
    - Main road crossing the Mohlosane River within the conservation area;
    - Mohlosane River conservation area west fence;
    - Ford/drift over the Mohlosane River near the conveyor crossing;
    - Broken concrete bridge adjacent to conveyor crossing the Mohlosane River;
    - Conveyor crossings 1, 2, 3, 4, and 5 over the Mohlosane River supporting Third Concentrator and crusher;
    - Haul road crossing over the Mohlosane River opposite the Platistone Crusher;
    - Bridge on Mohlosane River and western boundary fence;
    - Blinkwater 2 TSF North eastern corner clean water diversion canal;
    - Blinkwater 1 and 2 TSF within 50m of a wetland;
    - Groundwater feed via channel to wetland 1 and 2;
    - Storm Water feed via channel to wetland;
    - Blinkwater TSF 1 Protection Berm;
    - Gantry crossing the Mohlosane River carrying pipelines
    - Powerline 1 and 2 crossing the Mohlosane River;
    - Conveyor crossings supporting service road 1, 2; and 3
    - Vehicle access road 1 and 2 over the Mohlosane River;
    - Blue tailings return water pipelines 1 and 2 and haul road;
- Section 21(g) – Disposing of waste in a manner which may detrimentally impact a water resource;
    - East Waste Rock Dump – 69 420 960 t/a on 987 Ha;
    - Rock Dump Runoff Dam #1 – 8 556 000 m^3/a on 60 ha;
    - West Waste Rock Dump – 21 000 000 t/a on 297 Ha;
    - PCD-NN (Nitrate Dam) 0 8 556 000 m^3/a on 75 Ha;

- Blinkwater 1 tailings Complex (including silt trap) – 1 000 000 dry t/a on 300 Ha with final height of 60m;
- Vaalkop Tailings Dam 1 (including silt trap) – 7 404 756 m3/a slurry on 145 Ha;
- Vaalkop Tailings Dam 2 (including silt trap) – 425 000 t/m on area of 120 Ha with final height 43m;
- Return Water dam and Return Water Dam Extension – 10 658 m^3;
- PCD-NC – 70 000 m^3 on 4 Ha;
- Dam 1160 – 310 000 m^3 on 5,5 ha;
- PCD-Heli – 16 764 m^3 on 0,5 Ha;
- PCD-Truck – 2 740 m^3 on 0,3 Ha;
- Zwartfontein Landfill Site Dirty Water Dam – 1 000 m^3/a on 0,04 ha;
- SP Dam – 7 200 m^3 on 0,45 Ha;
- SWS Dam – 15 000 m^3 on 0,5 Ha;
- Crusher PCD – 12,7 m^3/a
- Waste Rock Disposal Facility RS3, W07, W01 – 276 306 886 t/a on 378 Ha;
- Ore Stockpile at South Concentrator, Oxidised Stockpile north of RS3 Waste Rock Facility, Z01 Stockpile east of Zwartfontein Pit, Stockpile east of Sandsloot Pit, Stockpile P53 and P54 adjacent and east of South Pit, ore stockpile south of Zwartfontein Pit, Ore pebble stockpile north of Third Concentrator, Platistone crusher area, North Concentrator ore stockpile – 6 694 293 m^3/a on 378 Ha
- North Concentrator Sewage Treatment Works – 400 m^3/day;
- Contractors Camp Sewage Works – 500 people per day;
- South Concentrator Sewage Treatment Works – 1 000 people per day – 120 l/s hydraulic load;
- Water Storage - PPRust North pit – 43 122 945 m^3;
- Water Storage - PPRust Central and South Pits combined – 14 024 265 m^3;
- Water Storage - Zwartfontein Pit – 21 524 445 m^3;
- Water Storage - Sandsloot Pit – 23 989 400 m^3;
- Use of pit water for dust suppression – 404 650 m^3/a;
- Use of Contractors Camp treated sewage effluent for dust suppression – 42 486 m^3/a;
- Use of return water dam 1 water for dust suppression – 500 000 m^3/d;
- Ericksen dam – 507 m^3;
- Zinc Dam washbay – 586 m^3 – 730 000 m^3/a throughput;
- Zinc Dam ZFT – 1 000 m^3;
- OS1 Oil Sump - - <1 m^3;
- OS 2 Oil Sump – 4 096 m^3;
- OS 2 Oil Sump new – 17 500 m^3;
- Gooseneck Sump – 222 m^3 – 3 650 m^3/a throughput;
- Zinc Dam North – 548 000 m^3/a;
- Blinkwater 2 Tailings Storage Facility – 32 000 000 m^3/a on a 2 345 047 m^2 area with a final height of 67m;
- North Waste Rock Dump and ore stockpile areas – 21 000 000 m^3/a on an area of 210 Ha;
- North and Third Concentrator Pollution Control Dam – 595 350 m^3/a with a capacity of 200 000 m^3;
- Third Concentrator Bulk Ore Stockpiles 1, 2 and 3 (low grade) – 15 000 000 m^3/a each on an area of 1,6 ha each;
- Third Concentrator Bulk Ore Stockpile 4 (low grade) – 8 000 000 m^3/a on an area of 1,6 Ha;
- Third Concentrator High Grade Stockpile – 30 000 000 m^3/a on an area of 1,6 Ha;
- Buffer Water Storage Dam – 33473 123 m^3/a with a capacity of 1 500 000 m^3.

- Section 21(j) – Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
  - Abstraction of groundwater from North Pit – 6 606 090 m^3/a;
  - Abstraction of groundwater from Central and South Pits combined – 2 337 600 m^3/a;
  - Abstraction of groundwater from Zwartfontein Pit – 1 845 892 m^3/a;
  - Abstraction of groundwater from Sandsloot Pit – 804 632 m^3/a.

6.6 OTHER APPLICABLE LEGISLATION

Various National, Regional and Local legislation (in addition to NEMA, NEM:WA and NWA) will be taken into consideration for applicability to support the lawful commencement of the various proposed projects on site. These National, Regional and Local legislation will be assessed in terms of assessing triggered activities, additional possible permit requirements, specialist assessments (criteria) and mitigation measure development and will be discussed in detail in each of the respective reports / applications. The list below highlights only a few of the additional legislation assessed for the proposed projects:

- National Environmental Management Air Quality Act, 2008 (AQA) (Act 39 of 2004) as amended.
- National Heritage Resources Act, 1999 (NHRA) (Act 25 of 1999)
- Conservation of Agricultural Resources Act, 1983 (CARA) (Act 43 of 1983)
- National Environmental Management: Biodiversity Act, 2008 (NEMBA) (Act No 10 of 2004)
- Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)

- Spatial Planning and Land Use Management Act, 2013 (SPLUMA) (Act No 16 of 2013) (SPLUMA)
- Mogalakwena Local Municipality By-Laws
- Waterberg District Municipality By-Laws

Permits in terms of all applicable National, Regional and Local legislation will be obtained prior to the commencement of the activities on site.

MOGALAKWENA COMPLEX

ENVIRONMENTAL STATUS QUO

7 ENVIRONMENTAL STATUS QUO (Baseline)

NOTE: The Environmental Status Quo Baseline has been compiled utilizing the specialist studies undertaken in support of the EIA Regulatory Process, the applicable study will be included within the relevant section of this chapter.

7.1 CLIMATE

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Air Quality Assessment to Support the Proposed Future Mining at the Mogalakwena Platinum Mine – Specifically Focusing on the Transition of The Sandsloot Mine from an Open Pit to Underground Mining Method. Complied by uMoya-NILA Consulting dated June 2023 (Annexure 5-5).*

The predominant factors that influence the climate of a location are latitude, elevation and the distance from the ocean. Latitude relates to the amount of radiation that is received with lower latitudes receiving more than high latitudes. Temperature decreases with increasing height hence the climate relationship to elevation. The ocean has a moderating effect on temperature range and coastal areas are cooler and generally wetter than inland areas. Other factors that influence climate are topography and local winds.

MM is situated at approximately 1 178 m above sea level and at a latitude of 24˚01' S. The long term climate records at Mokopane (30 km from Mogalakwena Mine) is representative of the general area which experiences an semi-arid climate.

MM falls within rainfall zone A6C and evaporation zone 1C which are characterised by a Mean Annual Precipitation (MAP) of approximately 585 mm (Potgietersrust Rainfall Station) and a mean annual evaporation (MAE) of approximately 1,800 mm.

7.1.1 Temperature

MM is located in the Limpopo Province, which experiences a sub-tropical climate through most of the province. The high average temperatures, low rainfall and high evaporation rate result in this area being classified as a semi-arid region.

The average maximum temperature in the Mokopane and the surroundings areas is 25.5 °C and the average minimum temperature is 12.9 °C. This can be seen in Table 7-1 below. Temperatures often exceed 35 °C and occasionally 40°C in summer.

Table 7-1: Average monthly temperatures at Mokopane (uMoya-Nila, 2023).

Month	Monthly Average		
	Maximum (°C)	Daily mean (°C)	Minimum (°C)
January	27.2	22.1	17.0
February	28.0	22.5	17.0
March	26.9	21.4	15.8
April	24.4	18.7	13.0
May	22.7	16.5	10.2
June	20.3	14.0	7.7
July	20.1	13.5	6.9
August	23.8	16.4	9.0
September	27.4	19.7	11.9
October	28.8	21.5	14.2
November	28.1	21.8	15.5
December	27.9	22.4	16.8
Annual Average	**25.5**	**19.2**	**12.9**

7.1.2 Rainfall

Mean annual rainfall is 527 mm/year which occurs mainly in the summer months between November and March. Rainfall peaks in December with a mean of 106 mm and there is less than 3 mm of rainfall per month during winter (June to August). Extreme rainfall days (> 20 mm) are rare, with an average of 3 days per annum. The average monthly rainfall depths are presented in Table 7-2.

Table 7-2: Average monthly rainfall depth for the rainfall record (uMoya-Nila, 2023).

Month	Average monthly rainfall (mm)
January	115
February	74
March	65
April	35
May	10
June	4
July	3
August	3
September	12
October	41
November	86
December	102
Annual Total (mm)	**550**

Since the MM site is in semi-arid area with an average of < 2mm of precipitation a day, the number of days with 20 mm of rain becomes a good indicator of heavy rainfall days. The MM area has experienced an average of three heavy rainfall days per annum since 1980, with nine heavy rainfall days occurring during the 2000's; one of the wettest years on record (Figure 7-1).

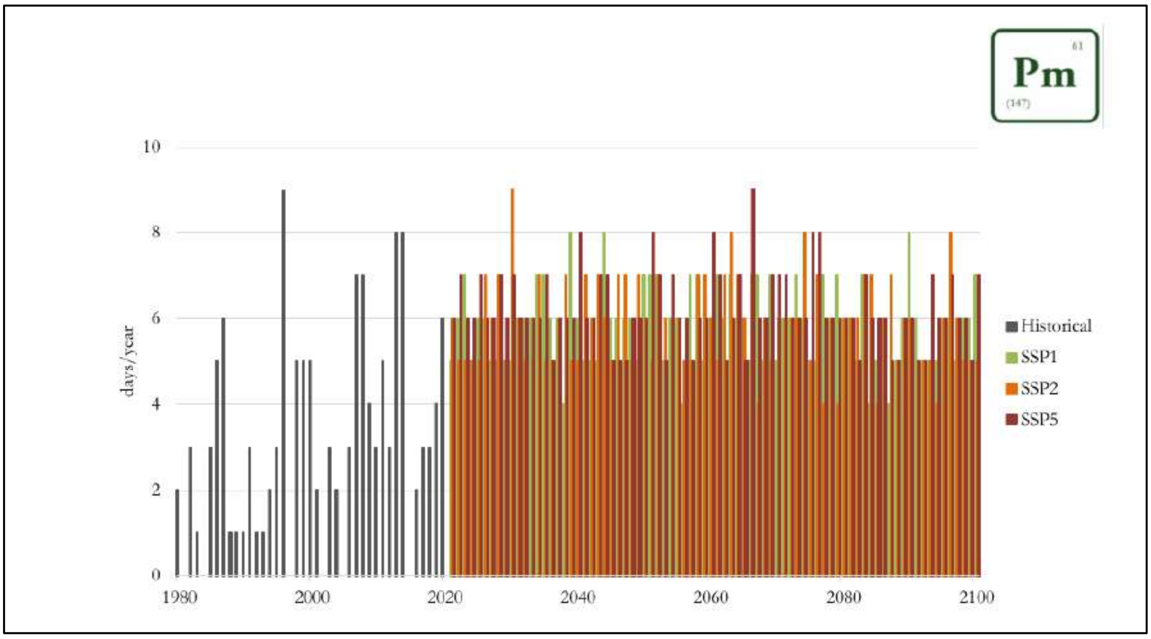


Figure 7-1: Near-historical and projected number of heavy rainfall days per annum in the MM area (Erasmus, 2023).

7.1.3 Evaporation

Evaporation is high, resulting in the classification of being semi-arid. The mine is within the evaporation zone 1C with an annual evaporation of ±1 800mm. The average monthly evaporation depths are indicated in Table 7-3.

Table 7-3: Average Monthly Evaporation Depths (J&W, 2021)

Month	S-pan Average Monthly Evaporation (mm)	Lake Average Monthly Evaporation (mm)
January	198	166
February	165	145
March	160	141
April	124	109
May	103	90
June	84	71
July	91	76
August	126	102
September	168	136
October	199	161
November	185	152
December	197	164
Annual Total (mm)	***1800***	1513

7.2 TOPOGRAPHY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist studies – *Financial Provisioning for the Rehabilitation and Remediation* and *Anglo American Platinum Mogalakwena Mine Complex 2023 Integrated Development Environmental Authorisation Process, EMPr Consolidation and Amendment. Complied by Hydrological Environmental Engineering Solutions (HEES) dated May 2023 (Annexure 5-9).*

Topographic elevations within the Mine study area vary from 1,750 meters above mean sea level (mamsl) in the east to 1,000 mamsl in the west. The natural ground slope of MM is associated with the three main drainage lines of the Wit-, Mohlosane- and Sandsloot rivers. The detail of the slope directions, generated from 5m contours, and the 20m contours are indicated in Figure 7-2.

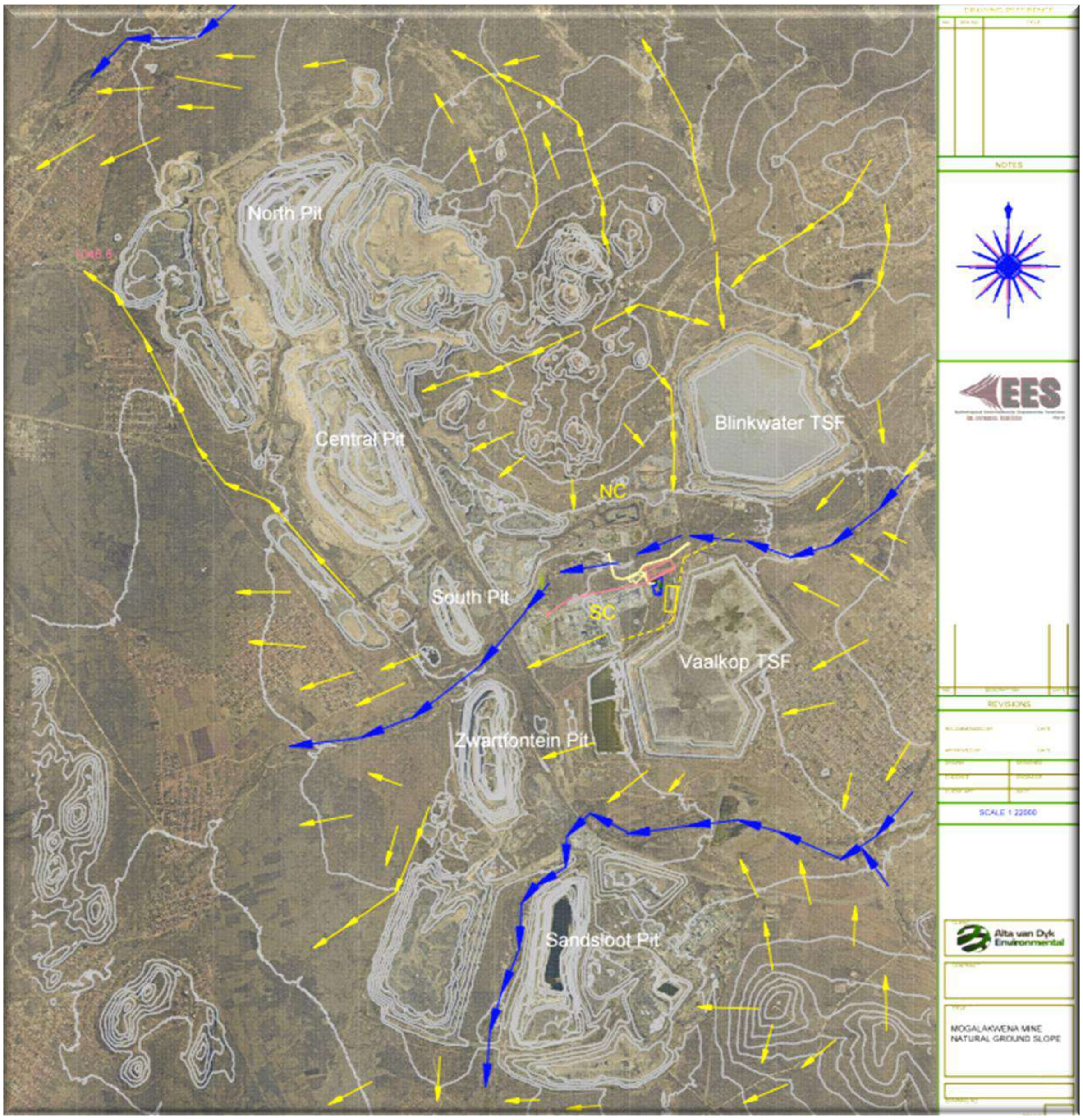


Figure 7-2: Natural ground slope directions of MM area (HEES, 2023)

7.3 GEOLOGICAL SETTING

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study - *Hydrogeology Specialist Input to EIA. Compiled by Knight Piesold Consulting dated May 2023 (Annexure 5-3).*

7.3.1 The Bushveld Complex

Formed over two billion years ago as a result of multiple injections of magma into the earth's crust many kilometres below the surface, the Bushveld Complex is geologically unique due to its size, uniformity of its layering and extent of known mineral content. This saucer-shaped intrusion is over 350km wide, 250km long and up to 12km thick. Over time, the rim of the intrusion has been exposed by erosion, revealing three separate main segments known as the western, eastern and northern limbs. The Mogalakwena Complex is located within the Northern Limb.

The Bushveld Complex comprises three main suites, namely the Rooiberg Group, Lebowa Granite Suite and Rustenburg Layered Suite. The Rustenburg Layered Suite comprises four major subdivisions: the Upper Zone, Main Zone, Critical Zone and Lower Zone. Economic concentrations of PGMs occur mainly in three distinct units within the Critical Zone: Merensky Reef; Upper Group 2 (UG2) chromitite; and Platreef. The Merensky Reef and UG2 Reef occur around the eastern and western limbs of the complex, while the Platreef is found only along the eastern edge of the northern limb.[215]

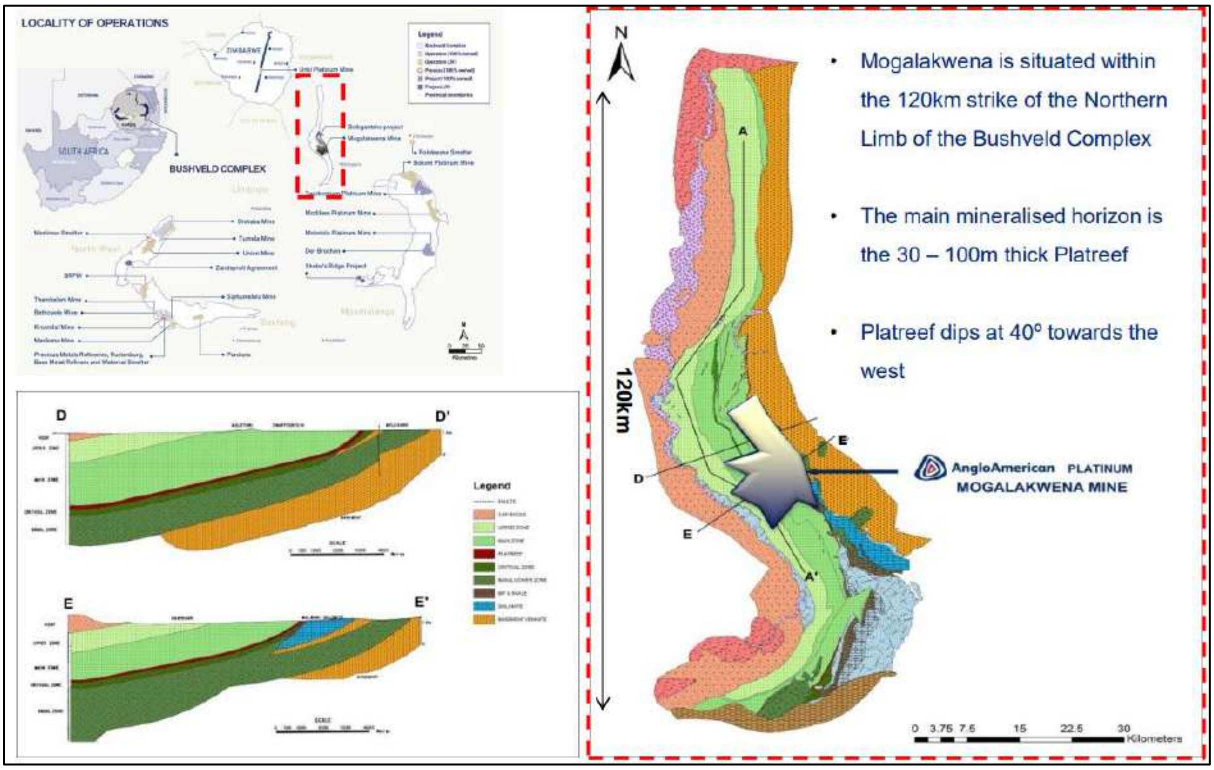


Figure 7-3: Geological Setting (Piesold, 2023)

7.3.2 Local Geology

The Platreef is developed in the Northern Limb of the Bushveld Complex and can be described as a multiple-pulse mafic magmatic horizon, dominantly pyroxenitic in composition as seen in Figure 7-4. It averages 150m in

[215] *Anglo American Platinum, 2021. Ore Reserves Mineral Resources Report. https://www.angloamericanplatinum.com/~/media/Files/A/Anglo-American-Group/Platinum/report-archive/2021/ore-reserves-mineral-resources-report.pdf. Date accessed: 15 August 2022.*

thickness, with a prominently top-loaded grade profile, where the optimal Mineralisation situated in the upper 30m to 40m of the package and strikes ~north-south, dipping at an average of 40° to 50° to the west.

In comparison to the Merensky and UG2 reefs, the Platreef is a far thicker and more variable orebody, typified by extensive contact with metasedimentary and granitic floor rocks and the assimilation of footwall fragments. The variability of lithology and thickness along the strike is attributed to underlying structures and the assimilation of local country rocks. This assimilation ranges from shales and banded ironstones in the south, through to dolomites in the center of the mining area, to granites in the northern portion of the property.

Carbonate floor rocks incorporated into the basal Platreef have been altered to mineralised parapyroxenites and calc-silicates formed during extensive syn-magmatic interaction with high-Mg silicate melts. Towards the north, where the Platreef country rock is Archaean basement granite, partial melting of this protolith has resulted in the formation of a metamorphic rock referred to as Granofels. The Granofels are present in a prominent interaction zone developed between the base of the Platreef and the underlying basement granite.

As a result, the Mineralised horizon defined for the Platreef orebody often incorporates significant portions of the immediate footwall. The Platreef hosts significant dolomite inclusions in the southern region of the mining area and these also constitute geological loss zones. Sulphide mineralisation (pyrrhotite, pentlandite, chalcopyrite and pyrite) is associated with the basal contact between pyroxenite and dolomite (both of which contained sulphide minerals) and the combination resulted in the platiniferous reef. These minerals are hosts for the PGE.

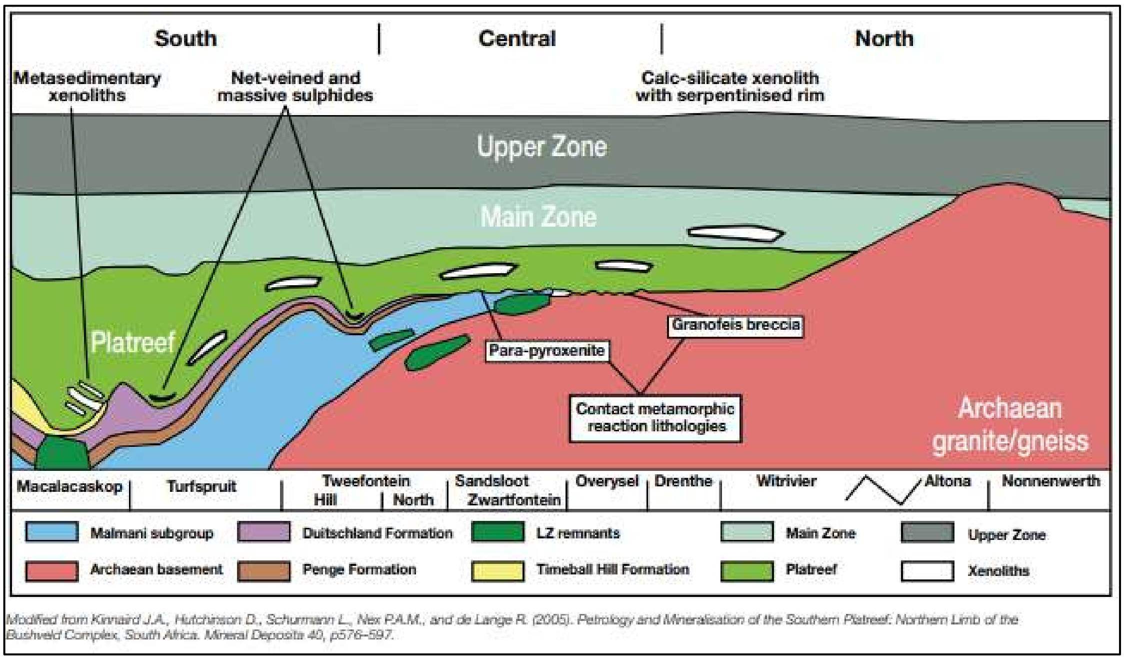


Figure 7-4: Geological Setting – Platreef Mineralisation Model (Piesold, 2023)

7.3.3 Structural Geology

At MM, the Platreef is structurally affected by dolerite dykes and several predominantly lateral fault systems orientated in a north-east/south-west direction. The fault systems display normal to reverse fault displacements ranging between 50m and 600m, with up-thrown blocks. Five major faults are designated as the Drenthe, NM, Pit, Centre Pit, and Mohlosane Faults.

The extrapolated Mohlosane Fault extends through the northern part of the Blinkwater tailings dam and the planned Compartment 2 of Blinkwater Phase 2. The NM and Drenthe Fault extend through the proposed expansion of the North Waste Rock Dump towards the Witrivier and could provide a hydraulic connection if the faults have higher permeability than the surrounding rock.

Three dykes, designated as the Southern Dyke, the Central Dolerite Dyke, and the Northern Dolerite Dyke have been identified. The dykes generally have low permeability resulting in compartmentalisation, although the contact with the country rock may provide a preferential flow path.

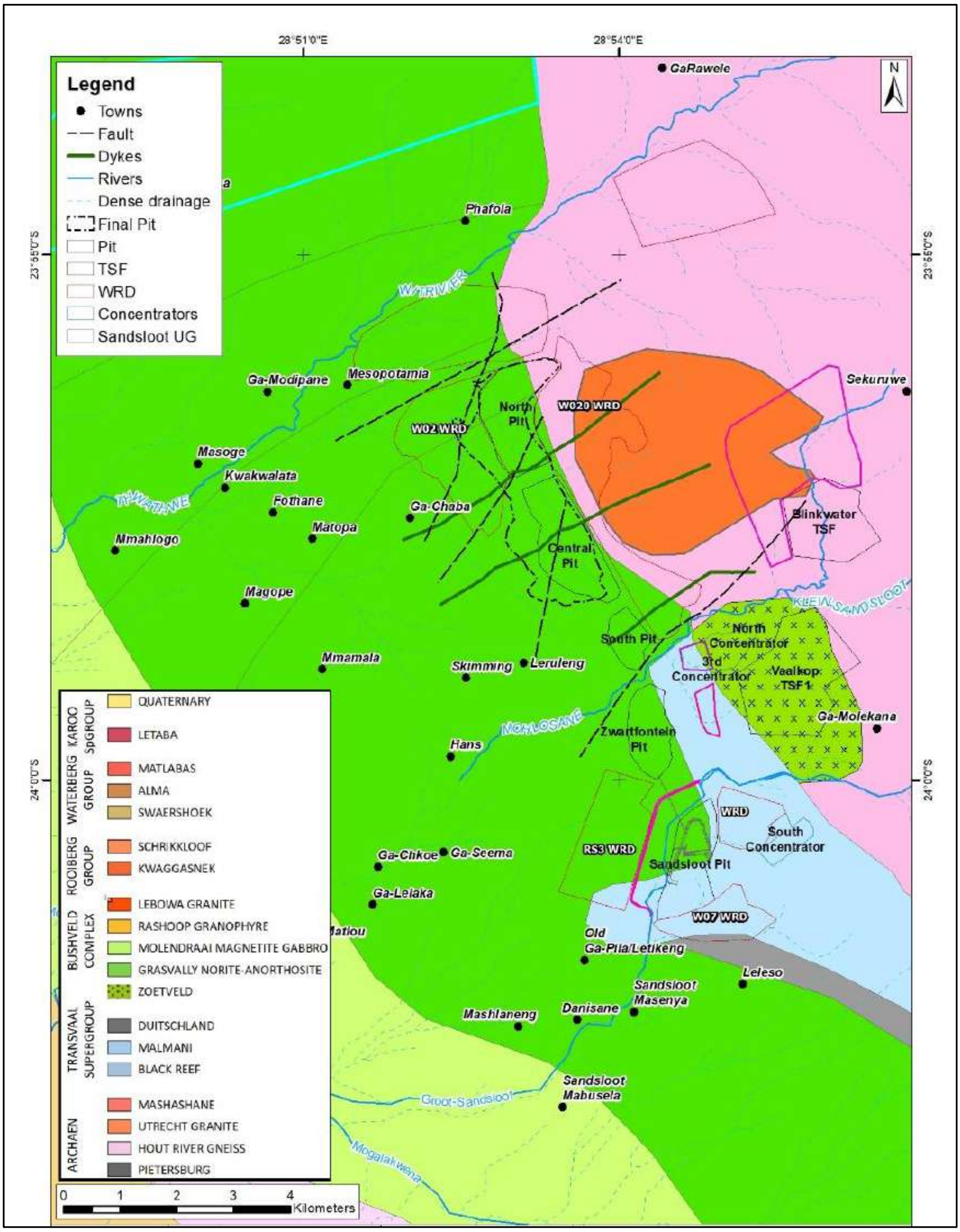


Figure 7-5: Local Geology showing infrastructure and communities (Piesold, 2023)

7.4 TERRESTRIAL BIODIVERSITY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study - *Terrestrial Biodiversity Assessment for the Proposed Integrated Permitting Application at the Mogalakwena Mine near Mokopane, Limpopo Province. Complied by Scientific Terrestrial Services dated June 2023 (Annexure 5-6)..*

7.4.1 Flora

MM is located within the Makhado Sweet Bushveld vegetation type as seen in Figure 7-6. The Makhado Sweet Bushveld is considered vulnerable (VU), however is of least concern (LC). The Makhado Sweet Bushveld is described as comprising of slightly to moderately undulating plains sloping generally down to the north, with some hills in the southwest. The vegetation type typically includes a short and shrubby bushveld with a poorly developed grass layer.

The area surrounding MM is largely undeveloped and the surrounding farms are host to rural villages and the subsistence agricultural activities associated with such communities. The National Biodiversity Map indicating the Vegetation Types for the area can be found in Figure 7-6. The Critical Biodiversity Areas (CBA) as described in the Limpopo Conservation Plan is highlighted within Figure 7-7. All protected areas around the mining area can be identified within Figure 7-8 below. The Waterberg Bioregional Plan indicating all Ecological Support Areas (ESA) can be found in Figure 7-9 below.

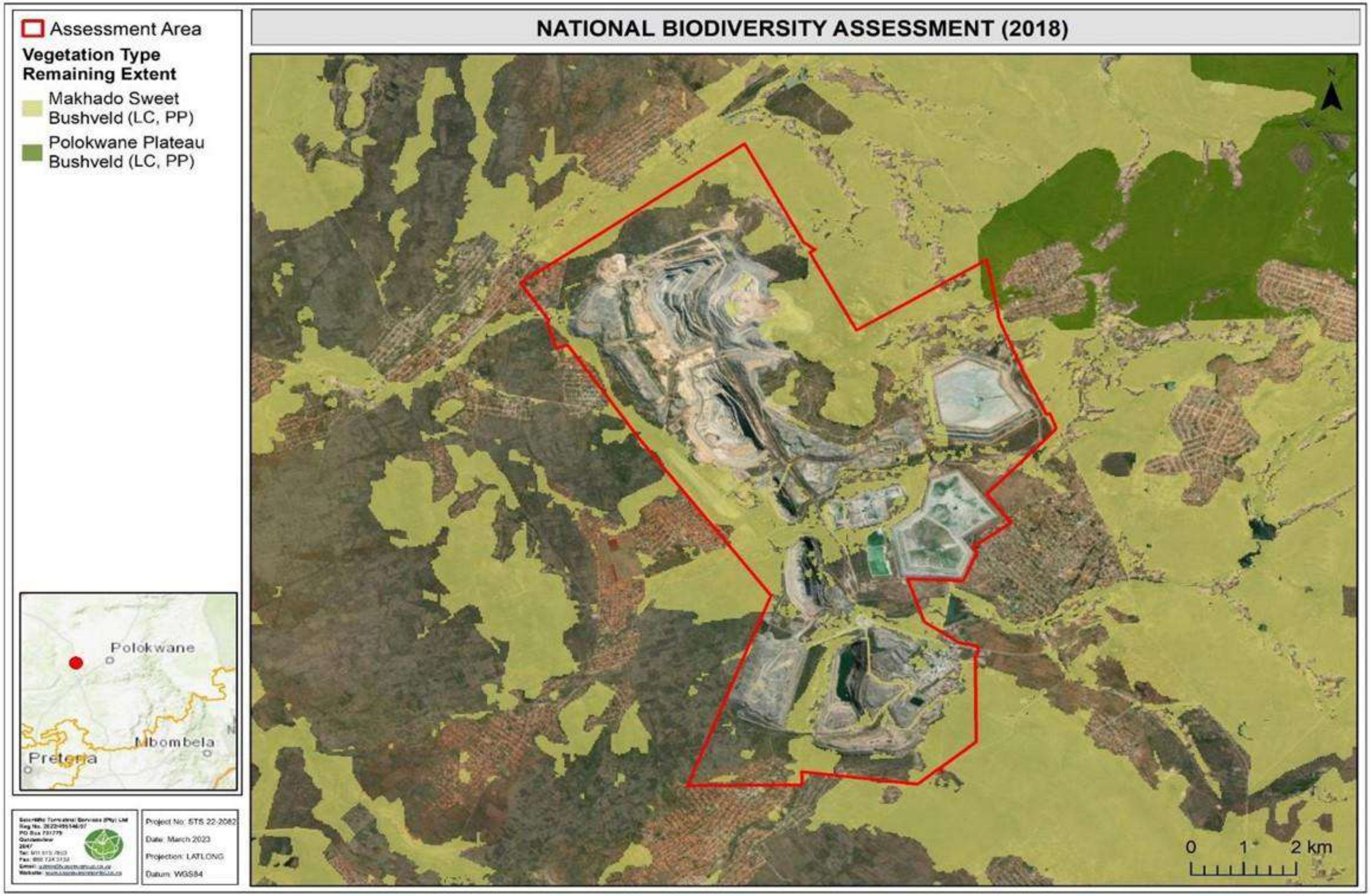


Figure 7-6: National Biodiversity Assessment (STS, 2023)

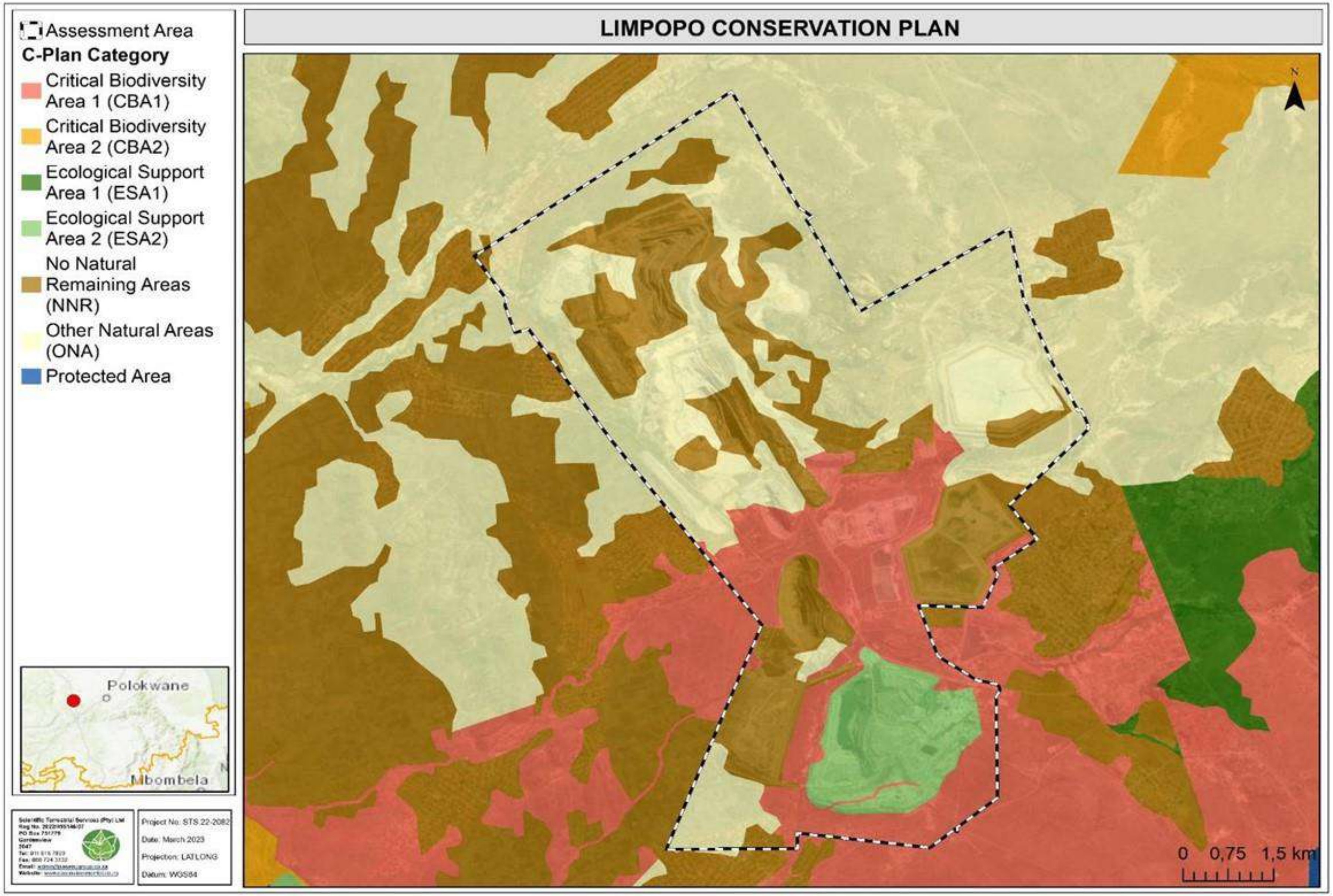


Figure 7-7: Limpopo Conservation Plan (STS, 2023)

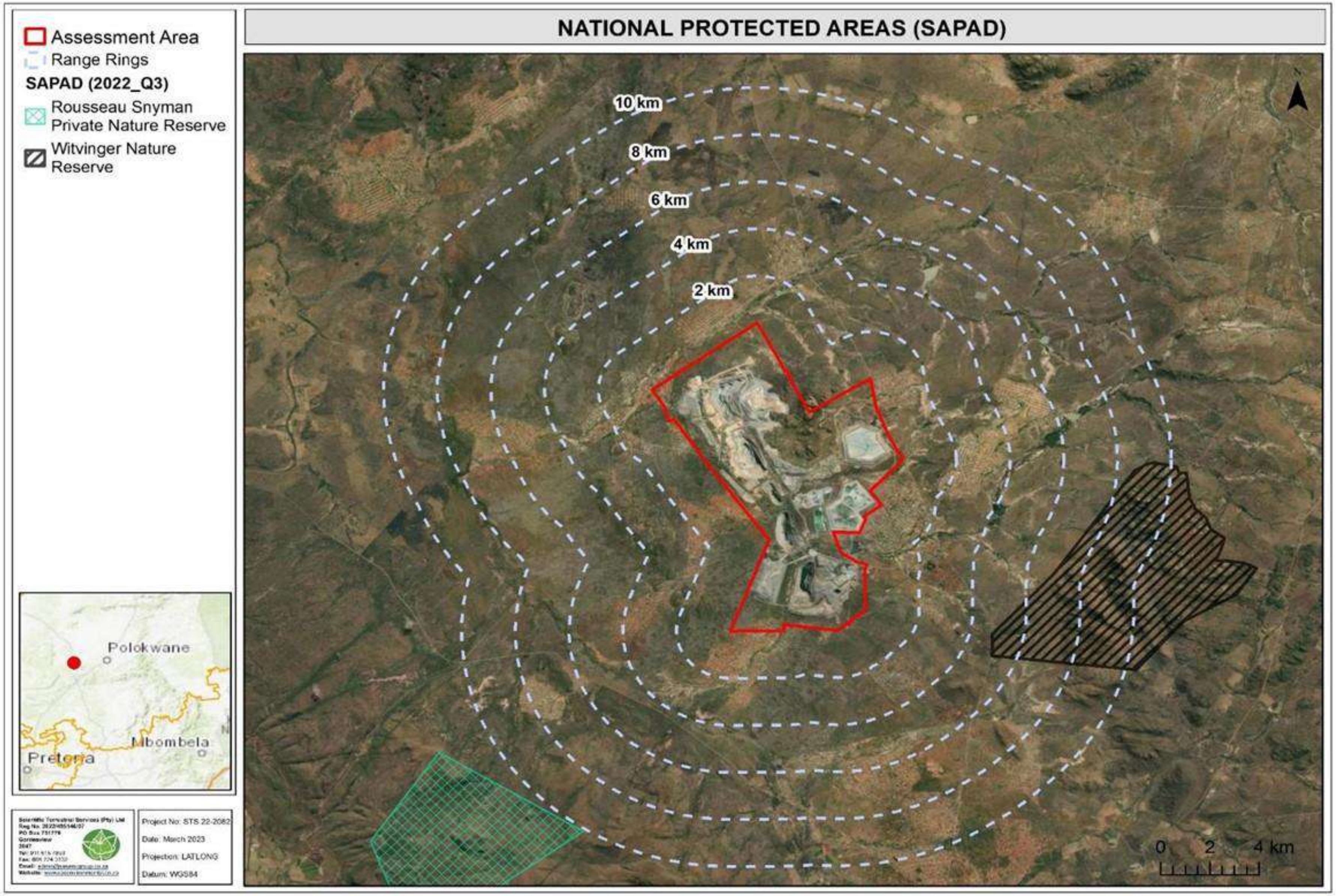


Figure 7-8: National Protected Areas (STS, 2023)

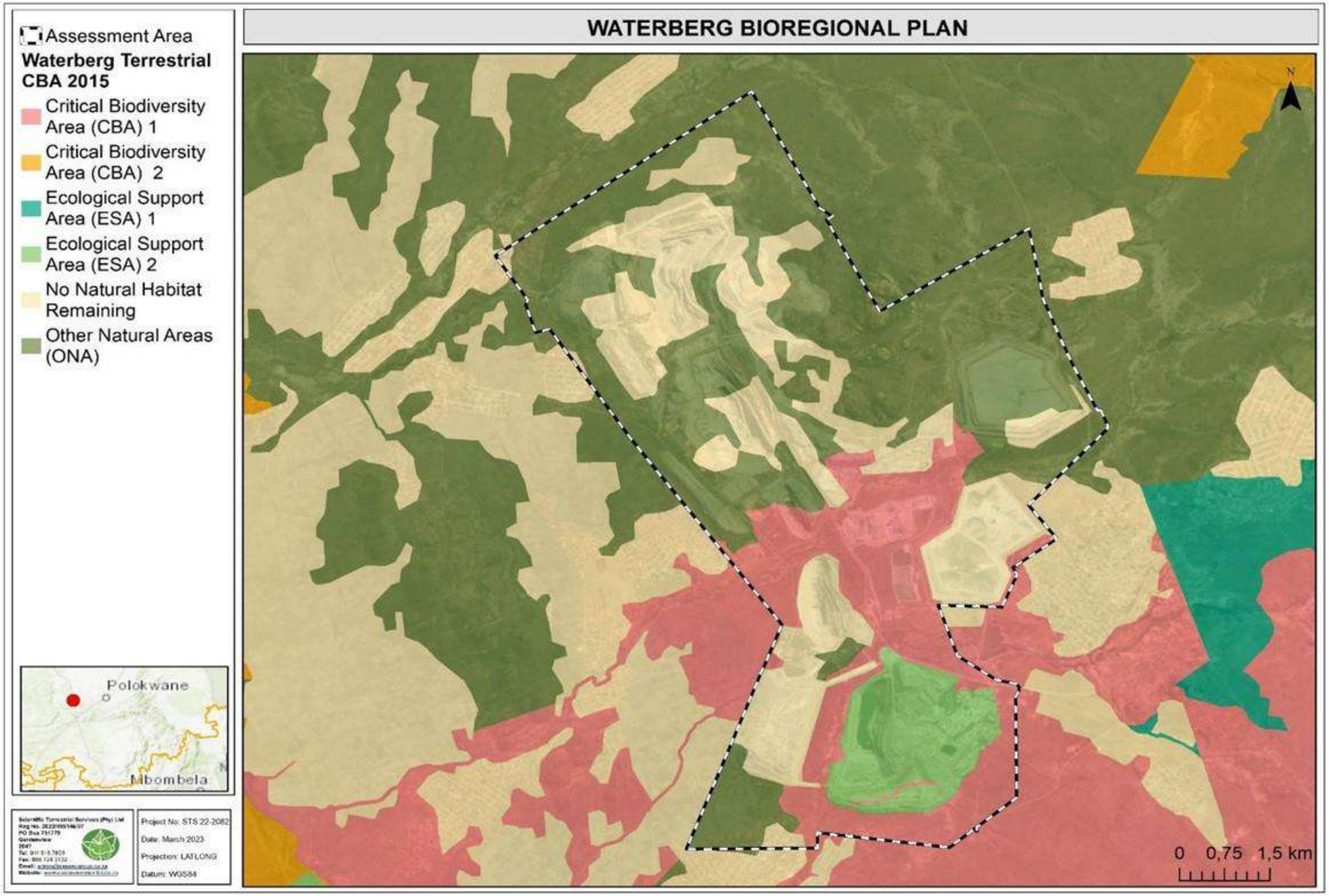


Figure 7-9: Waterberg Bioregion Plan (STS, 2023)

Five broad habitat units were distinguished for the site. These are further explained within Table 7-4 and this section. Figure 7-10 below shows where each habitat unit is located in relation to MM. Figure 7-11 to Figure 7-18 indicates the location of the proposed infrastructure in relation to the identified habitat units.

6. Bushveld Habitat
7. Freshwater Habitat
8. Erosion Gulley Habitat
9. Rock Habitat
10. Transformed Habitat

7.4.1.1 Bushveld Habitat

This habitat is characterised by bushveld vegetation (i.e., areas dominated by low-growing thorn trees and shrubs) in varying stages of recovery (recovery from impacts such as historic mining activities, excavations, etc) and habitat integrity. This habitat comprises of three subunits, namely Mixed Bushveld, Degraded Bushveld, and Secondary Bushveld. These habitats are located in small sections throughout the mining area as indicated in Figure 7-10.

Sections of the Bushveld habitat are located within the following biodiversity features:

Critical Biodiversity Area 1 (CBA):

Mixed Bushveld:
Although the Mixed Bushveld is subject to grazing pressures (in areas where the surrounding communities have access, e.g., the north WRD) and other anthropogenic influences (e.g., wood harvesting, etc), given that:

1. the habitat is representative of the reference vegetation type and
2. the habitat is in an overall good ecological condition and thus connective corridors (e.g., dispersal corridors) are largely intact,

the presence of functioning CBA 1 habitat (albeit somewhat modified) within the Mixed Bushveld Habitat was confirmed.

Degraded & Secondary Bushveld:
Given

1. the level of encroachment (particularly within the Degraded Bushveld) and degree of anthropogenic influences (e.g., AIP proliferation, mining edge effects, etc. particularly in the Secondary Bushveld),
2. the overall poor ecological condition, and
3. the lack of similarity (i.e., representation) of the reference vegetation type,

neither, the Degraded Bushveld nor the Secondary Bushveld habitats are anticipated to provide suitable sites that would be able to meet biodiversity pattern and / or ecological processes targets. These habitats are thus not considered to provide intact CBA 1 habitat.

Ecological Support Area 2 (ESA):

Mixed Bushveld:
Given the overall good ecological condition of this habitat, its ability to contribute to ecological processes (including habitat connectivity) is evident. The presence of intact ESA2 habitat in areas that overlap the Mixed Bushveld habitat is thus supported.

Degraded & Secondary Bushveld:
Both habitats are in a poor ecological state and are largely fragmented across the landscape. As such, the presence of functioning ESA2 habitat within areas that overlap with the Degraded and Secondary Bushveld is not supported.

7.4.1.2 Freshwater Habitat

This habitat is characterised by species that have an affinity for wetter conditions. The Freshwater Habitat consisted of three components, namely:

1. Riparian Habitat

2. Ephemeral Drainage Line features and a Wet Response area (grouped together because of similar vegetation characteristics).
3. Seep Wetlands

These habitats are located in small sections throughout the mining area as indicated in Figure 7-10.

Sections of the Freshwater habitat are located within the following biodiversity features:

Critical Biodiversity Area 1 (CBA):

Freshwater Habitat (Riparian Habitat and associated tributaries):
The riparian habitat largely overlaps with CBA habitat. Although the Riparian Habitat has been subject to anthropogenic influences (e.g., AIP proliferation, edge effects, etc), given that

1. the habitat provides unique habitat within the greater landscape,
2. the habitat is considered a watercourse as per the NWA, and
3. the habitat is in an overall good to fair ecological condition and thus connective corridors (e.g., dispersal corridors) are largely intact,

the presence of functioning CBA 1 habitat (albeit somewhat modified) within the Riparian Habitat was confirmed.

Ecological Support Area 2 (ESA):

Freshwater Habitat
Given that this habitat is in an overall good to fair ecological state, and that the habitat provides unique habitat within the landscape, its ability to maintain and contribute to ecological functions (including habitat connectivity, regulating services, and habitat resilience) and thus support CBAs is apparent. Specifically, the Seep Wetlands and the Ephemeral Drainage Line (and associated Wet Response Areas)) are considered to provide intact (albeit impacted from some anthropogenic influences, e.g., AIP proliferation) ES2 habitat.

7.4.1.3 Erosion Gulley Habitat

This habitat is characterised by very loose, sandy soils that are associated with the periphery of the Freshwater Habitat. This habitat is located in small sections throughout the mining area as indicated in Figure 7-10.

Sections of the Erosion Gully habitat are located within the following biodiversity features:

Critical Biodiversity Area 1 (CBA):

Erosion Gulley Habitat:
Although the Erosion Gulley has experienced some anthropogenic impacts (e.g., mining edge effects), given that

1. the habitat is in an overall fair to good ecological condition, and
2. given the location of the habitat along the periphery of the Freshwater Habitat, the presence of connective corridors (e.g., dispersal corridors) are apparent.

Thus, the presence of functioning CBA 1 habitat (albeit somewhat modified from AIP proliferation and mining edge effects) within the Erosion Gulley Habitat was confirmed.

7.4.1.4 Rocky Habitat

This habitat is characterised by a high incidence of (natural) rock within the landscape. The habitat is characterised by more specialised species that have an affinity for rockier conditions. This habitat is located in small sections throughout the mining area as indicated in Figure 7-10.

Sections of the Rocky habitat are not located within any biodiversity features.

7.4.1.5 Transformed Habitat

This habitat is associated with built-up areas within the site (i.e., current mining areas or areas where significant modification has occurred, rendering the environment largely barren and unproductive). This habitat is scattered throughout the site, and typically represented in large extents as indicated in Figure 7-10. No suitable habitat for Species of Conservation Concern (SCC) is available within this habitat attributed to the significant transformed nature thereof. Given the nature of this habitat, no further discussions will be provided.

Table 7-4: Terrestrial Biodiversity – Habitat Units across the entire mining right area

Unit No.	Description	Characterisation / Structure	Dominant Species (Woody Layer)	Dominant Species (Herbaceous Layer)	Dominant Species (Grassy Layer)	Alien Invasive Species	Species of Conservation Concern	Protected Trees	Threatened or Protected Species (TOPS)
1.1	**Mixed Bushveld** Area: ~299 Ha Species richness: Moderate Ecological State: Natural or near natural Vegetation Structure: Short-tall, semi-open bushveld AIP Proliferation: Not prominent	• Well developed woody layer; and • Moderately well developed to poorly developed grass layer.	Mix microphyllous species: • *Dichrostachys cinerea* • *Ormocarpum trichocarpum Vachellia karroo* • *Vachellia permixta* Broad-leaf woody species: • *Combretum mole* • *Combretum zeyheri* • *Grewia flavescens* • *Grewia flava Searsia lancea, Vangauria infausta* • *Ziziphus mucronate*	Forb and herb species • *Abutilon angulatum subsp. Angulatum* • *Harpagophytum zeyheri subsp. Zeyheri* • *Indigophera sp., Kyphocarpa angustifolia* • *Polygala hottentotta* • *Senna italica subsp. Arachioides* • *Zornia glochidiata* Succulent species: • *Aloe marlothii* • *Euphorbia ingens* • *Kalanchoe brachyloba* • *Sansevieria aethiopica*	• *Aristida congesta subsp. Congesta* • *Brachiaria nigropedata* • *Digitaria eriantha* • *Eragrostis rigidior* • *Heteropogon contortus* • *Melinis repens* • *Panicum maximum* • *Urochloa mosambicensis*	• *Tagetes minuta* • *Bidens Pilosa* • *Hibiscus trionum* • *Zinnia peruviana* • *Opuntia ficus-indica* • *Agave sisalana*	• *Huernia spp* • *Scadoxus puniceus* • *Orbea spp.* • *Stapelia spp.* • *Boscia foetida subsp. minima*	• *Boscia albitrunca* • *Sclerocarya birrea subsp. caffra* • *Combretum imberbe* • *Elaeodendron transvaalense* • *Vachellia erioloba*	• *Harpagophytum zeyheri subsp. zeyheri* • *Harpagophytum procumbens*
1.2	**Degraded Bushveld** Area: ~669 Ha Species richness: Moderately low Ecological State: Poor Vegetation Structure: Short closed bushveld AIP Proliferation: Fairly prominent	• Well developed woody layer; and • Poorly developed grass layer.	• *Dichrostachys cinerea* • *Combretum apiculatum* • *Grewia flava* • *Senegalia erubescens* • *Vachellia gerrardii* • *Ziziphus mucronata;*	Forb and herb species • *Chamaecrista absus* • *Geigeria burkei* • *Harpagophytum zeyheri subsp. Zeyheri* • *Leonotis sexdentata* • *Tephrosa sp.* Succulent species: • *Aloe marlothii* • *Euphorbia ingens* • *Stapelia gigantea*	• *Aristida congesta subsp. Barbicollisis* • *Brachiaria nigropedata* • *Eragrostis rigidior* • *Eragrostis trichophora* • *Heteropogon contortus* • *Melinis repens* • *Panicum maximum*	• *Agave sisalana* • *Bidens Pilosa* • *Cereus jamacaru* • *Opuntia ficus-indica* • *Schkuhria pinnata* • *Tagetes minuta* • *Xanthium strumarium* • *Zinnia peruvian*	• *Stapelia spp* • *Huernia spp* • *Orbea spp.* • *Boscia foetida subsp. minima* • *Spirostachys african a*	• *Sclerocarya birrea subsp. caffra* • *Combretum imberbe* • *Vachellia erioloba*	• *Harpagophytum zeyheri subsp. zeyheri* • *Harpagophytum procumbens*
1.3	**Secondary Bushveld** Area: ~204 Ha Species richness: Low Ecological State: Poor Vegetation Structure: Short sparse to open bushveld AIP Proliferation: Prominent	• Poorly developed woody layer; and • Well developed grass layer.	• *Euclea undulata, Dichrostachys cinerea* • *Gomphocarpus fruticosus* • *Mundelea sericea* • *Searsia lancea* • *Vachellia karroo*	• *Dicerocaryum senecioides* • *Dicoma tomentosa* • *Laggera decurrens* • *Senna italica subsp. Arachioides* • *Zornia glochidiala* Succulent species: • *Aloe marlothii* • *Sanservieria aethiopica*	• *Heteropogon contortus* • *Digitaria eriantha* • *Panicum maximum* • *Brachiaria nigropedata* • *Aristida stipitate* • *Tragus berteronianus* • *Melinis repens*	• *Agave sisalana* • *Bidens Pilosa* • *Cereus jamacaru* • *Opuntia ficus-indica* • *Schkuhria pinnata* • *Tagetes minuta* • *Xanthium strumarium* • *Zinnia peruvian*	*None*	• *Sclerocarya birrea subsp. caffra*	• *Harpagophytum zeyheri subsp. zeyheri* • *Harpagophytum procumbens*
2.1	**Freshwater Habitat** Area: ~44 Ha Ecological State: Good – Fair **Seep Wetlands** Species richness: Moderate Ecological State: Fair Vegetation Structure: Moist, short to tall open grassland AIP Proliferation: Not prominent	• Well structured Graminoid Later	• *Seasrisa lancea* • *Ziziphus mucronata*	• *Craterostigma plantagineum* • *Waltheria indica*	• *Cyperus laevigatus* • *Cyperus sexangularis* • *Eragrostis lehmanniana* • *Schizachyrium jeffreysii* • *Sporobolus africanus*	• *Bidens Pilosa* • *Schkuhria pinnata* • *Tagetes minuta* • *Xanthium strumarium*	*None*	*None*	*None*
2.2	**Riparian Habitat** Species richness: Moderate to moderately high Ecological State: Good Vegetation Structure: tall, semi-open to closed woodland	• Poorly developed graminoid and succulent layers; and • Denser woody vegetation communities	• *Carissa bispinosa* • *Celtis Africana* • *Dodonaea viscosa* • *Euclea crispa* • *Olea europaea subsp. Africana* • *Seasrisa leptodictya* • *Vitex cf. rehmannii*	• *Blepharis subvolubilis subsp. Subvolubilis* • *Dicoma tomentosa* • *Kyphocarpa angustifolia*	• *Bothriochloa insculpta* • *Chloris virgata* • *Eragrostis lehmanniana* • *Fingerhuthia Africana* • *Melinis repens*	• *Argemone ochroleuca* • *Bidens Pilosa* • *Tagetes minuta* • *Xanthium strumarium* • *Zinnia peruviana*	• *Orchidaceae Family* • *Scadoxus puniceus* • *Boscia foetida subsp. minima* • *Riocreuxia spp.* • *Spirostachys african a*	• *Elaeodendron transvaalense* • *Pittosporum viridiflorum*	*None*

Unit No.	Description		Characterisation / Structure	Dominant Species (Woody Layer)	Dominant Species (Herbaceous Layer)	Dominant Species (Grassy Layer)	Alien Invasive Species	Species of Conservation Concern	Protected Trees	Threatened or Protected Species (TOPS)
		AIP Proliferation: Moderate – moderately low		• *Ziziphus mucronata*		• *Phragmites australis* • *Sporobolus africanus* • *Triraphis andropogonoides* • *Typha capensis*				
2.3		**Ephemeral Drainage Lines and Wet Response Area** Species richness: Moderate Ecological State: Good - Fair Vegetation Structure: AIP Proliferation: Not prominent	• Weakly-defined riparian habitat	Mix microphyllous species: • *Dichrostachys cinerea* • *Ormocarpum trichocarpum* • *Vachellia karroo* Broad-leaf woody species: • *Combretum zeyheri* • *Grewia flavescens* • *Grewia flava* • *Searsia lancea* • *Ziziphus mucronata*	Forb and herb species • *Abutilon angulatum subsp. Angulatum* • *Harpagophytum zeyheri subsp. Zeyheri* • *Indigophera sp.* • *Kyphocarpa angustifolia* • *Polygala hottentotta* • *Senna italica subsp. Arachioides* • *Zornia glochidiata* Succulent species: • *Aloe marlothii* • *Euphorbia ingens* • *Kalanchoe brachyloba* • *Sansevieria aethiopica*	• *Aristida congesta subsp. Congesta* • *Brachiaria nigropedata* • *Digitaria eriantha* • *Eragrostis rigidior* • *Heteropogon contortus* • *Melinis repens* • *Panicum maximum* • *Urochloa mosambicensis*	• *Tagetes minuta* • *Bidens Pilosa* • *Hibiscus trionum* • *Zinnia peruviana* • *Opuntia ficus-indica* • *Agave sisalana*	• *Orchidaceae Family* • *Scadoxus puniceus* • *Boscia foetida subsp. minima* • *Spirostachys African a*	• *Elaeodendron transvaalense*	*None*
3	**Erosion Gully Habitat** Area: ~4 Ha Species richness: Moderate low Ecological State: Fair - Good Vegetation Structure: Short sparse shrubland AIP Proliferation: Not prominent		• Steep-sided erosion gulley's consisting of very loose, sandy soils	• *Boscia albitrunca* • *Carissa bispinosa* • *Diospyros lycoides subsp. Lycoides* • *Dodonaea viscosa* • *Euclea crispa*	• *Blepharis subvolubilis subsp. Subvolubilis* • *Dicerocaryum senecioides* • *Geigeria burkei* • *Polygala hottentotta* Succulent species: • *Huernia spp.* • *Kalanchoe thyrsiflora*	• *Aristida congesta subsp. Congesta* • *Aristida stipitate* • *Eragrostis rigidior* • *Fingerhuthia africana*	• *Tagetes minuta* • *Bidens Pilosa*	• *Huernia spp.* • *Orbea spp* • *Stapelia spp* • *Boscia foetida subsp. minima* • *Spirostachys African a*	• *Boscia albitrunca* • *Elaeodendron transvaalense*	• *Harpagophytum zeyheri subsp. zeyheri*
4	**Rocky Habitat** Area: ~5 Ha Species richness: Moderately High Ecological State: Good Vegetation Structure: Short, closed to open woodland AIP Proliferation: Rarely recorded		• Low and high lying rocky areas	• *Combretum mole* • *Combretum zeyheri* • *Englerophytum magaliesmontanum* • *Ficus cf. glumosa* • *Mundelea sericea* • *Pappea capensis* • *Searsia leptodictya* • *Strychnos madagascarensis* • *Tetradenia riparia*	• *Aptosimum lineare* • *Blepharis subvolubilis subsp. Subvolubilis* • *Dicoma tomentosa* • *Geigeria burkei* • *Leonotis nepetifolia var. nepetifolia* Succulent species: • *Avonia rhodesica* • *Aloe greatheadii* • *Aloe marlothii* • *Kleinia longiflora*	• *Aristida congesta subsp. Barbicollis* • *Aristida stipitate* • *Brachiaria nigropedata* • *Cymbopogon caesius* • *Fingerhuthia Africana* • *Heteropogon contortus*	• *Bidens Pilosa* • *Tagetes minuta* • *Zinnia peruviana.*	• *Avonia rhodesica* • *Huernia spp.* • *Stapelia spp.* • *Orbea spp.;* • *Boscia foetida subsp. minima;* • *Scadoxus puniceus* • *Spirostachys African a*	• *Sclerocarya birrea subsp. caffra* • *Boscia albitrunca* • *Erythrophysa transvaalensis* • *Combretum imberbe* • *Elaeodendron transvaalense*	*None*

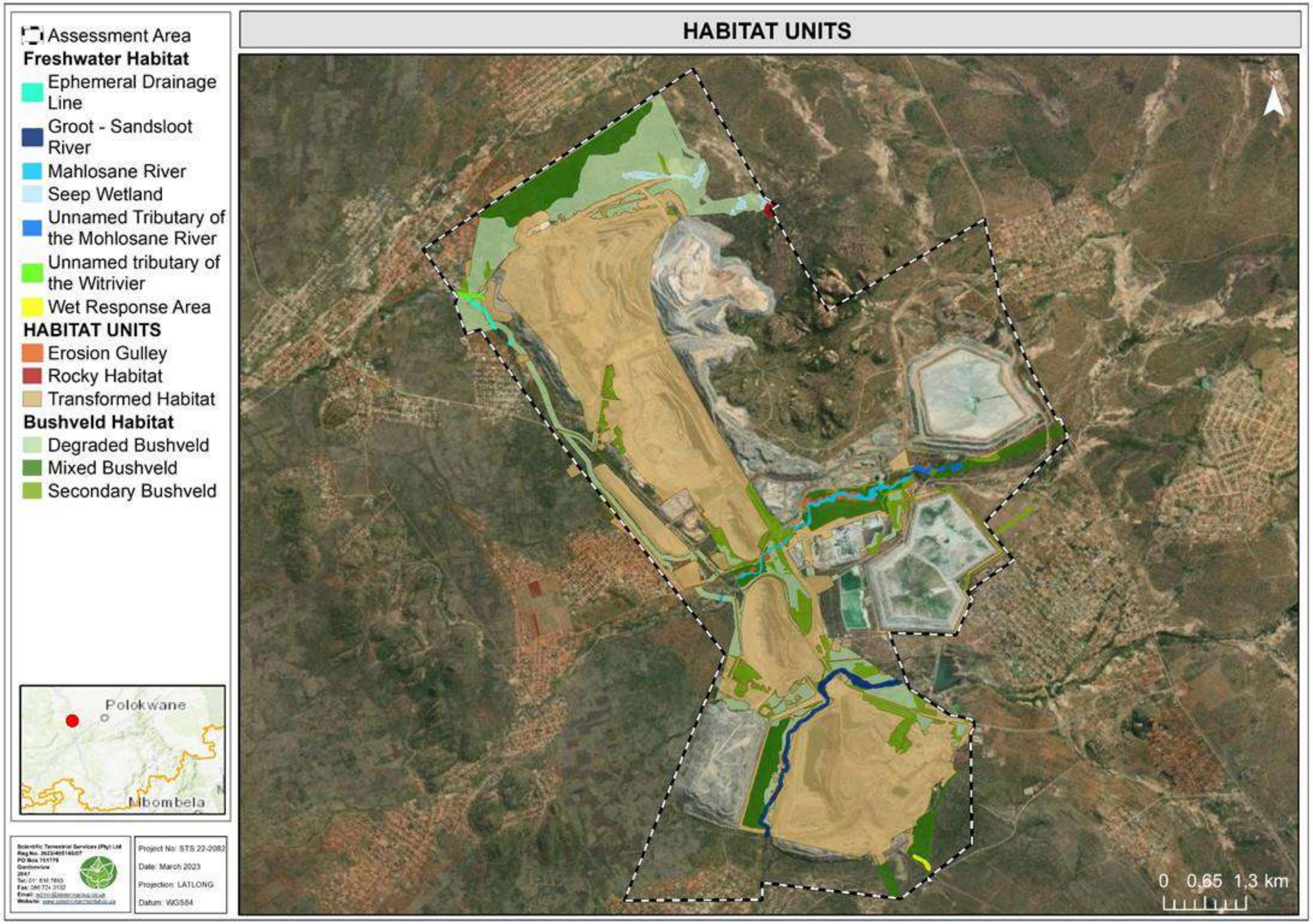


Figure 7-10: Conceptual illustration of the habitat units associated with MM (STS, 2023)

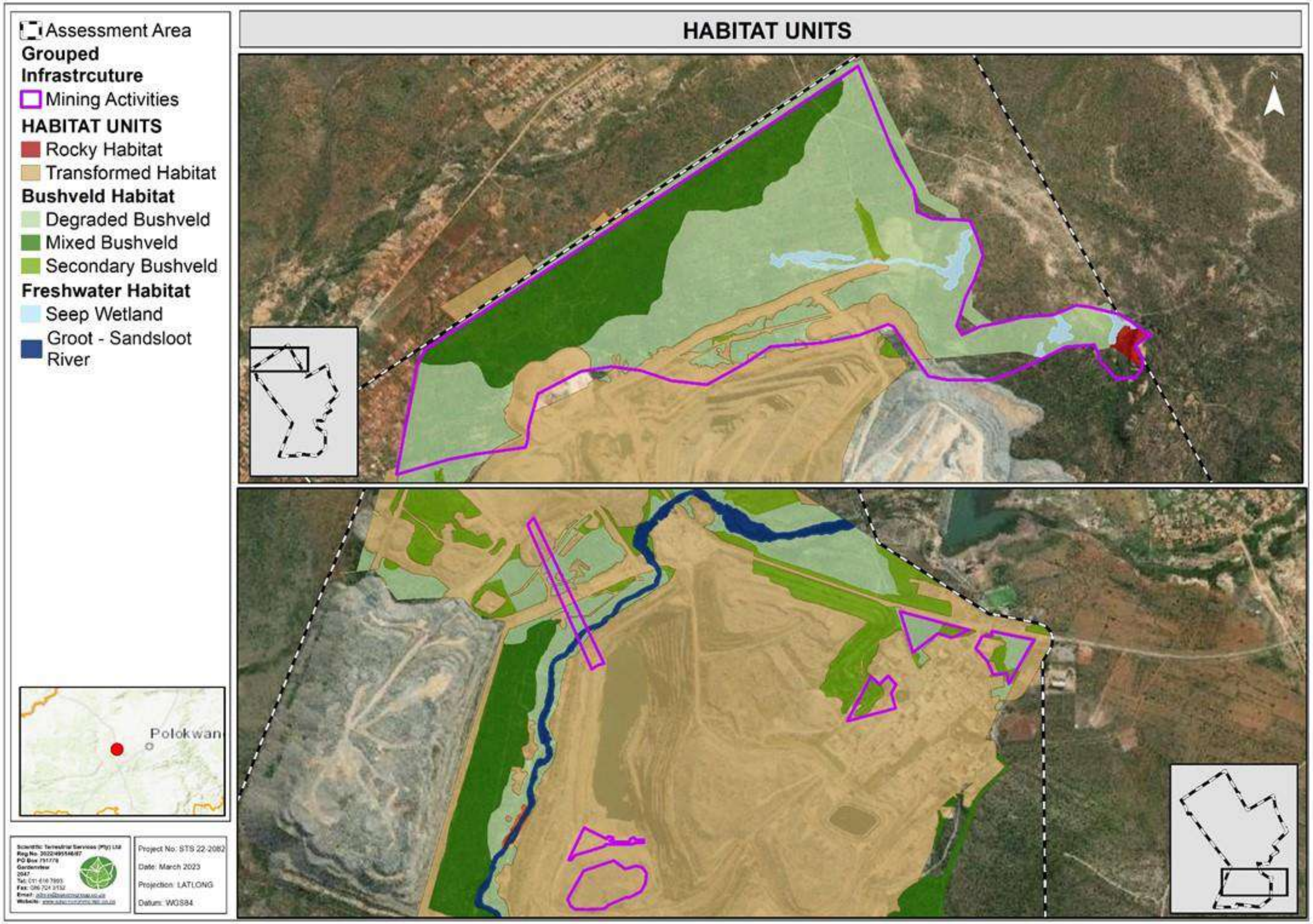


Figure 7-11: Conceptual illustration of the habitat units associated with the proposed mining activities within the focus area (STS, 2023).

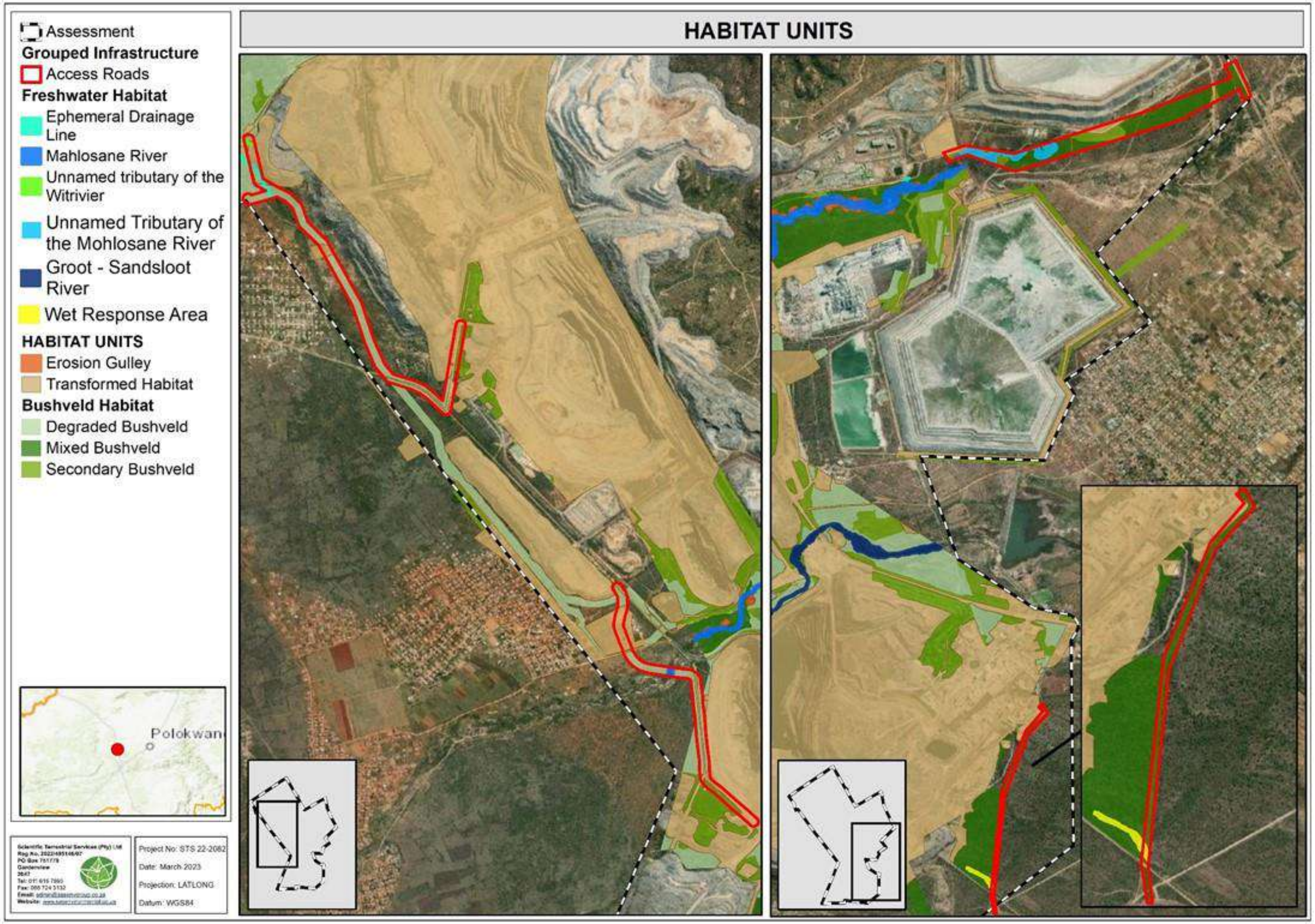


Figure 7-12: Conceptual illustration of the habitat units associated with the proposed access road development within the focus area (STS, 2023).

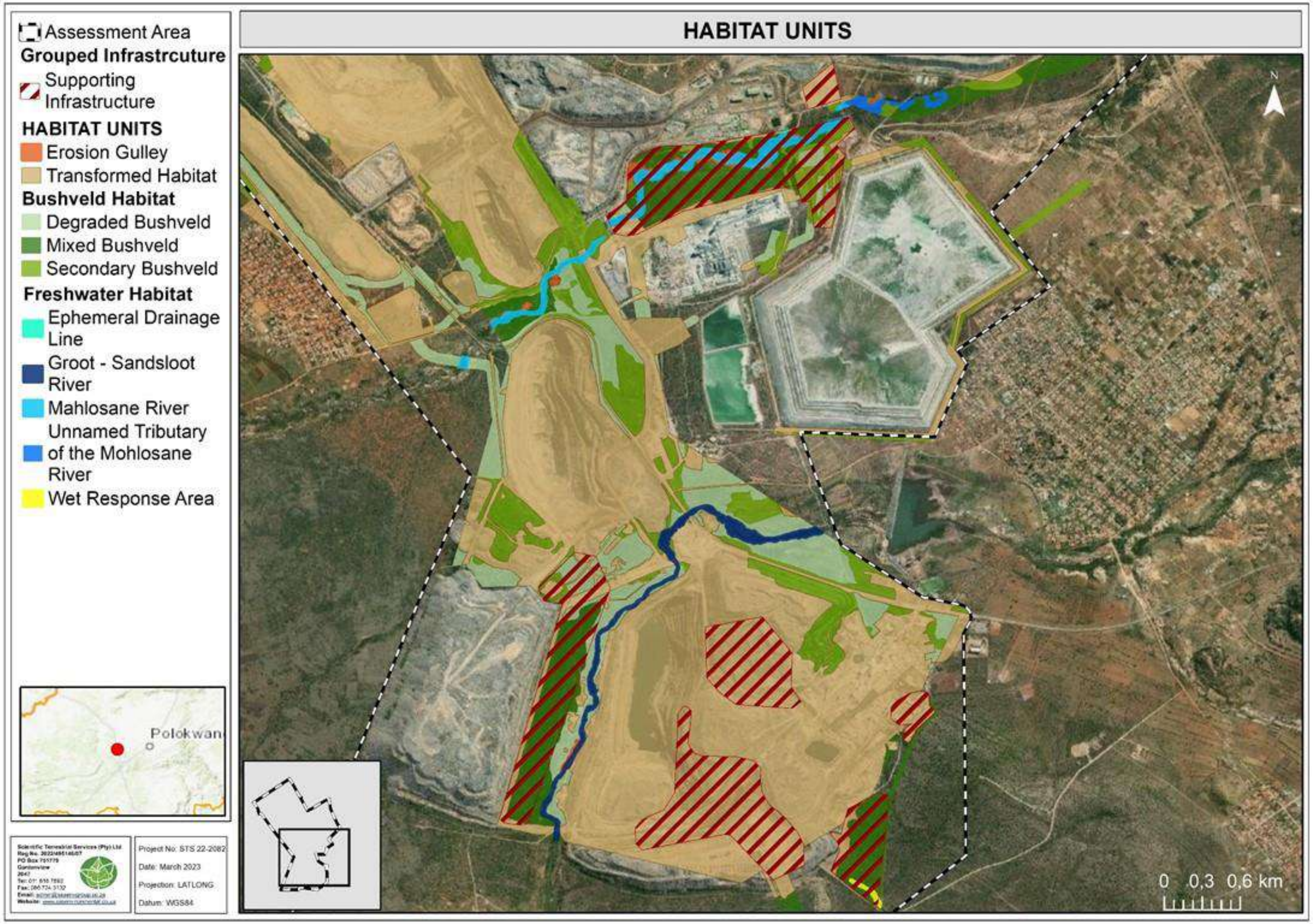


Figure 7-13: Conceptual illustration of the habitat units associated with the proposed supporting infrastructure development within the focus area (STS, 2023).

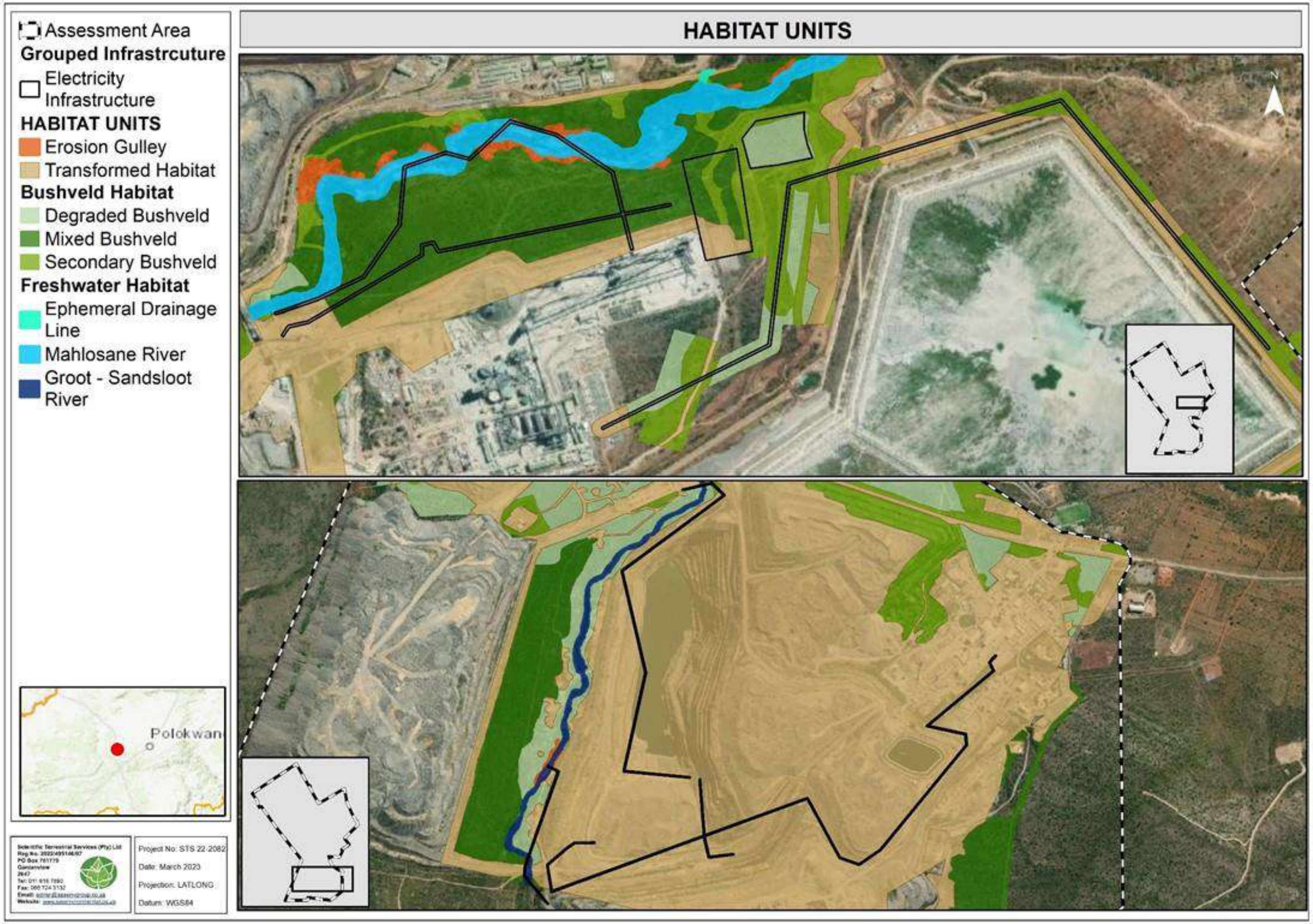


Figure 7-14: Conceptual illustration of the habitat units associated with the proposed electricity infrastructure development within the focus area (STS, 2023).

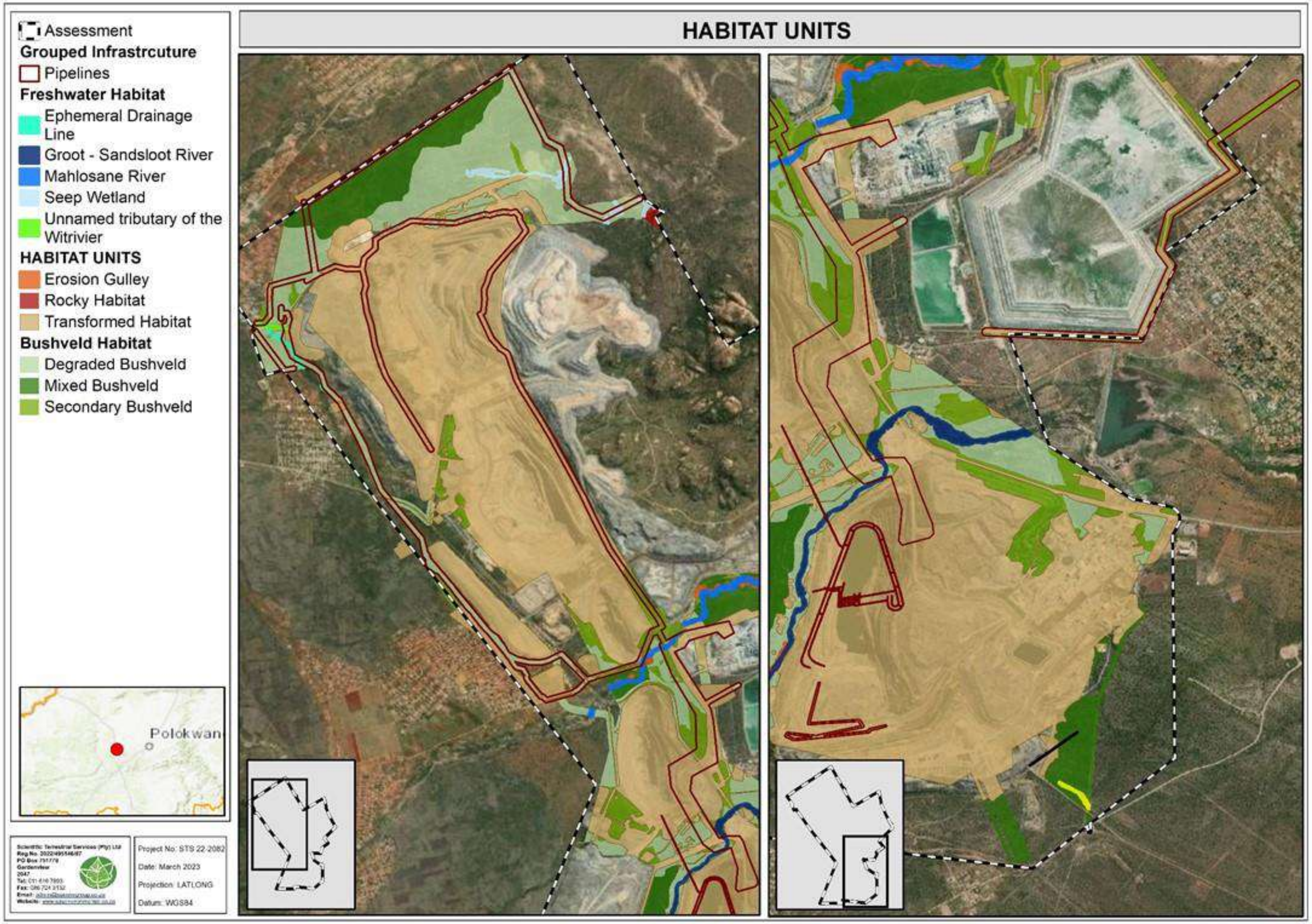


Figure 7-15: Conceptual illustration of the habitat units associated with the proposed pipeline development within the focus area (STS, 2023).

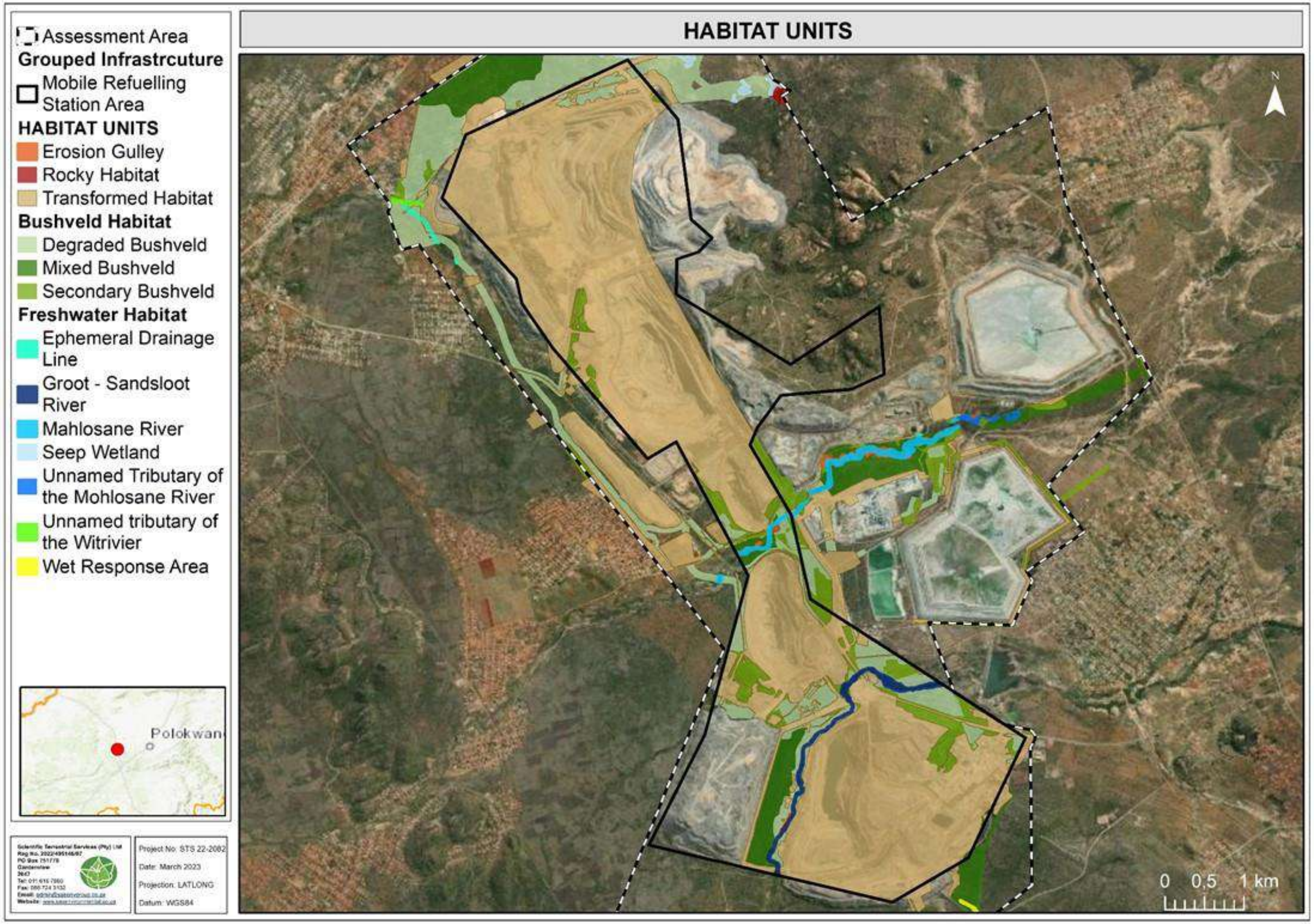


Figure 7-16: Conceptual illustration of the habitat units associated with the proposed refuelling stations within the focus area (STS, 2023).

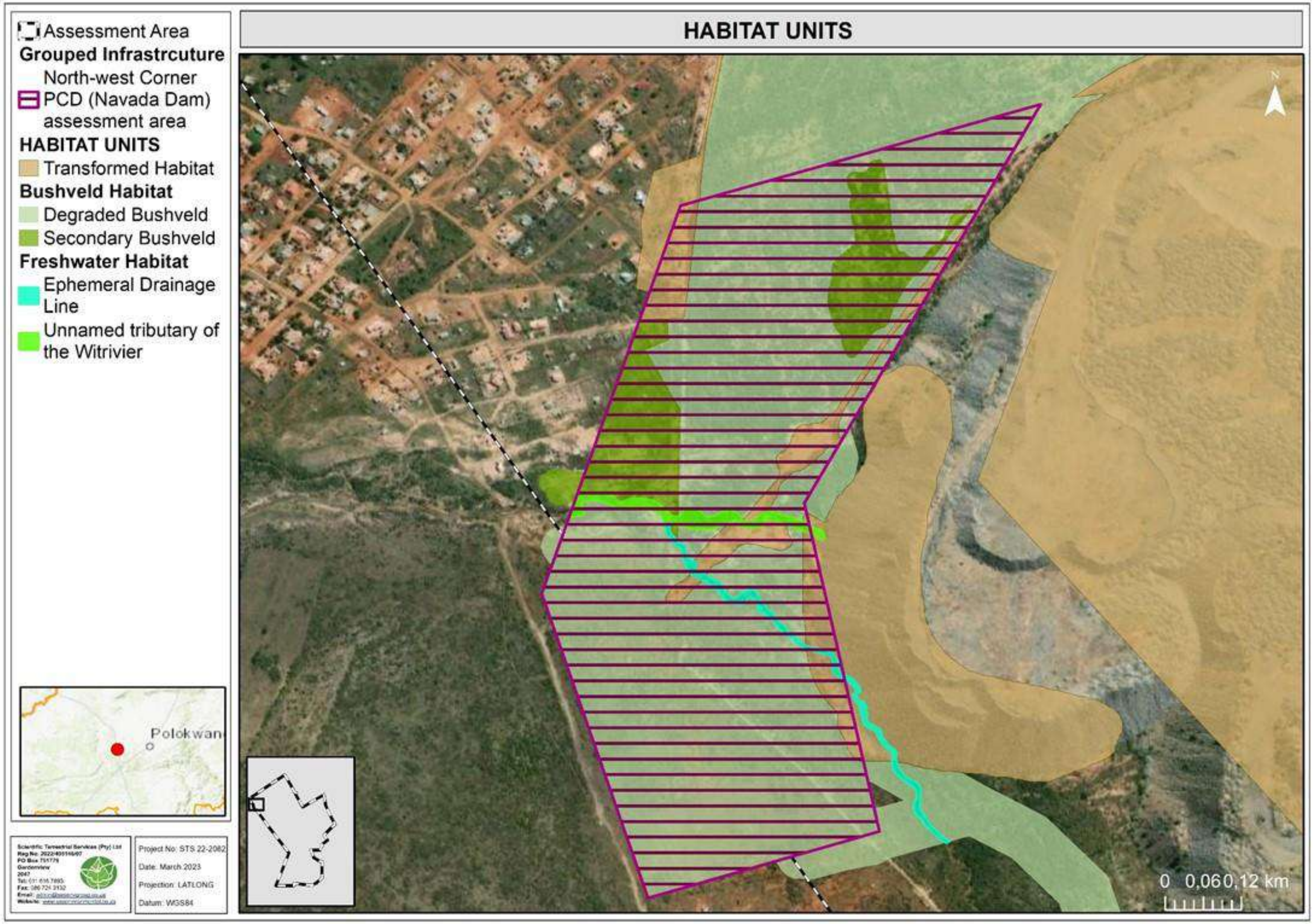


Figure 7-17: Conceptual illustration of the habitat units associated with the proposed stormwater control dam within the focus area (STS, 2023).

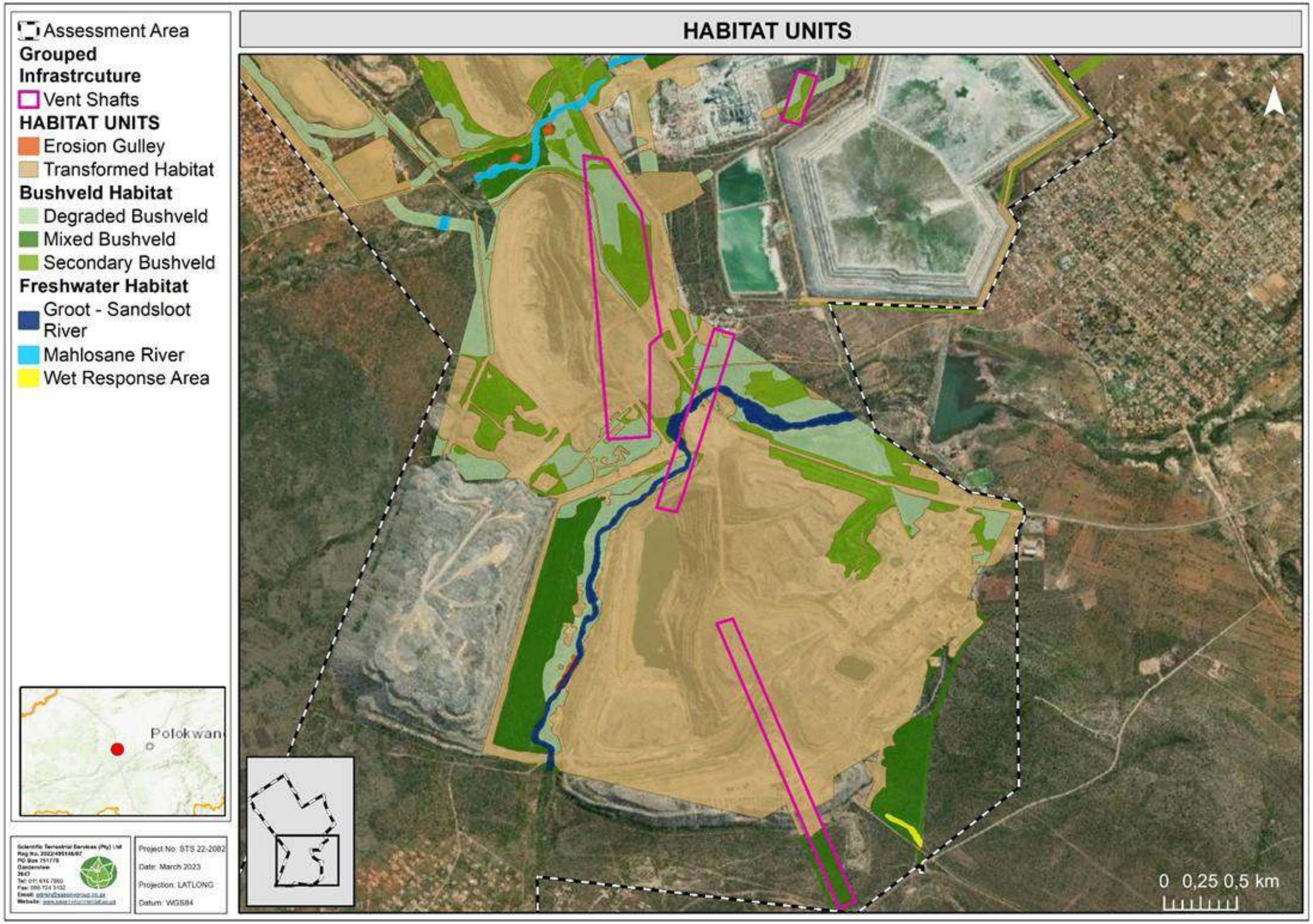


Figure 7-18: Conceptual illustration of the habitat units associated with the proposed ventilation shafts within the focus area (STS, 2023).

7.4.2 Fauna

Due to the existing mining activities being undertaken on the Surface Lease Area, all available natural faunal habitats have been altered with minimal animal life moving on the mining area apart from avifaunal species. The results of the Fauna assessment undertaken are highlighted in Table 7-5. Faunal sensitivity maps can be found in Figure 7-19 to Figure 7-27.

Table 7-5: Terrestrial Biodiversity – Faunal Species (STS, 2023)

Fauna Species	Associated Habitat Units	Possible Threats in the area	Species Identified	Species of Conservation Concern (SCC)	Other Information

<u>Mammals</u>
 	
<u>Diversity of Fauna Species:</u> Intermediate
	• Bushveld Habitat
	  ○ Degraded Bushveld
	  ○ Mixed Bushveld
	• Freshwater Habitat
	• Rocky Habitat
		• The close proximity of existing informal settlements poses a major threat and deterrent to most wildlife and would play a significant role (alongside habitat loss due to mining activities) in limiting overall mammal abundance and diversity levels.
		• Snares and hunting dogs
		• Poaching and hunting
		• Overgrazing
			• *Paraxerus cepapi* (Tree squirrel)
			• *Aepyceros melampus* (Impala)
			• *Atilax paludinosus* (Water Mongoose)
			• *Tragelaphus sylvaticus (Bushbuck).*
			• *Hystrix africaeaustralis* (Cape Porcupine)
			• *Lupulella mesomelas* (Black-backed Jackal)
			• *Lepus saxatilis* (Scrub Hare)
			• *Raphicerus campestris* (Steenbok)
			• *Sylvicapra grimmia* (Grey Duiker)
			• Cattle
			• Goats
			• Sheep
				<u>Observed:</u>
				• No mammalian SCC were observed.
				<u>Other possible SCC:</u>
				• *Parahyaena brunnea* (Brown Hyaena)
				• *Panthera pardus* (Leopard)
				• *Felis lybica* (African Wild Cat)
				• *Leptailurus serval* (Serval)
				• *Dasymys robertsii* (Robert's Shaggy Rat)
				• *Crocidura maquassiensis* (Makwassie Musk Shrew)
				• *Rhinolophus blasii* (Blasius's Horseshoe Bat)
				• *Rhionolophus smithersi* (Smiters's Horseshoe Bat)
				• *Cloeotis percivali* (Short-eared Trident Bat)
					• Capacity to support large wild grazers: considerably reduced as limited grazing available.
					• Highly disturbed condition of most habitats in the area is observed due to mining and local community activities

<u>Avifauna</u> <u>Diversity of Fauna Species:</u> Intermediate	• Bushveld Habitat ○ Mixed Bushveld • Freshwater Habitat • Rocky Habitat	• The loss of the Rocky Habitat and Freshwater Habitat have the potential to impact on SCC species. • Decreased suitability of the habitat for foraging, due to some of the bush encroached areas creating an impenetrable screen.	• *Emberiza flaviventris* (Golden-breasted Bunting) • *Cinnyris talatala* (White-breasted Sunbird) • *Ciconia nigra* (Black Stork) • *Tockus leucomelas* (Yellow-billed Hornbill). • *Chrysococcyx caprius* (Diederik Cuckoo) • *Ardea cinerea* (Grey Heron) • *Falco rupicolus* (Rock Kestrel) • *Elanus caeruleus* (Black-winged Kite) • *Haliaeetus vocifer* (African Fish Eagle) • *Charadrius tricollaris* (Three-banded Plover) • *Microcarbo africanus* (Reed Cormorant) • *Halcyon senegalensis* (Woodlands Kingfisher) • *Ardeola ralloides* (Squacco Heron)	**<u>Observed:</u>** • *Ciconia nigra* (Black Stork) **<u>Other possible SCC:</u>** • *Buphagus erythrorynchus* (Red-Billed Oxpecker) • *Hydroprogne caspia* (Caspian Tern) • *Aquila verreauxii* (Verreaux's Eagle) • *Gyps africanus* (White Backed Vulture) • *Mycteria ibis* (Yellow-billed Stork) • *Sagittarius serpentarius* (Secretarybird) • *Podica senegalensis* (African Finfoot)	• Majority of avifaunal species observed were small insectivorous, granivorous and mixed feeders. • Highest abundance of avifauna was observed around the Freshwater habitat
<u>Herpetofauna</u> <u>Diversity of Fauna Species:</u> High	• Bushveld Habitat ○ Mixed Bushveld • Freshwater Habitat • Rocky Habitat	• Disturbance • Persecution due to conflict with humans • Food resources becoming limited • Development • Vegetation clearance	• *Acanthocercus atricollis* (Southern Tree Agama) • *Trachylepis margaritifera* (Rainbow Skink) • *Matobosaurus validus* (Giant Plated Lizard) • *Pachydactylus punctatus* (Pointed Thick-toed Gecko) • *Rhinotyphlops lalandei* (Delalande's Beaked Blind Snake) • *Schismaderma carens* (African Red Toad) • *Amietia delalandii* (Common River Frog) • *Pyxicephalus edulis* (African Bullfrog) • *Trachylepis varia* (Variable Skink)	**<u>Observed:</u>** • No herpetofauna SCC were observed. **<u>Other possible SCC:</u>** • *Kinixys lobatsiana* (Lobatse Hinged Tortoise) • *Homoroselaps dorsalis* (Striped Harlequin Snake) • *Pseudocordylus transvaalensis* (Northern Crag Lizard) • *Python natalensis* (Southern African Rock Python) • *Pyxicephalus adspersus* (Giant African Bullfrog)	• Highest abundance of herpetofauna was observed around the Freshwater and Rocky habitats
<u>Invertebrates</u> <u>Diversity of Fauna Species:</u> Intermediate	• Bushveld Habitat ○ Degraded Bushveld • Freshwater Habitat • Rocky Habitat	• Habitat degradation • Encroached bushveld	• *Cypholoba notata* (Ground Beetle) • *Graphipterus westwoodi* (Velvet Ground Beetle) • *Chalconotus convexus* (Plum Dung Beetle) • *Anax ephippiger* (Vagrant Emperor) • *Leucocelis amethystina* (Amethyst Small Fruit Chafer) • *Conchyloctenia hybrida* (Tortoise and Hispine Beetles) • *Stenaelurillus sp* (Jumping Spider) • *Uroplectes planimanus* (Orange Lesser-Thicktail Scorpion)	• No invertebrate SCC expected within the site area	• The degraded habitat and sub-optimal floral species composition limits insect diversity as suitable food resources are not readily available. • Dominant orders observed throughout the site were *Coleoptera* (Beetles), *Lepidoptera* (moths and butterflies) and *Orthoptera* (Grasshoppers and Crickets)

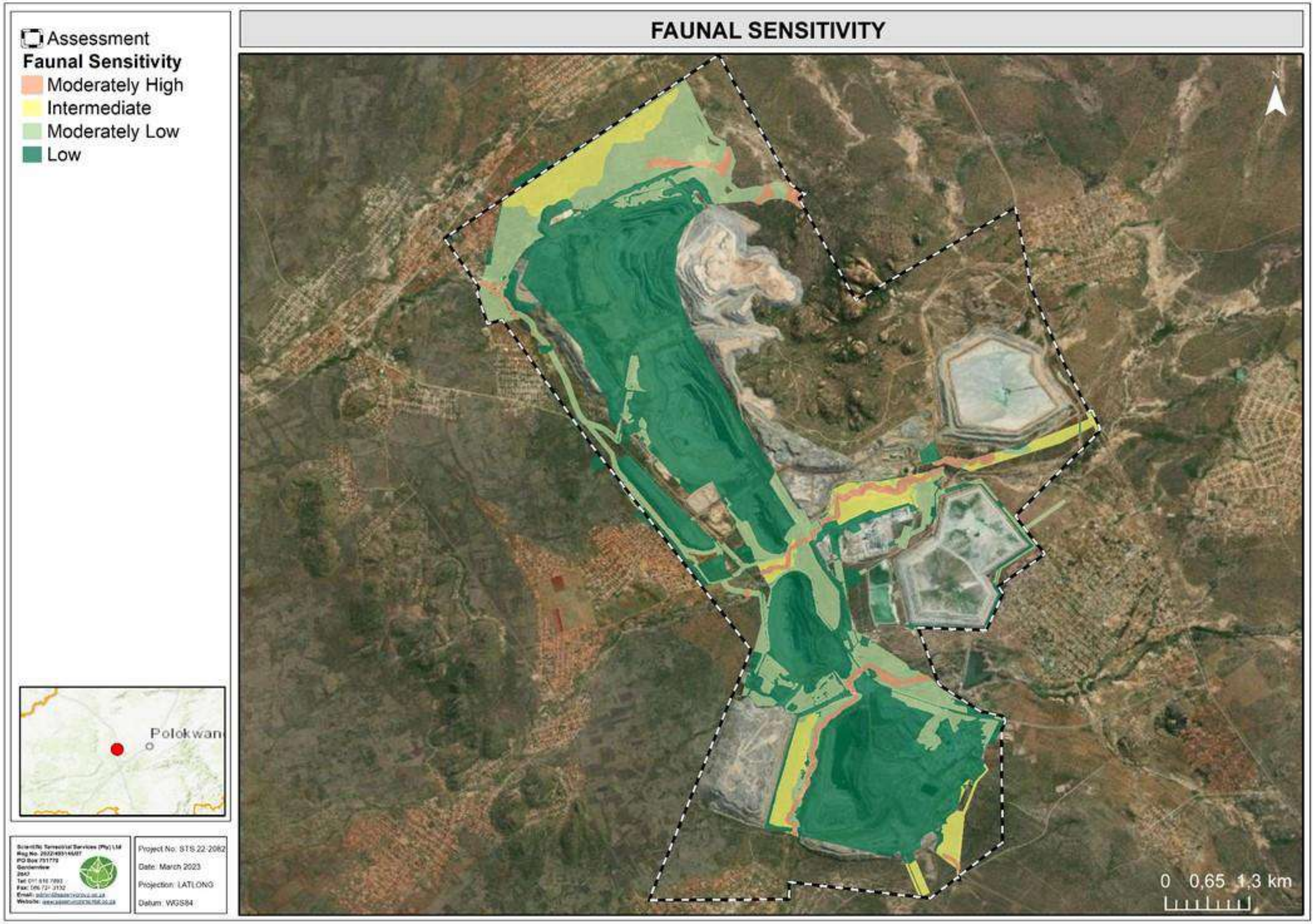


Figure 7-19: Habitat Faunal Sensitivity Map (STS, 2023)

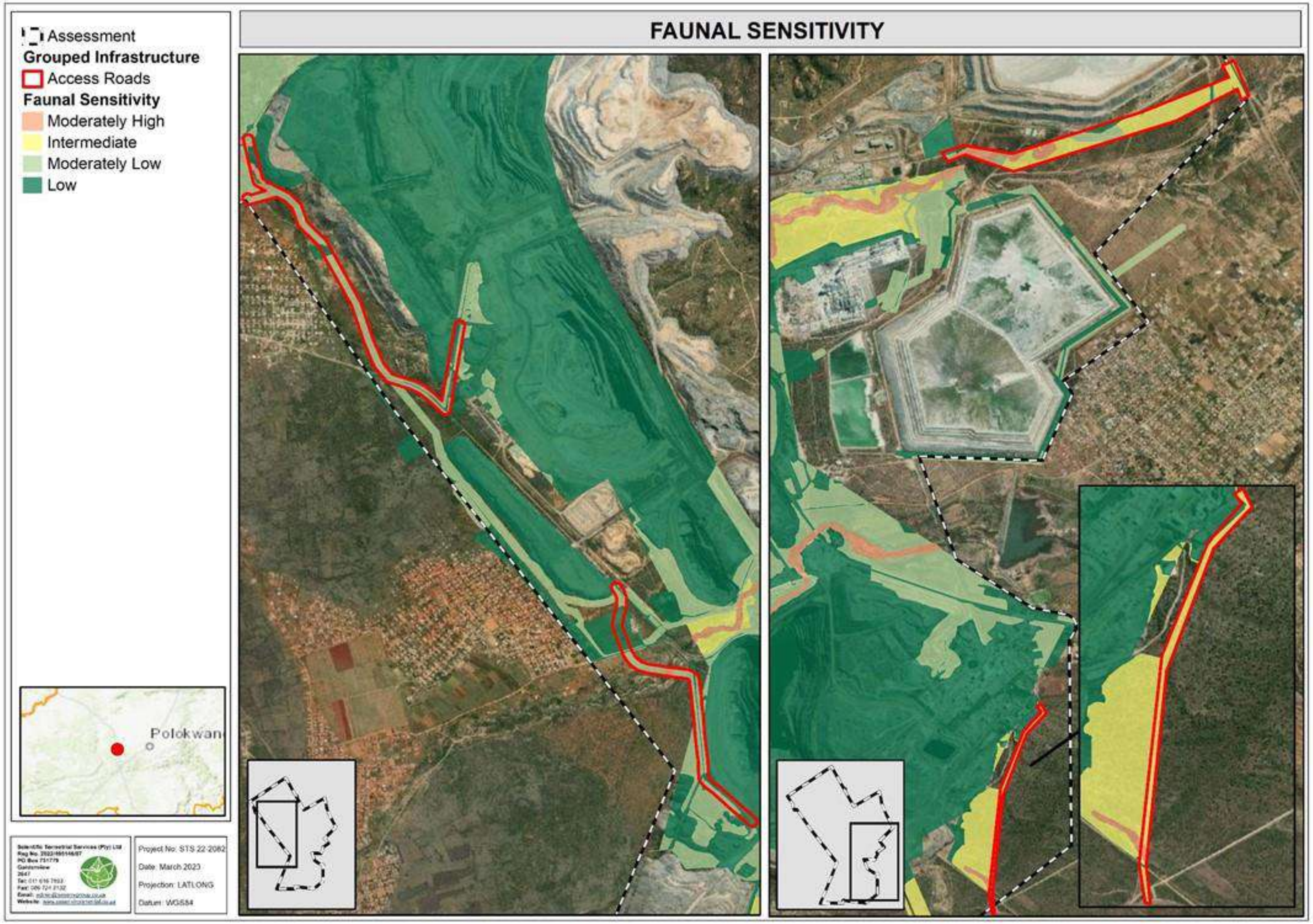


Figure 7-20: Conceptual illustration of the habitat sensitivity associated with the proposed Access Road (STS, 2023).

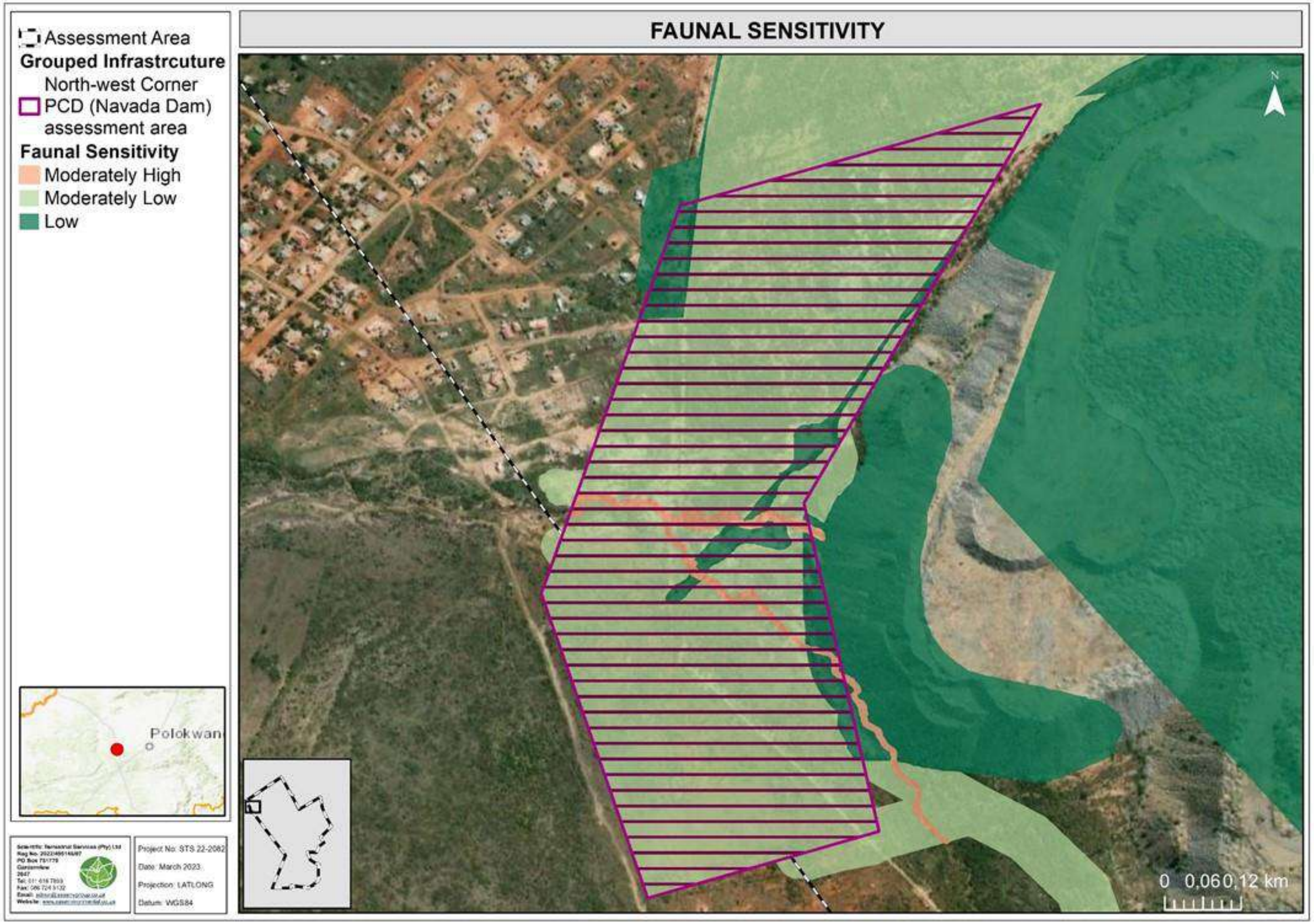


Figure 7-21: Conceptual illustration of the habitat sensitivity associated with the PCD within the focus area (STS, 2023).

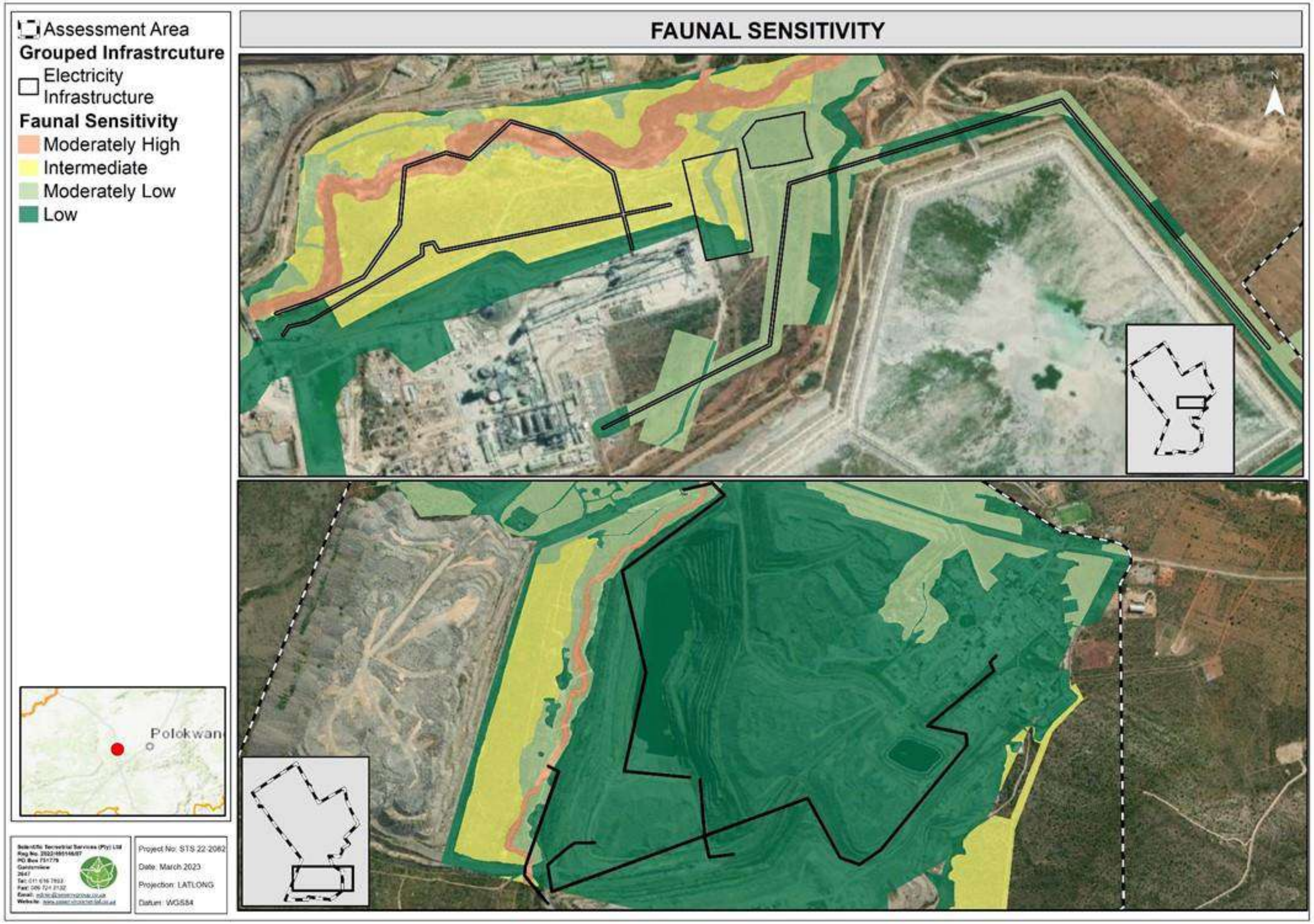


Figure 7-22: Conceptual illustration of the habitat sensitivity units associated with electricity infrastructure development within the focus area (STS, 2023).

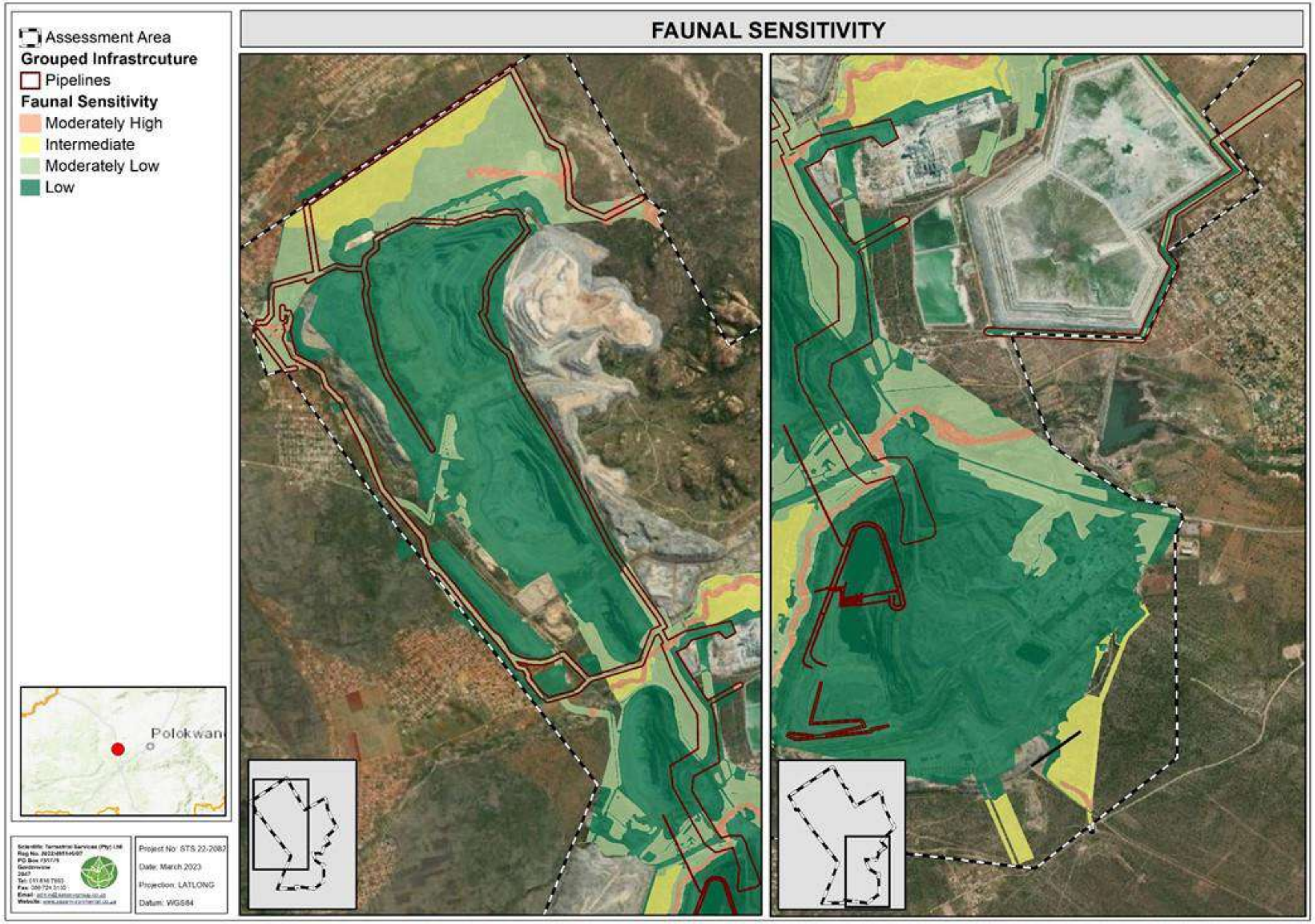


Figure 7-23: Conceptual illustration of the habitat sensitivity associated the proposed pipeline development within the focus area (STS, 2023).

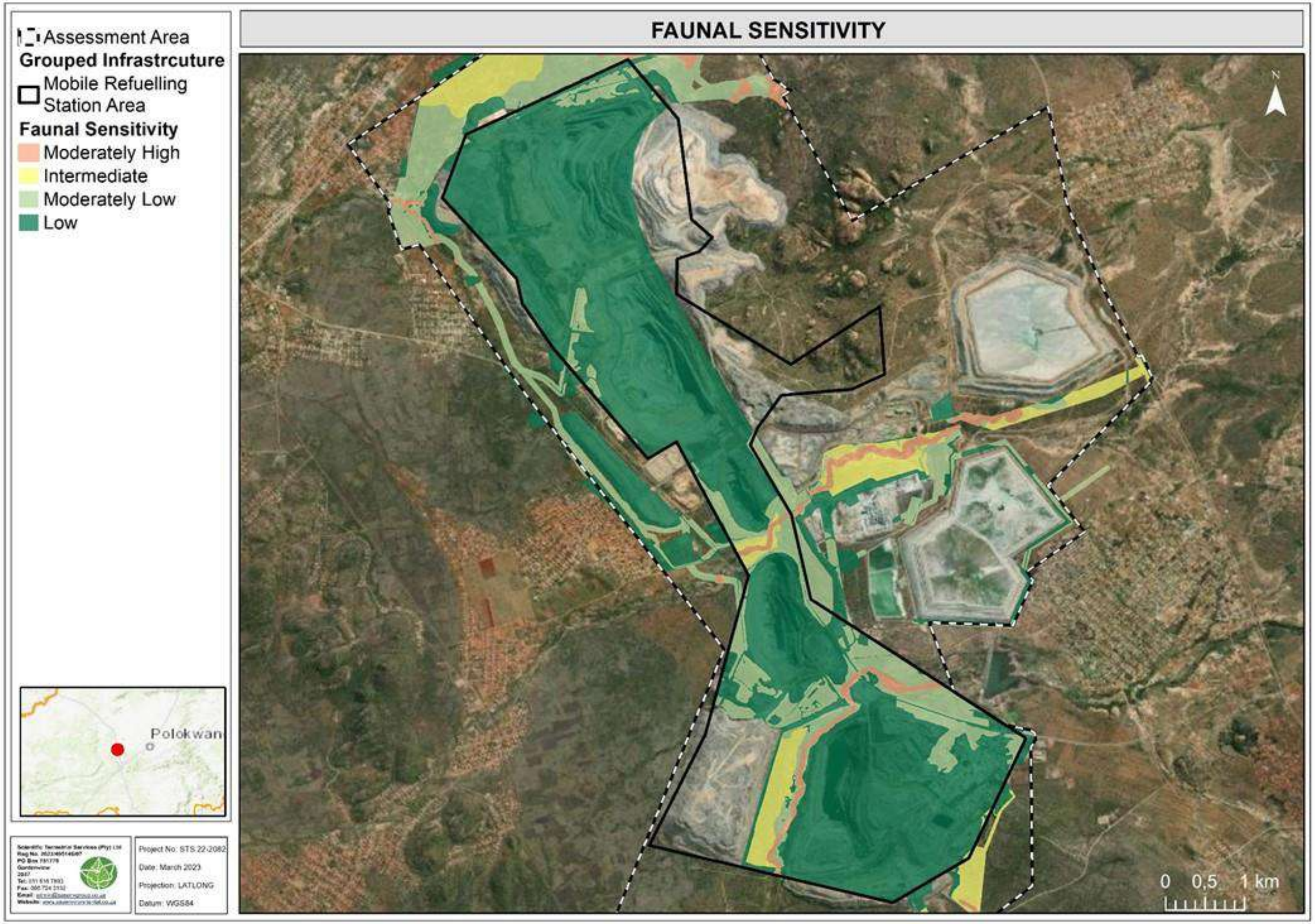


Figure 7-24: Conceptual illustration of the habitat sensitivity associated with the proposed refuelling stations within the focus area (STS, 2023).

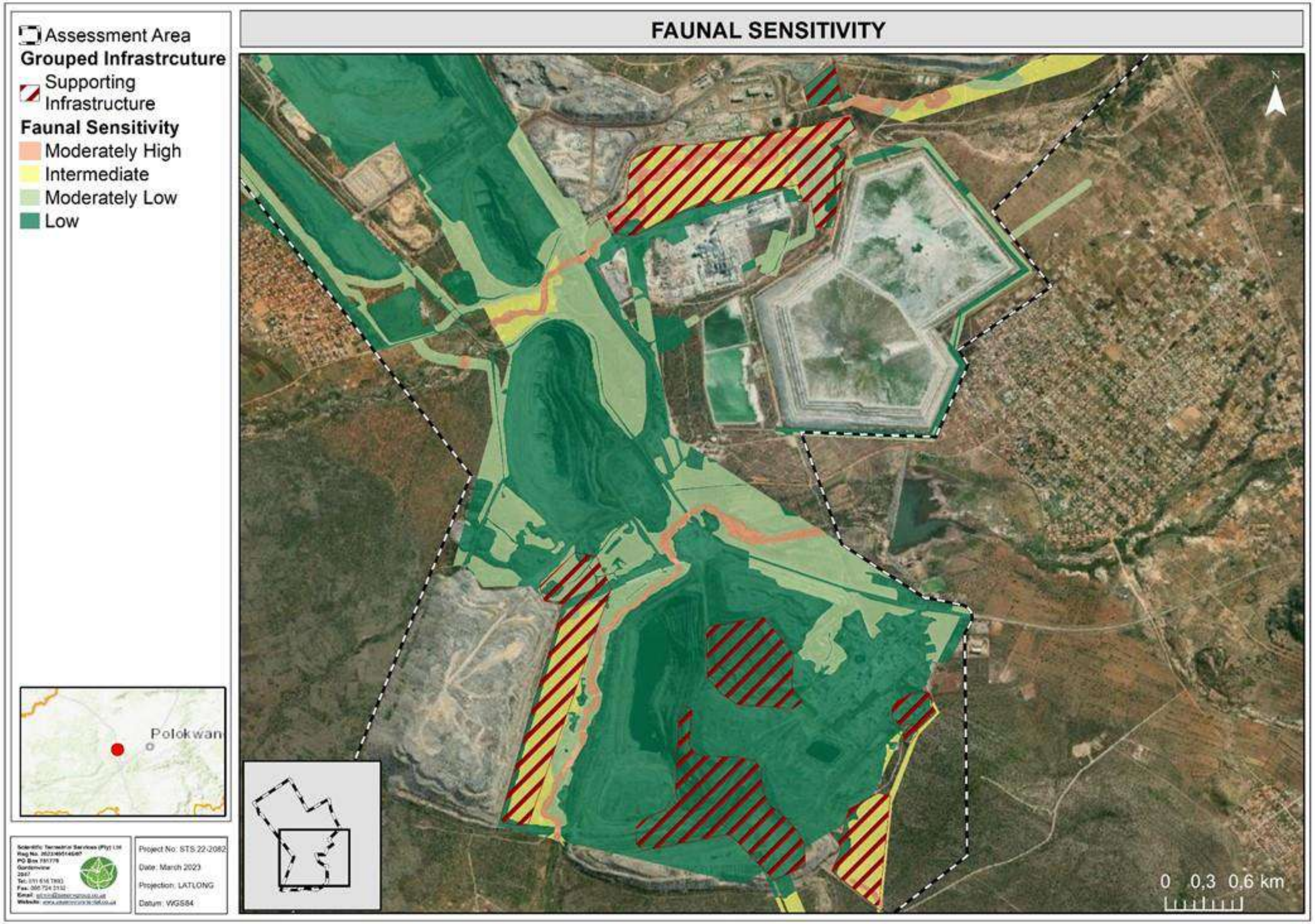


Figure 7-25: Conceptual illustration of the habitat sensitivity associated with the supporting infrastructure within the focus area (STS, 2023).

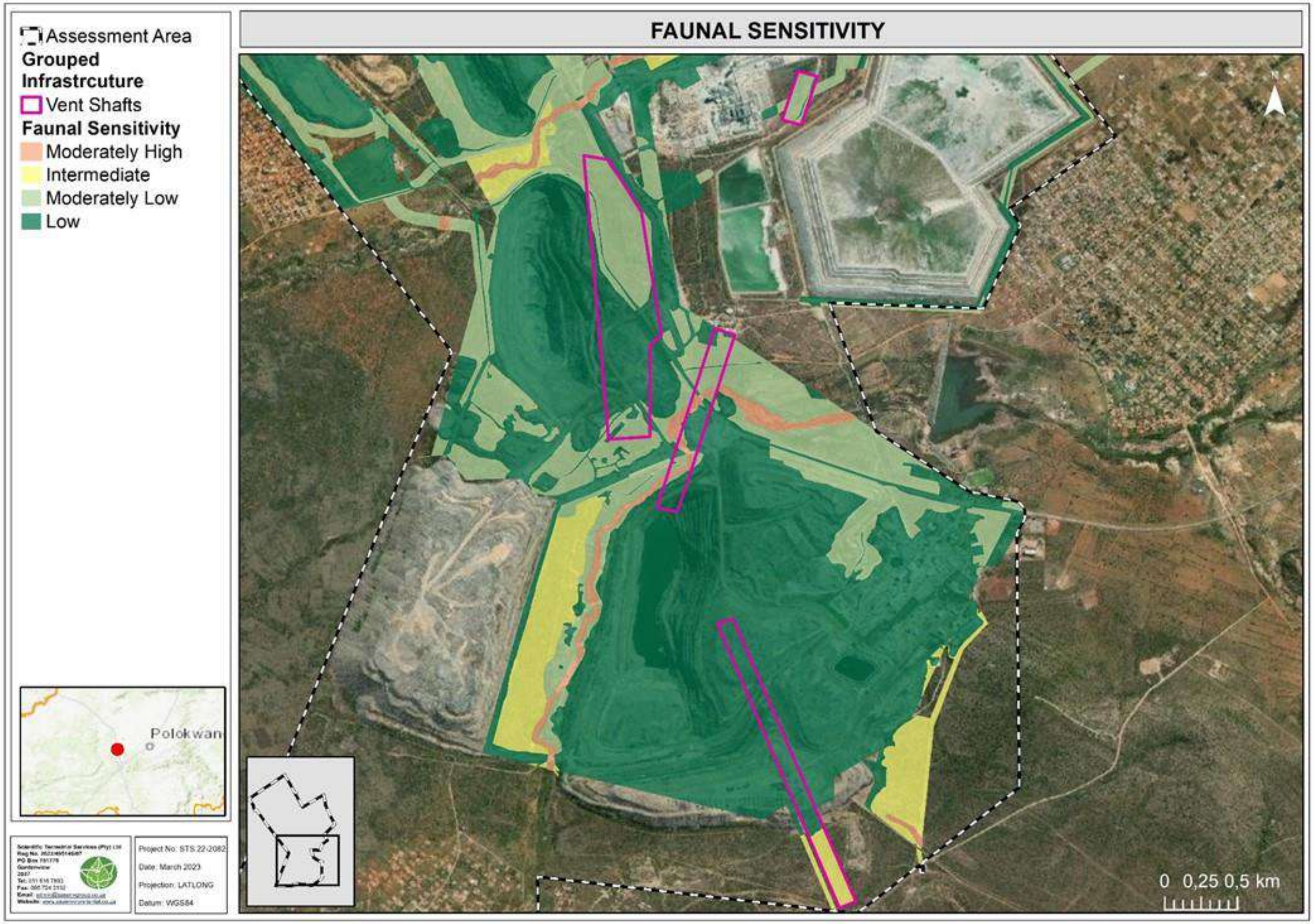


Figure 7-26: Conceptual illustration of the habitat sensitivity associated with the Ventilation Shafts within the focus area (STS, 2023).

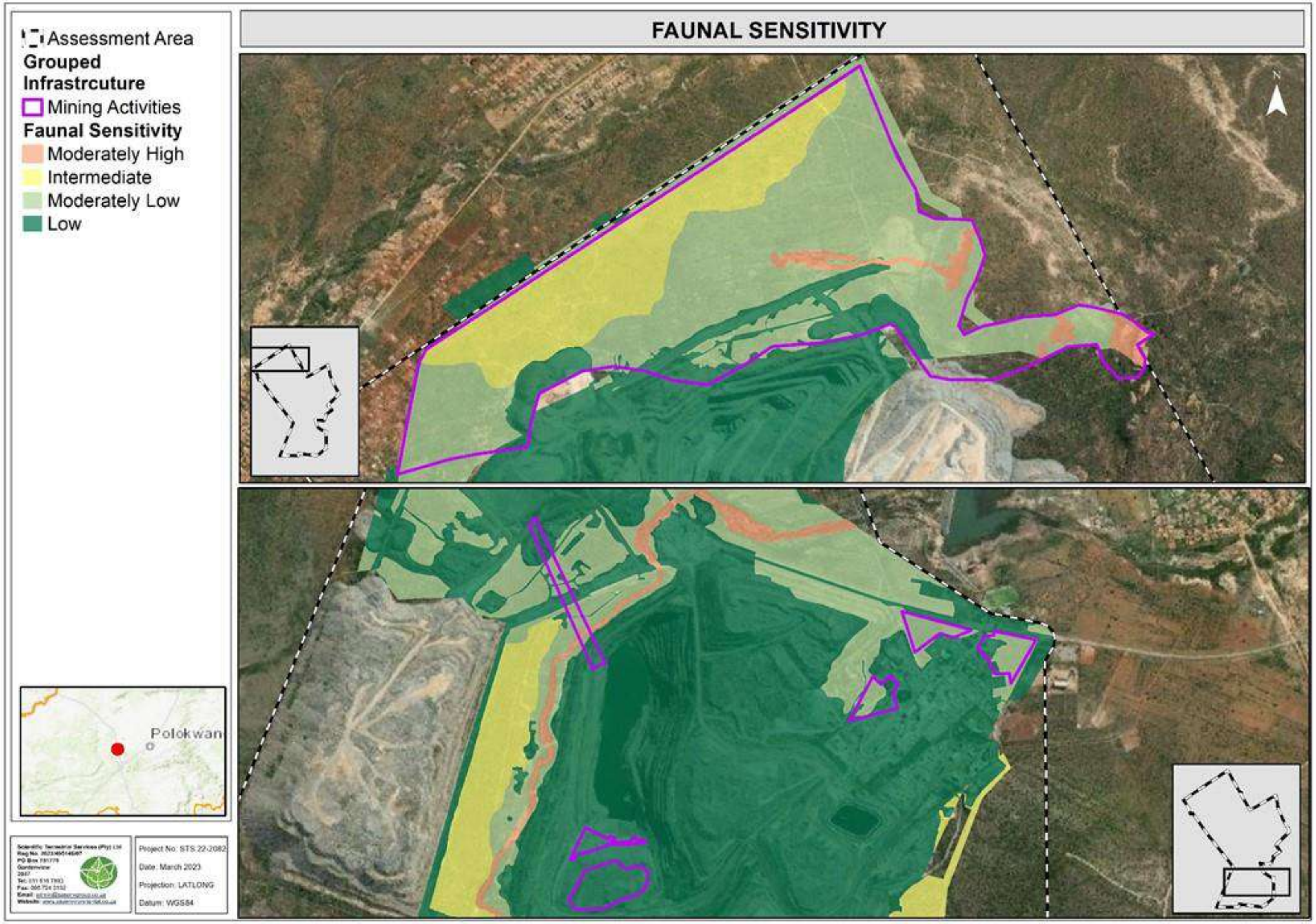


Figure 7-27: Conceptual illustration of the habitat sensitivity associated with the Mining Activities within the focus area (STS, 2023).

7.5 SOILS, LAND USE AND LAND CAPABILITY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study - *Soils, Land Capability & Pre-development Land Use Specialist Investigations, Impact Assessment and Management Programme. Complied by Earth Science Solutions dated May 2023 (Annexure 5-2).*

7.5.1 Soils

7.5.1.1 Soil Characterisation

The soils encountered can be broadly categorised into three major groupings, with a number of dominant and sub dominant forms that characterise the site area. The major soil forms are closely associated with the lithologies (geology) from which the soils are derived (in-situ formation), the topography and general geomorphology of the site, the effects of slope and attitude of the land forms and the pedogenetic processes involved affecting the soil pedogenisis and ultimately the soil forms classified and mapped. This is depicted in Figure 7-28.

The flat to undulating topography has resulted in the in-situ formation of soils, with some downslope transportation and accumulation of colluvial derived material in the valley bottoms and lower slope positions. The pedogenetic processes are symptomatic of the geomorphology of the site and the lithological units from which they are derived.

The climate also has an influence on the soil forming processes and outcomes, with the negative hydrological balance for the area (evaporation > rainfall) resulting in the development of evaporites within the soil profile where the accumulation of iron rich soil water (lower lying areas and valley bottoms) is able to precipitate and form nodules of ferrous oxide that become cemented over time into layers or “banks” of laterite (ouklip/hard pan ferricrete).

These processes result in the formation of layers of hard plinthite that form inhibiting layers or barriers to the vertical infiltration of water down the profile, a situation that over time results in further accumulations of relic ferric oxide. The soil water accumulates close to surface within the profile due to the low permeability’s across the hard plinthite and moves laterally along the horizon to issue at surface within the streams and waterways as springs and seep zones. These waters contribute to the “base-flow” of the rivers and are an important contributor to the wetlands and more sensitive and important ecological and biodiversity balance of the area.

The dominant soils classified are described in terms of their physical and chemical similarities and to some extent their topographic position and resultant pedogenisis, their spatial distribution being of importance to the formulation of the soil utilisation plan and management recommendations. A dominate soils map can be found in Figure 7-28.

The soils mapped range from shallow sub-outcrop and rocky outcrop to moderately deep sandy clay loams and structured clay loams, all of which are associated with either a thin saprolitic layer or a hard rock as the underlying “C” horizon.

The clay content and clay morphology are significant to the soil structure and texture, the difference in parent lithologies contributing to these changes. The granite derived soils are significantly much lower in clay than the intrusive lithologies, returning medium to coarse sandy loam textures and clays percentages below 15%. These soils comprise non-swelling clays, with better than average soil drainage and lower water holding capabilities. In contrast, the host geology (dunite, pyroxenite, ortho-pyroxenite etc.) returned a range of both swelling (montmorillonite and smectite) and non-swelling clay forms, clay percentages in the range of 20% to 45% and higher, with generally much stronger soil structures (pedocutanic to prismacutanic), better water holding capabilities, poor drainage characteristics and a preponderance of carbonate mineralisation.

Where present, the ferricretes (hard plinthite) are confined almost exclusively to the lower lying riverine and flood plain environments, or as relic landforms on the midslope and lower midslopes.

When considering the sensitivity of a site, aspects include the hydropedology/soil water, the amount of redoximorphic reaction present, soil wetness (noted in the degree of mottling and more importantly the greyness of the matrix soil) the depth to an inhibiting layer (<500mm) and the relative strength of the soil structure. These aspects/variables contribute to the ecological sensitivity or vulnerability of a site, a factor made more important if/when the resource (soil) is planned to be impacted.

As with any natural system, the transition across the ecological system is often complex with multiple facets and variations that change over relatively small/short distances, a factor that requires simplification if the data collected is to be meaningful and useful in planning a sustainable project. The system tabled needs to be scientifically sound and tailored to end use. In this case, the development of a soil utilisation plan.

To this end, the soils mapped have been grouped based on their inherent similarities of texture, structure and depth. The following major soil groupings have been mapped (Figure 7-28):

- The moderate to deep and more sandy loams (A and L) are considered to have a better land capability potential and better than average eco-system service rating. The better than average depth of relatively free draining (>600mm) soil distinguishing these materials from the shallow and more structured materials, while the absence of any signs of wetness within the profile distinguishing them from the wet based soils.
  - The sandy texture, weak and/or single grained apedal structure, inherent good drainage and moderate water holding capability renders these soils of the more easily worked, and of a lower site sensitivity.
- The shallow and very shallow sandy loams (G, H and I) returned rooting depths of between 100mm and 600mm, lower than average clay contents (12% to 22%), medium to coarse sandy textures, poor water holding capabilities and better than average drainage characteristics. These soils occur on the crest slopes and upper midslopes, down gradient of the granite outcrops and steep inselbergs (dome structures) that form the ridge slopes.
  - These sites are considered moderately sensitive to both erosion and compaction, the sand nature and single grained/apedal structure resulting in higher erosivity indices.
- In contrast, the more strongly structured and clay rich materials, both shallow and relatively much deeper profiles, are considered to be more sensitive and will require greater management if disturbed. This grouping of soils (C, B and J) is associated almost exclusively with the sub outcropping of the mineral host rock, the igneous intrusive geology (dunite and pyroxenites) producing soils that are structured and high in swelling clays. These soils returned moderate to shallow (400mm to 600mm) rooting depths, soil with a fine to medium grain texture, moderately strong blocky pedocutanic to strong prismacutanic structure, good water holding characteristics and moderate to poor soil permeability.
  - This grouping also includes a set of sub-dominant soil forms that are characterised by carbonates, a factor important to solution weathering and impacts of acidic environments.
- The final grouping of soils involves the wet based materials, a sub set of soils important to the wetlands and the sustainability of the ecology of any area. This grouping of soils (K) comprises those that are associated with the **hydromorphic** soil forms and profiles where wetness is noted at the base of the soil profile. This group of soils have a set of distinctive characteristics and nature that are separated out due to their inherently much more difficult management characteristics and the legal implications for impacting/disturbing these zones. These soils are characterised by relatively much higher clay contents (sometimes of a swelling nature), poor intake rates, poor drainage and liberation of soil water and a restricted depth (inhibiting barrier within the top 500mm of the soil profile).
  - These soils are regarded as **highly sensitive** zones that will require authorisation/permission if they are to be impacted. The legal implications (licensing) will need to be considered if these soils are to be considered within the development.
  - Where wetness is evident within the top 500mm they are considered to be wetland soils in terms of the wetland delineation guidelines. These soils are easily recognised by the

redoximorphic characteristics, mottled red and yellow colours on low chroma background colours (grey soils). These soils are important to the overall ecological balance of the area and should be considered very carefully before being disturbed.

7.5.1.2 Soil Chemical and Physical Characteristics

A suite of representative soil samples (composite) from the differing soil forms were taken and sent for analyses for both chemical and physical parameters. The samples were submitted to a reputable and accredited laboratory (Labserve), each sample containing a number of sub samples from a particular soil Form. Each sample comprises a “composite of individual samples” and is representative of the Soil Form rather than a specific point sampled.

7.5.1.2.1 Chemical Characteristics

Sampling of the soils for nutrient status was wherever possible confined to areas of undisturbed land. However, some of the better soil exposure is associated with land that has or could have been disturbed by the existing development and infrastructural activities. These results are representative indications of the pre-construction conditions and indicative of the baseline conditions at the time of survey.

The outcomes of the laboratory analysis (Table 7-6; Table 7-7 and Table 7-8) returned a range of physical and chemical results. The variation in results is concurrent with the variety of materials mapped and submitted for analysis, the difference in the host materials from which the soils are derived indicative of the differences noted.

The soils range from well sorted sandy loams and silty loams with lower-than-average nutrient stores and relatively low clay percentages (<18% - B2/1) associated primarily with the granite lithology, to soils with moderately stratified to strong blocky structure and higher clay percentages (22% to 35% B2/1). These soils are generally associated with the intrusive/igneous lithologies mineralised host rock.

In general, the pH ranges from acid at 5.2 to neutral and slightly alkaline at 6.25, a base status ranging from 11me% to over 30me% [Eutrophic (slight leaching status) to Dystrophic (moderate leaching status)], and nutrient levels reflecting generally high levels of calcium and sodium, but deficiencies in the levels of magnesium, potassium, phosphorous, copper, aluminum and zinc, with very low stores of organic carbon matter.

The more structured (moderate blocky to prismacutanic) and associated sandy and silty clay loams returned values that are indicative of the more iron rich materials and more basic lithologies that have contributed to the soils mapped. They are inherently low in potassium reserves and returned lower levels of zinc and phosphorous.

The growth potential on soils with these nutrient characteristics is at best moderate to poor and additions of nutrient and organics (compost) will be necessary if vegetative cover is to be propagated on these soils. They are at best moderate or poor grazing lands, with a poor arable land capability rating.

Table 7-6: Analytical Results (Historic)

Lab ID	Sample No.	pH (water)	Res	Ca	Mg	K	Na	P (Bray1)	Al	Ca/Mg	Ca+Mg/k	Zn	Fe	C	Org Mat	Sand	Silt
			Ohms	Mg/kg						Ratio		Mg/kg		%			
4265	M3	5.5	5400	442	159	34	4	9.6	7	2.78	17.68	0.83	22.2	0.24	0.41	86	3
4266	M34	5.52	1200	834	229	42	109	10.3	4	3.64	25.31	0.68	71.6	0.52	0.89	86	3
4267	M54	5.5	1300	832	230	42	101	9.9	5	3.62	25.29	0.83	65.8	0.52	0.89	84	1
4268	M12	5.38	4000	412	156	116	11	17.2	12	2.64	4.9	0.84	40.8	0.48	0.83	86	3
4269	M19	4.99	3900	246	130	62	3	8	8	2.03	6.36	0.69	27.2	0.24	0.41	86	5

Table 7-7: Analytical Results (Historic)

Sample No.	ME3	ME4	ME5	ME6	ME7	ME8	ME9	ME11	ME13	ME14	ME15	ME16	ME17	ME18	ME19
Soil Form	We/Ka	Rg/Ka	Va	Gs	Sw	Kd	We	Va	Se	Dr	Cv/Gs	Cv/Hu	GS	GS/Cv	Gs/Dr
Constituents mg/kg	PGM Host Rocks									Granites					
pH	4.8	5.6	5.2	5.5	6.2	6.4	6.4	4.6	5.8	6.1	5.5	5.52	5.55	5.38	4.99
"S" Value	26	35	8.4	12	24	22	5.8	19	20.2	5.2	6.4	4.8	5.2	5	6.2
Ca Ration	60	68	70	56	65	49	65	58	62	70	442	834	862	412	264
Mg Ratio	32	34	4	18	30	28	10	28	30	28	159	229	230	156	130
K Ratio	5	7	4	20	1	8	12	6	5	0.6	34	42	42	116	62
Na Ratio	0.6	0.7	0.3	0.3	0.2	0.3	0.2	0.4	0.5	1.4	4	109	101	11	3
P	22	24	22	98	8	15	82	12	15	5	9.6	10.3	9.9	17.2	8
Zn	1.2	1.2	2	6.8	1	1.4	1.6	2	3	1	0.83	0.68	0.83	0.84	0.69
Sand	26	22	44	42	34	21	44	42	40	48	86	86	84	86	86
Silt	20	24	34	35	38	27	35	24	26	34	3	3	1	3	5
Clay	54	54	22	23	28	52	21	34	34	8	11	11	15	11	9

Table 7-8: Analytical Results (2022)

Sample Name	Depth (cm)	Soil	pH	P (Ambic I)	K	Na	K	Ca	Mg	Cu	Zn	Mn	Na	Ca	Mg	B	B*	Fe	S	C	Na	KI	Ca	Mg	T-Value	Clay	Silt	Sand
		Texture	KCl	Mg.kg		Exchangeable cations (cmol/kg)				mg/kg										%	Base saturation %				cmol/kg	%		
AC1	40	salm	5.65	3.7	27	0.75	0.07	2.33	1.25	1.43	0.16	6.0	173	466	150	<0.10	<0.10	40.3	3	0.15	17.05	1.59	52.95	28.41	4.4	9	8	83
AC2	40	sacllm	4.66	5.8	36	0.74	0.09	2.63	1.07	3.18	0.33	5.7	171	525	129	<0.10	<0.10	48.9	6	0.13	16.34	1.99	58.06	23.62	4.53	20	11	69
AC6	60	sacllm	6.19	2.0	138	0.37	0.35	17.54	6.23	5.73	0.33	4.5	85	3508	748	0.45	0.2	11.7	17	0.53	1.51	1.43	71.62	25.44	24.49	35	15	50
AC8	40	sacllm	5.24	2.6	88	0.71	0.23	10.87	3.97	3.23	0.15	8.0	163	2173	476	0.22	<0.10	28.5	4	0.28	4.5	1.46	68.93	25.17	15.77	38	11	51
AC10	40	salm	4.23	3.7	56	0.21	0.14	2.32	1.38	2.2	0.3	4.2	49	464	166	<0.10	<0.10	27.9	21	0.11	5.17	3.45	57.14	33.99	4.06	16	7	77
WR1	60	salm	6.29	4.5	102	0.21	0.26	14.34	4.75	14.89	0.43	9.2	48	2869	570	0.12	<0.10	27.1	4	0.67	1.07	1.33	73.31	24.28	19.56	20	8	72
SP1	40	salm	5.59	3.8	103	0.20	0.26	2.9	1.02	1.42	0.54	3.7	46	581	122	<0.10	<0.10	23.3	3	0.13	4.57	5.94	66.21	23.29	4.38	13	8	79
LH2A	60	salm	4.04	5.1	71	0.20	0.18	2.16	0.8	1.86	0.53	18.6	46	432	96	<0.10	<0.10	51.7	4	0.17	5.97	5.37	64.48	23.88	3.35	13	11	76

7.5.1.2.2 Soil fertility

The soils mapped returned at best moderate levels of some of the essential nutrients required for plant growth with sufficient stores of calcium and magnesium but lower than acceptable levels of sodium, zinc, potassium and phosphorous required for optimum growth. A review of these results is important in better understanding the land capability ratings that are recorded, with the majority of the study area being rated as low intensity grazing land. These poor conditions for growth were further compounded by the low organic carbon (<1.0%) and shallow rooting depths.

The potential for a soil to retain and supply nutrients can be assessed by measuring the cation exchange capacity (CEC) of the soils.

The generally low organic carbon content is detrimental to the exchange mechanisms as it is these elements which naturally provide exchange sites that serve as nutrient stores.

The moderate to good clay contents (18%-25%) in all but a few of the sites (granite terrain) will temper this situation somewhat with the clays forming sites for nutrient exchange. This will however produce at best a moderate to low retention and supply of nutrients for plant growth.

Low CEC values are an indication of soils lacking organic matter and clay mineralisation. Typically, a soil rich in humus will have a CEC of 300 me/100g (>30 me/%), while a soil low in organic matter and clay may have a CEC of between 1-5 me/100g (<5 me/%).

Generally, the CEC values for the soils mapped in the area are moderate (10me/100g to 30 me/100g).

7.5.1.2.3 Physical Characteristics

The majority of the soils mapped exhibit an apedal or weak crumby to moderate blocky structure, moderate to good clay content and a dystrophic leaching status.

The texture comprises sandy loams to sandy clay loams for the most part, with more silty loams and clay loams associated with the transported and better sorted colluvial and alluvial derived materials mapped on the lower slope and bottom land stream and non-perennial waterways.

The semi-arid to arid climate (negative water balance) combined with the geochemistry of the host rock geology are conducive to the formation of evaporites, with the development of calcrete and ferruginous layers within the vadose zone. The accumulation of concentrations of iron and manganese rich fluids at or close to surface will result in the precipitation of these elements forming lateritic horizons when exposed to high evaporation (negative water balance), while lithologies rich in calcium and magnesium will result in the formation of calcium carbonate layers once the soil waters is lost due to evaporation.

These processes result in the development of a restrictive or inhibiting layer/zone within the profile over time, a factor that is important in a climate where water at surface is scares, a factor that influences the ecological cycles.

The negative water balance is evidenced by the generally low rainfall of between 550mm/yr and 650mm/yr, and the high evaporation that exceeds 1,350mm/yr on average. These are the driving mechanisms behind the ouklip/hard pan ferricrete/laterites and in places calcretes mapped.

The degree to which the plinthite layer has been cemented (friability of the ferricrete) will determine the effectiveness of the layer as a barrier to infiltration, while the depth of overlying soil will dictate how easily or difficult it is for the soil water to be accessed by the fauna and flora. The friability or relative hardness of the ferricrete will have an effect on its water storage capability and its effectiveness as a shallow reservoir or aquiclude, with the clay mineralisation and its character influencing the water holding characteristics of the soil.

In general, the degree of hardness of the evaporite is gradational, with soft plinthic horizons (very friable and easily dug with a spade or shovel), through hard plinthite soil (varying in particle size from sand to gravel – but no cementation) to nodular and hard pan ferricrete or hard plinthic (cementation of iron and manganese into nodules) that are not possible to free dig or brake with a shovel.

7.5.1.2.4 Soil Erosion and Compaction

Erodibility is defined as the vulnerability or susceptibility of a soil to erosion. It is a function of both the physical characteristics of a particular soil as well as the treatment of the soil.

The resistance to, or ease of erosion of a soil is expressed by an erodibility factor ("K"), which is determined from soil texture/clay content, permeability, organic matter content and soil structure. The Soil Erodibility Nomograph was used to calculate the "K" value. With the "K" value in hand, the Index of Erosion (I.O.E.) for a soil can then be determined by multiplying the "K" value by the "slope" measured as a percentage. Erosion problems may be experienced when the Index of Erosion (I.O.E) is greater than 2.

The majority of the soils mapped can be classified as having a moderate to high erodible erodibility index based on their low organic carbon content and duplex nature. These factors are tempered by the better than average clay for the majority of the soils and the undulating to shallow slopes that characterise the area. The steeper slopes and granitic derived soils associated with the inselbergs returned a significantly much higher IOE.

The vulnerability of the "B" horizon to erosion once the topsoil and/or vegetation is removed must not be underestimated when working with or on these soils. These horizons (B2/1) are vulnerable and rate as high when exposed.

The concerns around erosion and inter alia compaction, are directly related to the disturbance of the protective vegetation cover and topsoil that will be disturbed during any construction and operational phases of the development. Once disturbed and exposed, the effects and actions of wind and water will increase. Loss of soil (topsoil and subsoil) is extremely costly to any operation and is generally only evident at closure or when rehabilitation operations are compromised.

Well planned management actions during the planning, construction and operational phases will save time and money in the long run and will have an impact on the ability to successfully "close" an operation once completed.

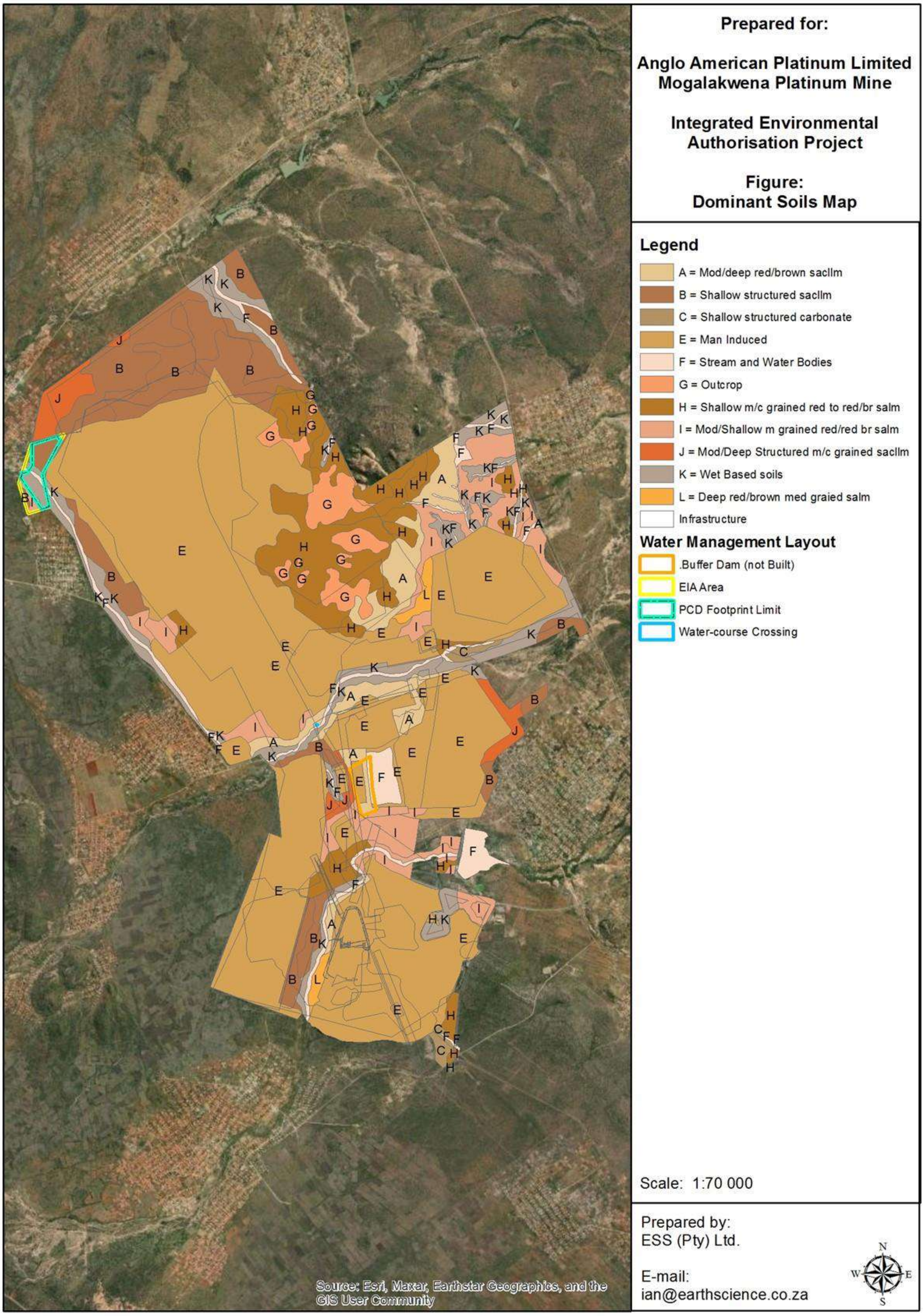


Figure 7-28: Dominant Soils Map (EES, 2023)

7.5.2 Pre-Construction Land Use and Land Capability

7.5.2.1 Data Collection

Based on a well-developed and scientifically founded baseline of information, the Department of Agriculture Land Capability Rating System has been used as the basis for the land capability study. The study classified the area based on a set of recognisable classes (Table 7-9).

Table 7-9: Criteria for Pre-Construction Land Capability (S.A. Chamber of Mines, 1991)

Criteria for Wetland

- Land with organic soils or supporting hygrophilous vegetation where soil and vegetation processes are water determined.

Criteria for Arable Land

- Land, which does not qualify as having wetland soils.
- The soil is readily permeable to a depth of 750mm.
- The soil has a pH value of between 4.0 and 8.4.
- The soil has a low salinity and SAR
- The soil has less than 10% (by volume) rocks or pedocrete fragments larger than 100mm in the upper 750mm.
- Has a slope (in %) and erodibility factor ("K") such that their product is <2.0
- Occurs under a climate of crop yields that are at least equal to the current national average for these crops.

Criteria for Grazing Land

- Land, which does not qualify as having wetland soils or arable land.
- Has soil, or soil-like material, permeable to roots of native plants, that is more than 250mm thick and contains less than 50% by volume of rocks or pedocrete fragments larger than 100mm.
- Supports, or is capable of supporting, a stand of native or introduced grass species, or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.

Criteria for Conservation of Land

- Land, which does not qualify as having wetland soils, arable land or grazing land, and as a result is regarded as requiring conservation practise/actions.

7.5.2.2 Description

The "land capability classification" as described herein used the soil and other geomorphological aspects (ground roughness, geology, topography, climate etc.) as the information source and basis for the land capability rating.

The outcomes of the study indicate that the activities and infrastructure planned will definitely have an impact on the surface environment and existing land use, with the footprint of disturbance being planned over a range of land capability classes and pre-development uses.

These include significant areas of low potential grazing land, sites with better than average grazing potential and/or arable land capability and smaller but significant sites of more sensitive land capability associated with shallow and erodible soils and sites comprising wet based soils and wetland status. The majority of the area under consideration has been impacted by historical and present day mining.

1. Arable Land

The arable potential soils are confined almost exclusively to the colluvial derived materials downslope of the granite inselbergs. The area mapped is extremely small and has been disturbed to a significant degree by illegal sand mining. There is some subsistence cattle grazing on the northern areas of the mining site.

2. <u>Grazing Land</u>

The areas considered and classified as having a grazing land capability are associated with the shallower and transitional zone soils (400mm to 600mm) that are sandy in texture, moderately low in clay mineralisation (12% to 20%) and well drained. These soils are capable of sustaining palatable plant species and form an important part of the subsistence farming undertaken in the area.

A significant portion of the study area classifies as low intensity grazing land or wilderness status.

3. <u>Wilderness / Conservation Land</u>

The shallow rocky areas and soils with a structure stronger than moderate blocky are characteristically poorly rooted and support at best very low intensity grazing, or wilderness land capability rating. These soils are commonly associated with the volcanic derived soils.

Included in this classification set are the areas that have been impacted by mining and/or influenced by man induced activities.

4. <u>Wetland</u>

As part of understanding the sensitivity of the sites mapped and in line with the land capability classification, wet based soils (those with hydromorphic characteristics at depth) were mapped and rated.

These zones (wetlands) are dominated by hydromorphic soils (wet based) that sometimes show signs of structure (stratification etc) and have plant life (vegetation) that is associated with seasonal wetting or permanent wetting of the soil profile (separate study).

These soils are generally characterised by dark grey to black (organic carbon) colours in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on gleyed backgrounds (pale grey colours) in the subsoil's.

A significant but relatively small proportion of the study area classifies as having wet based soils. These should not be mistaken as wetlands in terms of the delineation document but have been highlighted as potential zones of high sensitivity that will need to be well managed.

These zones are considered ecologically important, highly sensitive and vulnerable due to their ability to contain and hold water for periods through the summers and into the dry winter seasons.

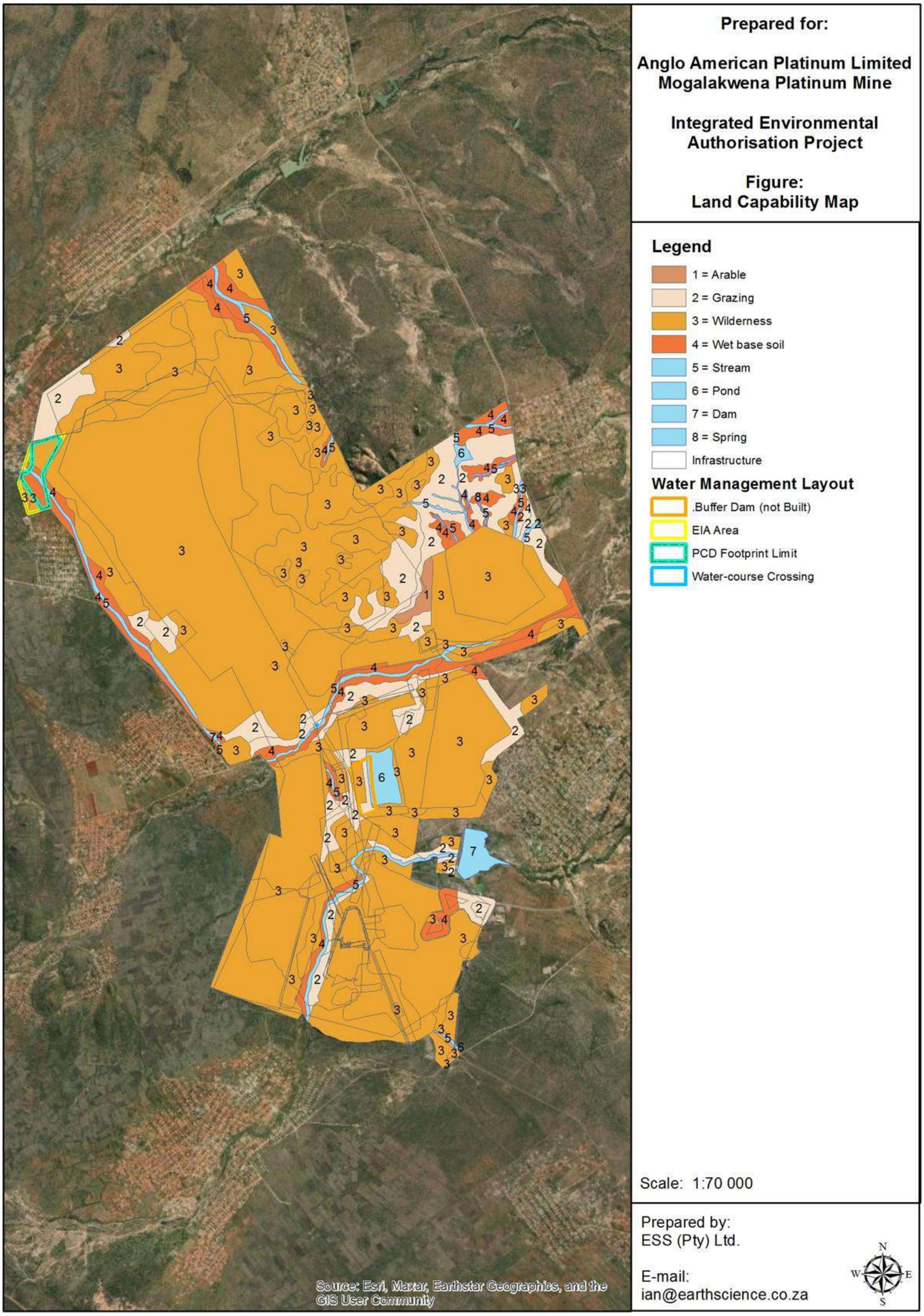


Figure 7-29: Land Capability Map (EES, 2023)

7.6 FRESHWATER

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Freshwater and Aquatic Assessment as part of the Environmental Authorisation and Planning Process for the Proposed Expansion of the Mogalakwena Platinum Mine near Mokopane, Limpopo Province. Complied by Scientific Aquatic Services dated June 2023 (Annexure 5-7).*

The MM Complex is located within the Limpopo Water Management Area (WMA) and the Mogalakwena subWMA. MM is currently situated within three (3) aquatic ecoregions namely the Limpopo Plain (Central Portion), the Eastern Bankenveld (Easter Portion) and the Bushveld Basic (Lower South Portion) The Complex is within the A61 tertiary drainage region and within the A61G quaternary sub-catchment. (Figure 7-30).

The following freshwater systems were identified at the MM Complex (Figure 7-31). These aspects are further explained within this section and a detailed overview can be found Table 7-10 below:

- Mohlosane River
    - This river traverses the central portion of the site and flows in a south-westerly direction.
- Groot-Sandsloot River
    - This river is located along the south-eastern portion of the site and flows in a southerly direction.
- Witrivier
    - This river is located along the northern boundary of the site and flows in a south-westerly direction.
- Various Ephemeral Drainage Lines (EDLs)
    - The EDL's are associated with the Groot-Sandsloot River
- Seep Wetland Areas
    - These areas are located to the north of the site within the proposed north WRD footprint area.
    - Five seep wetlands were identified.

The two main river systems that bisect the mine area are the Mohlosane River and the Groot Sandsloot River. The Mohlosane River drains an area of approximately 38 km^2 and the Groot Sandsloot River drains an area of approximately 180 km^2 to the points where both rivers leave the site boundary.

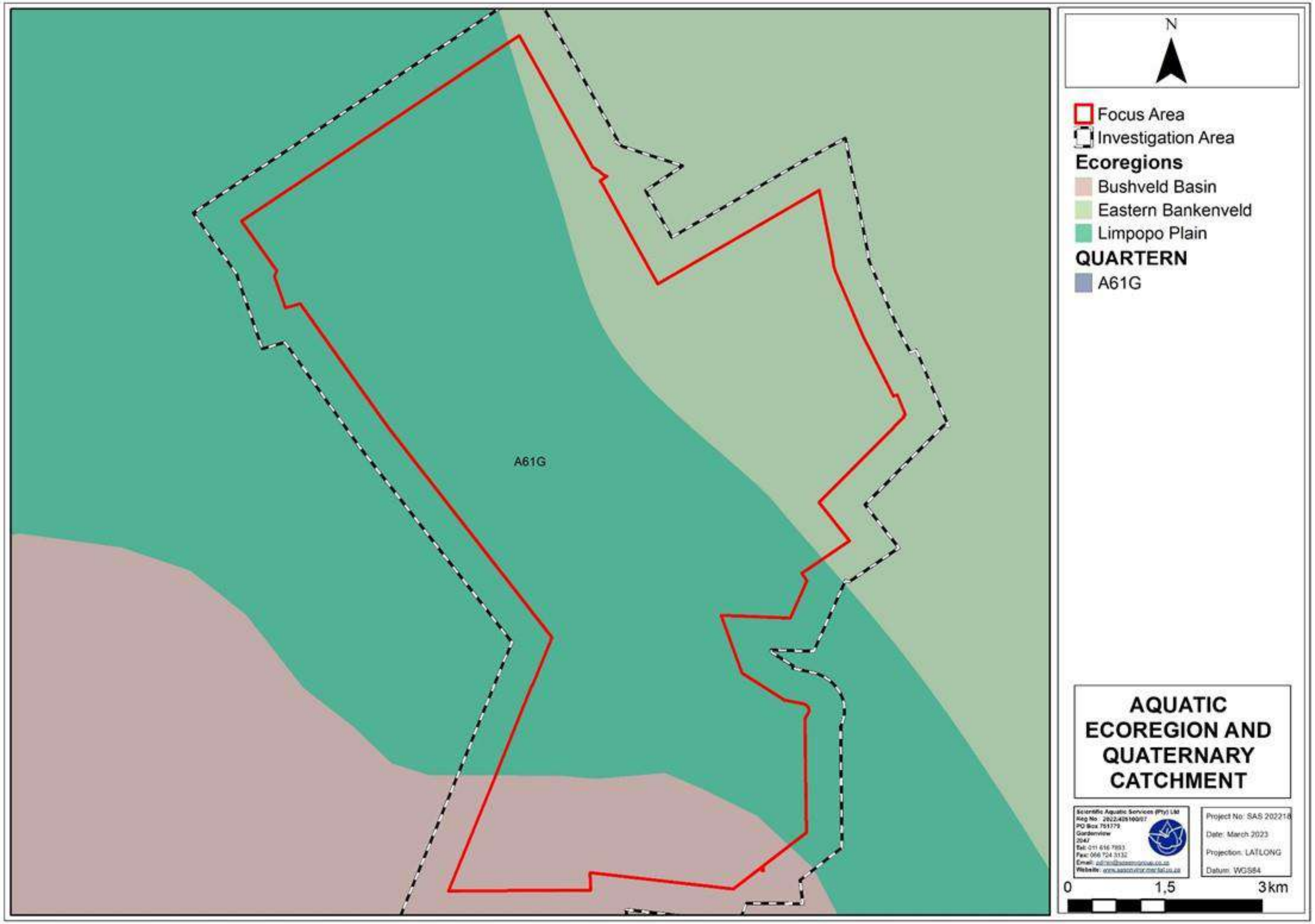


Figure 7-30: Aquatic ecoregions (SAS, 2023)

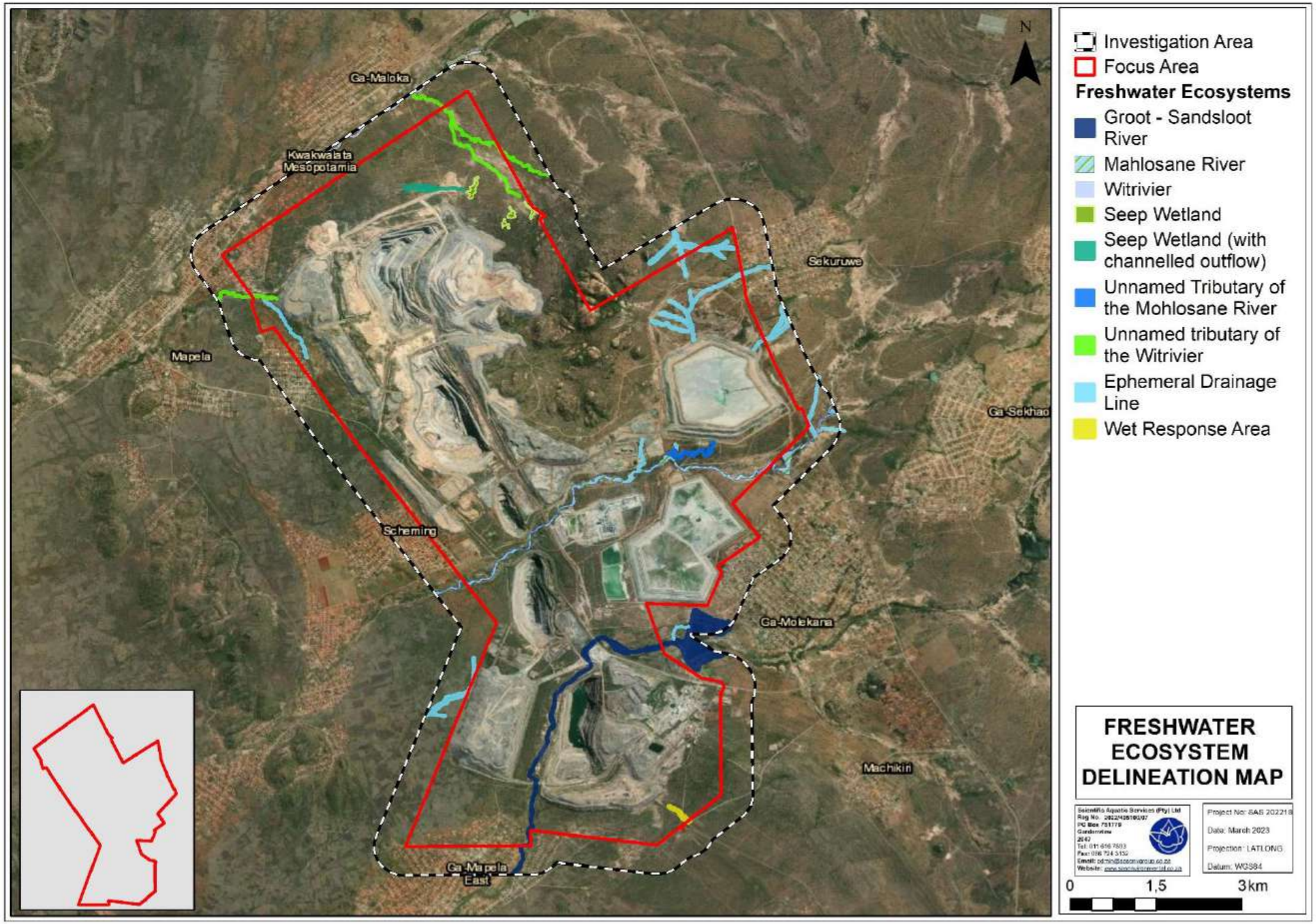


Figure 7-31: Delineated Freshwater Ecosystems (SAS, 2023)

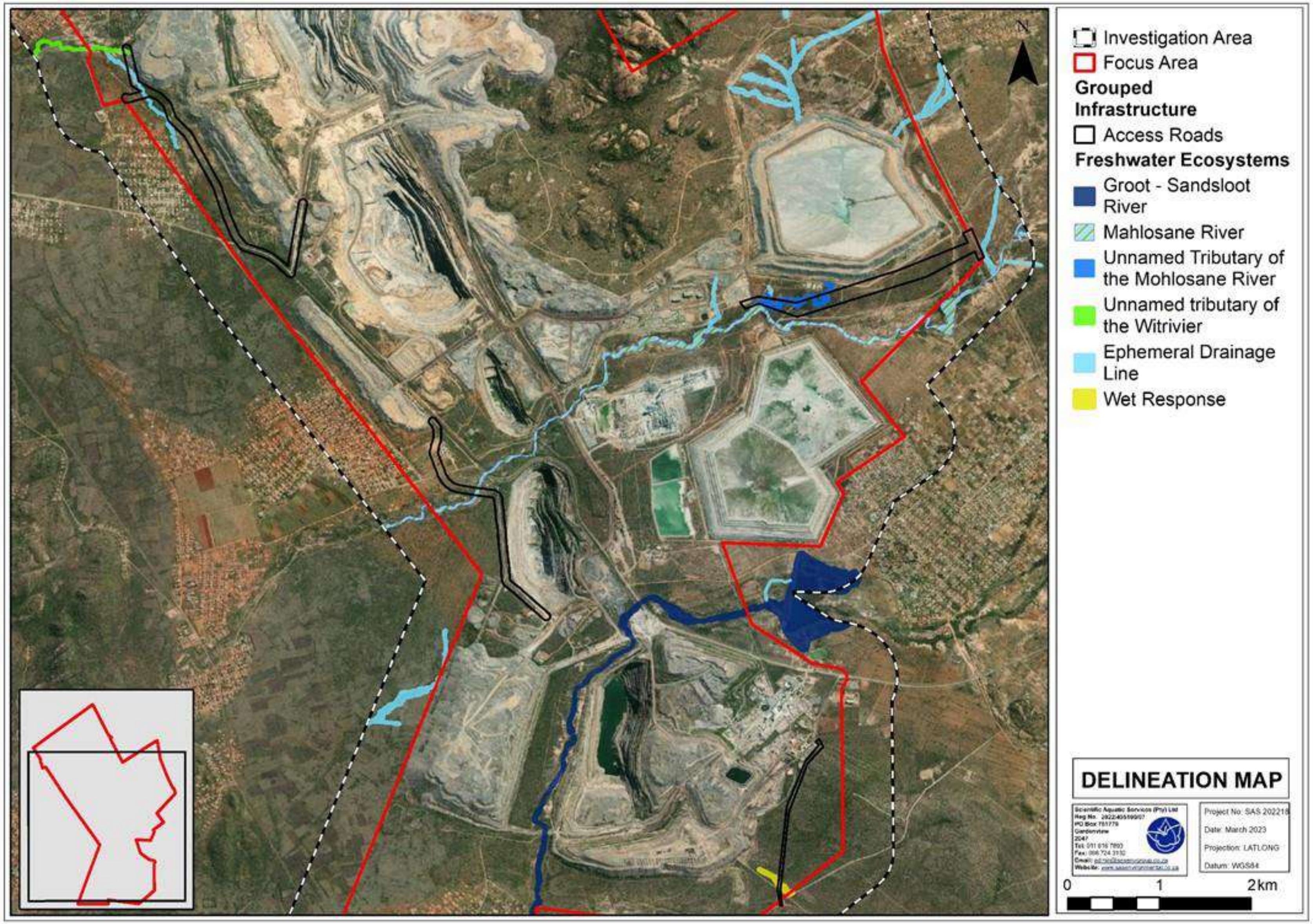


Figure 7-32: Delineated Freshwater Ecosystems specifically for the proposed access roads (SAS, 2023)

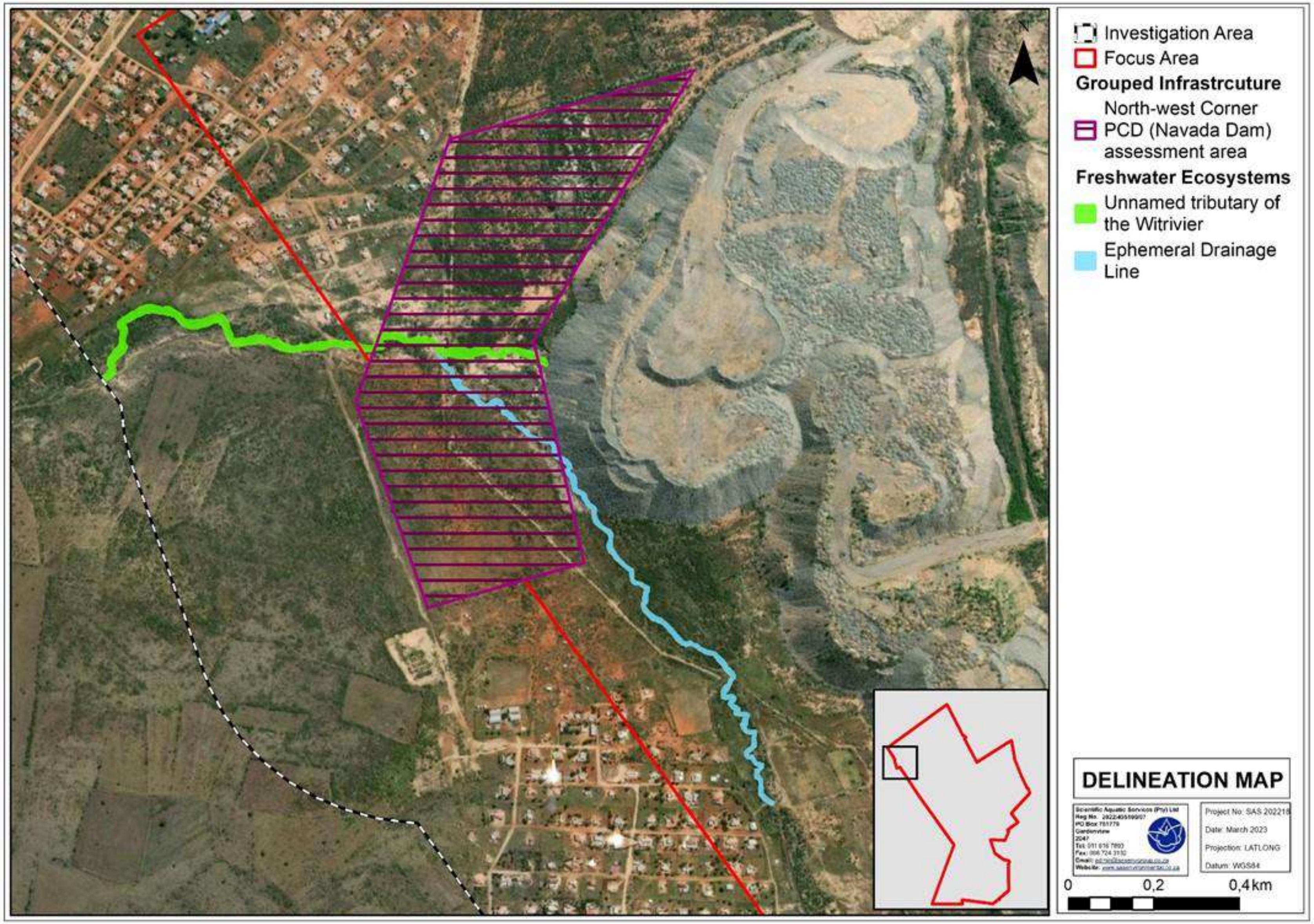


Figure 7-33: Delineated Freshwater Ecosystems specifically along the northwest corner PCD (Navada Dam) (SAS, 2023)

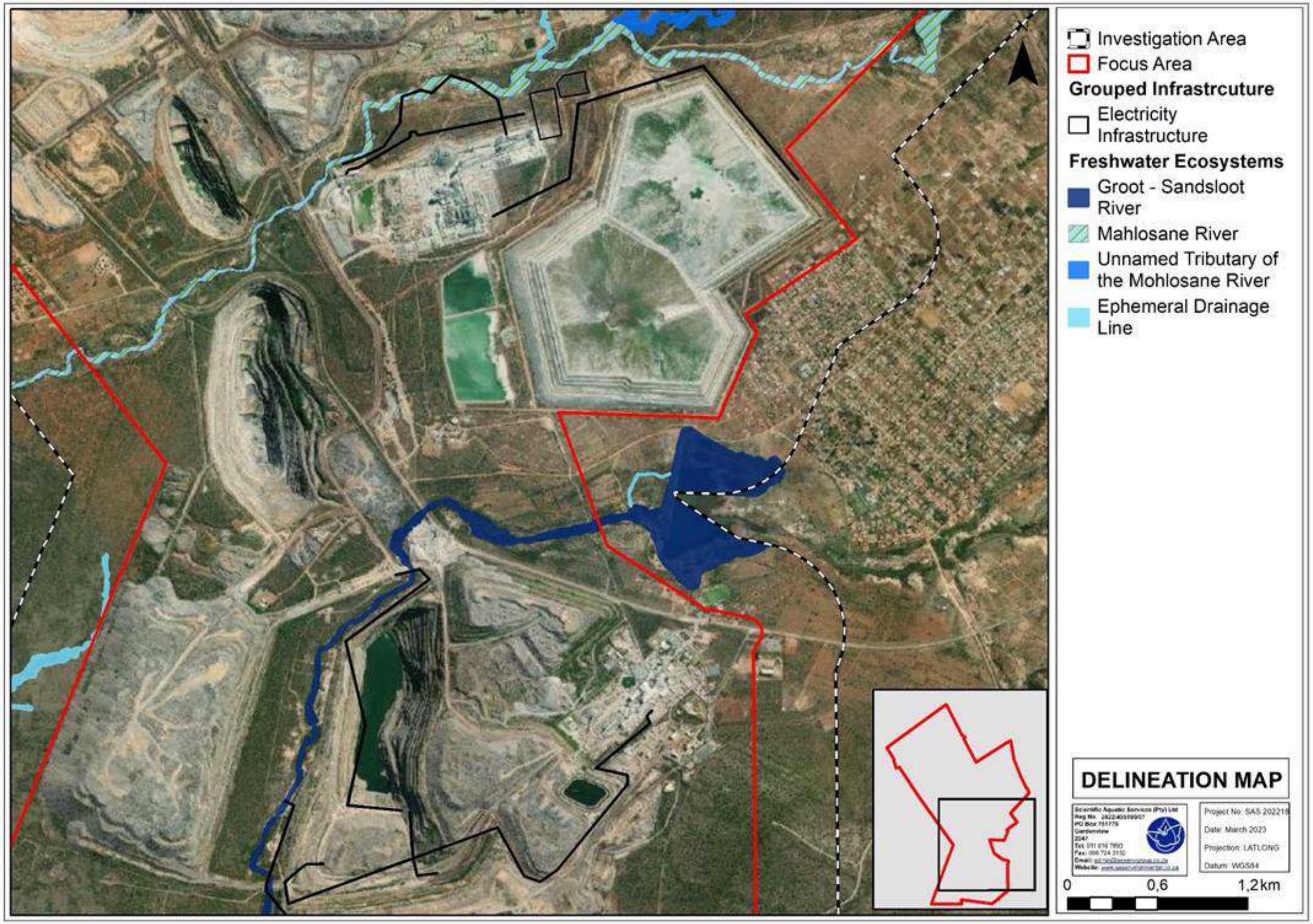


Figure 7-34: Delineated Freshwater Ecosystems specifically for the proposed electricity infrastructure (SAS, 2023)

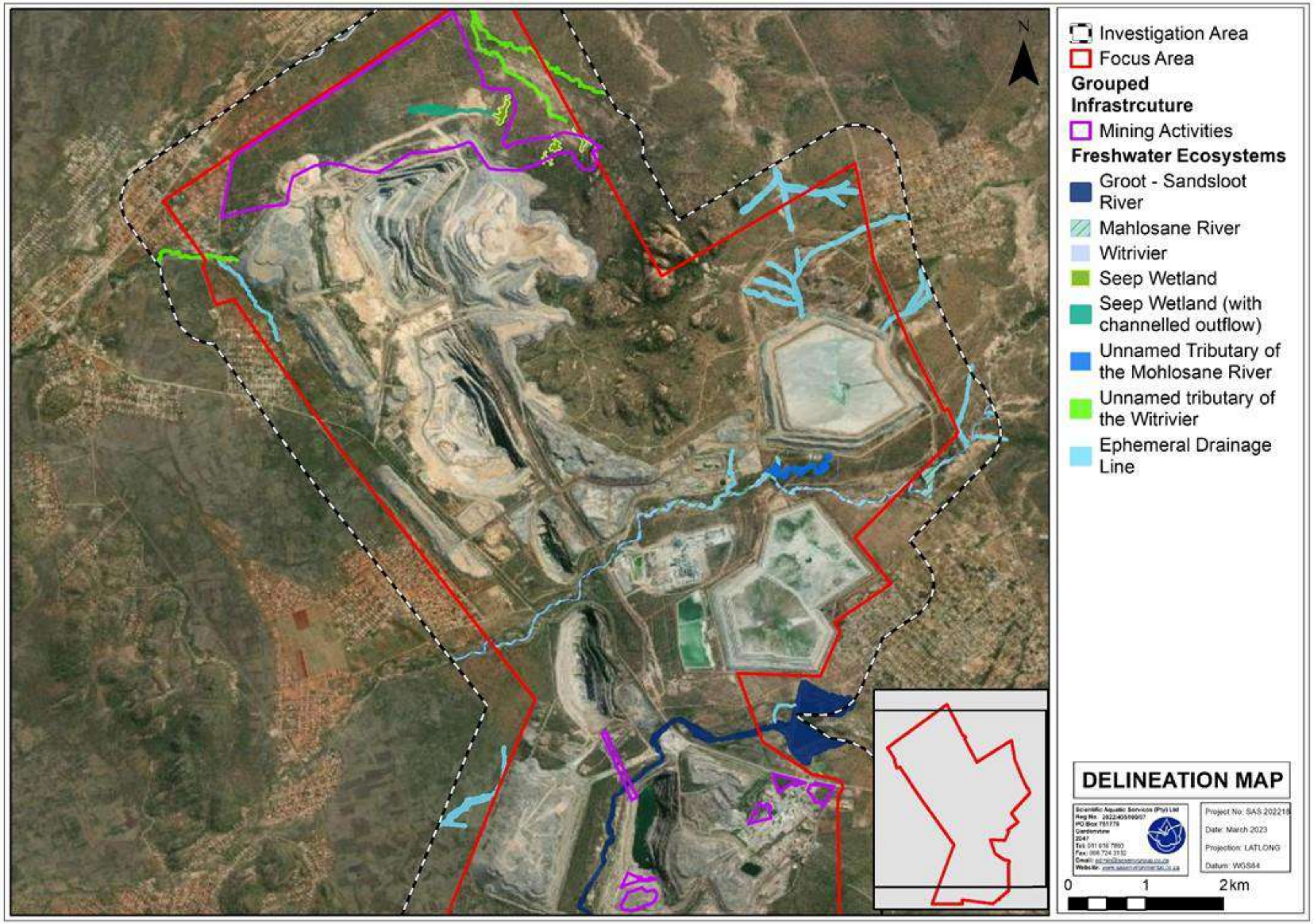


Figure 7-35: Delineated Freshwater Ecosystems specifically for the proposed mining activities (SAS, 2023)

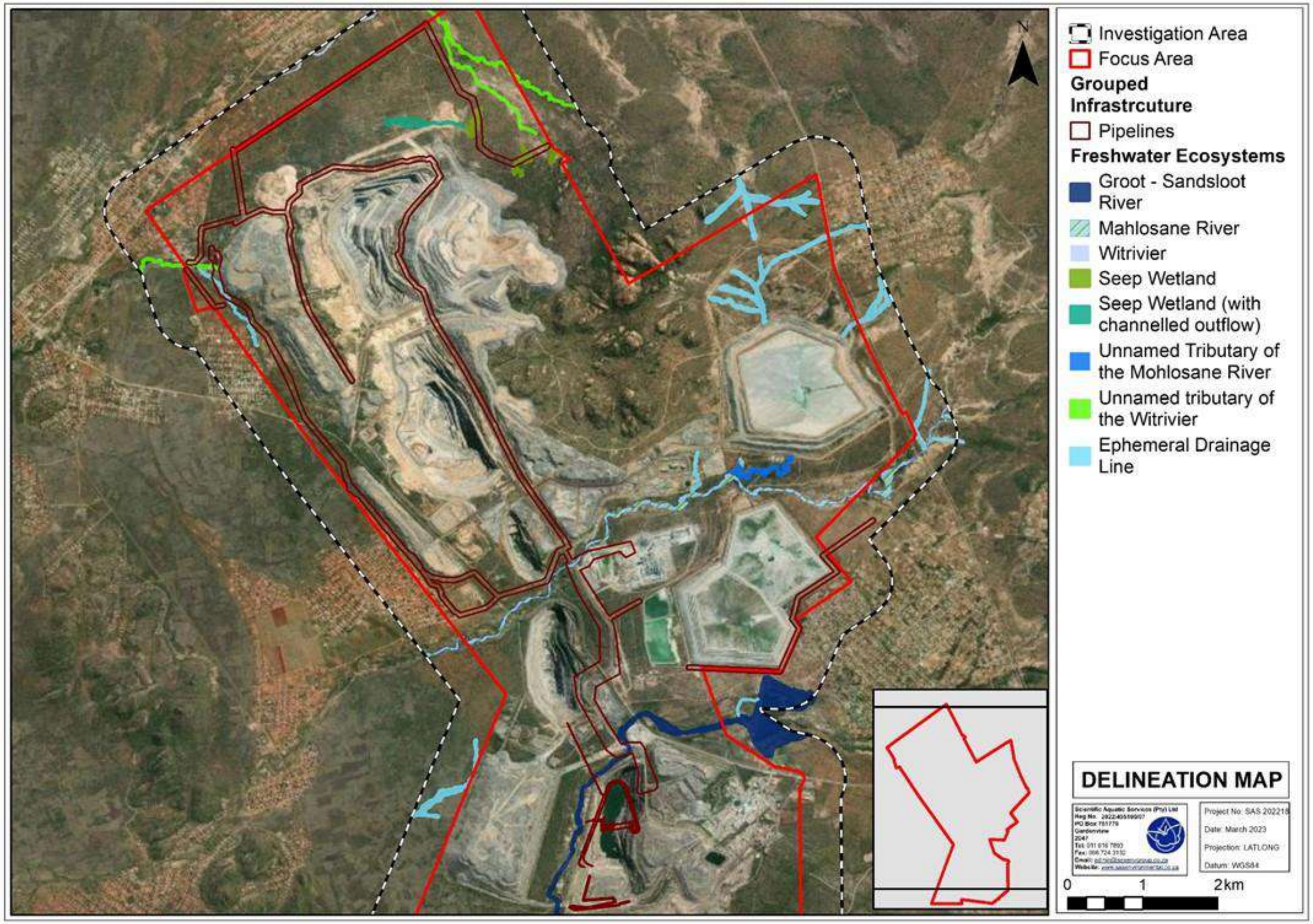


Figure 7-36: Delineated Freshwater Ecosystems specifically for the proposed pipelines (SAS, 2023)

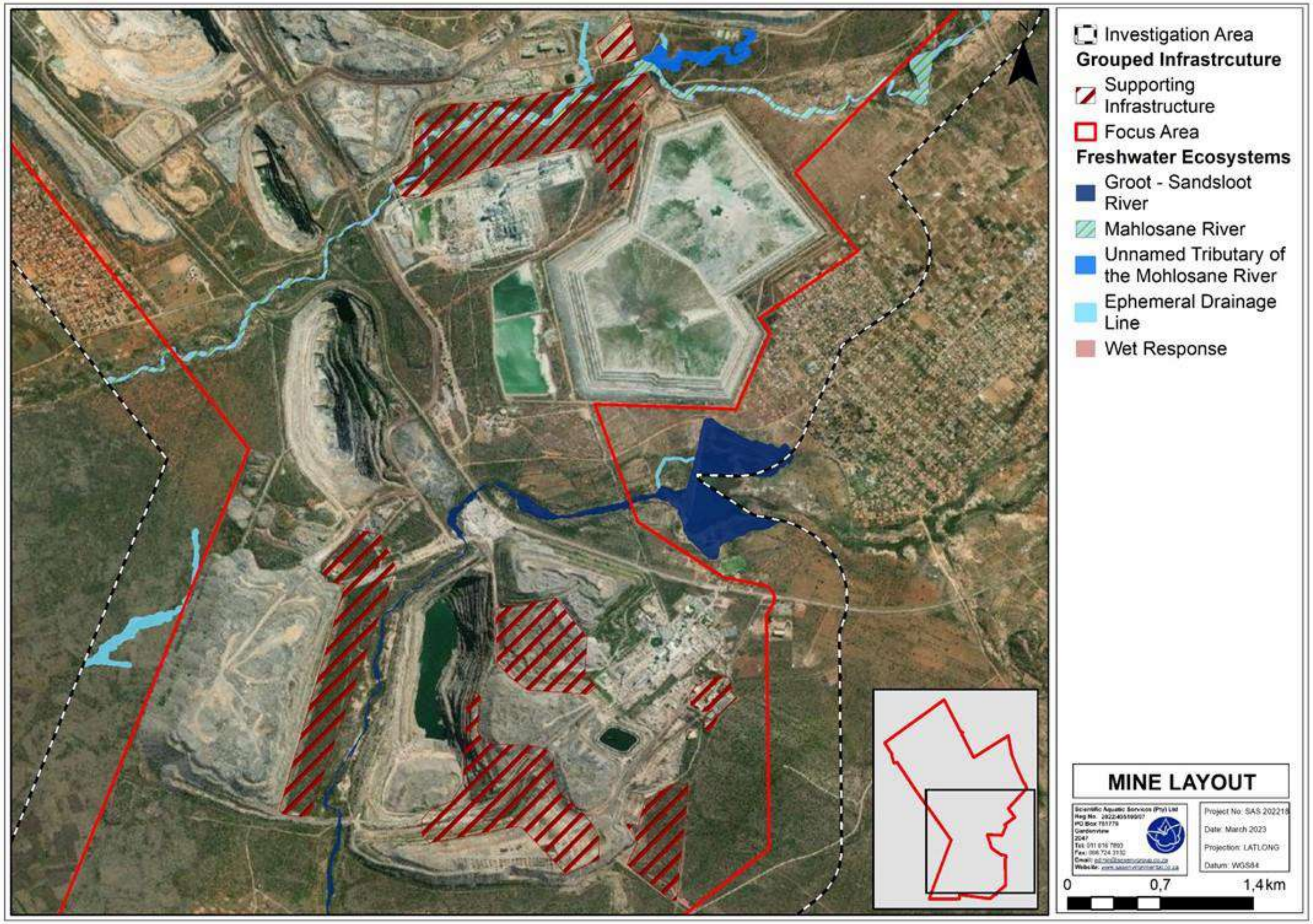


Figure 7-37: Delineated Freshwater Ecosystems specifically for the proposed supporting infrastructure (SAS, 2023)

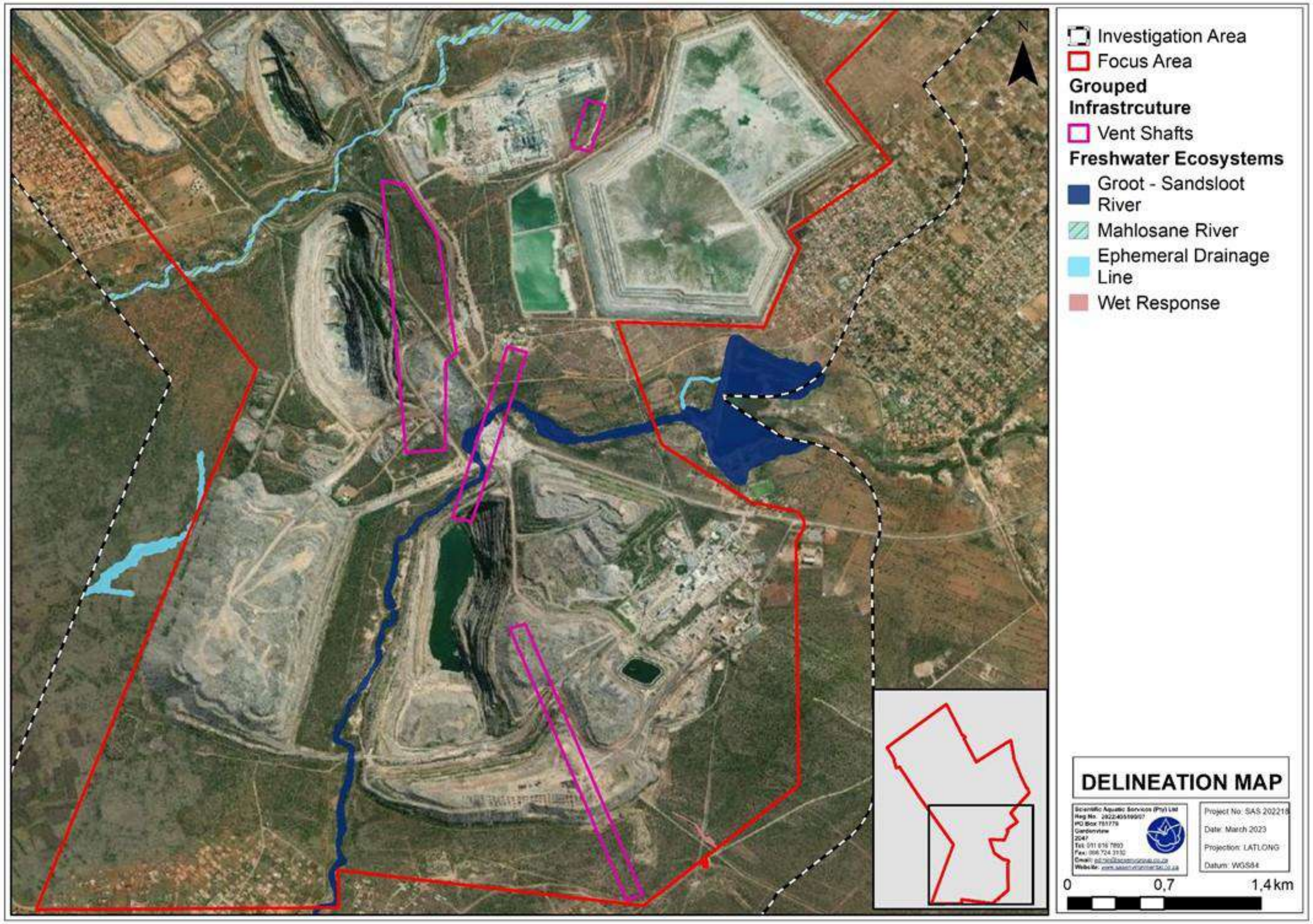


Figure 7-38: Delineated Freshwater Ecosystems specifically for the proposed ventilation shaft infrastructure (SAS, 2023)

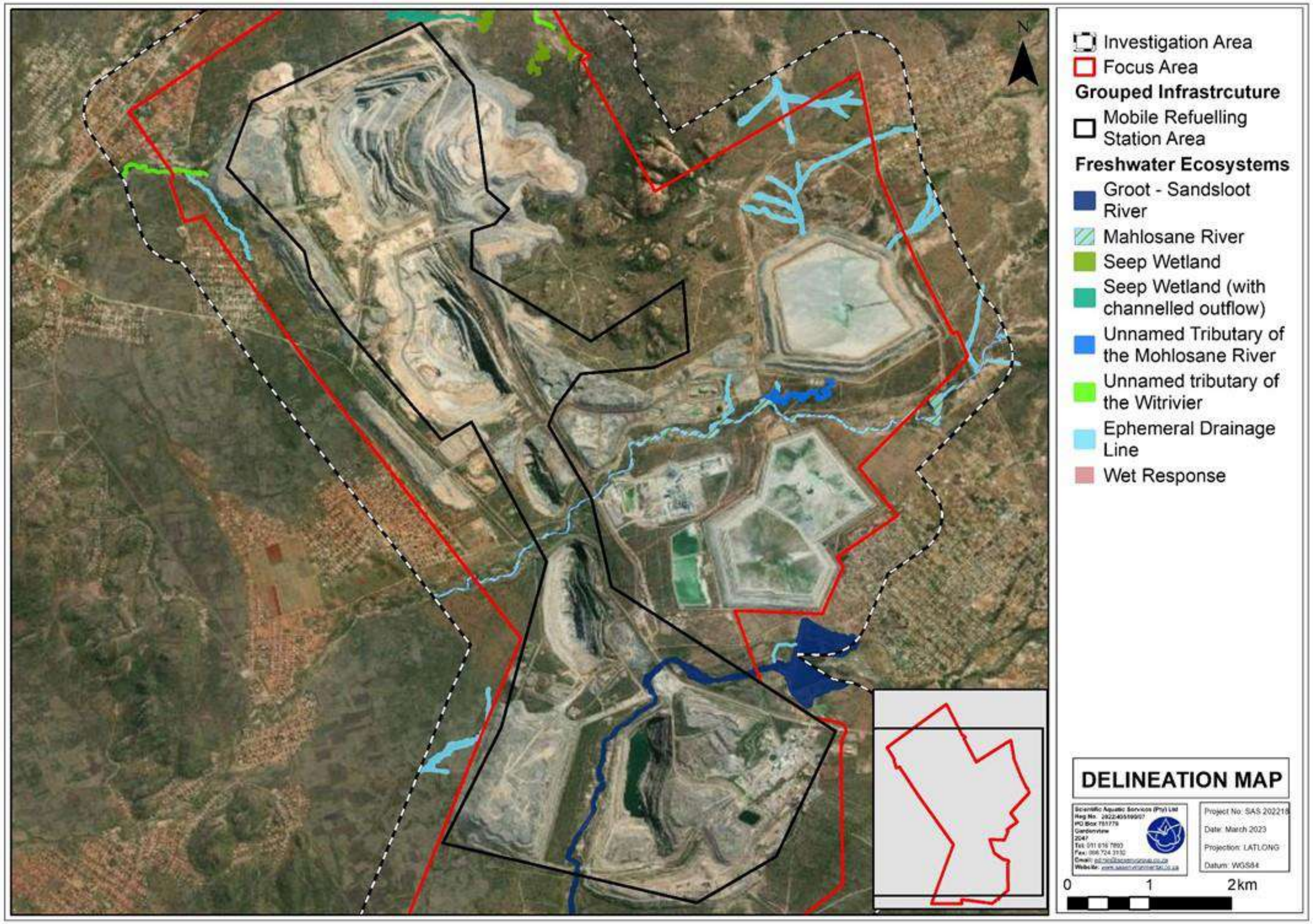


Figure 7-39: Delineated Freshwater Ecosystems specifically for the proposed mobile refuelling station corridor (SAS, 2023)

7.6.1 Mohlosane River Catchment

The Mohlosane River Catchment boundary in the east and the south-east runs parallel to the watercourse and is bounded by low catchment ridges. Thereafter, just passing the Zwartfontein Pit, the catchment boundary runs around the Vaalkop TSF and joins the Groot Sandsloot catchment boundary (passing by Ga-Sekhaolelo Village) up to the highest ridge, located to the northeast of the Ga-Sekhaolelo Village.

On the western side, the Mohlosane River catchment boundary runs along catchment ridges towards the Sekuruwe Village. The north-western catchment boundary is characterised by hills (found at Mohlotlo Village). From these hills, the catchment boundary runs along with the mine's workshop/wash bays/offices areas and past the South Pit.

The topography of the Mohlosane River catchment is relatively flat, with most of the catchment gradient ranging between 0.3% and 10%. This catchment comprises of steep areas (most noticeably localised hills on the south-western side), ranging between 10% and 50% in gradient. Urban development (both formal and informal) occurs at the downstream and upstream ends of this catchment, whilst in the middle, the catchment is characterised mainly by the mining activities of MM (such as the Tailings Dams, North Concentrator, workshops/offices/wash bays, etc.). The remaining catchment is characterised by open fields.

The Mohlosane River flows directly past the north of the North Concentrator, separating it from the offices and workshops area (to the north of the river) as well as the North, Central, and South Pits. The specific ecology of this river can be found within Table 7-10 below.

7.6.2 Groot Sandsloot River Catchment

The Groot Sandsloot River flows in a predominantly south-westerly direction, turning southwards as it rounds the northern edge of the Sandsloot Pit. On its south to south-eastern side, the catchment is bounded by catchment ridges which run from Ga-Mapela Village through Machikiri Village, passing the N11 national road. From this point, the catchment boundary runs along catchment ridges and hills, until it ties in with the quaternary catchment boundary in the east.

The Groot Sandsloot River catchment boundary runs along the quaternary catchment boundary to the north, near Matlaleng Village. The western catchment boundary is characterised by low ridges. The Vaalkop Tailings Storage Facility (TSF), Zwartfontein Pit as well as the existing waste rock dump (WRD) (to the west of the Sandsloot Pit), form the south to southwestern boundary of the overall catchment. Two north-east to south-west striking lineaments are present in the catchment, one in the far east of the catchment near the village of Ga-Mashashane Village and one east of Ga- Sekhaolelo Village.

The topography of the catchment is relatively flat to undulating, with most of the catchment slopes ranging between 3% and 10%. There are, however, steep areas within the catchment. Most noticeable are the localised hills on the eastern side (with slopes ranging between 10% and 50%).

The Groot Sandsloot River flows through the mining area, separating the North and South Concentrators, as well as the other pits (to the north of the river) from the Sandsloot Pit (to the south). There are several EDL associated with this river. The specific ecology of this river and associated drainage lines can be found within Table 7-10 below.

The overall catchment is largely characterised by open fields. Urban development (both formal and informal) is also found within the catchment. The mining activities and infrastructure (such as the tailings dams, South Concentrator, Sandsloot Pit and workshops at South Concentrator) are located in the downstream portion of the catchment.

There are four primary dams upstream of the mine, located within this catchment. Amongst the four dams, only one is a known Government Dam (also known as Vaalkop Dam). This Government Dam is located immediately south of Vaalkop TSF, whilst the other dams are located between 8 km and 12 km from the mine.

7.6.3 Witrivier Catchment

The Witrivier flows just outside the northern mine boundary. Within the mine boundary, a number of furrows, channels, and drainage lines flow in a north-easterly direction across the site towards this river system. The Witrivier catchment is approximately 221 km2 in extent and is generally flat with an average slope of 5%. The Witrivier flows in a south-westerly direction, receiving runoff from the northern portions of the site, most notably the west WRDs, adjacent to North Pit. of the site and includes the Western WRDs, a small portion of the Blinkwater TSF 2 and the full extent of Blinkwater TSF 3 expansion in its catchment.

All three rivers flow in a south-westerly direction where they join the Mogalakwena River, some 6 to 8 km downstream of the mine boundary, which flows to the north, eventually joining the Limpopo River. The specific ecology of the Witrivier can be found within Table 7-10 below.

7.6.4 Seep Wetland Areas

A total of five seep wetlands were identified within the site area, four of which were without a channelled outflow and one with a channeled outflow were identified. Seep wetlands can be categorised into (1) seeps with a channelled outflow, where water exits via concentrated surface flow and (2) seeps without a channelled outflow, where water exits via diffuse flows, interflows, evaporation, or infiltration. These seep wetland areas are located to the north; north-west of the boundary of the site.

The seep wetlands form as result of bedrock interflow that reach an impermeable layer beneath the ground and are forced to surface. These then occur in isolated areas in the landscape which accumulate surface water at or close to the surface but there is insufficient moisture to generate runoff that allows the wetland conditions to persist in the landscape and confluence with other freshwater ecosystems. These isolated areas support vegetation typically adapted to life in saturated soil and are classified as freshwater ecosystems, although they were considered to be of low/marginal ecological significance since they are almost completely hydrologically isolated and not significant in terms of their biodiversity support.

An additional seep wetland with a channelled outflow was identified within the study area and this was categorised as a separate HGM unit and was assessed separately. The specific ecology of the wetland systems can be found within Table 7-10 below.

The ecological importance and sensitivity (EIS) of the wetland was assessed to be low/marginal, despite degraded ecological integrity. The absence of significant flows throughout the duration of the year limits the ability of the seep to maintain ecological significance by providing ecoservices although when flows the present this wetland is utilised by amphibians to provide some suitable habitat. However, during periods when surface flows are present, the seep may provide important habitat, refugia, foraging and migratory sites for some faunal species.

Table 7-10: Freshwater Ecology Overview

Freshwater Ecosystem	Associated Infrastructure / Activities	System Type	Flow Condition	Present Ecological State (PES) / Vegetation Response Assessment Index (VEGRAI)	Instream Index of Habitat Integrity (IHI)	Riparian Index of Habitat Integrity (IHI)	Ecoservice	Ecological Importance and Sensitivity (EIS)	Landscape Unit	Algal Proliferation	Water clarity and odour
Mohlosane River	• N11 Access Road • Infrastructure Areas • Powerline Buffers • Point of Distribution Sub-station Alternatives	Non-Perennial River	Still standing pool	Category C/D (Moderately to Largely Modified)	Category C (Moderately Modified)	Category C (Moderately Modified)	Intermediate	Moderate	Valley floor	Algae present	Silty, no odour
Groot Sandsloot River	• Truck Workshop Area • Exploration Decline • Backfill Pipeline • Zwartfontein Pushback • Vent Shaft Corridors • Underground Mining Area	Non-Perennial River	Slow	Category C (Moderately Modified)	Category C (Moderately Modified)	Category C (Moderately Modified)	Low to Moderately Low	Moderate	Valley floor	Significant algal proliferation	Discoloured, strong organic smell
Witrivier	• Increased sediment runoff and dispersion from the waste rock dump	Non-Perennial River	Slow	Category C (Moderately Modified)	Category C (Moderately Modified)	Category C (Moderately Modified)	Low to Moderately Low	Moderate	Valley floor	Significant algal growth	Discoloured, no odour
Unnamed tributary of the Witrivier and Mohlosane River	• New Stormwater Control Dam • N11 Access Road	Non-Perennial River	Still standing pools with slow flowing runs	Category C (Moderately Modified)	Category C (Moderately Modified)	Category B/C (largely Natural to Moderately Modified)	Very Low to Low	Moderate	Valley floor	Significant algal beds	Discoloured, no odour
Ephemeral Drainage Lines	• N11 Access Road	Stormwater Drainage Line	Only flow in stormwater events	Category D (Largely Modified)	Category C/D (Moderately to Largely Modified)	Category C/D (Moderately to Largely Modified)	Very Low to Low	Moderate	Valley floor	Not Applicable	Not Applicable
Seep wetlands	• North Waste Rock Dump	Seep Wetland	Not Applicable	Category C (Moderately Modified)	Not Applicable	Not Applicable	Very Low to Low	Low/Marginal	Slope	Not Applicable	Not Applicable
Seep wetlands with a channelled outflow	• North Waste Rock Dump	Seep Wetland	Not Applicable	Category D (Largely Modified)	Not Applicable	Not Applicable	Very Low to Low	Low/Marginal	Slope	Not Applicable	Not Applicable

7.7 GROUNDWATER

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Hydrogeology Specialist Input to EIA. Compiled by Knight Piesold Consulting dated May 2023 (Annexure 5-3).*

The geologic setting of the Mine is in the Northern Limb of the Bushveld Igneous Complex, which is well known for its large proportion of the world's platinum and palladium resources. the Platreef is overlain by gabbronorites (Main Zone) that may have thicknesses up to 2,000 metres (m). The Platreef overlies the granites (Archean Basement) in the north as well as the dolomites and meta dolomites (Malmani Subgroup) in the south. A geologic transition zone or contact zone was assumed to exist on the hanging-wall side of the Platreef (referenced hereafter as the "shear zone"). The extent of the shear zone is not well defined and was assumed to be continuous along the Platreef unit with depth. The dip angle of the Platreef is generally 45 degrees from east to west, which is followed by various mining cuts. All geologic units are considered to be weathered near the ground surface, with thicknesses ranging from 30 to 50 m.

Five faults are present on site namely the Drenthe, NM, Pit, Centre Pit, and Mohlosane Faults. Because their spatial extents are smaller than the areal extent of the country-rock block model, these faults are considered to be localised to the Mine area.

Three dykes have been identified in the vicinity of the Mine; these dykes are designated as the Southern Dyke, the Central Dolerite Dyke, and the Northern Dolerite Dyke. Because the spatial extents of the Central and Northern Dykes are presented through the entire hydrogeological model domain of the country-rock block model, they were assumed to exist through the model domain of the groundwater flow model. The Southern Dyke was considered to be localised because the spatial extent is smaller than the areal extent of the country-rock block model.

7.7.1 Unsaturated Zone

The unsaturated zone refers to the portion of the geological/soil profile located above the static groundwater elevation or water table and consists of soil and weathered bedrock. The vadose zone is on average about 15-20 m thick and less close to a surface water body e.g. Mohlosane and Sandsloot rivers and the tailings facilities.

Test pits excavated on the western side of the mine in the hanging wall norites show that the transported and residual norites are fine-grained, generally sandy (30-70%), with gravelly zones near the weathered bedrock contact, and lesser percentages of silt and clay indicating moderate permeability. Clay lenses only occur at depth in the transported soil close to the river channels between the bedrock and within the alluvium due to the transportation of organic matter along the drainages under a wetter climate. The footwall granites and granofels are likely to be sandy with higher permeability.

The regional MIKESHE integrated water balance model indicates that up to 24% of the mean annual rainfall is transported laterally as overland flow in the vadose zone and the overland flow that did reach the rivers which flow intermittently, loses most of this flow to groundwater i.e. losing streams.

There is likely to be a perched aquifer that develops during the rainy season that is disconnected from the regional saturated weathered and fractured aquifers due to the lateral flow in the relatively permeable sandy soils.

Saturated and unsaturated permeability testing of the vadose zone under the proposed new facilities (i.e. Blinkwater Compartment 2 and North and Witrivier waste rock dump extensions and new concentrator area) should be undertaken before construction and used in the final design of these facilities.

Saturated and unsaturated permeability testing of the vadose zone under the proposed new facilities North WRD Phase 3 should be undertaken before construction and used in the final design of these facilities.

7.7.2 Saturated Zone

There are several water-bearing zones underlying the Mine area:

- There is a **localised primary aquifer** that occurs along the drainage channels of the Sandsloot, Mohlosane, and Witrivier non-perennial streams that drain the Mine area to the Mogalakwena River. Sub-surface flow throughout the year in the sandy sediments is intercepted in the shallow boreholes (<15 m depth average where measurable) that are used extensively by the local communities as their domestic water supply. Recharge is from the runoff and overland flow (perched aquifers in the vadose zone) to the losing streams as seen from the rapid increase in water levels following storm events.
- The **weathered bedrock aquifer** extends to a depth of at least 30 -50m within the weathered bedrock units. The weathered zone is more permeable than the underlying bedrock due to weathering and the presence of fractures. Deep weathering is associated with the Sandsloot and Mohlosane Rivers and tectonic structures. The weathered bedrock aquifer is hydraulically in connection with the alluvial aquifer in the non-perennial streams which are generally losing to the groundwater. Up to 90% of the water strikes of boreholes drilled occur at depths of less than 50 m below the surface at the contact of the weathered and fresher bedrock but have low yields from seepage to < 1 L/s.
- Groundwater flow in the **unweathered bedrock** is controlled mainly through fractures and joints and major fault blocks which are hydraulically connected. Higher yields occur in the shear zones at the contact with the Platreef, which serves as the main storage component of the aquifer, with some contribution by seepage from the overlying weathered zone. Boreholes drilled on lineaments that intercept water-bearing structures generally have blow-out yields of between 2.0- 8.0 L/s.
- The **dykes** may compartmentalize flow due to their low permeability. No major water strikes were intersected in the boreholes drilled on the Central and North dyke. Some of the boreholes drilled on the contact of the dykes indicated water strikes with blow-out yields of between 0.1 to 0.9 l/s indicative of flow along the contacts but not across them.

7.7.3 Hydraulic Conductivity (K)

The hydraulic properties of the water-bearing zones were assessed from the results of test pumping conducted during historical investigations and the more recent drill stem testing by Piteau.

The results of the slug testing of 22 boreholes drilled in 2015 (AEC) indicated hydraulic conductivity of 0.01 to 0.9 m/day with an average of 0.2 m/day. Test pumping of 8 boreholes with higher yields gave a transmissivity of 8 - 345 m^2/day with an average of 110 m^2/day. Most of these boreholes were in the hanging wall around the Central South and North Pits.

Between 2016 and 2017, packer testing and Nuclear Magnetic Resonance (NMR) testing were conducted to provide estimates of K values for the geologic units and geologic structures.

The lithologies/structures with the estimated K values from various testing programs are summarized below:

- **Gabbronorite**: The K values of the gabbronorite were measured with packer testing and ranged from 2.70×10^{-4} to 2.03×10^{-2} metres per day (m/day).
- **Pyroxenite**: The K values of the pyroxenite were measured with packer testing and were estimated to range from 1.11×10^{-3} to 3.75×10^{-1} m/day. The pyroxenite may be representative of the Platreef geologic unit.
- **Shear Zone**: The shear zone K values were measured with packer testing and NMR testing and ranged from 7.73×10^{-4} to 5.76×10^{-2} m/day.
- **Faults:** The estimated K values for the Pit, NM, and Drenthe Faults were approximately 2.61×10^{-3}, 2.08×10^{-3}, and 5.51×10^{-2} m/day, respectively.

- **Dykes:** The K value of the dyke was estimated to be approximately 5.46 x 10^{-21} m/day. It is unlikely that a K value of this magnitude was measurable with the field testing technique; however, the field estimate indicates that dykes at the Mine site are likely to have low permeability values.
- **Malmani Dolomites**: One borehole tested in the Footwall dolomite at Sandsloot indicated K of 17 m/day associated with the dissolution fractures encountered.

7.7.4 Groundwater Level Depths and Elevation

Regional groundwater level data was obtained from the 2018 hydrocensus and the groundwater results from the groundwater monitoring compliance and mine monitoring boreholes.

Between 2016 and 2017, the Mine installed 11 piezometers. Each piezometer was installed with multilevel vibrating-wire transducers (VWTs) with shallow and deeper transducers. The newly drilled monitoring boreholes have also been included in the monitoring programme.

Below is a summary of the measured groundwater-level data:

- The depth to the groundwater table is generally between 0.5 to 24 mbgl.
- A good correlation (R^2=0.93) between absolute surface and monitoring boreholes hydraulic head elevations in mamsl confirms that the phreatic surface mimics surface topography from higher-lying areas to lower-lying valleys (Figure 7-40).
- Regional groundwater flow is from SSE to NNW towards the Mogalakwena River, from > 1150 mamsl upgradient of the Mine to 1060 mamsl downgradient of the mine. Localised groundwater flow is towards the drainage channels (Sandsloot, Moholosane and Witrivier).
- Significant groundwater level fluctuations occur, in response to the recharge and discharge cycles that occur during the wet and dry seasons in the shallow boreholes in the weathered aquifer. This suggests that the recharge to the bedrock groundwater system during precipitation is limited to the unsaturated, permeable topsoil and fractured rock.
- Average groundwater levels (collected by Delta H (2018)) of around 9 mbgl in the tailings dam area reflect shallow water levels within the upper weathered aquifer due to seepage from the unlined TSFs (Figure 7-41)
- No significant fluctuations in groundwater levels were recorded during January 2017 to May 2021 monitoring period in response to the precipitation, although there is a slightly decreasing trend in the water table during the dry months in boreholes around the tailings facility.
- Almost all the measured groundwater levels in the deeper fracture MM monitoring boreholes do not fluctuate with precipitation events. The recharge from precipitation to the deeper groundwater system is a slow infiltration process.
- Figure 7-41 shows the groundwater levels in the vibrating wire piezometers around the Sandsloot Pit. There is a disconnect between the groundwater levels in the weathered aquifer (1100 mamsl -1060 mamsl) and the fractured bedrock with a downward hydraulic pressure gradient towards the pit.
- There is a strong lateral and vertical connection in the Platreef.
- In the vicinity of the existing Sandsloot pit, dewatering has resulted in the disconnection between the shallow weathered aquifer and the deeper fractured rock aquifers as shown in a cross-section from W-E in Figure 7-42.
- For the low K-value rocks at MM, it is reasonable to observe no obvious or minor downward vertical gradients at the piezometers that are outside the perimeter of the open pits, confirming that the cone of drawdown due to the mining is steep and does not extend laterally.

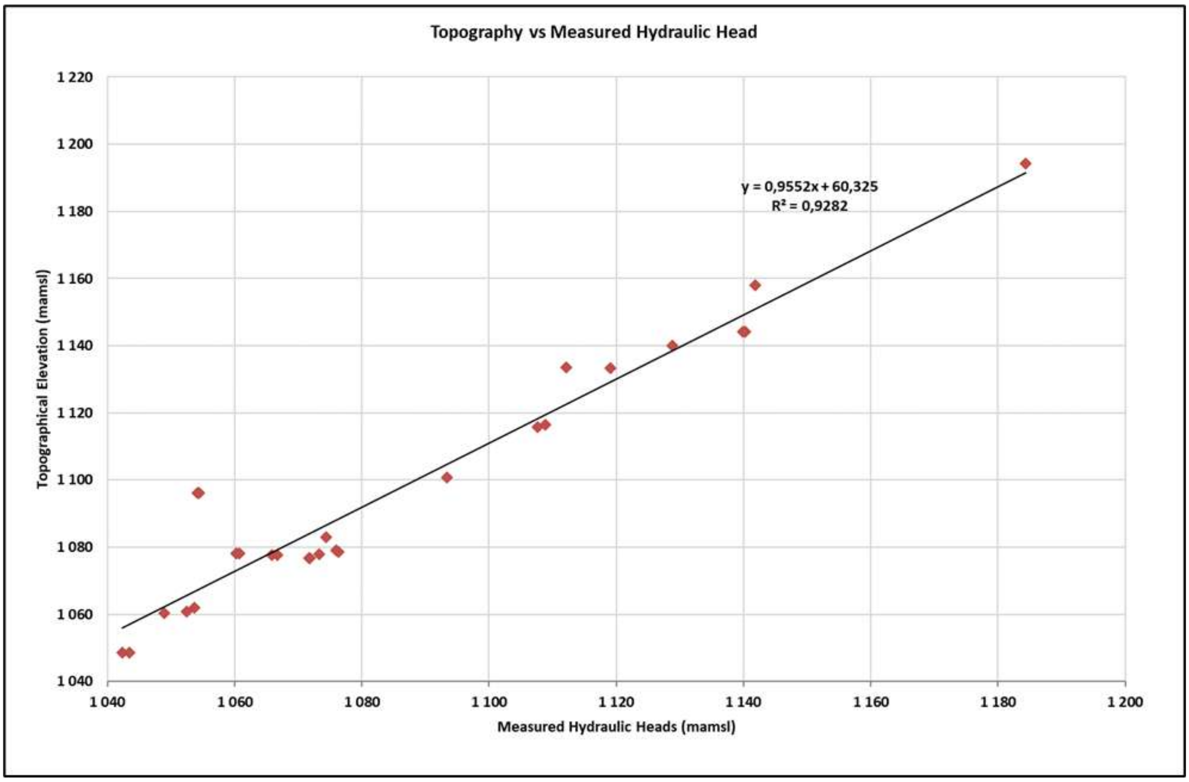


Figure 7-40: Groundwater table versus topographical elevation (Piesold, 2023)

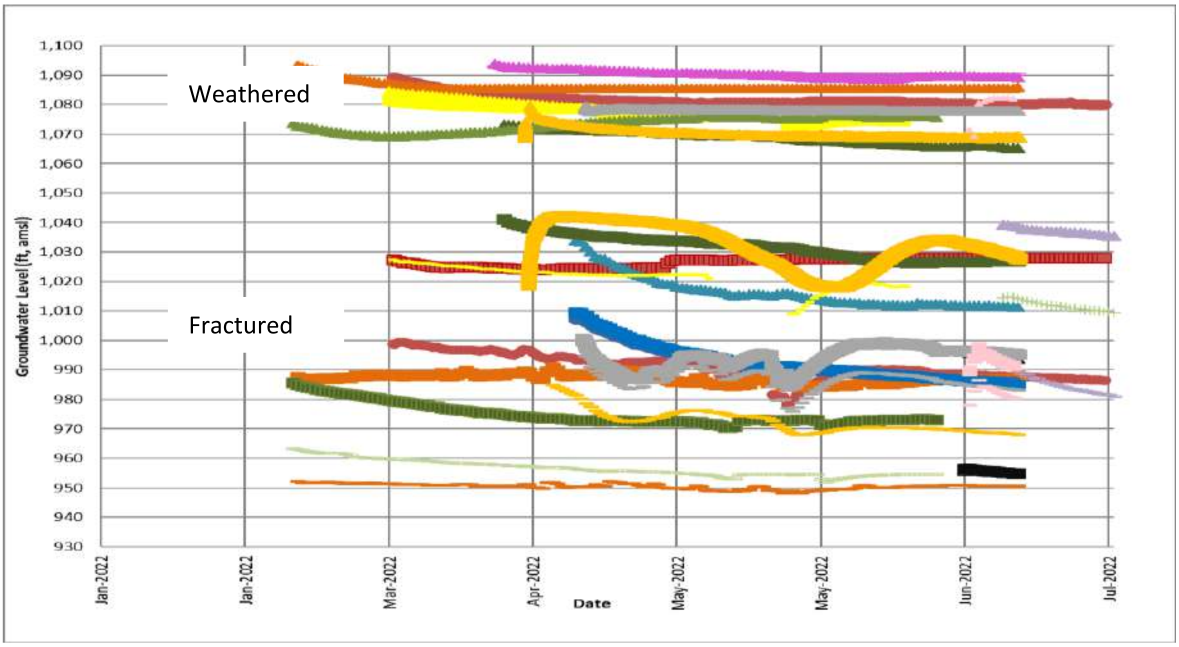


Figure 7-41: Groundwater head around Sandsloot Pit in mamsl (Piesold, 2023)

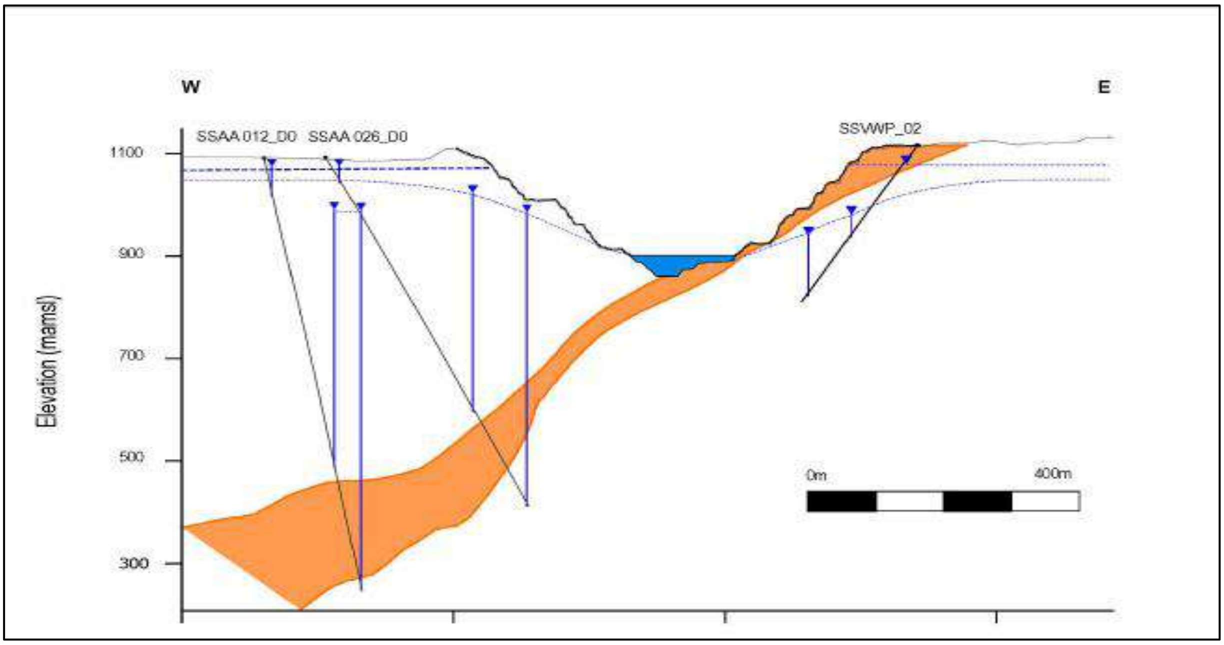


Figure 7-42: Cross section through Sandsloot Pit showing Weathered and Fractured groundwater heads (Piesold, 2023)

7.8 HYDROPEDOLOGY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist studies – *Hydropedological Assessment as part of the Environmental Authorisation and Planning Process for the Proposed Expansion of the Mogalakwena Platinum Mine, near Mokopane in the Limpopo Province. Complied by Zimpande Research Collaborative dated April 2023 (Annexure 5-8).*

Soil physical and hydraulic properties (such as textural class, hydraulic conductivity and porosity) have an influence on numerous processes such as runoff, infiltration, groundwater recharge and general water movement in soils. Whereas soil morphological properties do not have any direct impact on hydrological processes but serve as indicators of dominant flow paths, flow directions and storage mechanisms in the form of mottling and the presence and/or absence of signs of hydromorphy. The correct mapping and interpretation of these soil morphological properties thus allows for the correct conceptualisation of hydropedological processes spatially. Consequently, the captured hydropedological information allows for effective water resource management. Figure 7-43 below indicates the identified hydrological soil types within the site area.

The MM site area is associated with several watercourse systems, thus it is deemed important to understand the status of the affected wetlands in terms of their Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) to ensure that the necessary protection is afforded. Details of this can be found within Section 7.6 above.

The site is largely a brownfield comprising large opencast pits, tailings facilities and other mining and related infrastructure which have significantly altered the natural soil and hydropedological regime. The remaining areas are comprised of shallow lithic soils (including rocky outcrops) and moderately deep soils, majority of which lack hydromorphic characteristics.

The riverine systems as well as the ephemeral drainage lines associated with the site are non-perennial systems which are dominantly driven by catchment hydrological processes (i.e., surface runoff) with limited contribution from subsurface interflow process.

The soils within the site area were classified as responsive soils since these soils largely contribute to surface runoff during highly intensive rainfall events and drive riverine recharge in this manner. Limited interflow soils were identified within the far east portion (>1km from the footprint area) of the site.

The anticipated dominant recharge mechanism of the Seep wetlands is anticipated to be the shallow aquifer which manifests as springs. As such, the hydropedological processes are deemed to have a limited contribution (if any) to the wetlands due to the occurrence of shallow soils (less than 35cm at most) which contribute to surface overflow flow during the rainy season.

A portion associated with the development associated with the Seep with a Channelled flow depicted lateral flows in the vadose zone, however the hydropedological connectivity of these soils to the Witrivier was not evident due to the occurrence of shallow responsive and staging soils immediately downgradient of this area. It is assumed that the contribution of the lateral flows to the Witrivier may be through the geological fractures of the underlying material where water mostly likely appears as spring or shallow groundwater.

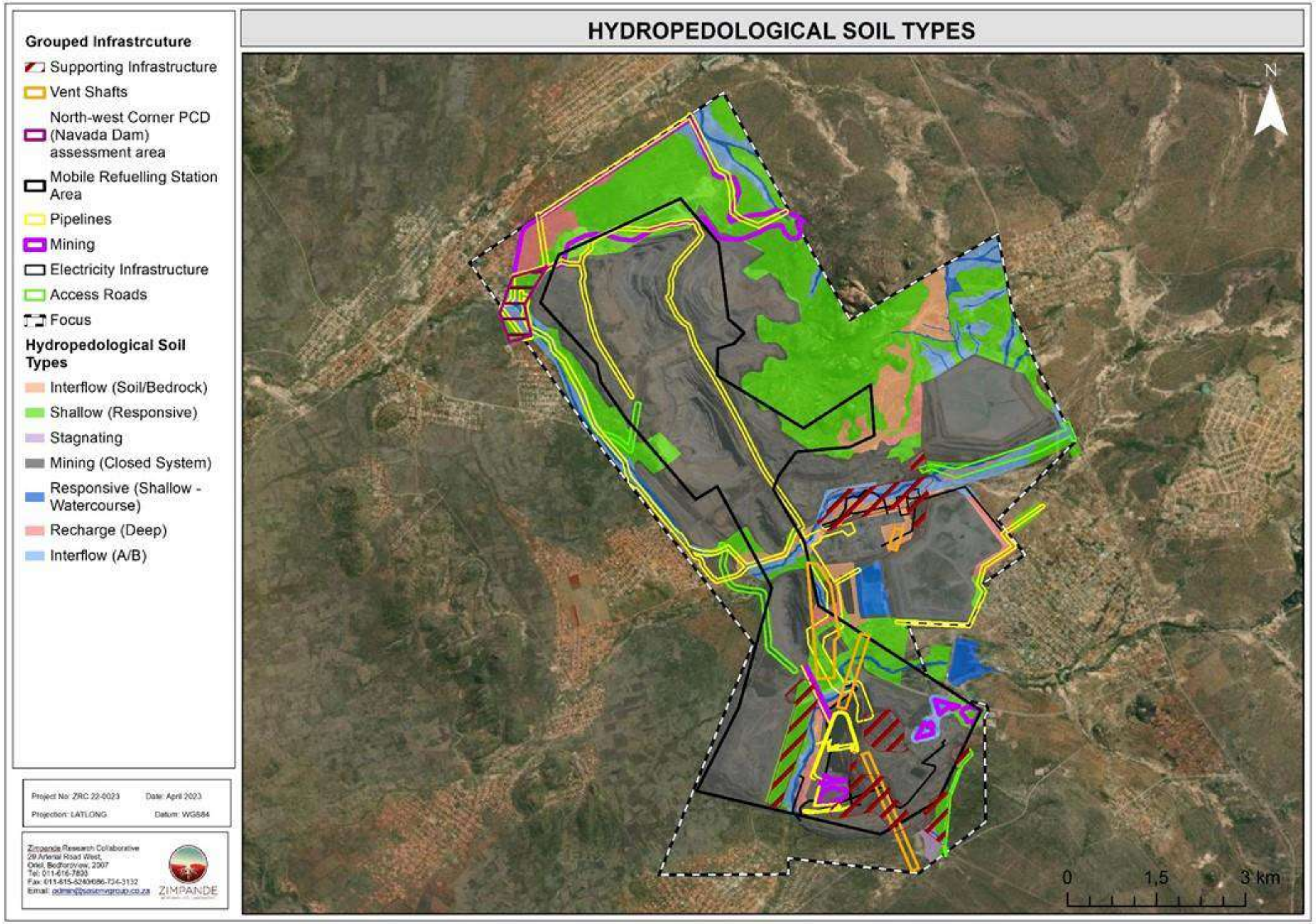


Figure 7-43: Hydropedological Soil Types (Zimpande, 2023)

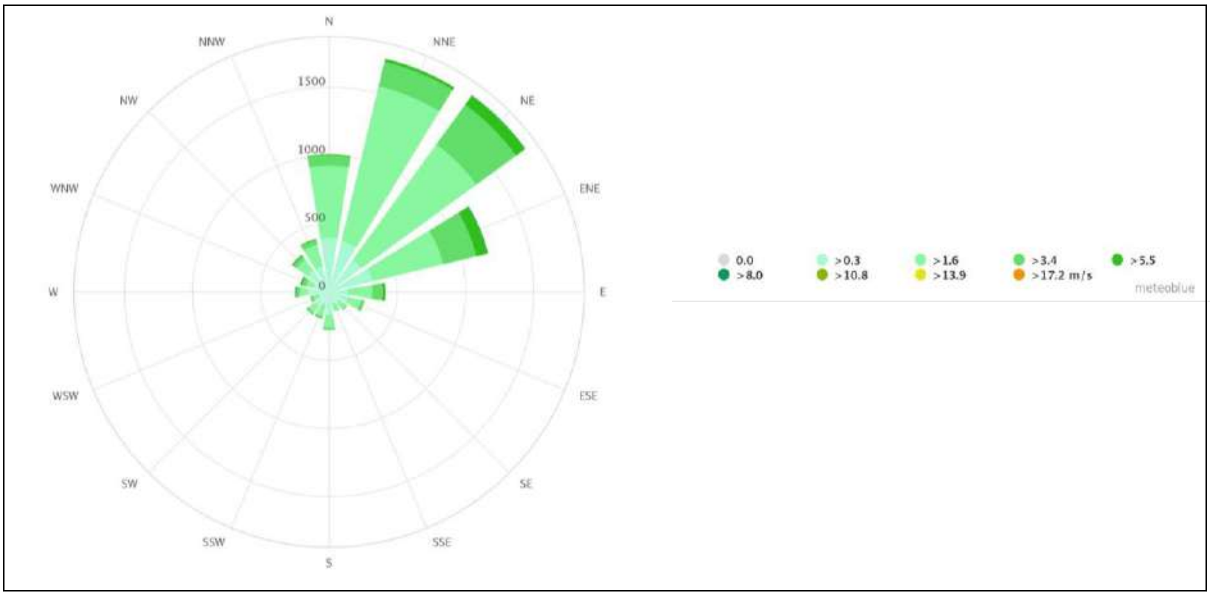
7.9 AIR QUALITY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Air Quality Assessment to Support the Proposed Future Mining at the Mogalakwena Platinum Mine – Specifically Focusing on the Transition of The Sandsloot Mine from An Open Pit to Underground Mining Method. Complied by uMoya-NILA Consulting dated June 2023 (Annexure 5-5).*

7.9.1 Wind Speed and Direction

The hourly wind speed and direction data are presented in the annual windrose in Figure 7-44. A windrose illustrates the frequency of hourly wind from the 16 cardinal wind directions, with wind indicated from the direction it blows, i.e. easterly winds blow from the east. It also illustrates the frequency of average hourly wind speed in six wind speed classes in m/s.

The predominant wind directions are north-northeast (NNE) to north-northeasterly (NNE) with some winds from the north (N). Generally, winds in these directions are light with the majority of hourly winds less than 3.4 m/s, see wind frequency vs wind speed in Figure 7-44. Stronger winds reaching more than 8 m/s do occur, mostly from the NNE and northeast (NE). Winds rarely occur from the other wind sectors. The observed wind directions appear to be largely influenced by topography which varies for higher elevations of up to 1 750 m in the east, and decreasing steading to elevations of 1 000 m in the west. The fall towards the west induces a natural drainage from east to west.



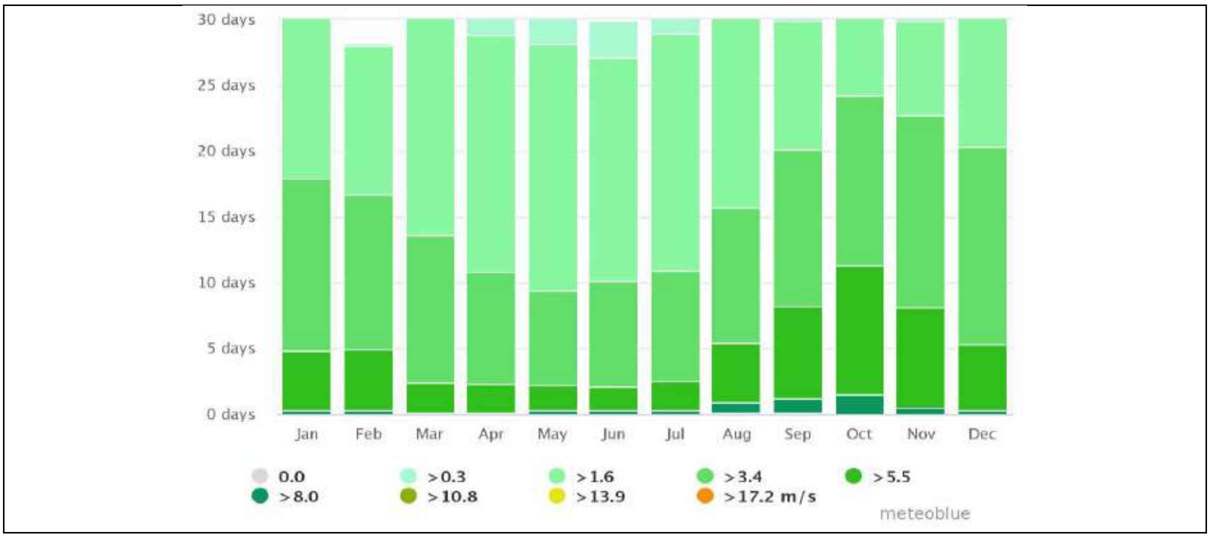


Figure 7-44: Annual windrose at Mokopane (top) with wind speed in m/s and frequency banks of 250 hours, and wind frequency (bottom) (uMoya-Nila, 2023)

7.9.2 Ambient air quality

Dust Fallout (DFO) monitoring is undertaken at MM on a monthly basis utilising the ASTM D1739 Method and assessed with the national dust fall standards as highlighted in Table 7-11 below. The National Dust Control Regulations were published on 1 November 2013. It lists guidance on the requirements for monitoring dust fallout and provides limit values for acceptable dustfall rates for residential and non-residential areas.

Table 7-11: National limit values for dustfall rates in mg/m²/day as a 30-day average (uMoya-Nila, 2023)

Area	Dustfall rate (D)	Permitted frequency of exceedance
Residential	D < 600	Two within a year, not in sequential months
Non-residential	600 < D < 1 200	Two within a year, not in sequential months

The dust fallout monitoring network includes 20 sampling sites in the residential areas surrounding the MM, and 14 on-site sampling sites (Figure 7-45). In some months data was collected at 18 monitoring sites.

Dust fallout measure in the 10 months at the residential monitoring points was consistently well below the limit value of the national standard of 600 mg/m^2/day. There were however exceedances of the limit value at one site in January 2022 and at two sites in October 2022. In January 2022 a fallout rate of 1 709 mg/m^2/day was measured at the Popo-19 site in Ga-Sekhaolelo. In October 2022, dust fallout rates of 3 522 mg/m^2/day and 4 859 mg/m^2/day were measured at Langa in Skimming and at Tsalebelella in Ga-Seema, respectively. It is noteworthy that Popo-19 is approximately 5 km upwind of MM under the prevailing northeasterly winds. The monitoring points at Langa at Tsalebelella are downwind of MM under the prevailing northeasterly winds.

In the same period, dust fallout was relatively low at all on-site monitoring points and below the limit value of the national standard of 1 200 mg/m^2/day. There were exceedances of the limit value at one site in February 2022 and at three sites in October 2022. A dust fallout rate of 1 360 mg/m^2/day was measured at site P21 in February 2022. In October 2022, dust fallout rates of 1 409 mg/m^2/day was measured at the P46 monitoring point.

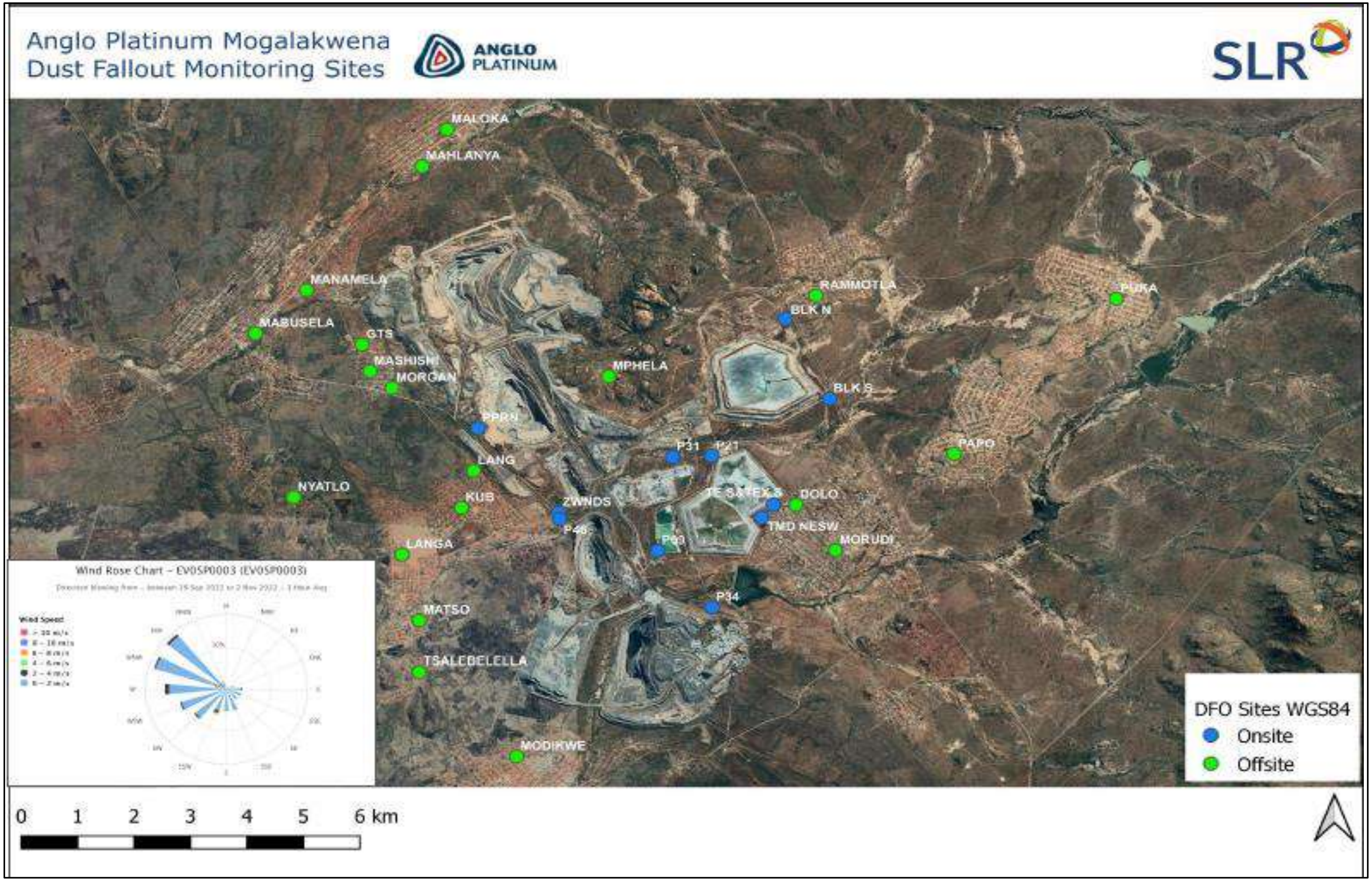


Figure 7-45: Dust fallout monitoring sites at Mogalakwena Mine (uMoya-Nila, 2023)

The national ambient air quality standard (NAAQS) for criteria pollutants consists of a limit value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted frequency of exceedance represents the tolerated exceedance of the limit value annually and accounts for high concentrations as a result of process upsets and meteorological variation. Compliance with the ambient standard implies that the frequency of exceedance does not exceed the permitted tolerance. The NAAQS for PM_{10} and $PM_{2.5}$ are shown in Table 7-12 below.

Table 7-12:NAAQS in µg/m^3 form PM_{10} and $PM_{2.5}$ (uMoya-Nila, 2023)

Pollutant	Averaging period	Limit value	Tolerance	Compliance date
PM_{10}	24 hours	75	4	
	1 year	40	0	
$PM_{2.5}$	24 hours	40	0	
		25	0	1 Jan 2030
	1 year	20	0	
		15	0	1 Jan 2030

7.9.3 Air Pollutants

All aspects of mining generate dust, referred to as particulate matter. The dispersion of dust in the atmosphere is a function of the particle size, shape and density, as well as wind speed and other climatic effects. Large dust particles (greater than 30 µm), which make up the greatest proportion of dust emitted from mining activities will largely deposit relatively close to the source. Intermediate-sized particles (10 - 30 µm) are likely to travel up to 200 - 500 m from the source. Smaller particles (less than 10 µm) which make up a small proportion of the dust emitted from mining activities, travel further from sources and deposit slowly.

Particulate matter is a broad term used to describe the fine particles that occur in the atmosphere, including soil dust, dirt, soot, smoke, pollen, ash, aerosols and liquid droplets. The most distinguishing characteristic of particulate matter is the particle size and the chemical composition. Particle size has the greatest influence on the behaviour of particulate matter in the atmosphere with smaller particles tending to have longer residence times than larger ones. Particulate matter is categorised, according to particle size, into total suspended particulates (TSP), PM10 and PM2.5.

TSP consist of all sizes of particles suspended within the air smaller than 100 micrometres (µm). TSP is useful for understanding nuisance effects of particulate matter, e.g. settling on houses, deposition on and discolouration of buildings, and reduction in visibility.

7.10 ARCHAEOLOGICAL, CULTURAL AND HERITAGE

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Heritage Impact Assessment for the Proposed Mogalakwena Mine Integrated EIA Project. Complied by PGS Heritage dated May 2023 (Annexure 5-11).*

The 2023 Heritage report summarised the identified heritage sites as presented in Table 7-13 as recorded as part of the assessment in support of the MM Integrated project. These are also represented in Figure 7-46 below. All new sites as identified within the 2023 study were given a site number with the prefix **MMIEP**. This prefix stands for Mogalakwena Mine Integrated EIA Project.

Table 7-13: Heritage Aspects recorded for the Mogalakwena Complex (PGS, 2023)

Number	Coordinates	Significance	Brief Site Description
MMIEP 1	S -24.005692 E 28.927426	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. One of these structures comprises the foundations of a circular dwelling (rondavel). Cultural material in the form of potsherds were observed on the surface of the site. The risk for unmarked graves associated with the site exists.
MMIEP 2	S -24.005865 E 28.927404	Medium (IIIB)	A small rectangular structure was identified here. The structure is most likely associated with the historic homestead at MMIEP 1. The risk for unmarked graves associated with the site exists.
MMIEP 3	S -24.005554 E 28.927128	Medium (IIIB)	A large rectangular walled structure is located here. The structure is 30m by 10m in extent. It seems likely for the structure to have formed part of the historic homestead at MMIEP 1. A lower grinding stone was observed at the site. The risk for unmarked graves associated with the site exists.
MMIEP 4	S -24.006442 E 28.931628	Low (IIIC)	A low-density surface scatter (10m x 10m in extent) of ceramics associated with the Iron Age or Historic Period was identified here.
MMIEP 5	S -24.006438 E 28.932429	Low (IIIC)	A low-density surface scatter (10m x 10m in extent) of ceramics associated with the Iron Age or Historic Period was identified here.
MMIEP 6	S -24.005989 E 28.932951	Low (IIIC)	A low-density surface scatter (15m x 10m in extent) of ceramics associated with the Iron Age was identified here.
MMIEP 7	S -23.969666 E 28.930374	Medium (IIIB)	A small circular stone concentration is located here. The exact function or origin of the feature is not presently known. Mitigation would be required due to the potential presence of graves.
MMIEP 8	S -23.968351 E 28.932609	Low (IIIC)	A low-density surface scatter (10m x 10m) of Middle Stone Age lithics was identified here. The lithics appear to be exposed by a stream.
MMIEP 9	S -23.970062 E 28.936206	Medium (IIIB)	A small circular stone concentration is located here. The exact function or origin of the feature is not presently

			known. Mitigation would be required due to the potential presence of graves.
MMIEP 10	S -23.966683 E 28.947331	Medium (|IIB)	A homestead is located here and extends over an area roughly 150m by 50m in extent. The site comprises the poorly preserved foundations of the site's structural elements. The use of cinder blocks in the construction indicates that at least the later history of the site can be associated with the recent past. The risk for unmarked graves associated with the site exists.
MMIEP 11	S -24.000619 E 28.910019	Medium (|IIB)	A historic homestead is believed to be located here. The risk for unmarked graves associated with the site exists.
MMIEP 12	S -23.984573 E 28.900980	Low (IIIC)	A single lower grinding stone was identified here.
MMIEP 13	S -23.932535 E 28.902988	Medium (|IIB)	A historic homestead is located within the NE WRD area and comprises the poorly preserved foundations of the site's structural elements. As indicated in **Section 1.3** and **Appendix C**, the mine believes that the risk for unmarked graves within the NE WRD had been mitigated.
Sites MMIEP 14 to MMIEP 22 were originally identified within and in proximity to the previous layout for the NWRD Disposal Facility Phase 3. The recent amendment of this layout resulted in these sites being located at some distance from the new footprint area. As a result, these sites have been removed from this report.			
MMIEP 23	S -23.949387 E 28.862779	High (|IIA)	A grave is located here and has an oval stone-lined dressing with an upright stone on its western end. The grave is associated with the Chaba family.
MMIEP 24	S -23.949165 E 28.862758	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists. The Chaba family is associated with the homestead.
MMIEP 25	S -23.948298 E 28.863097	Medium (|IIB)	A historic homestead is located here. The homestead is poorly preserved. The risk for unmarked graves associated with the site exists. The Langa family is associated with the homestead.
MMIEP 26	S -23.947779 E 28.862962	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists.
MMIEP 27	S -23.947483 E 28.862438	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists. A person by the name of Joshua Manamela used to live here.
MMIEP 28	S -23.947620 E 28.862031	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists. A person by the name of Solomon Manamela used to live here.

MMIEP 29	S -23.947122 E 28.861449	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists. A person by the name of Raesibe Frieda Manamela used to live here.
MMIEP 30	S -23.946618 E 28.860967	Medium (|IIB)	A historic homestead is located here and comprises the poorly preserved foundations of the site's structural elements. The risk for unmarked graves associated with the site exists. A person by the name of Johannes Machoga used to live here.

Figure 7-46: Heritage Sites Map (PGS, 2023)

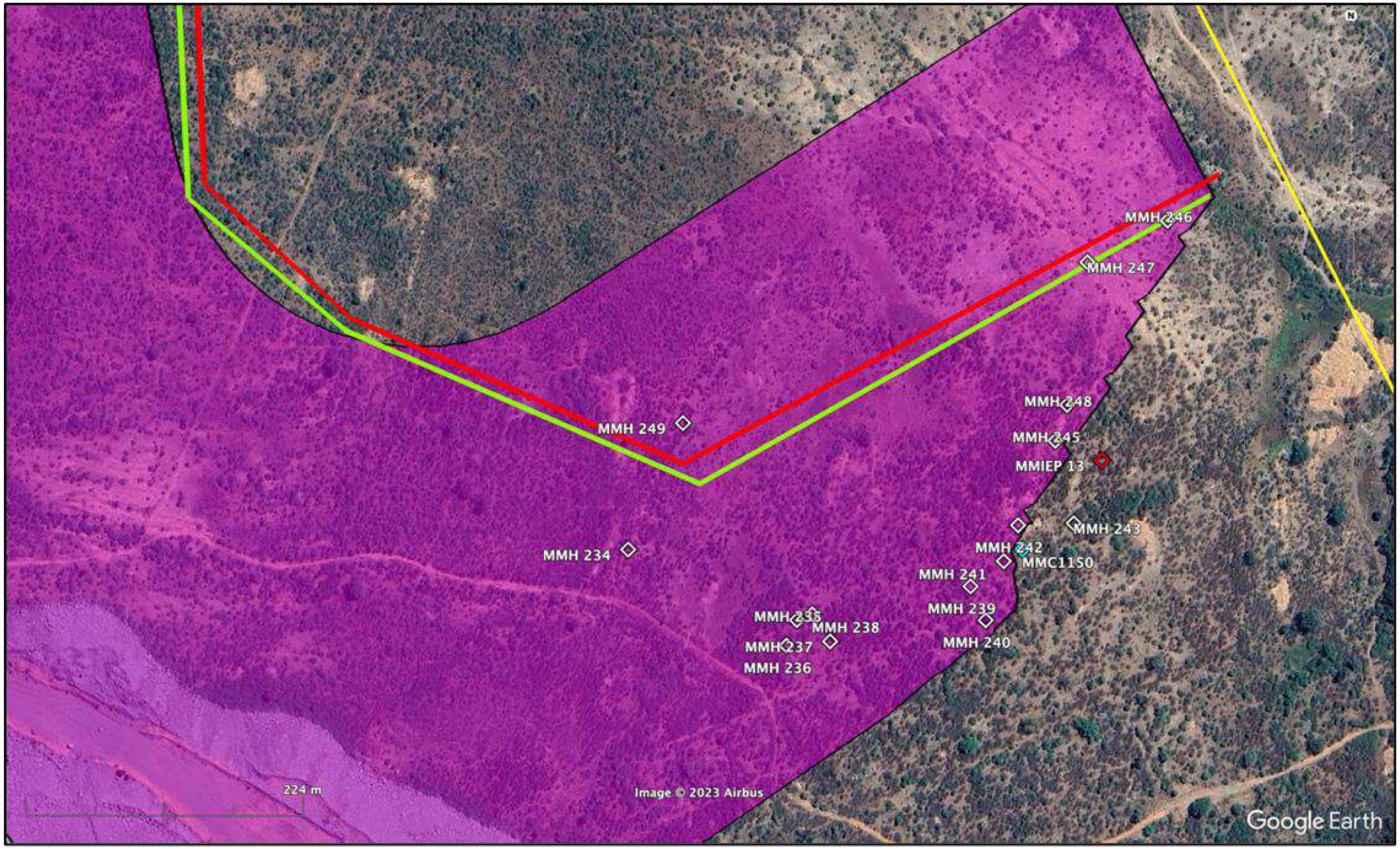


Figure 7-47: Heritage Sites Map in the South-Eastern end of the amended North Waste Rock Disposal Facility Phase 3 (PGS, 2023)

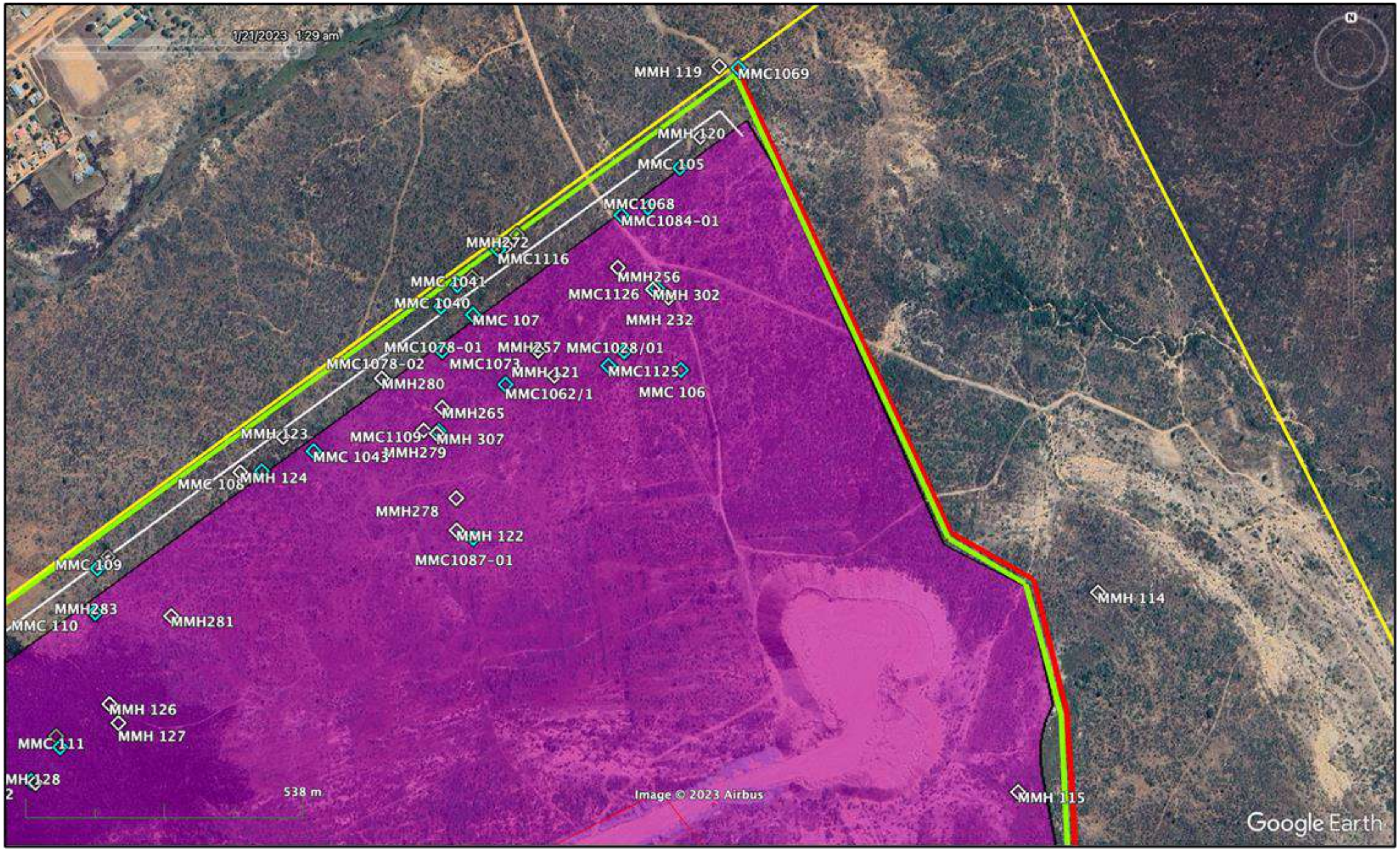


Figure 7-48: Heritage Sites Map in the North-Eastern end of the amended North Waste Rock Disposal Facility Phase 3 (PGS, 2023)

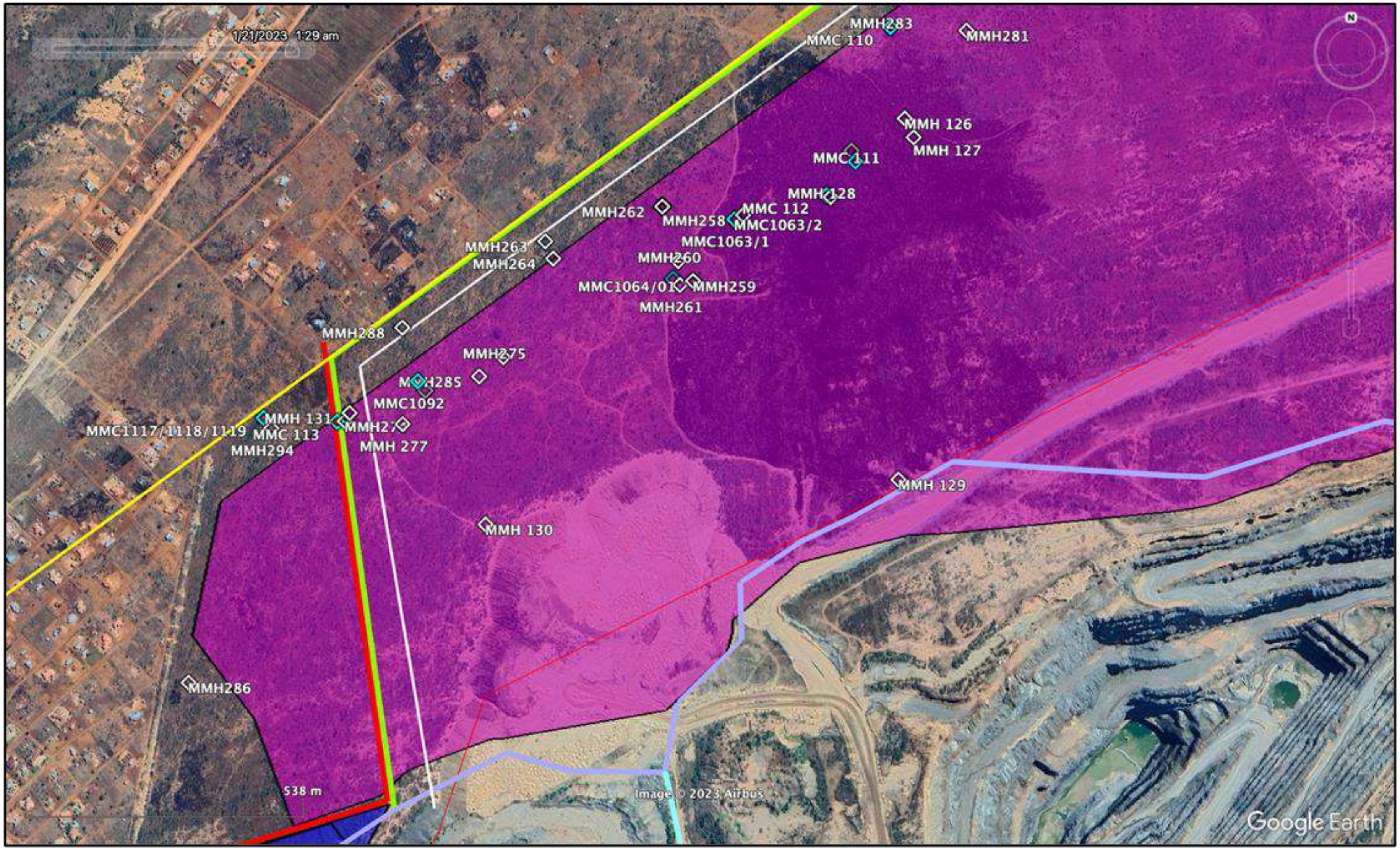


Figure 7-49: Heritage Sites Map in the North-Western end of the amended North Waste Rock Disposal Facility Phase 3 (PGS, 2023)

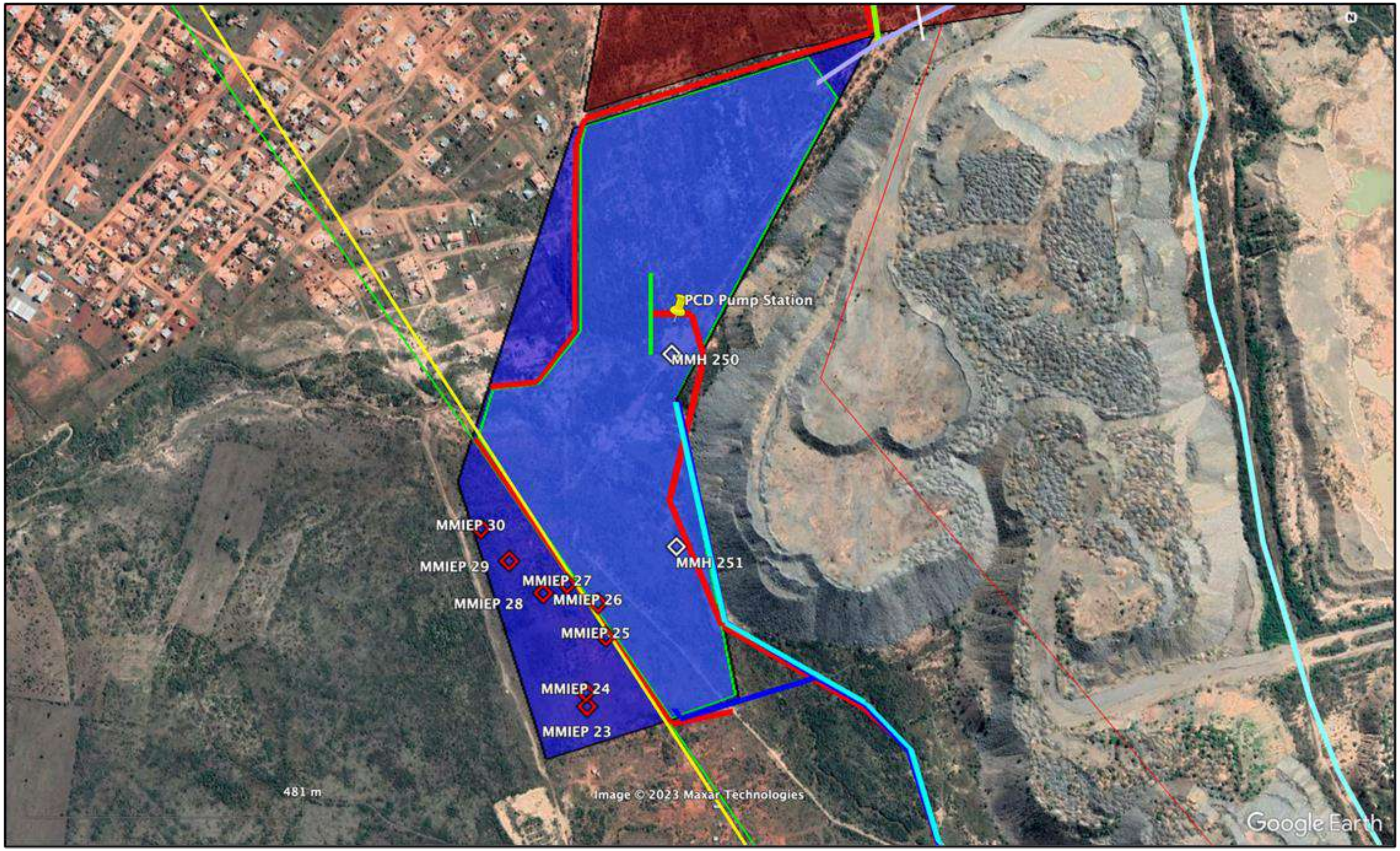


Figure 7-50: Heritage Sites Map in the Stormwater Control Dam (PGS, 2023)

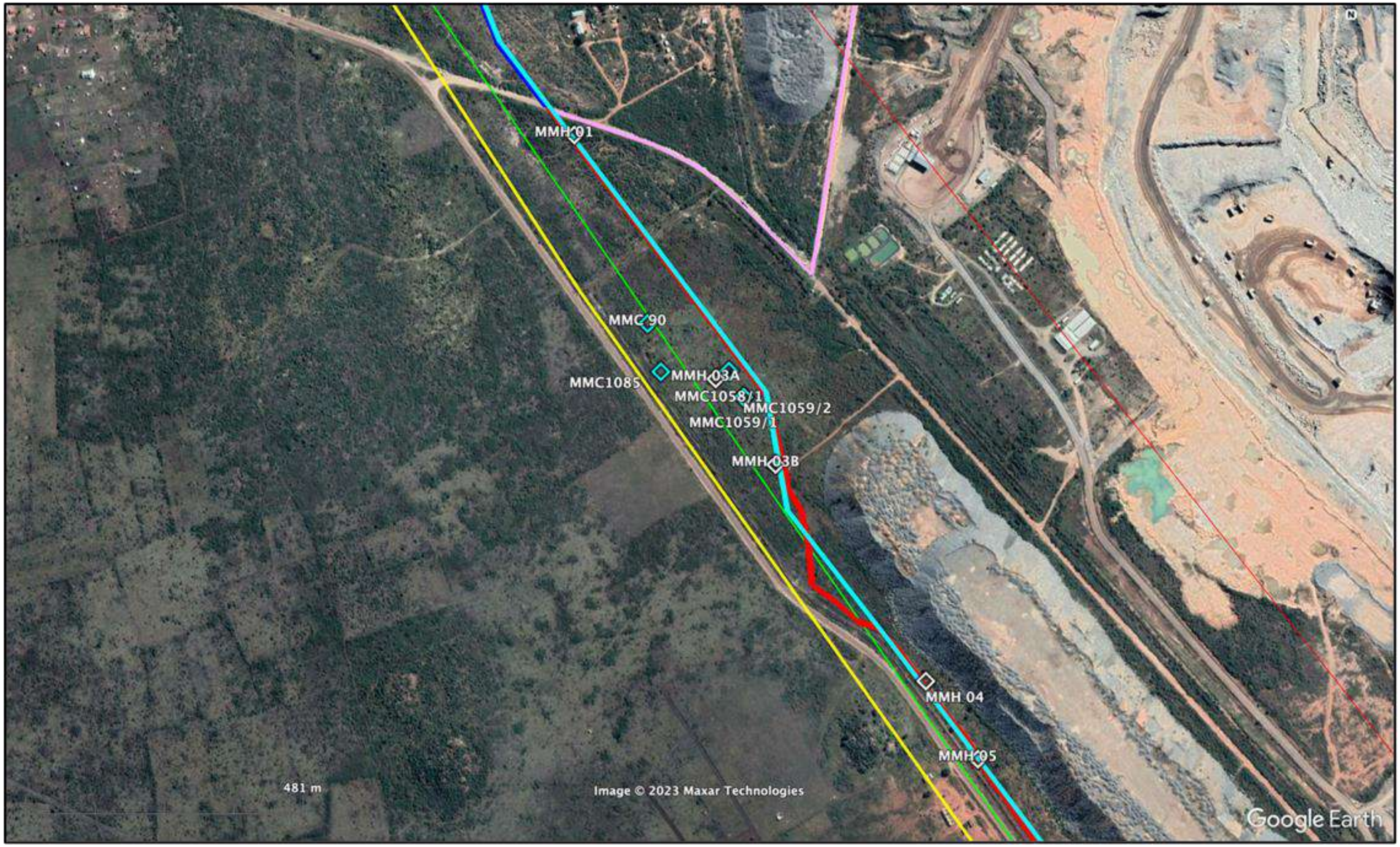


Figure 7-51: Heritage Sites Map in the North end of the channels and berms proposed to the west of the Mine (PGS, 2023)

Figure 7-52: Heritage Sites Map in the South end of the channels and berms proposed to the west of the Mine (PGS, 2023)

Figure 7-53: Heritage Sites Map in the Southern end of the Mine between the South Concentrator and Sandsloot Areas (PGS, 2023)

Figure 7-54: Heritage Sites Map in the Central section of the Mine west of the Vaalkop TSF (PGS, 2023)

Figure 7-55: Heritage Sites Map in an area south and south west of the mine offices (PGS, 2023)

Figure 7-56: Heritage Sites Map in the area between the Vaalkop TSF and Blinkwater TSF (PGS, 2023)

7.11 PALAEONTOLOGY

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Palaeontological Impact Assessment for Mogalakwena Mining Complex. Complied by Banzai Environmental dated April 2023 (Annexure 5-12).*

The proposed mining development is underlain by rocks of the Bushveld Complex, Archaean Granitoid Intrusions as well as the Malmani Subgroup. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Bushveld Complex and Archaean Granitoid Intrusions is Zero as they are igneous in origin and thus unfossiliferous, while the Malmani Subgroup has a Very High Palaeontological Sensitivity. This is depicted in Figure 7-57 below.

The Bushveld Complex comprise of the largest mafic intrusion in the world and underlie an area of almost 65 000 km2. This intrusion is world renowned for the ore reserves of platinum-group elements namely chromium and vanadium. The Bushveld Complex is divided in 4 groups namely the Lebowa Granite Suite, Rashoop Granophyre Suite, Rustenburg Layered Suite and Rooiberg Group.

The southern portion of the Mogalakwena Complex is underlain by the Malmani Subgroup. The Malmani Subgroup carbonates of the Transvaal comprise of an assortment of stromatolites (microbial laminates), ranging from supratidal mats to intertidal columns and large subtidal domes. Stromatolites are layered mounds, columns and sheet-like sedimentary rocks. These structures were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe. Cyanobacteria are prokaryotic cells (simplest form of modern carbon-bases life). Stromatolites are first found in Precambrian rocks and are known as the earliest known fossils. These algae photosynthesised in the low oxygen atmosphere and deposited layer upon layer of calcium sulphate, magnesium sulphate and calcium carbonate as well as other compounds to form these domes. Researchers have examined and classified the stromatolite structures but seldomly find preserved algal cells. The oxygen atmosphere that we depend on today was generated by numerous cyanobacteria photosynthesizing during the Archaean and Proterozoic Era.

No fossiliferous outcrop was detected in the proposed development area.

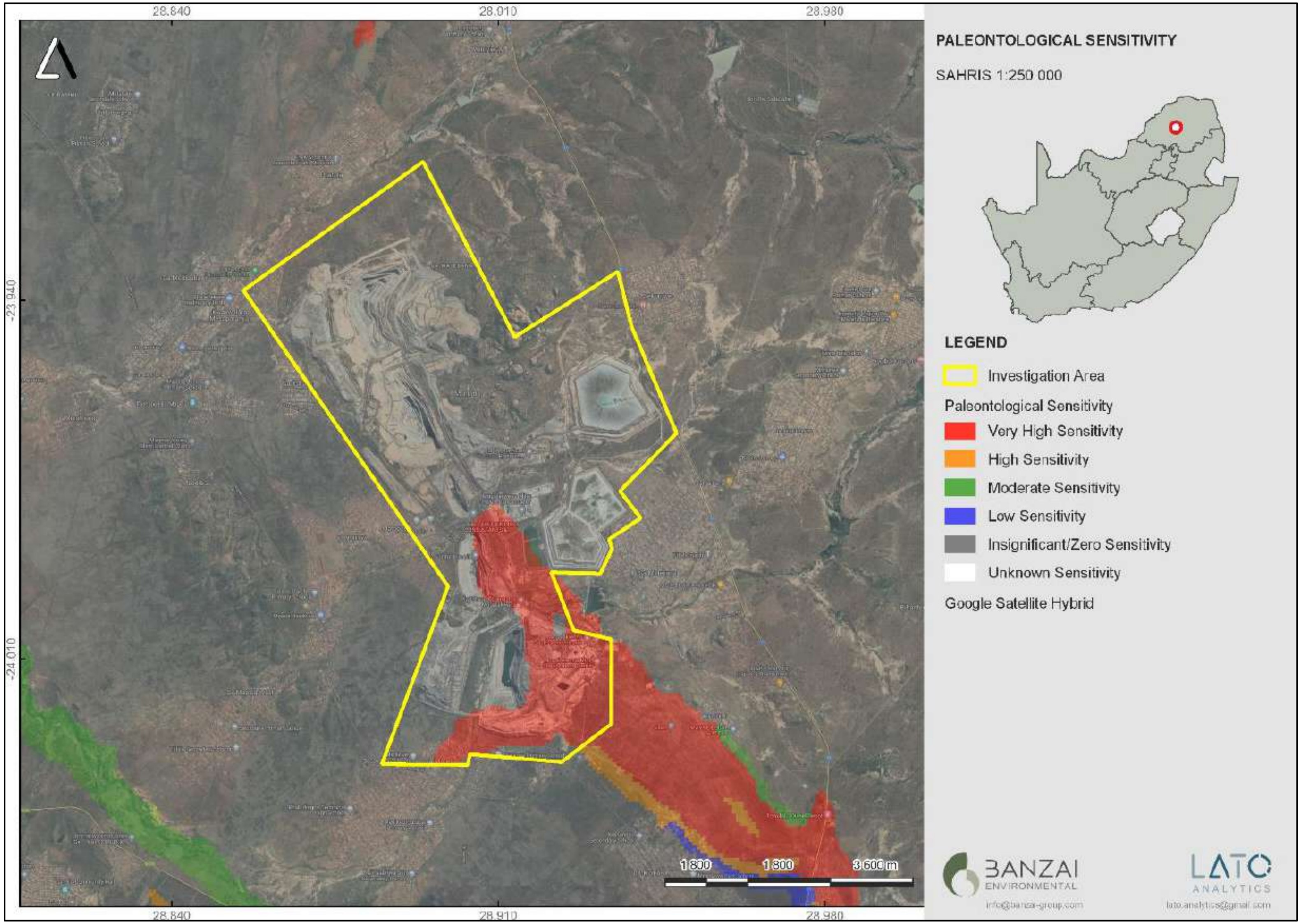


Figure 7-57: MM Palaeontological Sensitivity (Banzai, 2023)

7.12 NOISE

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Environmental Noise Impact Assessment for Anglo-American Platinum Limited Rustenburg Platinum Mines Mogalakwena Complex Integrated Authorisation Process. Complied by dBAcoustics dated March 2023 (Annexure 5-1).*

Sound is a wave motion, which occurs when a sound source sets the nearest particles of air in motion. The movement gradually spreads to air particles further away from the source. Sound propagates in air with a speed of approximately 340 m/s.

The distances between the noise sources and the receptors, topography, vegetation, noise level at the noise source and the wind direction are all variables that may have an impact on how the sound will be propagated to the noise receptor/s. There is a difference in the prevailing ambient noise levels between the summer and winter periods as the insect activities such as crickets and cicadas raise the prevailing ambient noise levels during the summer period whereas the prevailing ambient noise levels will not be influenced by insects during the winter period. The distances and topography between the proposed mining establishment activities and the residential areas play a role in the noise propagation and how the sound from the proposed mining establishment will be perceived.

MM is in an area where there are also other mining activities taking place. There is a constant to intermitted flow of traffic along the tarred feeder road connecting the North and South Concentrator areas as well as through the N11 access road. Distant traffic noise and mining activity noise contributes to a large portion of the prevailing ambient noise levels. Current noise sources in the area include the existing MM mining activities, traffic noise along the feeder roads, distant traffic noise from the abutting feeder roads, traffic noise from the N11 road, subsistence farming activities, insects, birds and wind noise.

The noise measuring points are indicated in Figure 7-58. Table 7-14 below highlights the findings of the noise survey undertaken. The time-varying characteristics of environmental noise are described using statistical noise descriptors:

- **Leq**: The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same period.
- **LMax**: The instantaneous maximum noise level for a specified period.
- **LMin:** The instantaneous minimum noise level for a specified period.
- **LA_{eq}:** Equivalent continuous A-weighted sound pressure level

The World Bank in the Environmental Health and Safety Regulations has laid down the following noise level guidelines:

- Residential area – 55.0dBA for the daytime and 45.0dBA for the nighttime period;
- Industrial area – 70.0dBA for the daytime and nighttime periods.

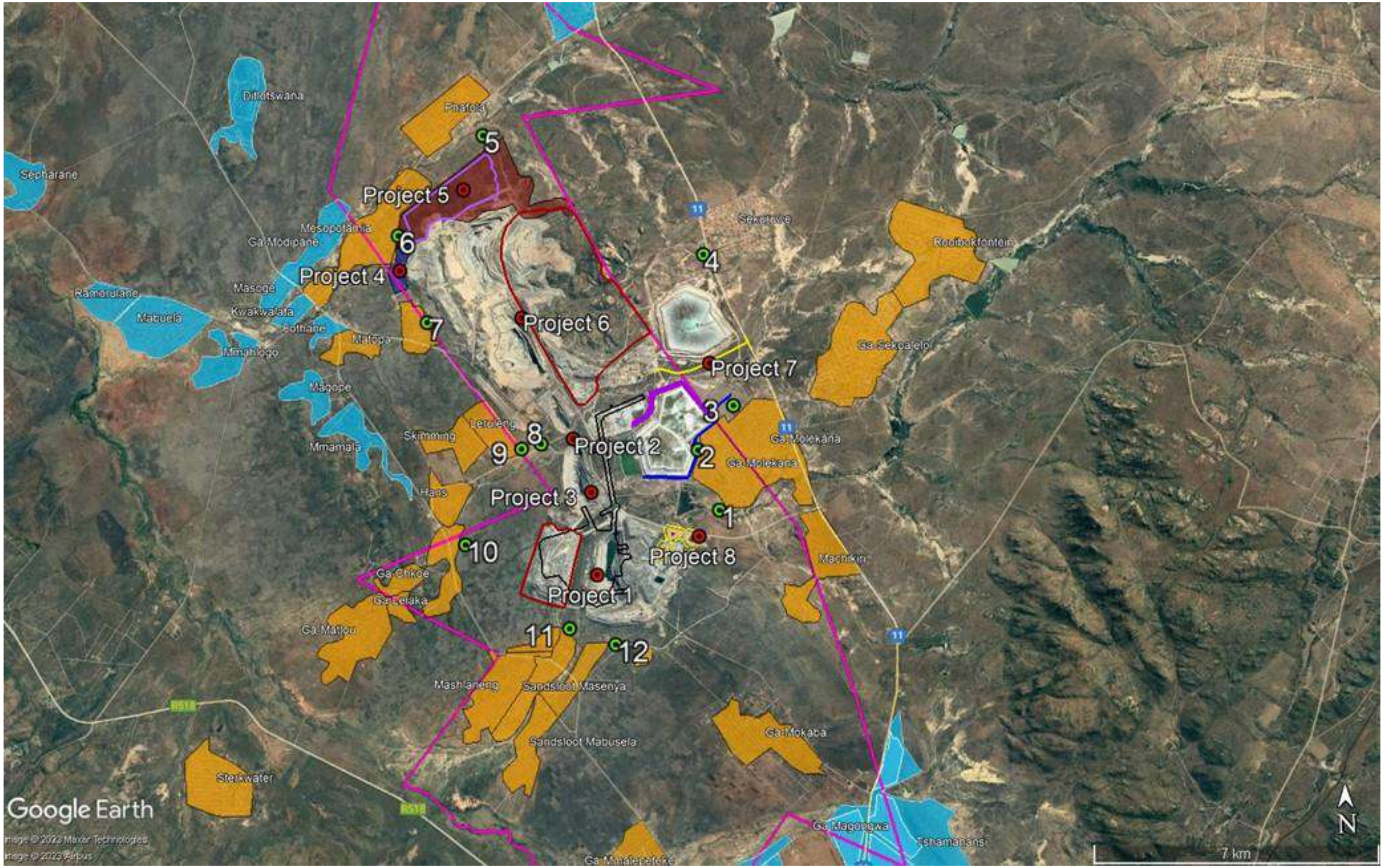


Figure 7-58: MM Noise Measuring Points (dBAcoustics, 2023)

Table 7-14: Noise Levels for the day and night within the site area (dBAcoustics, 2023)

Measuring point	Daytime				Night 1				Night 2			
	LAeq-dBA	Lmax - dBA	Lmin - dBA	Remarks	LAeq-dBA	Lmax - dBA	Lmin - dBA	Remarks	LAeq-dBA	Lmax - dBA	Lmin - dBA	Remarks
1	**43.9**	64.3	37.0	Domestic, distant road construction and mining activities.	**50.7**	56.3	35.1	Insects, entrance to mine activities, distant hauling vehicles.	**45.8**	62.9	39.0	Distant mining activities and insects.
2	**42.4**	59.3	30.4	Domestic and birds.	**50.8**	60.1	30.0	Insects and domestic	**45.9**	61.0	38.3	Insects and mining activities.
3	**39.4**	58.8	31.6	Domestic Malekana ext, distant siren, tipping and Blinkwater activities.	**40.6**	56.2	31.0	Traffic from N11, hauling vehicles and tipping of waste rock.	**41.1**	63.4	34.1	Distant mining activities and insects.
4	**44.7**	63.9	26.2	Traffic along N11.	**44.3**	59.8	32.1	Distant traffic along N11.	**53.8**	58.3	45.1	Insects and distant N11 (intermittent).
5	**39.1**	58.4	26.0	Domestic.	**40.4**	63.2	28.4	Distant hauling vehicles and tipping activities.	**38.4**	62.2	30.6	Hauling and tipping activities.
6	**44.3**	61.1	33.6	Distant mining activities, tipping ,domestic and birds.	**41.6**	67.0	32.5	Domestic and hauling of waste rock.	**37.8**	59.0	32.0	Distant hauling of waste rock.
7	**39.4**	57.5	30.7	Distant mining activities and domestic.	**45.5**	70.8	35.9	Distant mining activities.	**42.7**	56.2	35.3	Distant mining activities.
8	**46.7**	61.0	35.5	Distant mining activities.	**45.8**	59.1	40.2	Distant mining activities.	**48.5**	67.9	41.5	Distant mining activities and insects.
9	**47.8**	63.4	40.3	Distant mining activities, School children at Seritarita School.	**45.1**	59.6	38.6	Distant mining activities and insects.	**48.1**	67.2	43.2	Distant mining activities and insects.
10	**40.9**	58.1	31.3	Distant mining activities, birds, and insects.	**37.3**	60.8	27.7	Distant mining activities and insects.	**43.1**	63.6	37.8	Distant mining activities and insects.
11	**45.0**	58.7	26.8	Distant Sandsloot mining activities, birds and domestic.	**40.0**	58.1	26.1	Distant Sandsloot mining activities and insects.	**36.9**	58.4	29.0	Distant Sandsloot mining activities and insects.
12	**42.4**	58.1	38.1	Distant Sandsloot mining activities, domestic.	**40.9**	55.6	26.7	Distant Sandsloot mining activities, domestic and aircraft	**37.4**	57.5	27.0	Distant Sandsloot mining activities and insects

7.13 VISUAL AND SUNLIGHT

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Visual Impact Assessment and Sunlight Impact Assessment for Anglo American Platinum: Rustenburg Platinum Mines. Mogalakwena Mine Complex. Complied by Alta van Dyk Environmental Consultants dated March 2023 (Annexure 5-14).*

7.13.1 Visual Assessment

The initial establishment of the MM operations and its associated infrastructure has already altered the visual landscape of the area. The highly sensitive receptors that surround the mining operation have already been visually impacted upon and the sense of place drastically altered due to the initial establishment of infrastructure that is not congruent to that of the visual backdrop.

The affected areas of the receiving landscape have already been altered and impacted upon by the extent of the MM operations and its associated infrastructure i.e., mineral residue disposal facilities, processing plants, mining operations and supporting infrastructure.

The majority of the visual receptors within the Zone of Visual Influence (ZVI) are residential areas (community clusters) and have been deemed **HIGHLY** sensitive visual receptors. People travelling in and around the area to work or home are considered to be **MODERATELY** sensitive receptors. These visual receptors have a particular interest in their living environment and are exposed to visual impacts adjacent to the road or near their working environment more frequently than, for instance, a once-off visitor to the region.

Due to the extent of the MM operations and its associated infrastructure (Waste Rock Disposal Areas) and the close proximity of the community clusters in relation to these operations, the WRD Areas are highly visible to all receptors within its vicinity. The main zone of visual influence is approximately 5 km after which an increase in the distance from these facilities will start to diminish the visibility. Refer to Figure 7-59 below.

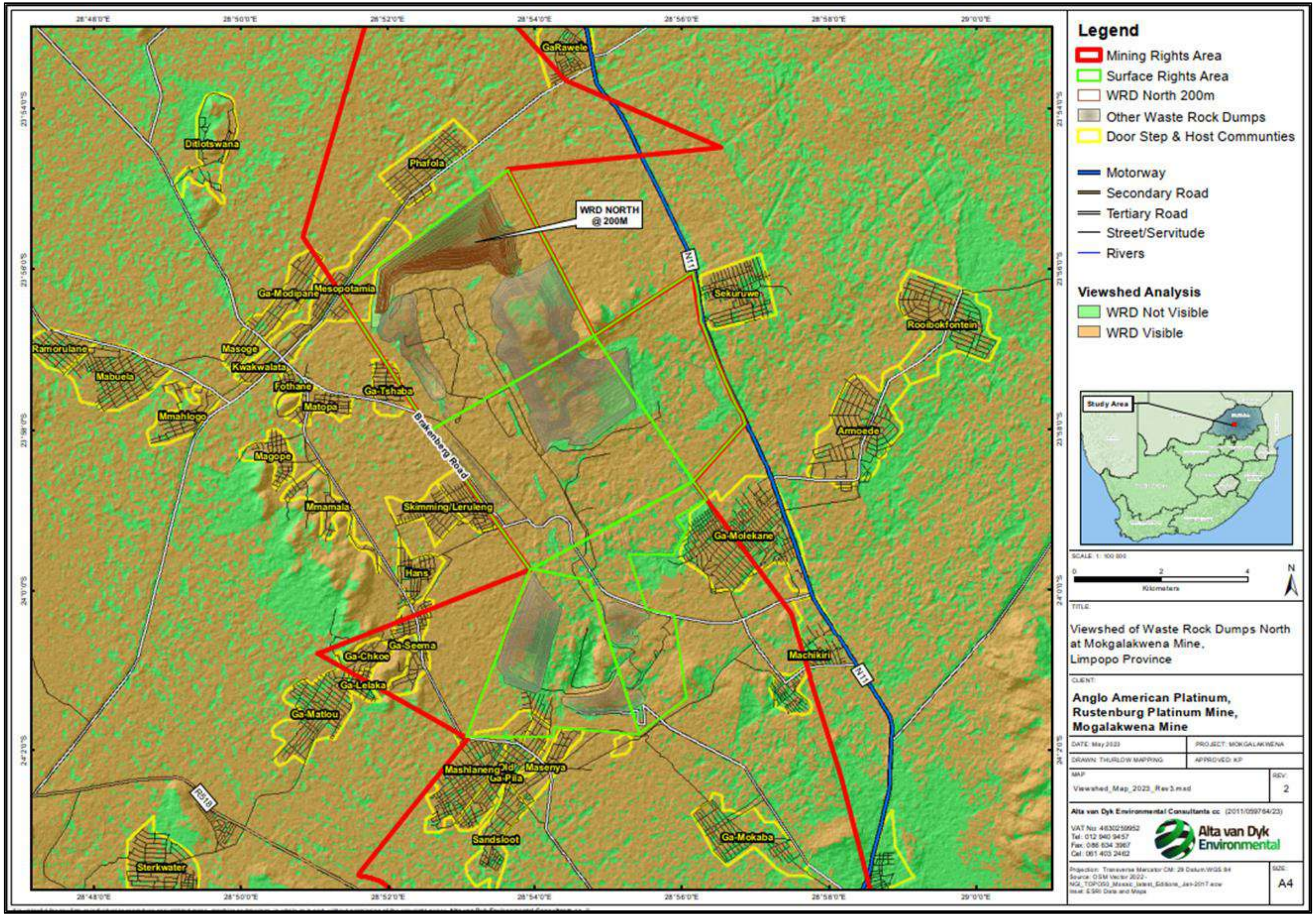


Figure 7-59: View Catchment Area (AvDE, 2023)

7.13.1.1 Visual Exposure

Within the Zone of Visual Influence (ZVI) - view corridors, viewpoints and receptors will experience "*Visual Exposure*" to the MM operation and its associated infrastructure (and the newly proposed NWRD Phase 3) . Based on distance from the project to selected view corridors, viewpoints, or receptors, the '*visual exposure'* or visual impact tends to diminish exponentially with distance.

As the distance between the viewer and the facility is reduced, so the impact reduces. This phenomenon is known as "adjacent principle" where the apparent size or position of an object in the line of sight is determined by whatever size or distance cues occur between it and an adjacent object.

Visibility analysis determines visibility on the principle of "*line-of-sight*" (LOS) – a straight line is generated between two points, and if at any point the line is obstructed by the surface, the target point is deemed "*not visible*". The area determined as visible through visibility analysis is known as a "*viewshed*" and presents the area determined as visible within the setting from the point of which visibility was determined.

Visual exposure to the NWRD is influenced by the following aspects:

- Distance from the source of visual impact;
- True visibility of the project keeping in mind visual contrast (Visual Absorption Capacity), topography and the decrease in visibility over distance;
- Duration, i.e., prolonged, temporary, intermittent exposure, etc.

The visual exposure of the proposed NWRD Phase 3 is high to visual receptors in the area (especially to the communities located within close proximity to the foot of these facilities) as they are dominantly noticeable in the geographical area.

Table 7-15: Existing Visual exposure of the Waste Rock Disposal Areas

Component	Description	Rating		Specific Criteria
Visual exposure of the area	The geographic area from which the Waste Rock Disposal Areas will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings).	High visual exposure		Dominant or clearly noticeable to visual receptors in the geographical area and covers a large area (e.g., several square kilometres).

7.13.1.2 Viewshed & Line of Sight Analysis

The section below details the findings from the viewshed and Line-of-Sight analysis for the Waste Rock Disposal Areas at current height.

7.13.1.2.1 Viewshed

Due to the extent of the MM operations and its associated infrastructure and the close proximity of the community clusters in relation to these operations, the operations are highly visible to all receptors within its vicinity. The main zone of visual influence is approximately 5 km after which an increase in the distance from the operations will start to diminish the visibility.

Refer to Figure 7-59 for an indication of the visibility against the receptors in the area.

7.13.1.2.2 Line of Sight Analysis 1(a)

This LoS analysis was undertaken from an on-site perspective. The LoS direction is towards the south.

On site staff have been deemed as moderately sensitive visual receptors. The initial establishment of operations would have resulted in the loss of views of the surrounding landscape which includes community clusters, agricultural land, and informal roads.

7.13.1.2.3 Line of Sight Analysis 1(b)

This LoS analysis was undertaken from the edge of the Ga-Mapela West community on a gravel road located to the west of the mining operations. The LoS direction is towards the east.

This assessment is taken in close proximity to the Ga-Mapela West community which has been identified as a highly sensitive visual receptor. From it can be observed from Figure 7-60 that the operations are highly visible to the sensitive receptor and travellers on the Mapela road.

The initial establishment of the operations would have resulted in the obstructed view from a community perspective onto the surrounding landscape which includes mining, agricultural land, and undulated topography of the geographical area.

The current height of Waste Rock Disposal Areas does not significantly alter the initial loss of these views.

7.13.1.2.4 Line of Sight Analysis 1(c)

This LoS analysis was undertaken from a gravel road located on a ridge to the east of mining operations. The LoS direction is towards the north-west.

From the ridge, which is not located in close proximity to any of the highly sensitive visual receptors identified, the mining operations are visible. From Figure 7-60 it can be observed that even though this facility is highly visible, the operations fade into the backdrop of the undulated topography of the operations would have resulted in the altered view of the surrounding landscape which includes community clusters, agricultural land, and informal roads.

7.13.1.2.5 Line of Sight Analysis 1(d)

This LoS analysis was undertaken from the Mapela Road located to the south-west of the mining operations. The LoS direction is towards the north-east.

Travellers travelling on the Mapela road have been deemed as moderately sensitive visual receptors while the community clusters (Ga-Mapela and Mapela) are deemed as highly sensitive visual receptors.

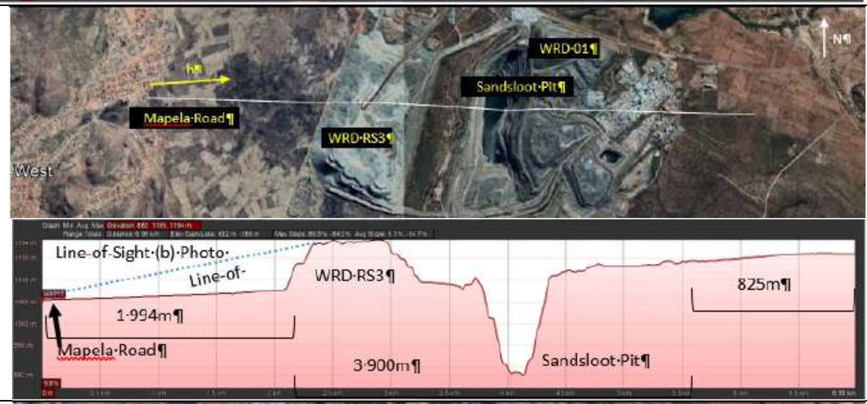
From Figure 7-60 it can be observed that the operations actively obstruct visibility to the landscape and the mining activities located beyond.

The initial establishment of the mining operations would have resulted in the obstructed view of the surrounding landscape which includes the mining activity and the undulated topography of the landscape beyond.

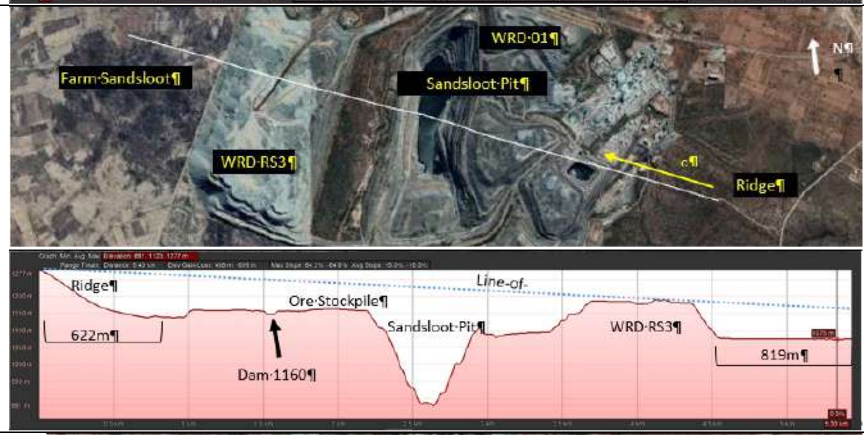
Baseline – Line of Sight Analysis 1

Line-of-Sight Analysis 1 (a)

Line-of-Sight Analysis 1 (b)



Line-of-Sight Analysis 1 (c)



Line-of-Sight Analysis 1 (d)

Figure 7-60: Line-of-Sight Analysis 1

7.13.1.3 Line-of-Sight Analysis 2 (WRD 020 (East))

7.13.1.3.1 Line of Sight Analysis 2(a)

This LoS analysis was undertaken from the Mapela road located to the west of the mining operations. The LoS direction is towards the east.

This assessment is taken in close proximity to the Ga-Tshaba and Mapela communities which have been identified as highly sensitive visual receptors. From Figure 7-61 it can be observed that the mining operations is highly visible to the sensitive receptors and traveller on the Mapela and Bakenberg roads.

From Figure 7-61 it can be observed that mining activities actively obstructs visibility to the original natural landscape located beyond. The current operations does not significantly alter the initial loss of these views. With reference to the Figure 7-61, the Motlhotlo Mountains remain visible to the Mapela community.

7.13.1.3.2 Line of Sight Analysis 2(b)

This LoS analysis was undertaken from an informal gravel road located within the Phafola community to the north-west of the mining operations. The LoS direction is towards the south-east.

This assessment is taken in close proximity to the Phafola community which has been identified as highly sensitive visual receptors. From Figure 7-61 it can be observed that mining operations is highly visible to the sensitive receptors and traveller on the informal gravel road.

The initial establishment of the mining operations would have resulted in the obstructed view from a community perspective onto the surrounding landscape which includes mining, the Motlhotlo Mountains and undulated topography of the geographical area. From Figure 7-61, the Motlhotlo Mountains is visible and located adjacent to the east of the operations. However, this view will change pending the LoS and the further development of mining operations will obstruct the view from certain community viewpoints.

7.13.1.3.3 Line of Sight Analysis 2(c)

This LoS analysis was undertaken from the N11 to the north-east of the mining operations. The LoS direction is towards the south-west.

Travellers travelling on the N11 have been deemed as moderately sensitive visual receptors. No community clusters are located directly to the north-east of the operations.

From Figure 7-61 it can be observed that this facility is highly visible to the traveller on the N11 road.

The initial establishment of the operations would have resulted in the loss of views of the surrounding landscape which includes community clusters, agricultural land, and informal roads. The Motlhotlo Mountains and undulated topography of the geographical area can still be seen from this view. The operations fade into the backdrop of the undulated topography of the geographical area.

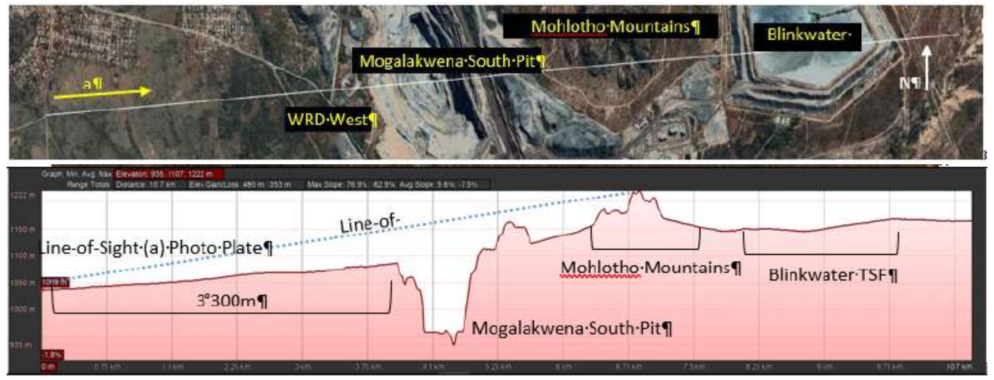
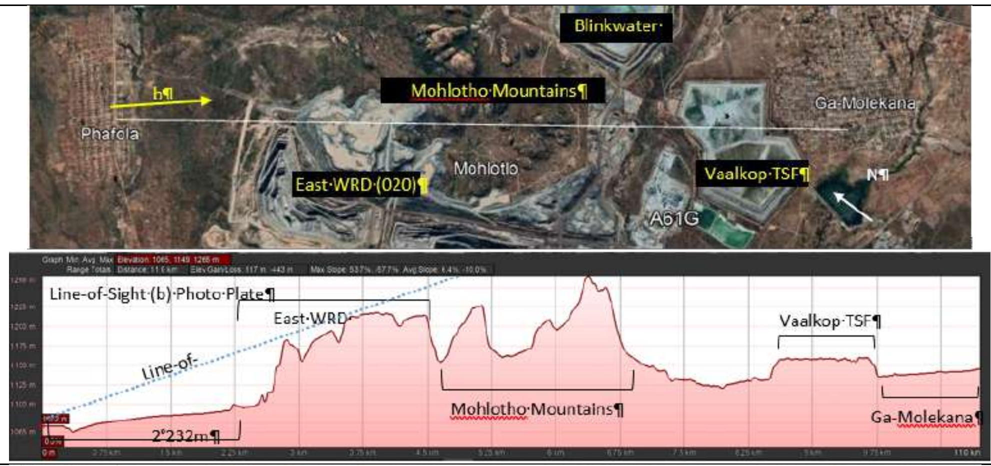
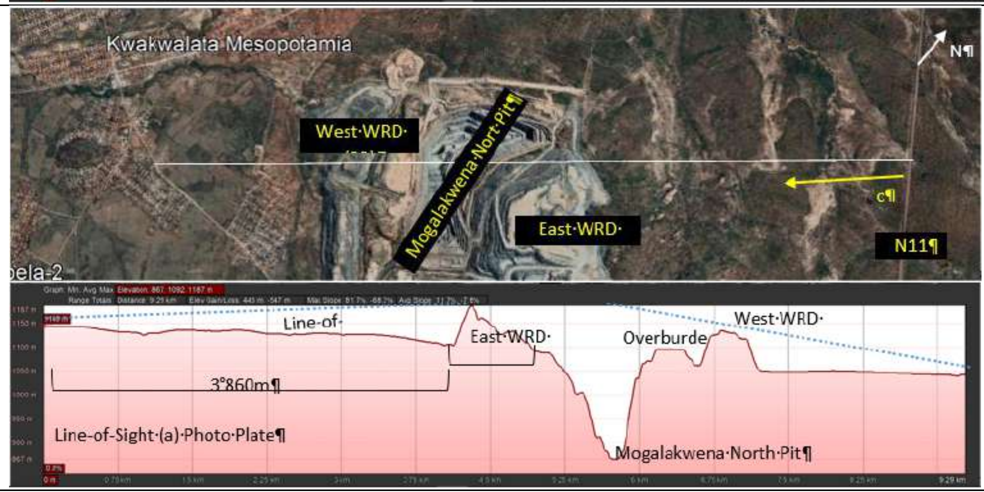
Baseline – Line of Sight Analysis 2		
Line-of-Sight Analysis 2 (a) 		
Line-of-Sight Analysis 2 (b) 		
Line-of-Sight Analysis 2 (c) 		

Figure 7-61 Line-of-Sight Analysis 2

7.13.2 Sunlight Assessment / Sunlight Path

The MM area is located within an area bordered by various communities as receptors to the mine and its associated infrastructure and activities (Waste Rock Disposal Areas): these communities include Phafola to the north, Ga-Modipana, Mesopotani and Ga-Mosege to the north-west, Ga-Tshaba, Mapela and Ga-Masenya to the west, Ga-Mapela to the west and south-west, Ga-Molekana, Ga-Sekhaolelo and Sekuruwe to the east. This chapter assesses the levels of natural light available around the mine and its associated infrastructure and activities, while assessing the natural light perception from the surrounding communities.

7.13.2.1 Sunlight Path vs Shadow Ratio Assessment

Table 7-16: Mogalakwena Mine – Sunlight Path and Shadow Direction (Summer and Winter Cycles)

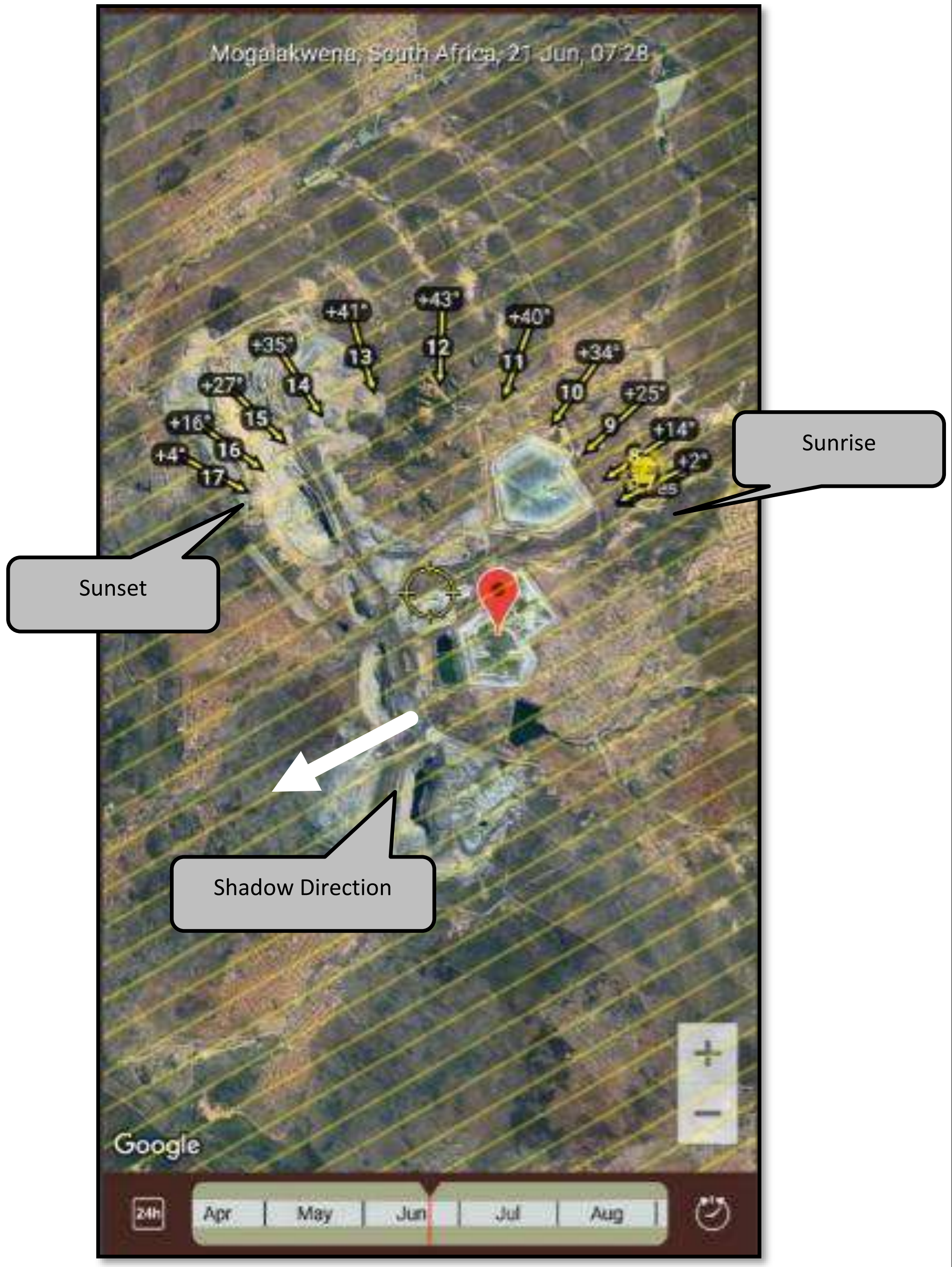
Season	Sunlight Path vs Shadow Ratio Assessment	Season	Sunlight Path vs Shadow Ratio Assessment
Summer Golden Hour (Morning and Afternoon)		 Winter Golden Hour (Morning and Afternoon)	

Table 7-17: Summer Baseline Sun-Shadow Ratio

	Time of Day	**Baseline Assessment**
Baseline Summer Sun-Shadow Ratio	*Golden Hour Morning*	• W07 o At golden hour (morning) the shadow will lie to the north west of the WRD W07 facility towards the MM Sandsloot pit, Groot Sandsloot River and RS3 WRD. The shadow as a result of WRD W07 intrusion into the light ray pathway will impact onto the mining rights area of MM and not towards the surrounding community. • *RS3* o At golden hour (morning) the shadow projection will lie to the north west of the WRD RS3 facility towards the Sandsloot farm (current mining rights area for MM for future mining activities). The shadow projection as a result of WRD RS3 intrusion into the light ray pathway will impact onto the mining rights area of MM. o The Shadow ratio at this time is between 0.00 and 92.29. At the current height of the facility (109 m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (2 km (Ga-Seema and Hans)) however this shadow projection will be brief (± 30 minutes) between 05:00 am and 06:00 am. • W01 o At golden hour (morning) the shadow projection will lie to the north west of the WRD W01 facility towards the Zwartfontein Pit The shadow projection as a result of WRD W01 intrusion into the light ray pathway will impact onto the mining rights area of MM. • W02 o At golden hour (morning) the shadow projection will lie to the northwest of the WRD W02 (west) facility towards the Mesopotamia and Ga-Chaba Community. The shadow projection as a result of WRD W02 (west) intrusion into the light ray pathway will impact onto surrounding community. o The Shadow ratio at this time is between 0.00 and 92.29. o At the current height of the facility (95 m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (less than 1km) This shadow projection will last an estimated 1 hour between 05:00 am and 06:00 am. • W020 o At golden hour (morning) the shadow projection will lie to the northwest of the WRD W020 (east) facility towards the north pit and Mesopotamia community. The shadow projection as a result of WRD W020 (east) intrusion into the light ray pathway will impact onto the mining rights area of MM as well as the Mesopotamia community. o The Shadow ratio at this time is between 0.00 and 92.29. At the current height of the facility (175 m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (2 km (Mesopotamina)) however this shadow projection will be brief (± 30 minutes) between 05:00 am and 06:00 am.
	Midday	• W07 o As the sun path moves from east to west (anticlockwise direction) the shadow projection will move incrementally from northwest to northeast in an anti-clockwise direction. o Between 11:00 -13:00 the shadow projection will move from West to East of the WRD W07 facility. o The Shadow ratio at this 11:00 – 13:00 is between 0.26 and 0.24. At the current height of the facility (82 m) coupled with the Shadow Ratio, the shadow projection will be close to the foot of the facility and will not impact on the closest surrounding community. • *RS3* o As the sun path moves from east to west (anticlockwise direction) the shadow projection will move incrementally from northwest to northeast in an anti-clockwise direction. o Between 11:00 -13:00 the shadow projection will move from West to East of the WRD RS3 facility. o The Shadow Ratio at this time is between 0.26 and 0.24. o At the current height of the facility (109 m) coupled with the Shadow Ratio, the shadow projection will be close to the foot of the facility, however there are currently a few houses located within 0.5 km of the foot of the facility which will be impacted on by the shadow projection (± 5 minutes) between 12:00 am and 12:05 pm. After 12:05 pm the shadow projection will move to the east of the facility and will impact onto the mining rights area of MM over the MM Sandsloot pit and Groot Sandsloot River. • W01 o As the sun path moves from east to west (anticlockwise direction) the shadow projection will move incrementally from northwest to northeast in an anti-clockwise direction. o Between 11:00 -13:00 the shadow projection will move from West to East of the WRD W01 facility. o The shadow projection as a result of WRD W01 intrusion into the light ray pathway will impact onto the mining rights area of MM • W02 o As the sun path moves from east to west (anticlockwise direction) the shadow projection will move incrementally from northwest to northeast in an anti-clockwise direction. o Between 11:00 -13:00 the shadow projection will move from West to East of the WRD W02 (west) facility. o The Shadow ratio at this time is between 0.26 and 0.24. o At the current height of the facility (95 m) coupled with the Shadow Ratio, the shadow projection will be close to the foot of the facility and will not impact on the surrounding community (Ga-Chaba) • W020 o As the sun path moves from east to west (anticlockwise direction) the shadow projection will move incrementally from northwest to northeast in an anti-clockwise direction. o Between 11:00 -13:00 the shadow projection will move from West to East of the WRD W020 (east) facility. o The Shadow Ratio at this time is between 0.26 and 0.24. o At the current height of the facility (175 m) coupled with the Shadow Ratio, the shadow projection will be close to the foot of the facility on the mining rights area and will not impact on any surrounding communities.
	Golden Hour Afternoon	• *W07* o At golden hour (afternoon) the shadow projection will lie to the north-east side of the WRD W07 facility towards the South Concentrator. o The shadow as a result of WRD W07 intrusion into the light ray pathway will impact onto the mining rights area of MM and not towards the surrounding community. • *RS3* o At golden hour (afternoon) the shadow projection will lie to the north-east side of the WRD RS3 facility towards the MM Sandsloot pit and Groot Sandsloot River. o The shadow as a result of WRD RS3 intrusion into the light ray pathway will impact onto the mining rights area of MM and not towards the surrounding community. • *W01* o At golden hour (afternoon) the shadow projection will lie to the north-east side of the WRD W01 facility towards the Vaalkop Dam and Groot Sandsloot River. o There are no communities located within close proximity to the north-east side of the WRD W01 facility. • *W02* o At golden hour (afternoon) the shadow will lie to the north-east side of the WRD W02 (west) facility towards the MM north pit. o There will be no impact on any community as the intrusion into the light ray pathway will impact onto the mining rights area of MM. • *W020* o At golden hour (afternoon) the shadow projection will lie to the north-east side of the WRD W020 (esst) facility towards a portion of land not occupied by both mining activities as well as community settlements. The shadow projection will be over the Mtlotlo Hills. o The shadow projetion as a result of WRD W020 (east) intrusion into the light ray pathway will not impact onto surrounding communities

Table 7-18: Winter Baseline Sun Shadow Ratio

	Time of Day	Baseline Assessment
Baseline Winter Sun-Shadow Ratio	*Golden Hour Morning*	• *W07* ○ At golden hour (morning) the shadow projection will lie to the south west of the WRD W07 facility towards the Sandsloot Masenya, Danisane and Mashlaneng Communities. The shadow projection as a result of WRD W07 intrusion into the light ray pathway will impact onto the surrounding community. ○ The shadow ratio at this time is between 55.95 and 86.28. ○ At the current height of the facility (82 m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (0.4 km (Sandsloot Masenya Community)). ○ This shadow projection will last an estimated 1 hour between 07:00 am and 08:00 am • RS3 ○ At golden hour (morning) the shadow projection will lie to the south west of the WRD RS3 facility towards the Ga-Seema Communities. The shadow projection as a result of WRD RS3 intrusion into the light ray pathway will impact onto the surrounding community. ○ The shadow ratio at this time is between 55.95 and 86.28. At the current height of the facility (109 m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (2 km). ○ This shadow projection will last an estimated 30 minutes between 07:00 am and 07:30 am • *W01* ○ At golden hour (morning) the shadow projection will lie to the south west of the WRD W01 facility towards the Sandsloot Pit and Groot Sandlsoot River. The shadow projection as a result of WRD W01 intrusion into the light ray pathway will impact onto the MM Mining Rights Area. • *W02* ○ At golden hour (morning) the shadow projection will lie to the south west of the WRD W02 (west) facility towards the Ga-Chaba Community. The shadow projection as a result of WRD W02 (west) intrusion into the light ray pathway will impact onto the surrounding community. ○ The shadow ratio at this time is between 55.95 and 86.28. At the current height of the facility (95m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (less than 1 km). This shadow projection will last an estimated 30 minutes between 07:00 am and 07:30 am • W020 ○ At golden hour (morning) the shadow projection will lie to the south west of the WRD W020 (east) facility towards the Ga-Chaba Community. The shadow projection as a result of WRD W020 (east) intrusion into the light ray pathway will impact onto the surrounding community. ○ The shadow ratio at this time is between 55.95 and 86.28. At the current height of the facility (175m) coupled with the Shadow Ratio, the shadow projection will impact on the closest surrounding community (2.1 km). This shadow projection will last an estimated 30 minutes between 07:00 am and 07:30 am
	Midday	• *W07* ○ The shadow projection will move from south-west to south east. ○ From 09:00 am to 16:00 pm the shadow ratio is between 2.30 and 3.17, with midday at 1.08. ○ At the current height of the facility (82 m) coupled with the Shadow Ratio from 09:00 am to 16:00 pm, the shadow projection will be close to the foot of the facility and will not impact on the closest surrounding community. • *RS3* ○ The shadow projection will move from south-west to south east. ○ From 09:00 am to 16:00 pm the shadow ratio is between 2.30 and 3.17, with midday at 1.08. ○ At the current height of the facility (109m) coupled with the Shadow Ratio from 09:00 am to 16:00 pm, the shadow projection will be close to the foot of the facility and will not impact on the closest surrounding community (Mashlaneng and Danisane Community) • W01 ○ The shadow projection will move from south-west to south east. ○ From 09:00 am to 16:00 pm the shadow ratio is between 2.30 and 3.17, with midday at 1.08. ○ At the current height of the facility (82 m) coupled with the Shadow Ratio from 09:00 am to 16:00 pm, the shadow projection will be close to the foot of the facility and will not impact on any surrounding community • W02 ○ The shadow projection will move from south-west to south east. ○ From 09:00 am to 16:00 pm the shadow ratio is between 2.30 and 3.17, with midday at 1.08. At the current height of the facility (95m) coupled with the Shadow Ratio from 09:00 am to 16:00 pm, the shadow projection will be close to the foot of the facility and will not impact on the closest surrounding community (Ga-Chaba Community) • W020 ○ The shadow projection will move from south-west to south east. ○ From 09:00 am to 16:00 pm the shadow ratio is between 2.30 and 3.17, with midday at 1.08. At the current height of the facility (175 m) coupled with the Shadow Ratio from 09:00 am to 16:00 pm, the shadow projection will be close to the foot of the facility and will not impact on the closest surrounding community.
	Afternoon	• *W07* ○ At golden hour (afternoon) the shadow will lie to the south-east side of the WRD W07 facility. ○ The shadow as a result of WRD W07 intrusion into the light ray pathway will impact onto a portion of land not occupied by both mining activities as well as community settlements. • *RS3* ○ At golden hour (afternoon) the shadow will lie to the south-east side of the WRD RS3 facility. ○ The shadow as a result of WRD RS3 intrusion into the light ray pathway will impact onto MM Mining Rights Area (Groot Sandsloot River and Sandsloot Pit) • *W01* ○ At golden hour (afternoon) the shadow will lie to the south-east side of the WRD W01 facility. ○ The shadow as a result of WRD W01 intrusion into the light ray pathway will impact onto MM Mining Rights Area (South Concentrator) • W02 ○ At golden hour (afternoon) the shadow projection will lie to the south-east side of the WRD W02 (west) facility. ○ The shadow as a result of WRD W02 (west) intrusion into the light ray pathway will impact onto MM Mining Rights Area (North Pit & Central Pit) • W020 ○ At golden hour (afternoon) the shadow projection will lie to the south-east side of the WRD W020 (east) facility. ○ The shadow as a result of WRD W020 (east) intrusion into the light ray pathway will impact onto a portion of land not occupied by both mining activities as well as community settlements

7.13.2.2 *Light Refraction & Line of Sight Assessment*

A site visit was undertaken on 13-14 October 2022 as to assess the perceived impact from the community as impacted upon by the existing mining infrastructure. This assessment took into consideration the line of sight to the sun as well as the experienced light refraction.

7.13.2.2.1 *Line of Sight to Sun*

The figures below (Figure 7-62 and Figure 7-63) depicts the sun path for sunrise and sunset against the eastern (sunrise direction) and western (sunset direction) side of the Mogalakwena Mine Operation.

Based on the field assessment the following was observed:

- Existing Waste Rock Disposal Facilities, where communities are located near the foot of the facility, will obstruct the line of sight of the sun during sunrise and sunset.
  - This obstruction of the line of sight of the sun, and the experienced impact is directly linked to the proximity of the community to the waste rock disposal facility. As the distance is reduced between the foot of the facility and the community, so is the impact increased in the obstruction of the line of sight of the sun. This phenomenon is known as “adjacent principle” where the apparent size or position of an object in the line of sight is determined by whatever size or distance cues occur between it and an adjacent object.

7.13.2.2.2 *Light Refraction*

Sunrise - During sunrise, the sun is rising above the horizon. The rays from the sun get refracted as they travel from more dense air to less dense air and the light rays bend away from the normal.

Sunset - The Sun, after sunset, is setting below the horizon. With dusk, the apparent position of the sun is visible. and not the actual position due to atmospheric refraction.

Atmospheric refraction makes the sun visible even when the sun is just below the horizon.

- Based on the field assessment, although the existing waste rock disposal facilities hinder the line of sight of the sun, the surrounding communities still experience “Light Refraction” which allows for normal day and night cues. Although the shadow projection does impact on the community, this is only on direct received sun rays and not on light refraction and the experience of the sun’s daily *“light/day-night”* cycle.

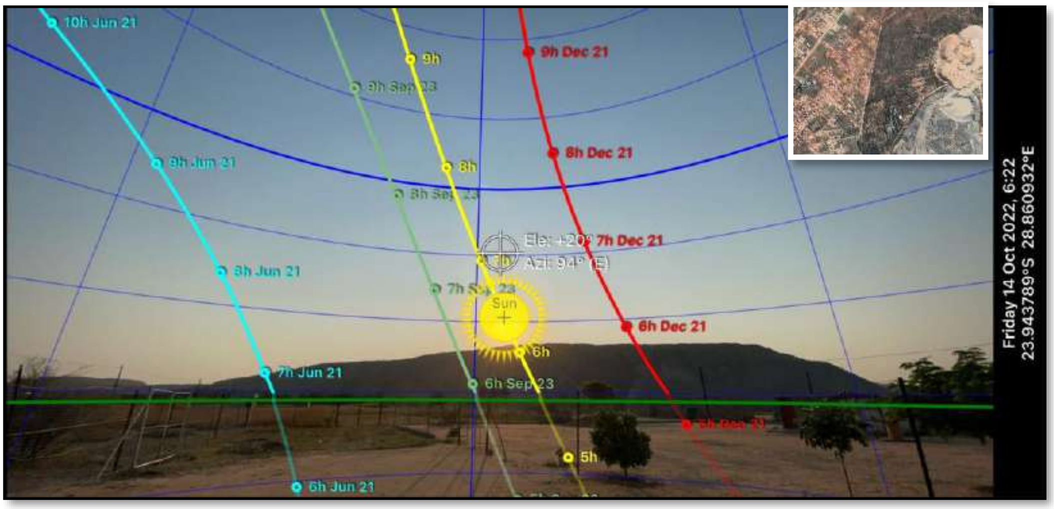


Figure 7-62: Sun Path - Sunrise path over Mogalakwena Mine (AvDE, 2023)

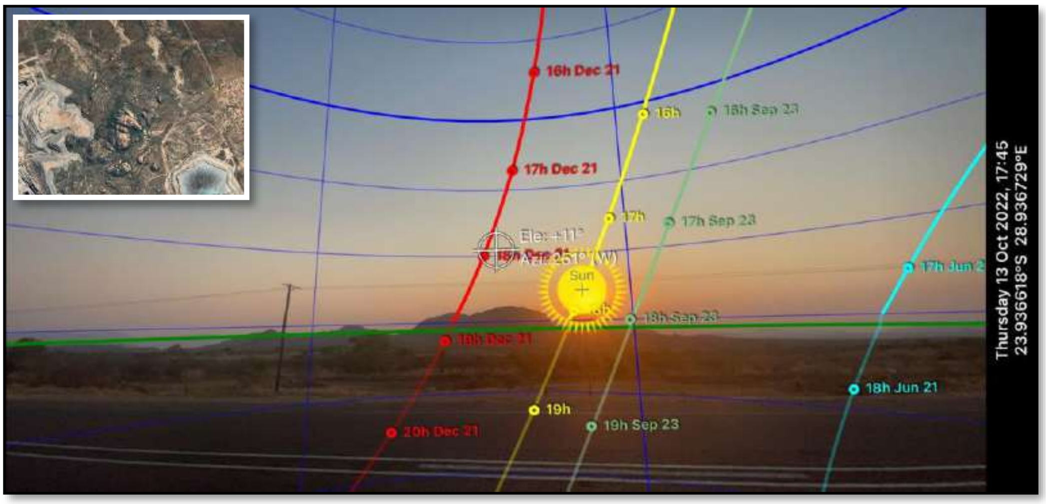


Figure 7-63: Sun Path - Sunset path over Mogalakwena Mine (AvDE, 2023)

7.14 SOCIO-ECONOMIC

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Social Impact Assessment for Rustenburg Platinum Mi9nes Limited Mogalakwena Mine. Compiled by Tony Barbour Environmental Consulting dated May 2023 (Annexure 5-13).*

7.14.1 Overview of Local Settlements

7.14.1.1 Area of Influence

The Sandsloot Underground Mining Pre-Feasibility A Study, Section 16 Corporate Relations Report (November 2022) identifies five areas of influence (AoI) that experience various opportunities and adverse impacts arising from the operation of the MM. The five areas are:

- **Area 1**: Area 1 consists of the rural doorstep/ interface communities located in close physical proximity to the mine that are exposed to the direct and indirect impacts associated with the operations. They are also prioritised for local opportunities. These communities are the source of the majority of grievances.
- **Area 2**: This area includes rural and peripheral communities and settlements that experience some indirect adverse impacts. These areas do not typically experience direct adverse impacts and are not located immediately adjacent to existing operation or construction activities. These communities also benefit from opportunities and projects associated with the mining operations.
- **Area 3**: Area 3 consists of the town of Mokopane. As the administrative centre of the Mogalakwena Local Municipality, the town is exposed to indirect impacts associated with the mine and also benefits from the mine.
- **Area 4**: Area 4 includes the broader area including communities and towns located within the District Municipality and Limpopo Province that may benefit from the mine in as a source of procurement and workers. In this regard Polokwane is the most important town that falls within Area 3.
- **Area 5**: Area 5 includes national cities, specifically Johannesburg and Pretoria, that accommodate employees and are also a key source of procurement items for the mine.

MM identifies communities as either "Doorstep" or "Host" Communities. Communities within Area 1 are identified as Doorstep communities and those in Area 2 and 3 are identified as Host Communities. Figure 7:64 below depicts these communities in relation to the mine.

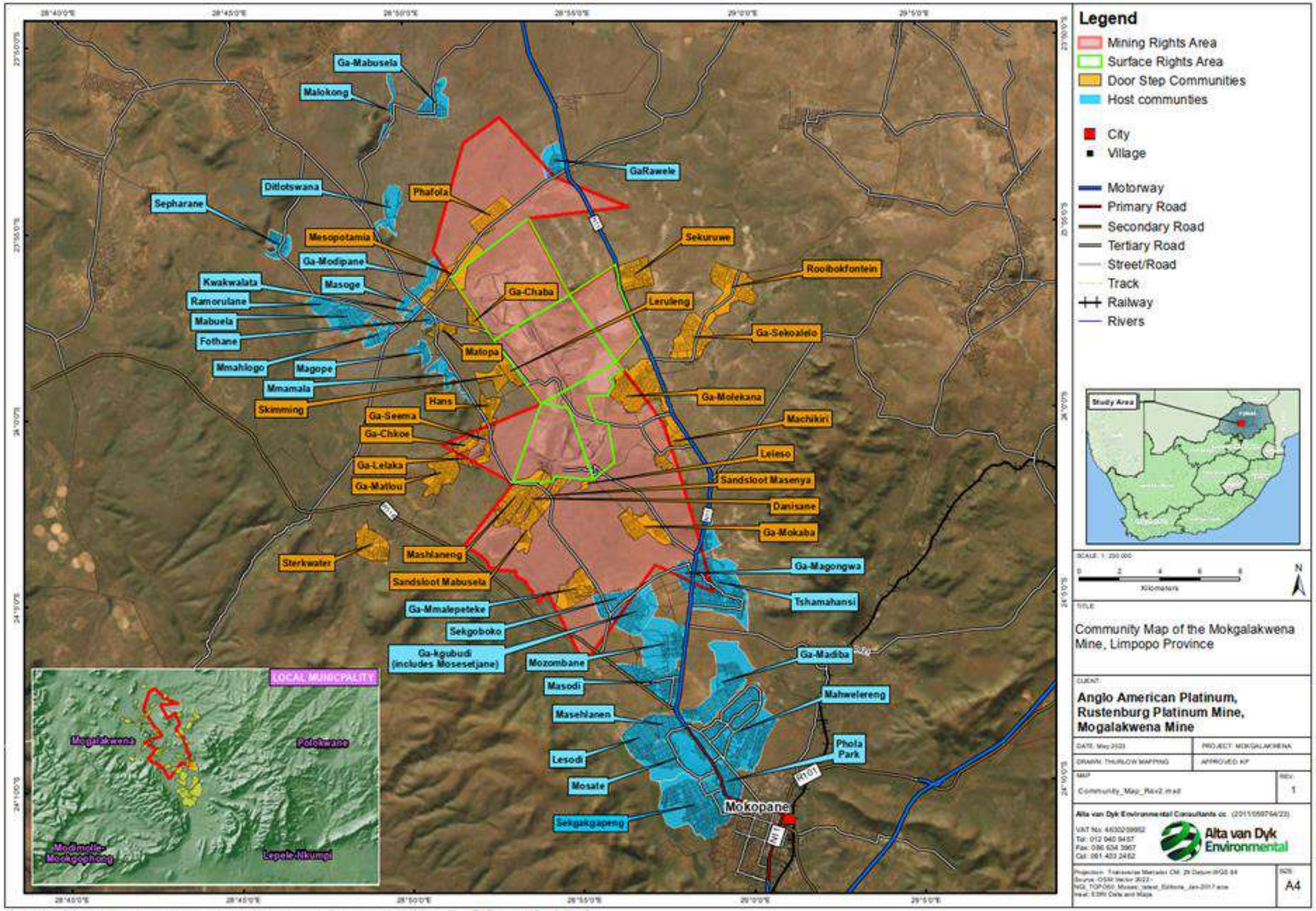


Figure 7:64 *Area of Influence – Mogalakwena Complex*

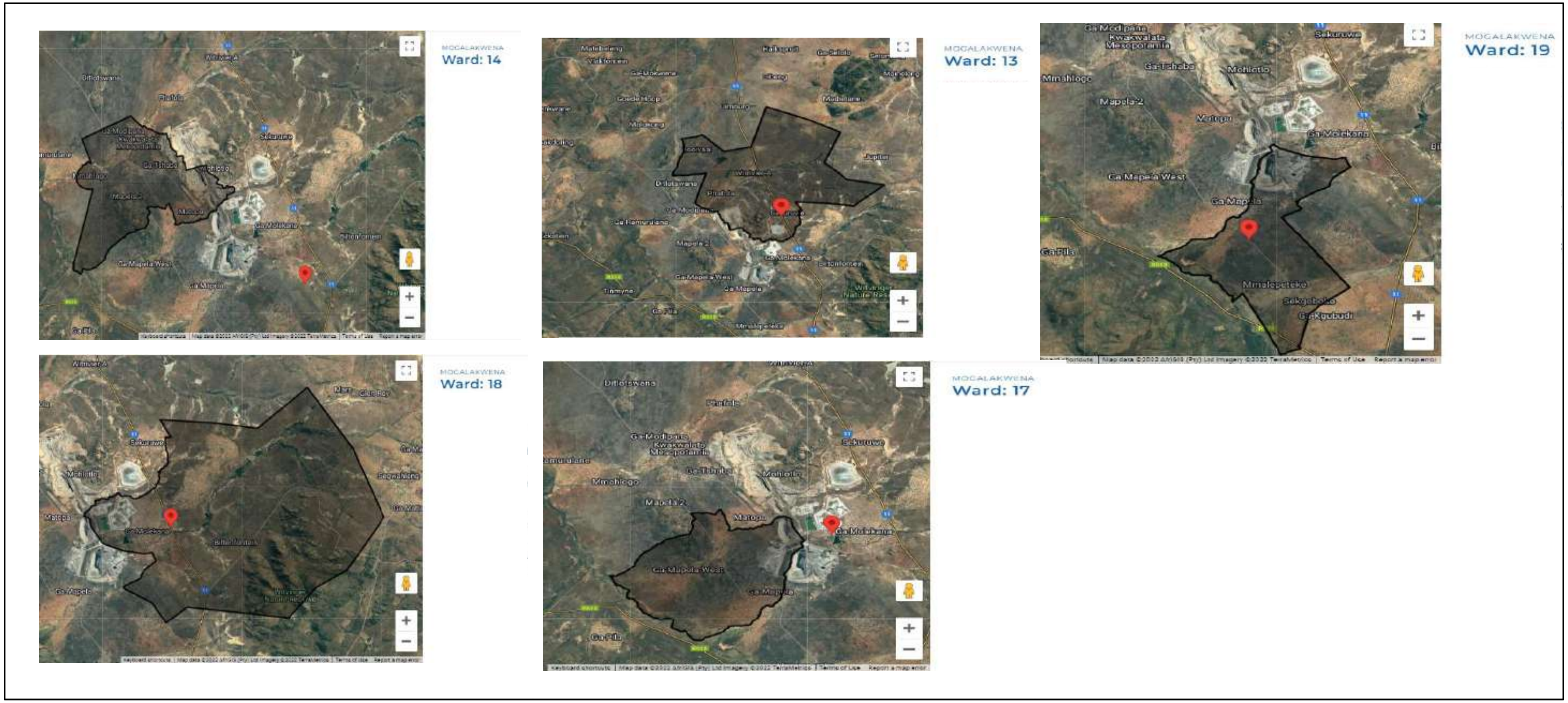


Figure 7:65 Mogalakwena Local Municipality Wards affected by the proposed project

7.14.2 Demographic Overview – Mogalakwena Local Municipality

The study area is located within the Mogalakwena Local Municipality (MLM), which is one of the six local municipalities that make up the Waterberg District Municipality (WDM). The town of Mokopane is the administrative centre of the MLM. 42 villages are located within the MM's 50km Zone of Influence (ZoI). Of the 42 villages, 36 fall under the Mapela Traditional Authority (TA) and 6 under the Mokopane TA. The majority of villages impacted by the mining activities as part of this EIA Application are located within Ward 13, 14, 17 and 19 of the Mogalakwena LM as per Figure 7:65. The focus on Ward level information is therefore on these applicable wards.

7.14.2.1 Population

The population of the MLM in 2016 was 315 814. Of this total, 47.5% were under the age of 18, 45.9% were between 18 and 64, and the remaining 6.6% were 65 and older. The population of Ward 17, 14, 13 and 19 in 2011 was 9 531, 9 805, 10 283 and 9 516 respectively. Of these totals, 44.7%, 44.2%, 46.1% and 43.5% were under the age of 18 (Table 7-19). The respective wards therefore have a large young population. This creates challenges in terms of creating employment opportunities.

Table 7-19: Population by age groups (Barbour, 2023)

Age	Limpopo Province	Waterberg DM	Mogalakwena LM	Mogalakwena Ward 17	Mogalakwena Ward 14	Mogalakwena Ward 13	Mogalakwena Ward 19
0-9	23.4%	24.5%	28.6%	26.6%	24.9%	27.7%	25.4%
10-19	21.4%	18.6%	20.5%	25.3%	26.5%	24.8%	25.2%
20-29	19.7%	18.4%	15.7%	13.5%	11.8%	13.4%	16.6%
30-39	12.9%	13.8%	10.5%	8.9%	8.1%	9.5%	9%
40-49	8.7%	9.8%	8.4%	7.6%	8.1%	8.7%	7.9%
50-59	6.3%	7.3%	6.8%	6.1%	5.7%	5.7%	5.9%
60-69	4.2%	4.4%	5%	5.4%	6.4%	4.1%	4.3%
70-79	2.3%	2.4%	3.2%	4.3%	5.7%	3.9%	3.8%
80+	1.1%	0.9%	1.3%	2.4%	2.8%	2.3%	1.9%
Under 18	42.6%	41.4%	47.5%	44.7%	44.2%	46.1%	43.5%
18 to 64	52.3%	53.5%	45.9%	46.6%	44.3%	46%	49.3%
65 and over	5.1%	5.1%	6.6%	8.7%	11.5%	7.9%	7.3%

The high percentage of young people also means that a large percentage of the population is dependent on a smaller productive sector. The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates reduced revenue for local authorities to meet the growing demand for services. The national dependency ratio in 2011 was 52.7%, while the Limpopo Province had the highest provincial dependency level in South Africa, namely 67.3% in 2011. The dependency ratio for the WDM in 2011 was 55.5%. The traditional approach is based people younger than 15 or older than 64. The information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e. they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratios for the MLM (2016), Ward 17, 14, 13 and 19 (2011) were 118%, 115%, 126%, 117% and 103% respectively. These figures are significantly higher than the national and provincial level in 2011, 52.7% and 67.3% respectively. These figures are also high by international standards. The 2020 dependency ratios for Zambia and Zimbabwe were 85.2% and 81.6% respectively. These are recognised as some of the poorer countries in the world. The high dependency ratios reflect the limited employment opportunities in the area and represent a significant risk to the district and local municipality.

In terms of race groups, Black Africans made up 97.1%% of the population on the MLM, followed by Whites, 2.2% and Indian or Asians, 0.5%. In Ward 17 and 14 Black Africans made up over 99% of the population. The main first language spoken in both the MLM and Ward 17, 14, 13 and 19 was Sepedi (80%, 71.1%, 93.5%, 88.5% and 78% respectively.

Table 7-20: Population by group (Barbour, 2023)

Group	Limpopo Province	Waterberg DM	Mogalakwena LM	Mogalakwena Ward 17	Mogalakwena Ward 14	Mogalakwena Ward 13	Mogalakwena Ward 19
Black African	97.1%	91.3%	97.1%	99.7%	99.8%	99.7%	99.8%
Coloured	0.3%	0.3%	0.2%	0%	0%	0%	0%
Indian or Asian	0.3%	0.4%	0.5%	0.1%	0.1%	0.1%	0.1%
White	2.3%	8.1%	2.2%	0.1%	0%	0.1%	0.1%

The overwhelming majority of the population in the study area (Ward 17, 14, 13 and 19) fall within the Historically Disadvantaged (HD) Black African group. In addition to being HD, the education and income levels are low, and the community is also predominately rural. These socio-economic factors increase the vulnerability of community.

7.14.2.1.1 Population Growth

The average household size in the Doorstep Area 1 village was 4.3, compared to 4 in Host Area 2. The average age of communities in the Doorstep Area 1 and Host Area 2 villages was 29.8 and 30.9 respectively. Households who have moved to the village within the last five years (~ 10% of all surveyed households) tended to have slightly fewer household members (with an average household size of 3.4 members versus 4.3 members for older households).

7.14.2.2 Households and house types

Based on the information from the 2011 Census the majority of the households in Ward 17 (88.1%), 14 (96.2%), 13 (91.1%) and 19 (85.6%) reside in formal houses. The same applies to the MLM (87.5%). This, together with the information that the majority of members from the local community in Ward 17, 14, 13 and 19 are likely to have been born and raised in the area, reflects a stable and well-established community that has strong historical, social and cultural links to the area. The findings of the Digby Wells survey (2021) confirm that the majority of people in the area are locals.

The majority of the houses in Ward 14 are owned and fully paid off (85.2%). This figure is significantly higher than the figure for Ward 17 (46.9%), 13 (68%) and specifically Ward 19 (4.2%). A number of villages located in Ward 19 are located closer to Mokopane which may be the reason for the lower figure. The data could be interpreted to imply a more stable and established community in Ward 14 and 13 compared to Ward 17 and 19. As indicated above the doorstep communities in respective wards include Leruleng, Skimming, Ga-Chaba and Phafola 1 and 2 in Ward 13, Mesopotamia and Matopa in Ward 14, Hans, Ga-Seema and Ga-Chkoe in Ward 17 and Sandsloot Masenya, Sandsloot Mabusela, Mashlaneng and Danisane in Ward 19.

Based on the information from the 2016 Community Household Survey and 2011 Census the majority of households in the MLM and Ward 17, 14, 13 and 19 are headed by females, 57.7%, 57.5%, 54.1% and 59% respectively. The majority of households in the Limpopo and WDM are headed up by males. However, even at a Provincial and DM level a significant percentage are headed up by females, namely 48.9% and 40.9%

respectively. The high number of female headed households at the local municipal and ward level may reflect the lack on formal employment and economic opportunities in the MLM and respective wards. As a result, job seekers from the MLM and these wards may have left the area to seek work in the larger centres, specifically Gauteng. The majority of the job seekers are likely to be males. This is due to traditional rural patriarchal societies where the role of the women is usually linked to maintaining the house and raising the children, while the men tend to be the ones that migrate to other areas in search of employment. However, at the same time the MLM IDP and SDF identify Mokopane as a growth point due to the mining related activities in the area. This has resulted in an influx of job seekers to the area. The Digby Well survey (2021) confirms that much of the influx can be attributed to local people returning; many in search of work linked to the mines. In this regard it should be noted that the ward level data in dated (2011). The current situation on the ground, specifically post Covid-19, is likely to have changed.

7.14.2.3 Household Income

Based on the data from the 2011 Census, 15.4% of the population of the MLM had no formal income, 5.2% earned less than R 4 800, 10.5% earned between R 5 000 and R 10 000 per annum, 23.4% between R 10 000 and R 20 000 per annum and 22.1% between R 20 000 and 40 000 per annum (2016). The figures for Ward 17, 14, 13 and 19 are based on 2011 Census data and are reflected in Table 7-21.

The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 77 % of the households in the MLM live close to or below the poverty line. The figures for Wards 17, 14, 13 and 19 were 87%, 85%, 85.9% and 85.6% respectively. The low-income levels reflect the rural subsistence nature of the economy and the limited formal employment opportunities in the area. This is also reflected in the high unemployment rates. The Digby Wells survey confirmed the low-income levels. In this regard 54% of respondents interviewed indicated that government grants represented the most important source of income. The low income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the MLM. This in turn impacts on the ability of the MLM to maintain and provide services.

Table 7-21: Annual Household Income (Barbour, 2023)

	Limpopo Province	Waterberg DM	Mogalakwena LM	Mogalakwena Ward 17	Mogalakwena Ward 14	Mogalakwena Ward 13	Mogalakwena Ward 19
No income	13.9%	13.9%	15.4%	19.6%	16.1%	16.9%	18.4%
Under R4800	6.4%	3.9%	5.2%	5.4%	5.2%	6.5%	6.6%
R5k - R10k	12%	7.8%	10.5%	10.9%	10.9%	13.4%	15.9%
R10k - R20k	23.2%	20%	23.4%	25.5%	29.1%	26.2%	22.9%
R20k - R40k	20.9%	21.4%	22.1%	25.6%	23.4%	22.9%	21.8%
R40k - R75k	9.8%	14%	10%	7.4%	7.2%	7.8%	8.4%
R75k - R150k	6.3%	9%	6.3%	3.3%	4.5%	3.9%	3.8%
R150k - R300k	4.5%	6%	4.4%	1.7%	2.4%	1.6%	1.5%
R300k - R600k	2.2%	2.8%	2%	0.3%	1.1%	0.7%	0.6%
R600k - R1.2M	0.6%	0.8%	0.5%	0.2%	0.1%	0.1%	0.1%
R1.2M - R2.5M	0.2%	0.3%	0.2%	0%	0%	0.1%	0.1%

	Limpopo Province	Waterberg DM	Mogalakwena LM	Mogalakwena Ward 17	Mogalakwena Ward 14	Mogalakwena Ward 13	Mogalakwena Ward 19
Over R2.5M	0.2%	0.2%	0.2%	0%	0%	0%	0%

7.14.2.4 Employment

Based on the MLM 2020/2021 IDP, 40.2% of the economically active population was classified as unemployed in 2011, with the unemployment rate of Mogalakwena being almost double that of the other municipalities in the district. The unemployment estimates in the Municipality vary between 45% and 70% of the economically active population (people between the ages of 15 and 64 years). The MLM IDP indicates that the employment rate is 26%.

The IDP also notes that unemployment is generally highest in the Mapela TA villages to the West/South-West of MM particularly in Ward 17. Youth unemployment in the MLM was reported to be high (51.7%) compared to the general unemployment rate of 40.2%. Women, and especially rural women, form the greatest number affected by the lack of job opportunities as well as other social problems, with the unemployment rates for women being on average 15% higher than their male counterparts.

In addition, almost half of the population within the study area is identified as being not economically active, which indicates a very high dependency ratio, with almost three quarters of the population supported by less than a third who are employed. This correlates with the findings of the 2021 Digby Wells Household Survey which found that the majority of households have only one income earner (see below). The survey also found that:

- Unemployment is significantly higher among working-age females than males, with women more likely to rely on social grants to survive and feed their families.
- Among those who are employed, men are most likely to be employed in mining, while women are more likely to be employed in other fields, in both the private and public sectors.
- The main source of income for the majority of households in the area is social grants (54%), followed by casual employment (11%) and then salaries from small and large-scale mining (combined 11%).

7.14.2.5 Education

In terms of education levels, the percentage of the population over 20 years of age in the MLM, Ward 17, 14, 13 and 19 with no schooling were 10.2% (2016), 29.2%, 19.3%, 21.2% and 18.9% (2011) respectively, compared to 13.9% for the Limpopo Province in 2016. The percentage of the population over the age of 20 with matric were 26.5%, 17.8%, 22%, 20.9% and 23.7% respectively, compared to 28.3% for the Limpopo Province. The low education levels in the MLM and respective wards reflect the rural nature of the province and the study area and the highlights the vulnerability of the local communities in these areas.

7.14.3 Economic Overview

The Waterberg District Plan (undated) indicates that the economy of the Waterberg DM is largely dominated by three (3) sectors, namely, mining, tourism, and agriculture. The largest contributor to Waterberg's Gross Value Add (GVA) (Figure 7-66) is mining with 56%. Other contributing sectors include community services (12%); finance (8%); trade (8%); transport (4%); manufacturing (3%); electricity (3%); agriculture (3%); and construction (2%)., followed by community services with 12% and Trade with 9%. Mining is also the most important sector in terms of employment, contributing 33% to all employment, followed by trade (17%), personal services (12.5%), government (10%), agriculture (7.1%), finance (6.1%), construction (5.8), manufacturing (4.4%), transport (2.6%) and utilities (0.4%).

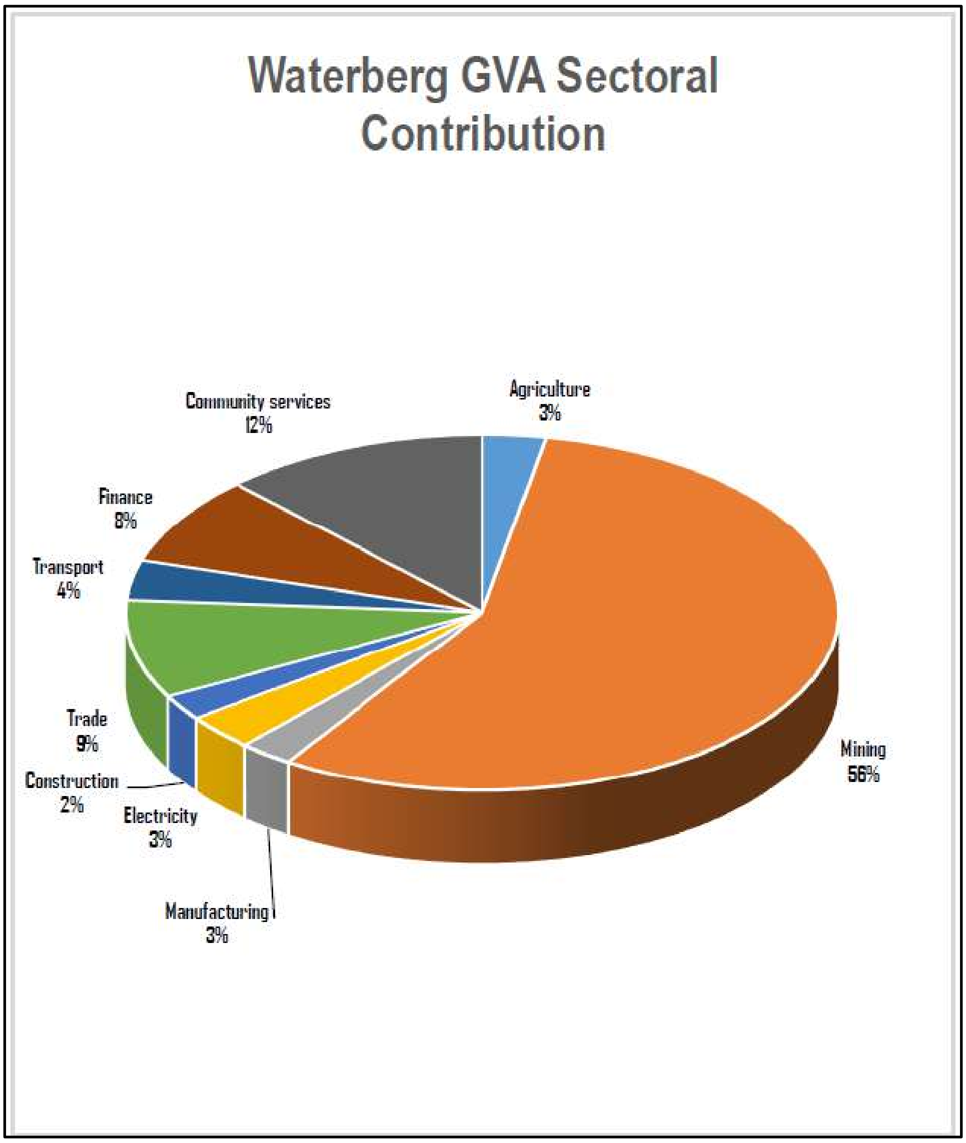


Figure 7-66: Waterberg District Municipality GVA (Barbour, 2023)

The Waterberg District is one of the major mining regions in South Africa with platinum, iron ore, coal, and diamonds as the main resources. The district is also home to 40% of the national coal reserves, the largest remaining known coal reserves in South Africa. The district is also characterised by large private commercial farming activities linked to game farming. In this regard the Waterberg's comparative tourism advantage is based on its unique bushveld landscapes, rich biodiversity, culture, and heritage attributes.

The GDP of the Mogalakwena Local Municipality was valued at R12.5 billion in 2018 (up from R 6.12 billion in 2008). This made up 19.05% and Waterberg District and Limpopo Province respectively. In terms of sector contributions, the community services sector, which includes government services was the largest contributor accounting for R2.82 billion (or 26.2% of the total GVA), followed by finance (20.4%) and mining (20.1%). The fact that community services is the largest sector in the local economy makes government the single biggest employer in the municipality. The municipality has a lower labour force participation rate (49.9%) when compared to South Africa (59.3%). However, it is slightly higher than the Waterberg District average of 48.4% and the Limpopo's 47.9%.

7.15 NETWORK

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Specialist Assessment of Impact from Waste Rock Disposal Facilities and Tailings Storage Facilities on Network Coverage for Mogalakwena Mine Complex. Complied by The Council for Scientific and Industrial Research (CSIR) dated June 2023 (Annexure 5-16).*

A network specialist assessment was undertaken to determine the impact of the current heights of MM TSF and WRD facilities on coverage of the television (TV), frequency modulation (FM) radio and other networks in the communities around the mine. The following facilities are of interest:

- W07 WRD
- W01 WRD
- RS3 WRD
- W020 East WRD
- W02 West WRD
- North WRD (not yet constructed)
- Blinkwater TSF
- Vaalkop TSF

7.15.1 Satellite Television (TV) Broadcasting

Satellite TV is provided by geostationary satellites transmitting signals which are received by the receivers on the ground (usually using the high gain parabolic reflector antennas commonly called “satellite dishes”).

Satellites in a geostationary orbit have an orbital period that matches the Earth's rotational period, which is approximately 24 hours. This means that a satellite in a geostationary orbit appears to remain stationary in the sky when observed from a fixed point on the Earth's surface, always staying above the same point on the Earth's equator. This makes geostationary orbits particularly useful for broadcasting and communication, as they provide constant coverage over a specific geographic region. Refer to Figure 7-67 below indicating the locations of applicable satellites in relation to South Africa.

Because of a very large distance and associated attenuation, the ground receivers use high gain (usually around 40 dBi) antennas, with very narrow beams (around 2 deg wide). For the most common/popular satellite TV choices in South Africa, these antennas are normally oriented at around 38 deg elevation angle (off the ground). With such a high elevation, the reception of satellite TV is normally fairly resilient and uneasy to block or interfere to (unless the blocking tree/building or other structure is very close to the dish). Refer to Figure 7-68 below for a visual representation.

DStv and OpenView are the most popular choices for satellite TV in South Africa. Their signals are broadcast by the satellites Intelsat 20, Intelsat 36 and SES-5, in the Ku frequency band (frequencies around 11 GHz).

The theoretical estimation based on a trapezoidal prism model of the WRD (Figure 7-68) showed that the satellite TV signals will not be blocked with the current WRD and TSF heights as the required minimum distances between the satellite antenna (in the community houses) and the visible top of the WRD/TSF (in the mine) are below 200 m. This estimation was validated with the experimental results, as both the DStv and OpenView satellite TV were received in all locations without noticeable distortion or degradation.

It was found that the considered mine’s infrastructure has no influence on the reception of DStv and OpenView broadcasts by Intelsat satellites. Receiving other satellites that require lower elevation angles may require significantly longer minimum distances and may lead to greater significance scores.

During the measurements in the communities, the team was approached by a community member, a satellite TV entrepreneur. He opined that incompetent and unaccredited installers have installed satellite TV reception equipment in some of the houses, improperly and without testing. If this opinion is true, faulty installations may have contributed to the community’s concerns.

Figure 7-67: View of applicable satellites relative to South Africa and the African continent. (CSIR, 2023)

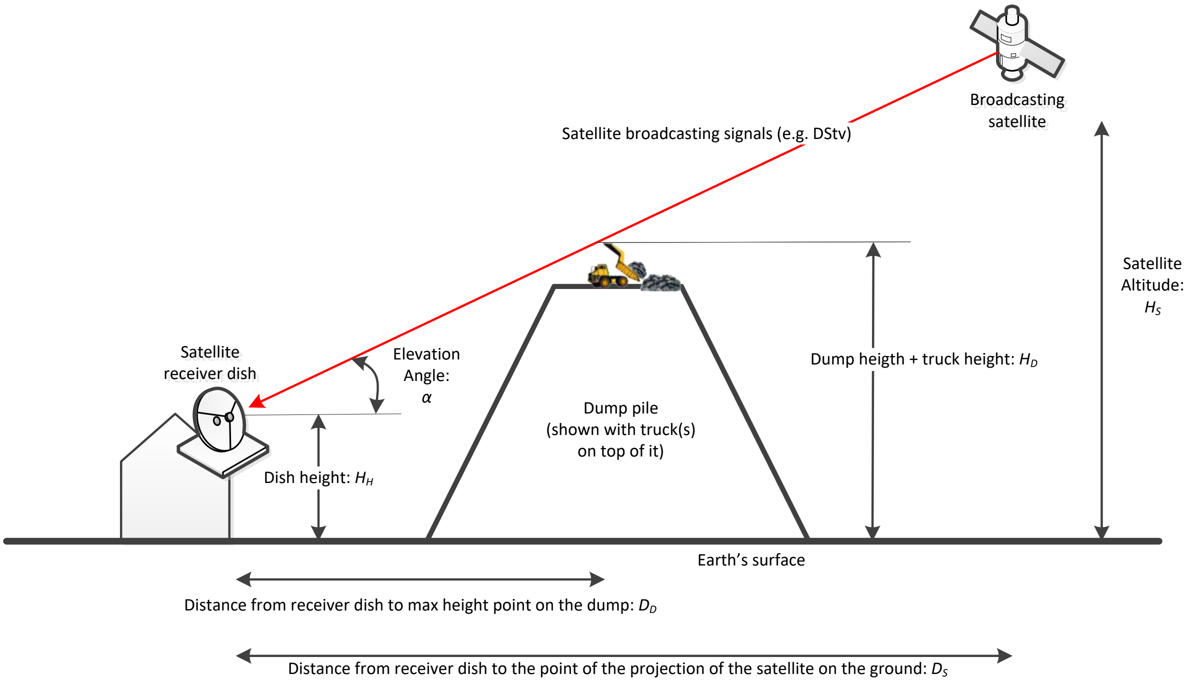


Figure 7-68:Geometry used to determine the impact of the mine facilities on Satellite coverage (CSIR, 2023)

7.15.2 FM Radio Broadcasting

Frequency Modulation (FM) radio is broadcast using the same approach as terrestrial TV, but at lower frequencies (87.5 MHz – 108 MHz). Often, the same towers are used, too. Each FM broadcasting tower usually can serve up to several tens of kilometers. Thanks to the longer wavelength, the FM signal is usually slightly more resilient than analogue TV but it can still be blocked.

Because the receiving terrestrial antennas are located relatively close to the ground and have to be pointed towards the broadcast tower in a direction along the horizon, the signals are sometimes blocked by natural obstacles such as hills, or even by physical structures such as growing trees and new buildings. In this regard, mine structures may have an influence on the propagation of terrestrial broadcast signals.

Overall, only the service of one FM station (Mokopane, from Mokopane tower) seems to have been completely lost and/or its coverage significantly reduced to Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, and Leruleng communities, due to the mine's growth so far. Other locations have experienced no change or only a minor change in the coverage for this and other FM transmitters. This is visually represented in Figure 7-69 below.

The certainty in the obtained results is however not high as the data on the heights of the mine facilities in 2000 was not available (which can noticeably offset the results in either underestimating or overestimating the loss of coverage).

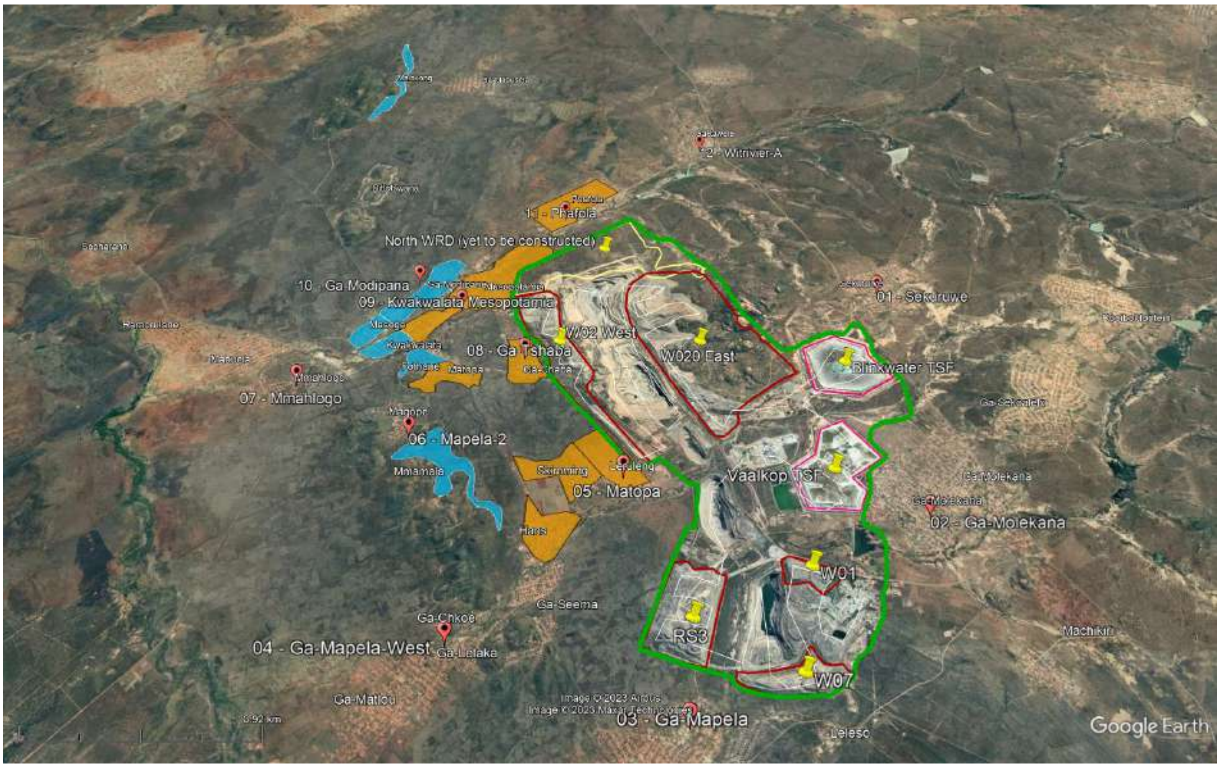


Figure 7-69: Map highlighting (in blue and orange) the most impacted communities in terms of reduced FM Broadcast coverage from Mokopane Station (CSIR, 2023)

7.15.3 Mobile Networks for data

The mobile networks are usually large (nation-wide) and organised into hexagonal cells, where each cell serves an area around it (or a sector of such area). Even though Global Systems for Mobile Communication (GSM) can theoretically reach 35 km distance, in practice, each cell usually covers an area of 500 m to a few kilometers. This is done to ensure high quality of service when serving large population around the cell/tower.

Traditionally, each cell uses a unique frequency, code etc. to avoid inter-cell interference. With this range of distances, it is possible that mine's structures could influence mobile network's operations. However, the mobile network operator would normally become aware of this (as the number of customer calls originating or ending at the specific affected base station would likely decrease) and would need to decide if it is worth moving the base station.

The current heights of the mine facilities may influence the signal propagation. However, such influence is dependent on the service provider and radio type. The current heights are unlikely to change the current status quo. Thus, the mine’s facilities have a low impact on mobile network access. The mobile operators are private entities and may decide on network planning, investment and optimisation in a particular area or community.

7.15.4 Wi-Fi Networks for data

Wi-Fi networks are usually small, localised to a room, house or small building. Larger buildings require multiple coordinated access points. This is because Wi-Fi standard and related regulations only cater for small transmit power. This means that most Wi-Fi installations are very local and only serve a small area of 10-50 m in linear size and will not be affected by mine’s structures.

Only a few specialized versions of Wi-Fi implementations offer higher transmit power. Usually these are used for long range point-to-point links.

Most Wi-Fi connections will not be affected by the height of mine facilities, regardless of how tall they are. One exception is the point-to-point links between different communities. Due to the specifics of technology and the relevant regulatory framework, identifying such links technically is exceptionally difficult and time-consuming. Instead, one could conduct a survey of people living in the area, asking the people directly about the links which the mine’s structures may have blocked, followed by verification interviews.

7.16 TRAFFIC / ACCESS

NOTE: The Environmental Status Quo Baseline for this section has been compiled utilizing the specialist study – *Hydrogen Plant Access: Mogalakwena Platinum Mines. Complied by Corli Havenga Transportation Engineers dated October 2022 (Annexure 5-15).*

7.16.1 Current Access Roads

MM existing access roads via the Bakenberg Road from the N11 is an approved interchange. The traffic volumes along the N11 (towards the east) and the R518 (towards the west) are generally high, while the volumes along Mapela Road (towards the west) and Bakenberg Road (traversing the site) are moderate during the AM and PM peak hours.

7.16.1.1 N11 Road

The N11 is a National Road with one lane per direction. The road has mainly an overall mobility function. A turning movement count was done at the intersection of the N11 and the Bakenberg Road. The peak hour traffic flow along the N11 derived from the count was as follows:

N11 Eastbound:

- AM – 175
- PM – 166

N11 Westbound:

- AM – 110
- PM – 146

7.16.1.2 R518 Road

The R518 is a Regional Road with one lane per direction. The road has mainly mobility function. This road carries moderate traffic volumes during the weekday AM and PM peak hours.

7.16.1.3 Bakenberg Road

The Bakenberg Road is a District Road. The road connects Mapela Road to the west and the N11 to the east. The road is a paved class 3 road that is in good condition. This road has adequate road signs and clear lane markings.

7.16.1.4 Mapela Road

The Mapela Road is a District Road. The road connects Bakenberg Road to the east and the R518 to the west. The road is a paved class 3 road that is in okay condition. This road has adequate road signs and clear lane markings.

7.16.2 Current Access Routes

The following routes provide access to the study area mainly from Mokopane (Figure 7-71):

Route 1: This route runs north along the N11 from Mokopane and connects to Bakenberg Road which leads to the site access road. The route is fully paved, and it provides a link of approximately 25.5km from Mokopane to the site access roads.

Route 2: This route runs north along the N11 from Mokopane and heads west at the R518/ N11 intersection along the R518. The route then proceeds North at the R518/ Mapela Road intersection along Mapela Road and connects to the Bakenberg Road at the Mapela Junior Primary School. This route provides a link of approximately 42km from Mokopane to the site access roads.

Route 3: This route obtains access from the R518 through a gravel road heading north, approximately 21.5km west of the R518/ N11 intersection. This gravel road intersects with Bakenberg road which leads to the site access roads. This route provides a link of approximately 52 km from Mokopane to the site access roads.

7.16.3 New Proposed Access Road

The mine in future is proposing to develop a Hydrogen Plant located within the MM mining area along the N11, where a preferred location has been identified. MM requires a secondary access point that can be used for emergencies to access the mine as well as access to the proposed Hydrogen Plant.

To comply with SANRAL's requirements the access position should co-inside with a possible future interchange position. SANRAL has not planned the position of interchanges along this section of the N11. The interchange at the intersection with Bakenberg Road is approved with a fixed position.

The proposed Hydrogen Plant access, which also serves as an emergency and alternative route access for the mine is proposed in a position where the access road to the mine and the on- and off-ramps to the mine on the mine's side are located on mine property where surrounding communities are not affected as depicted in Figure 7-70. .

Figure 7-70: Interchange Positions (Havenga, 2022) Yellow circle indicates the proposed access road to MM from the N11.

Alta van Dyk Environmental	MM Access Routes	Figure 7-21

Figure 7-71: MM Current and Proposed Access Routes

MOGALAKWENA COMPLEX

PUBLIC PARTICIPATION

8 PUBLIC PARTICIPATION PROCESS

The objectives of the Stakeholder Engagement process include the following:

- To identify the relevant Interested and Affected Parties (I&APs) for this project.
- To provide opportunities for the public and stakeholders involved to gain a better understanding of the proposed project and its possible impacts;
- Provide an opportunity as to draw knowledge and experience from the stakeholders to improve planning and decision-making;
- To build relationships with the public and stakeholders that lead to mutual support and confidence; and
- To enable Anglo American Platinum Mogalakwena, Mine to meet its legal and regulatory responsibilities.

At a high level, the Project EIA process is undertaken in four key phases, in accordance with the EIA Regulations (GNR. 326) of April 2017 as amended.

- **Application Phase** – identify listed activities that are triggered by the Project and submit an application for Environmental Authorisation (EA) to the competent authority.
- **Scoping Phase** - identify interactions of project activities and environmental and social resources to determine which should be included in the scope of the impact assessment.
- **Environmental Impact Reporting Phase** - the characteristics of the potential effects of project activities on bio-physical and social resources and features are evaluated and quantified to determine potential impact significance (or importance) taking into account the sensitivity of the particular resource or receptor. This phase also includes the identification of mitigation/management measures and the development of an Environmental Management Programme (EMP).
- **Competent Authority Decision** – the decision on the Project will be distributed to all project I&APs where they will also be informed of the appeal process.

Before submission of the Final Environmental Impact Assessment (EIA) Report, allowance is made to give potential I&APs access to, and an opportunity to comment on the Draft EIA Report, as well as register as I&APs (Registered I&AP).

To note, the Project is currently at the Environmental Impact Assessment Phase.

8.1 SCOPING PHASE PUBLIC PARTICIPATION

The Stakeholder Engagement Report detailing the activities undertaken as part of the Scoping Phase Public Participation Process is provided in Appendix 4-2. A summary of the activities undertaken is as follows:

- Pre-Consultation with the Mapela and Mokopane Traditional Councils on 29 November and 8 December 2022 respectively.
- Pre-Consultation with the Competent Authority (DMRE) on 17 January 2023.
- Notifications to I&AP's inclusive of:
    - Notification letters/ emails
        - Notification emails/letters were sent on 27 January, 1 February and 10 March 2023.
    - SMS Notifications,
        - SMS Notification were sent on 27 January, 1 and 20 February 2023.
    - Site Notices,
        - Site notices in English and Sepedi were placed around the project area on 31 January 2023
    - Newspaper Advertisement,
        - A newspaper advert in English and Sepedi was placed in the Bosveld Newspaper on 2 February 2023

- Focus group meetings
  - Focus group meeting were held at the Mokopane and Mapela Traditional councils on 16 and 19 January 2023 respectively.
- Public Open Days
  - Two public open days were held on 11 and 16 February 2023
- Background Information Documents (BID)
  - BIDs and comments sheets in English and Sepedi were provided during the open days to all I&APs

8.2 EIA PHASE PUBLIC PARTICIPATION

In accordance with the EIA Regulations, the applicant / environmental assessment practitioner (EAP) must give notice to all potential I&APs of the application. AvDE will be notifying I&AP's by means of the following methods:

8.2.1 Notification Letters

Notification letters will be sent to all registered I&APs informing them of the availability of the Draft EIR and the Public Open Days. These stakeholders are invited to register as Interested and Affected Parties for the proposed project and attend the project open days.

All notifications to I&APs will highlight the availability of Draft EIA Report that will be placed in the public domain for comment with the associated response period of 30 calendar days – 17 July until 16 August 2023.

8.2.2 Comment Boxes

Comment boxes will be available during the open day, and at the TC offices, and Kgoro's office for the duration of the public comment period. The boxes will be collected once the comment period has lapsed, and all comments will be addressed within the Comment and Response Report (CRR).

8.2.3 Newspaper Advertisement

According to the EIA Regulations, the advertisement should indicate the duration of a commenting period. In accordance with the minimum requirements of the promotion of Administrative Justice Act, 2000 (Act No 3 of 2000) (PAJA), all I&APs must be provided with a reasonable opportunity to make representations. This reasonable period is 30 (thirty) calendar days.

A newspaper advertisement was placed in both English and Sepedi in the week of the 3rd to 7th July 2023. The information within this advert included a brief explanation of the project; the authorisations to be undertaken; invitation to the public open days and the availability of the Draft EIA Report for review and comment.

8.2.4 Public Open Days

Public Open Day's will be undertaken as to provide the project information to all attendees. The Open Day allowed for a wider area of the community engagement as well as to limit the number of repeated questions or concerns. I&AP's were informed of the public open day through their relevant traditional councils; notification letters; newspaper advertisements and SMS notifications.

Face-to-face Open Day's will be held on the 13 July 2023 at the Mapela TC Offices and on 15 July 2023 at the Aboo Tayob Hall in Mokopane.

8.3 PLACEMENT OF DRAFT EIR & EMP REPORT IN THE PUBLIC DOMAIN

Before submission of the Final EIA and EMP Report, allowance must be made to give potential I&AP's access to, and an opportunity to comment on the Draft EIA and EMP Report, as well as Register as a Registered Interested and Affected Party (I&AP). A Registered I&AP is entitled to comment on all draft documents placed in the public domain and to bring to the attention of the EAP any issues which the I&AP believe may be of significance to the consideration of the application. These comments will be submitted within the specified timeframes. The Department's reference number will be quoted in all correspondence.

The purpose of the impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

Comments received on the Draft EIA and EMP will be included into the Stakeholder Engagement Report (SEP) as a separate Comments and Response Register (CRR) which will form an Annexure to the Report for Authority consideration prior to submission of the Final EIA and EMPr to the Regulatory Authority for decision making.

Specialist studies in support of the EIA and EMP will be annexed to the Draft EIA and EMP as well as the Final EIA and EMP and will be included in the documents set out in the public domain during the commenting period. Once the 30-calendar day comment period has closed, the Final EIA and EMP will be prepared for submission to the Regulatory Authorities. Once a decision has been taken, all I&APs will be informed of the decision and allowed an opportunity to appeal the decision, if need be

Only if there are substantial changes to the Draft Environmental Impact Assessment/ Environmental Management Programme should it be made available to the registered I&AP prior to submission otherwise it may be submitted together with the Comments and Response Report to the competent authority.

The competent authority will be consulted on all documents placed within the public domain. The Draft EIA and EMP Report will be placed at the following public places for public viewing and commenting:

Table 8-1: Public Places where the Draft EIA and EMP Report will be made available

Public Place	Locality	Physical Address	Contact Details
Mapela Traditional Council (TC) Office	Magope	MTC Offices Mapela 2	Madimetja Tjale madimetjale729@gmail.com
Mokopane Traditional Council (TC) Offices	Moshate	Moshate, Mokopane	Ms Emily Nkogatse Email: emilynkogatse1@gmail.com
Mogalakwena Mine Social Performance Office	South Concentrator	Mogalakwena Mine, South Concentrator	Mmakgobane Manyathela mmakgobane.manyathela@angloamerican.com
Mogalakwena Library	Mokopane	55 Van Riebeeck Street	Ms Refilwe Madisha
Alta van Dyk Environmental Consultants cc	Olifantsfontein	Unit 2212 9 Mountain Sherman Crescent Midlands Estate	Tel: +27 12 940 9457 Fax: +27 86 634 3967
Kgoro Offices – Mapela TC and Mokopane TC (Summary Documents)	Kgoro Offices – Mapela TC and Mokopane TC	Kgoro Offices	N/A
Website	https://www.altavandykenvironmental.co.za		

8.4 MAIN CATEGORIES OF COMMENTS RAISED TO DATE

The public participation undertaken as part of the Scoping Phase has been included in **Appendix 4-1.** Below highlights some of the main concerns raised by the I&APs during this consultation process. A full Comments and Response Report can be found in Annexure 4-2.

- Impacts on water quality due to mining activities.
- Impact of blasting and vibrations on houses.
- Decrease in ambient air quality as a result of mining activities.
- Opportunities afforded to the communities as a result of mining activities eg use of waste rock.
- Job creation / employment opportunities.
- Allocation of mining land for the use of cattle farming.
- Insufficient Community Liaison Officers (CLO) and communication platforms with the mine.
- Opportunities and leadership programmes for the youth.
- Community development and services.
- Possible new impacts associated with underground mining.
- Land ownership and relocation; and
- Impact on heritage resources such as graves.

MOGALAKWENA COMPLEX

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 IMPACT ASSESSMENT METHODOLOGY USED

The environmental impact assessment forms the basis for the Environmental Management Programme (EMP). The main purpose of the EMP is to ensure that effective management measures are tabled, that will ensure through the practical implementation thereof that all potential impacts are either avoided, successfully managed or mitigated to such an extent that it does not lead to environmental degradation or contamination.

The significance of the identified impacts will be determined using an accepted methodology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998. As with all impact methodologies, the impact is defined in a semi-quantitative way and will be assessed according to methodology prescribed in the following section.

Table 9-1: Scale utilized for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating	Scale	Description / criteria
MAGNITUDE of negative impact (at the indicated spatial scale)	**10**	**Very high**	Bio-physical and/or social functions and/or processes might be *severely* altered.
	8	**High**	Bio-physical and/or social functions and/or processes might be *considerably* altered.
	6	**Medium**	Bio-physical and/or social functions and/or processes might be *notably* altered.
	4	**Low**	Bio-physical and/or social functions and/or processes might be *slightly* altered.
	2	**Very low**	Bio-physical and/or social functions and/or processes might be *negligibly* altered.
	0	**Zero**	Bio-physical and/or social functions and/or processes will remain *unaltered.*
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**10**	**Very high**	Positive: Bio-physical and/or social functions and/or processes might be *substantially* enhanced.
	8	**High**	**Positive**: Bio-physical and/or social functions and/or processes might be *considerably* enhanced.
	6	**Medium**	**Positive**: Bio-physical and/or social functions and/or processes might be *notably* enhanced.
	4	**Low**	**Positive**: Bio-physical and/or social functions and/or processes might be *slightly* enhanced.
	2	**Very low**	**Positive**: Bio-physical and/or social functions and/or processes might be *negligibly* enhanced.
	0	**Zero**	**Positive**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
DURATION	**5**	**Permanent**	**Impact in perpetuity. –**
	4	**Long term**	Impact ceases after operational phase/life of the activity > 60 years.
	3	**Medium term**	Impact might occur during the operational phase/life of the activity – 60 years.
	2	**Short term**	Impact might occur during the construction phase - < 3 years.
	1	**Immediate**	**Instant impact.**
EXTENT (or spatial scale/influence of impact)	**5**	**International**	**Beyond the National boundaries.**
	4	**National**	Beyond provincial boundaries, but within National boundaries.
	3	**Regional**	Beyond 5 km of the proposed area and within the provincial boundaries.
	2	**Local**	Within a 5 km radius of the proposed area.
	1	**Site-specific**	**On site or within 100 meters of the site boundaries.**
	0	**None**	**Zero extent.**
IRREPLACEABLE loss of resources	**5**	**Definite**	**Definite** loss of irreplaceable resources.
	4	**High potential**	**High** potential for loss of irreplaceable resources.

	3	**Moderate potential**	**Moderate** potential for loss of irreplaceable resources.
	2	**Low potential**	**Low** potential for loss of irreplaceable resources.
	1	**Very low potential**	**Very low** potential for loss of irreplaceable resources.
	0	**None**	**Zero potential.**
REVERSIBILITY of impact	**5**	**Irreversible**	Impact **cannot** be reversed.
	4	**Low irreversibility**	**Low** potential that impact might be reversed.
	3	**Moderate reversibility**	**Moderate** potential that impact might be reversed.
	2	**High reversibility**	**High** potential that impact might be reversed.
	1	**Reversible**	Impact **will be** reversible.
	0	**No impact**	No impact.
PROBABILITY (of occurrence)	**5**	**Definite**	>95% chance of the potential impact occurring.
	4	**High probability**	75% - 95% chance of the potential impact occurring.
	3	**Medium probability**	25% - 75% chance of the potential impact occurring
	2	**Low probability**	5% - 25% chance of the potential impact occurring.
	1	**Improbable**	<5% chance of the potential impact occurring.
	0	**No probability**	**Zero probability.**

Evaluation Component	**Rating scale and description / criteria**
CUMULATIVE impacts	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. ***Medium**:* The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. ***Low**:* The activity is localised and might have a negligible cumulative impact. ***None**:* No cumulative impact on the environment.

Once the Environmental Risk Ratings have been evaluated for each potential environmental impact, the Significance Score of each potential environmental impact is calculated by using the following formula:

SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential environmental impact as per Table 9-2 below. The Environmental Significance rating process is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

Table 9-2: Significance Score utilized for the evaluation of the Environmental Risks Rating

Significance Score	**Environmental Significance**	**Description / criteria**
125 – 150	**Very high (VH)**	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	**High (H)**	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	**Medium-high (MH)**	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked at.

40 – 74	**Medium (M)**	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	**Low (L)**	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	**Positive impact (+)**	A positive impact is likely to result in a positive consequence/effect and is likely to contribute to positive decisions about whether or not to proceed with the project.

9.2 PROJECT SPECIFIC ACTIVITIES

This chapter provides identification and description of potential project activities as a result of the proposed project.

9.2.1 Construction Phase

The proposed activities for the construction phase of the proposed project includes:

- Clearance of the area for the development of new infrastructure.
    - Stripping vegetation from the area.
    - Removal of garden waste
    - Stripping of topsoil and stockpiling on areas not previously used for this activity.
- Vehicular movement and operation of machinery.
- Parking of vehicles and equipment.
- Storage and handling of potential pollutants i.e. chemicals, fuels, oils, lubricants, general waste.
- Generation of general and hazardous waste.
- Levelling and terracing of areas for construction.
- Mixing of concrete.
- Implementation of a Storm Water Management Plan that allows for the separation of clean and dirty water on site and the containment of contaminated stormwater.
- Installation of pollution control structures.
- Installation of access control measures.
- Placement of infrastructure and lighting.
- Placement and use of ablution facilities.
- Construction of the Mining Related Surface Infrastructure, services and development of foundation layers and water infrastructure for the waste rock dump
- Development of roads.

9.2.2 Operational Phase

The activities associated with the operation of the proposed project include:

- Management, operation and maintenance activities associated with the operation of the Mining Related Infrastructure.
- Stockpiling of ore and waste rock.
- Heavy vehicular movement due to the loading of product and light vehicle movement.
- Refuelling of vehicles and equipment.
- Parking of vehicles and equipment.
- Operation and maintenance activities associated with storm water management on site.
- Surface and Groundwater Monitoring will be undertaken in accordance with the requirements of the Approved Water Use Licences.
- Dewatering of the underground workings to keep the underground workings dry.
- Storage and handling of potential pollutants i.e. chemicals, fuels, oils, lubricants, general waste.
- Generation of general and hazardous waste.

- Removal of silt from dams for reprocessing.
- Mine Residue Disposal for tailings residue and waste rock.

9.2.3 Decommissioning and Closure phase

Decommissioning and closure activities associated with the proposed project include but are not limited to:

Underground Infrastructure/processes

- Closing, dismantling and demolishing the conveyor, chairlifts, electrical infrastructure, refuse bays, and underground equipment etc.
- Removal of hazardous waste, oils, diesel, batteries will be removed off site and disposed of at a permitted facility.
- Stabilizing underground workings
- Water management
- Sealing off of the shaft, etc.

Surface Infrastructure

- Closing, dismantling, decontaminating, removing, and disposing of surface infrastructure with no post closure beneficial use.
- Ripping, shaping, and vegetating of general disturbed surface areas.
- Salvageable equipment will be decontaminated, inspected, and removed from site for reuse and recycling.
- Non-salvageable materials and demolition waste will be disposed of in accordance with the Mine Closure and Rehabilitation Plan.
- All structures unless otherwise specified will be completely dismantled or demolished.
- Foundations will be removed up to 1m below ground level or covered with growth medium.
- Removal of all chemicals from site.
- All hydrocarbon or chemical contaminated material will be removed off site and disposed of at a permitted facility.
- Asphalt paved road surface will be ripped to break up the asphalt and base layers. Asphalt could be stockpiled for reuse by the Local Municipality.
- All linear items such as pipelines (Unless specifically left for post-closure community use), fences and power lines will be dismantled. Salvageable materials will be treated as stated above and waste disposed of as specified.
- The in-situ soil will be ameliorated based on an assessment of the growth medium at closure.
- Baren areas, must be covered with soil previously stockpiled, and vegetation will be re-established in accordance with the Mine Closure and Rehabilitation Plan which should centre around allowing for an optimal post-closure end land use and will take into consideration biodiversity requirements.
- All concrete canals will be removed, and the concrete disposed.

Dirty Water Containment Facilities

- North west Polllution Control Dam- Navada Dam will be maintained for 5 years post closure until rehabilitation has stabilised.
- Water will be allowed to evaporate from the dams.
- Sediments in the dam basins will be tested to confirm contamination potential and will be disposed of accordingly.
- All liners, where applicable, will be removed and disposed of off-site as hazardous waste if classified as such.
- It was assumed that dam walls will be breached, and the walls will be reshaped by dozing the material back into the dam basin to create a free draining profile without steep slopes.

- The basin and wall footprint areas will be ameliorated based on an assessment of the growth medium at closure.
- Vegetation will be re-established in accordance with the Mine Closure and Rehabilitation Plan which should centre around allowing for an optimal post-closure end land use and will take into consideration biodiversity requirements.

Ore Stockpiles

- Ore stockpiles which contain materials of economic value will be processed and the stockpile footprint areas rehabilitated.

Waste Rock Dumps

- Shaping, benching and rehabilitation of the remaining WRD.
- Establishment of vegetation on the WRD.

Anthropogenic Aquifer and open pit lakes

- Installation of security fencing at safety berm.
- Some of the open pits will remain post closure and will fill up with rain and fissure water and form pit lakes.

General Area

- Monitoring and maintenance of the rehabilitated areas will be required.
- Surface and Groundwater Monitoring will be undertaken in accordance with the requirements of the Approved Water Use Licences as well as in accordance with the Mine Closure and Rehabilitation Plan.

9.3 PROJECT SPECIFIC IMPACTS

This chapter provides identification, description and impact significance of all potential impacts associated with the proposed projects.

9.3.1 Topography

The impact on topography is unavoidable during both the construction and operational phase of the project. There will be a localized change in the topography due to bulk excavations, earth works, soil profiling, leveling and the construction of the mining related infrastructure and Waste Rock Disposal Facilities.

In terms of the cumulative impacts, the proposed mining activities and associated infrastructure will alter the topography of the study area and contribute to the cumulative impact as mining activities exist. The establishment of additional projects in the area could impact on the current topography.

The quantified anticipated impacts pre-and post-mitigation measures are provided in **Table 9-3**.

Table 9-3: Topography Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Topography																				
Construction Phase																				
Altered Topography	Alteration to the local topography due bulk excavations, earthworks soil profiling, and levelling	6	4	1	3	4	4	72		Medium	Negative (-)	• Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Optimises mine related surface infrastructure areas ○ Minimizes footprint disturbance ○ Demarcates laydown areas ○ Demarcates construction areas ○ Demarcates development areas ○ Demarcates stormwater management infrastructure ○ Demarcates no-go zones and sensitive areas ○ Demarcates mine residue areas ○ Demarcates stockpiling areas ○ Restricts vehicular movement within no-go zones and sensitive areas; and ○ Aligns with the site specific Closure and end Land Use Plan. • Development of a site-specific Closure Plan aligned with the End Land Use Development Framework/Objectives • Implement all mitigation measures as per the Soils and Land Use Capability.	4	2	1	2	4	3	39	
Operational Phase																				
Altered Topography	Operation of mine and related activities / infrastructure	6	4	1	3	4	4	72		Low	Negative (-)	• Update, implement and maintain the Master Layout Plan • Update, implement and maintain the Closure Plan (aligned with the End Land Use Development Framework) • Undertake concurrent rehabilitation of Waste Rock Disposal Facilities.	4	2	1	2	4	3	39	
Closure Phase																				
Altered Topography	Decommissioning activities	4	2	1	2	4	3	39		High	Positive (+)	• Develop and implement a Final Rehabilitation and Closure Plan at least 5-years prior to closure needs to be obtained inclusive but not limited to the following: ○ Ensure that Waste Rock Disposal facilities that will remain post closure are at a stable slope as to allow for vegetation re-growth and the prevention of gully formation. ○ Re-profile waste rock dumps and tailings dam facilities (TDFs) down to a stable slope. ○ Return the area, as far as possible, to a topography aligned with the End Land Use Development Framework/Objectives as agreed upon in consultation with stakeholders. ○ Remaining surface excavations will be made safe as required in terms of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002). ○ Demolish and remove structures and infrastructure such as the concentrators, shafts and other mining related infrastructure as well as rehabilitate the footprint and associated disturbed areas from which these have been removed. ○ Demolish all structures and removing terracing and foundations to a predetermined minimum depth below the final rehabilitated ground level. ○ Landscape and topsoil disturbed areas and stockpiles to facilitate natural succession of suitable indigenous flora and supplement with composting and seeding if required. ○ Shape, rip and vegetate roads that do not have a post-closure use. ○ Ensure that the rehabilitated mine site is free-draining, and runoff is routed to natural drainage lines as far as possible.	4	3	1	2	4	2	28	

9.3.2 Soils, land Use and Land Capability

The impact assessment has been compiled with reference to the Soils, Land Capability & Pre-development Land Use Specialist Investigations, Impact Assessment and Management Programme. Complied by Earth Science Solutions dated May 2023.

The proposed project and associated activities will entail the removal of significant quantities of soil, and possibly the complete removal of soil and soft overburden in places where the foundations are deep. Some of the additional infrastructure proposed will require that both soils and soft overburden are disturbed over areas of deep foundations. In contrast, the access roads and general service ways (powerlines and pipelines etc.), contractors camp and contractor's laydown areas will be less invasive on the natural environment. However, all of these soils will be sterilised and lost from the system for the life of the operation and possibly beyond in the case of the permanent structures (WRDs).

In better understanding the impacts and their significance a number of site-specific baseline (existing environment) conditions are as follows:

- The presence of a significantly large area that has been impacted by historical mining. These brownfields baseline conditions contribute to the cumulative impacts and overall negative significance rating assigned for the future developments being considered.
- All/any natural features that classify as wetlands (areas with wet based soils less than 500mm deep) are considered to be ecologically sensitive and legally important.
- The soil structure and texture (clay content) are important when considering the effects of soil removal and storage, the effects of compaction and degradation of soil structure and soil health being adversely impacted. These aspects make for more difficult working while wet and form hard clods while in storage, all of which make for difficult management of the natural resources during rehabilitation.
- The occurrence/presence of evaporites (ferricrete/calcrete) and soils with a shallow rooting depth (<400mm) are considered areas of sensitivity to erosion, and soil water (hydropedology) balance. These conditions/horizons will in almost all cases [deep foundations (dams' large infrastructure etc.)] be destroyed and possibly removed from the system.
- Removal of vegetation from any of the soils mapped will result in increased exposure and resultant erosion to varying degrees, a factor that will increase the sediment load and impacts on the receiving environment (streams, rivers and dams).

These conditions will have a bearing on the ratings being assigned to the overall impact statement as loss of these features will have a definite localised or site-specific negative impact during the construction and operational phases. These impacts will in turn have a negative impact significance on the ecological functionality of the area and a bearing on the management recommendations tabled.

9.3.2.1 Construction Phase Impacts

The construction phase will potentially involve:

- The sterilisation of utilisable soil and loss of vegetative cover over greenfield areas where infrastructure and support activities are to be constructed/implemented.
- The potential contamination and possible salinisation of soils by dirty water ingress and/or hydrocarbon and reagent spills on unprotected soils.
- The separate placement of soil stocpiles
- The erosion and loss of soil from unprotected (removal of vegetation) areas downstream or downwind, and
- The compaction of unprotected soils (both *in-situ* and stored) by heavy machinery etc.

9.3.2.2 Operational Phase

Due to the advanced nature of open cast mining and processing at MM, the different phases will inevitably overlap with the historical mining areas potentially being rehabilitated and closed as new areas are being developed. The operational phase will see the ongoing management of the open cast mining areas and the development the final pushback of Zwartfontein Pit, the management of significantly much larger areas of waste rock disposal areas, increased dirty water management as part of the stormwater management program and the management of additional footprint areas associated with underground mining adits and portals, ventilation shafts and the storage of water within the mined out pit areas (Anthropogenic Aquifers).

During the operation of these mining operations and the support activities it is anticipated that there will be potential impacts from:

- The spillage of waste rock, run of mine ore product and by-products [tailings paste, dirty water (filter press) and waste rock] during conveyancing/transportation to the disposal and storage facilities.
- The control and storage of dirty water (storage of and the return of water to the processing and beneficiation works.
- The potential for contamination from spillage during the delivery of fuels and reagents to the complex, and dispensing thereof.
- Spillage and contamination of the *in-situ* and stockpiled materials/soils due to dirty water run-off
- Contamination by dust deposition/dispersion, the de-nutrification of the stockpiled soils due to excessive through flow of rainwater on unconsolidated and poorly protected soils.
- The loss of the nutrient pool from the stockpiled materials due to unprotected soil stockpiles
- Unprotected stockpiles resulting in unprotected leaching.
- In addition, the potential for compaction of the in-situ materials by uncontrolled vehicle movement, heavy machinery, bare soils, and the loss to the environment (down-wind and downstream) of soil by wind and water erosion over un-protected ground is considered probable if not well managed.

These effects will, if not well managed and mitigated have a negative impact on the physical and socio-economic environment.

In summary, the operation will result in the following potential impacts:

- The sterilisation of the soil resource on which the facilities are constructed. This will be an on-going loss for the duration of the operation and beyond in the case of the permanent structures (Open pits, and WRD's).
- The creation of dust and the possible permanent loss (erosion) of utilisable soil down-wind and/or downstream, the potential for contamination of the stored and in-situ soils from dust fallout and the contamination of downstream water supplies due to an increased sediment load.
- The compaction of the more clay rich soil, both *in-situ* and while in storage, and the potential loss of the soils utilisation potential as a result.
- The contamination of the soils by dirty water run-off, product and hydrocarbon spillage from conveyancing and haulage systems from vehicle and machinery used on site and/or by dust from the haulage/conveyancing of materials and from the stockpiles/waste facilities/dumps.
- Contamination of soils by use of dirty mine water for dust suppression and/or irrigation of vegetation on stockpiles (soil and soft overburden).
- Potential contamination of soils by chemical spills of reagents being transported to the facility/site.
- Sterilisation and loss of soil nutrient pool, organic carbon stores and fertility of soils during storage.
- Impact on soil structure and soil water balance due to longevity of storage.
- The potential loss of some of the soil's original nutrient store and organic carbon by leaching of the soils while in storage during the operational phase leaving behind a less quality soil.
- Erosion and de-oxygenation of materials while stockpiled during the operational phase.

Un-managed soil stockpiles and soil that is left uncovered/unprotected will potentially be lost to wind and water erosion, will loss the all-important, albeit moderately poor nutrient content and organic carbon stores (fertility) and will be prone to compaction.

9.3.2.3 Decommissioning and Closure

The impacts on the soil resource during the decommissioning and closure phase will have both a positive and a negative effect, with:

- Compaction and contamination from dust due to vehicle movement while rehabilitating the area.
- Erosion due to slope stabilisation and re-vegetation of disturbed areas.
- Contamination of replaced soils by use of dirty water for plant watering and dust suppression.
- Hydrocarbon or chemical spillage from contractor and supply vehicles.
- The potential loss of soils sterilised by permanent structures where soils were not stripped ahead of construction.
- Areas receiving less topsoil than is optimal.
- Positive impacts from the reduction in footprint area of disturbance and the return of soil utilisation potential, reinstatement of areas of non-permanent structures and areas of storage, and the rehabilitation of disturbed areas.

Table 9-4 provides the impact rating for soils and land capability.

Table 9-4: Soils and Land Capability Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Soils and Land Capability																				
Construction Phase																				
Loss of vegetation cover/soil protection and soil resource (sterilisation and erosion) and resultant loss of ecosystem services, contamination and compaction.	Ongoing development of the open pit mine, Zwartfontein final pushback, ventilation shafts & support infrastructure, Hydrogen plant pipelines, powerlines, truck workshop, mobile refuelling stations, Permit to Innovate areas, access road and stormwater management infrastructure.	8	4	2	4	4	5	110		Medium	Negative	• Develop and Implement a Topsoil Utilisation Management Plan, that includes but is not limited to: ○ Alignment of the Topsoil Utilisation Management Plan with the site-specific Biodiversity Management Plan, Alien and Invasive Plant Species Management Plan and Rehabilitation Strategy and Implementation Programme for the prevention of erosion and loss of soil quality and promoting of rehabilitation. ○ Single handling of topsoil will be practised where possible. ○ Removal/stripping of all utilisable soil from footprint of structures and the stockpiling/storage of the resource. ○ Removal/stripping of all utilisable soil from footprint of permanent structures and the stockpiling/storage of the resource with vegetative matter included (inclusive of seed pool and organic matter). ○ Limiting the areas of impact to as small a footprint as possible wherever possible. ○ Store soil stockpiles outside the 1:100 year flood line and flood plains of watercourses, in areas where they will not be impacted upon by mining operations, and upslope of areas of disturbance or development, to prevent contamination by contaminated runoff or seepage. ○ Stockpile utilisable soil (as defined) separately from the soft overburden. ○ Restriction/minimisation of movement of vehicles, animals, servicing vehicles, spillage from haulage vehicles and bunding of all services areas (fixed and mobile units).	6	4	2	4	4	4	80	
Loss of vegetation cover and topsoil protection, erosion and permanent loss of resource downslope with negative impact of the receiving environment (streams and rivers) and ecosystem services.	Surface clearing, soil removal, infrastructure footprint pad construction and excavation of foundations.	8	4	2	4	4	5	110		Low	Negative		6	4	2	4	4	4	80	
Contamination, salinisation, loss of soil resource and utilisation potential	Vehicle maintenance and movement, contamination by hydrocarbon/reagent spills and/or dirty water runoff from mobile refuelling activities and localised workshops	8	3	1	5	4	4	84		Low	Negative		4	2	1	4	4	3	45	
Operational Phase																				
Sterilisation and loss of soil resources, its utilisation potential and ecosystem services of permanent structures, contamination, salinisation and compaction of unprotected sites.	Disposal of waste rock and storage of natural resources (soils and overburden). On-going use of a large footprint for support infrastructure and open cast mining.	10	5	2	5	4	5	130		Medium	Negative	• Update and maintain the Topsoil Utilisation Management Plan that includes but is not limited to the following: ○ Alignment with the Master Layout Plan which coincides with the Life of Asset Mine Plan, that includes but is not limited to: ▪ minimising footprint and restrict areas of impact to as small an area as practical; ▪ remove all utilisable soil; ▪ stockpile soils and manage stored soils to prevent water and wind erosion as well as contamination. ▪ Manage vegetative/rock cladding and impacts of dirty water/dust ingress.	8	5	1	4	4	5	110	
Loss of resource, contamination and erosion of unprotected materials (in-situ and stored) and impact on downstream/downwind socio and biophysical environments.	Stormwater runoff and overland flow of dirty water (suspended solids and possible hydrocarbons/chemical spillage) erosion of soils by water and or wind, potential for off-site (downstream and downwind) contamination/impacts by dust and dirty water.	10	4	2	4	4	5	120		Medium	Negative	• Update and maintain a site specific Stormwater Management Plan which meets the requirements of GN704 as well as best practices with regards to: ○ The effective separation of clean and dirty water on site. ○ The containment of dirty water run-off. ○ The implementation of concurrent rehabilitation on mineral residue disposal facilities to minimise / restrict ingress of dirty water onto/into resource stockpiles. ○ The maintenance of berms to maintain/manage vegetative cover to restrict erosion. ○ The handling of hazardous material	6	3	1	4	4	4	72	
Continued sterilisation and loss of soil resource, its utilisation potential and ecosystem services due to unmanaged operation of materials transportation/conveyancing (waste rock, Run of Mine ore and pumping activities for all areas covered by infrastructure and operational activities.	Spillage of raw (ROM ore stockpile), and waste rock and hydrocarbon storage and re-fuelling operations, vehicle and mechanical maintenance of haulage and conveyancing systems, operation and beneficiation infrastructure (paste plant) and wastewater systems and reticulation and storage of dirty (sediment) stormwater runoff.	10	4	2	4	4	5	120		Medium	Negative	• Update and maintain a site-specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ On-going management and control (auditing and monitoring) of mining activities ○ the minimisation/prevention of spillage from pipelines, vehicles, and electrical reticulation. • Update and maintain a site-specific Vehicle and Machinery Maintenance and Management Plan, inclusive but not limited to the following: ○ Restriction on vehicle maintenance, re-fuelling areas and movement (access and haulage ways). • Update and maintain a site-specific Stormwater Management Plan, inclusive but not limited to the following: ○ Management and control of stormwater runoff; ○ Restriction of dirty water quantities and release of clean water to natural environment.	8	3	1	4	4	4	80	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Soils and Land Capability																				
Loss of soil nutrient store, structure and utilisation potential as a result of leaching of nutrients and soil moisture from utilisable soil stockpiles.	Storage of soil resource and overburden in unprotected berms and stockpiles (no cover protection) and for extended periods of time.	8	4	1	4	4	5	105		Medium	Negative	• Develop and implement a Concurrent Rehabilitation and Closure Plan, inclusive but not limited to: o The on-going monitoring and maintenance of vegetative cover/rock cladding to all material stockpiles and berms; o concurrent rehabilitation of all non-essential areas and activities; o the maintenance of stormwater control systems. o Management of soil stockpiles, including evaluation of soil quality.	6	3	1	4	4	4	72	
Closure																				
Loss of soil organic matter and nutrient stores and long-term utilisation potential due to erosion and compaction. Potential contamination and salinisation of receiving environment (soil and water bodies)	Closure of excavations (dams, canals and trenches), roads and access ways, haulage routes and decommissioning of water and electrical reticulation, re-emplacement of overburden and utilisable soils, landscaping of disturbed areas to be free draining and re-vegetation of rehabilitated areas.	4	2	1	2	4	3	39		Low	Negative	• Develop and implement a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: o Management of demolition activities, movement and maintenance of equipment and vehicles. o Ripping of compacted areas o Replacement of nutrient and organic carbon requirements at time of rehabilitation (lab analysis), landscaping of the topographic slope (free draining), cultivation of soils and replacement of vegetation cover as soon after replacement of materials as possible. o Analysis of soils to determine need for remediation. o Monitoring of vegetative growth until self-sustaining.	6	4	1	2	4	4	68	
Contamination of in-situ and stored materials by dirty water ingress.	Use of dirty water for irrigation during the rehabilitation of the site	4	2	1	2	4	3	39		Low	Negative	• Maintain a Surface Water Quality Monitoring Programme until closure is obtained, inclusive but not limited to: o Monitoring and management of water quality to be used for irrigation of vegetated areas.	6	3	1	3	4	4	68	
Contamination, salinisation, compaction, and erosion of rehabilitated soil resources due to unmanaged and poorly serviced machinery, spillage and lack of well-engineered stormwater controls. Resultant downstream sedimentation and contamination of receiving environment (soils and water bodies)	Demolition and removal of large infrastructure and the use of mechanical equipment for rehabilitation during reinstatement of overburden materials, soils and the re-vegetation of rehabilitated areas.	6	2	1	3	3	3	45		Low	Negative	• Maintain a site specific Vehicle and Machinery Maintenance and Management Plan, inclusive but not limited to the following: o Maintenance and management of all vehicles and equipment, restriction on access of vehicles to rehabilitated areas and/or unprotected soils. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: o Installation of erosion control measures along all draining ways/channels and on any/all sensitive sites and the landscape of topography to be free draining. o Cultivation of soils and replacement of vegetative cover as soon after replacement of material as possible. Monitoring of vegetative growth until self-sustaining. • Restriction of grazing animals on newly rehabilitated areas.	6	3	1	3	4	4	68	

9.3.3 Biodiversity (Fauna & Flora)

The impact assessment has been compiled using information from the Terrestrial Biodiversity Assessment for the Proposed Integrated Permitting Application at the Mogalakwena Mine near Mokopane, Limpopo Province. Complied by Scientific Terrestrial Services dated June 2023.

9.3.3.1 Flora

The impact assessment was undertaken on all aspects of floral ecology likely to be affected by the proposed project. Impacts on habitat and diversity are anticipated to vary between medium high and low (habitat dependent, in which sensitive habitat typically scored higher than that of less sensitive habitat). The impact assessment as provided on Table 9-5 assessed impacts associated with the identified habitat units, as each habitat unit is associated with varying sensitivity. The proposed development activities will result in the clearance of vegetation (~ 3600-ha footprint, pending final layouts), which will lead to a loss of floral habitat and diversity within the focus area (with anticipated to range from local scale to regional scale (if CBA and ESA habitat is impacted) implications).

Mixed Bushveld Habitat Unit

The Mixed Bushveld Habitat is of intermediate floral sensitivity. In total ~ 302 ha of Mixed Bushveld habitat will be lost if the proposed activities were to be approved. Of the proposed activities, the proposed mining activities, and development of supporting infrastructure are anticipated to result in the greatest loss of Mixed Bushveld Habitat (~ 106 ha and 100 ha respectively). The remaining activities (road development, electricity infrastructure development, pipeline development, and ventilation shaft development) collectively will result in the loss of ~ 40 ha. The proposed activities are anticipated to result in the loss of habitat that is structurally similar to the reference vegetation type. Although vegetation that has an affinity with the reference vegetation type will be lost, the Mixed Bushveld Habitat is represented within the surrounding areas and thus the impact is anticipated to remain localised (provided that strict mitigation measures are implemented).

Secondary Bushveld & Degraded Bushveld

Both the Secondary Bushveld and the Degraded Bushveld Habitat units are of moderately low floral sensitivity. In total, approx. 208 ha of Secondary Bushveld and approx. 686 ha of Degraded Bushveld are anticipated to be lost as a result of the proposed activities. For the Secondary Bushveld, the activities resulting in the greatest loss of habitat include the pipelines and associated infrastructure (~105 ha). For the Degraded Bushveld, the activities resulting in the greatest loss of habitat include mining activities (~ 245 ha) Both the Secondary Bushveld and the Degraded Bushveld habitats are largely degraded in nature and do not support a floral community representative of the reference vegetation type. As such, a significant loss of the associated degraded floral communities is not anticipated. The impact is anticipated to remain localised (provided that strict mitigation measures (e.g., edge effect management) are implemented).

Freshwater Habitat

Approximately 32 ha of the Freshwater Habitat (of moderately high and intermediate floral sensitivity) will be directly impacted by the proposed mining and construction activities; however, the larger reach of these systems will be impacted if mining activities cut off the connectivity of these features within the landscape. The Freshwater Habitat (including Seep Wetlands, Riparian Habitat, and Ephemeral Drainage Line habitat) provides unique (floral) habitat and connective corridors (ecological) within the landscape; impacts to the Riparian habitat (in particular) will be of greater ecological consequence as these features provide important ecological roles within the landscape. Individually, the proposed activities will result in the loss of Freshwater Habitat as follows: road development (~ 4 ha), electricity infrastructure development (0.5 ha), mining activities (~ 9 ha), pipeline development (4 ha), North west Polllution Control Dam- Navada Dam development (~ 1 ha), and ventilation shaft development (~ 1 ha). Such activities within the Freshwater Habitat will result in the destruction and fragmentation of these connective features within the landscape. As such, a loss of the associated floral communities is anticipated for the proposed mining and construction activities.

Erosion Gully Habitat

Approximately 3 ha of the Erosion Gulley Habitat (of intermediate floral sensitivity) will be directly impacted by the proposed mining and construction activities through vegetation clearance. Although this habitat has been impacted by anthropogenic influences (thus resulting in an increase in the scale thereof than what would be anticipated under natural circumstances), it still provides unique habitat for a variety of specialised species and SCC. Impacts are anticipated to be higher in the absence of mitigation measures. This habitat is particularly prone to erosion and as such, mitigation measures (throughout all phases) should consider appropriate stormwater management. Despite this, impacts to this habitat are anticipated to be more localised in nature, provided that strict mitigation measures are implemented (i.e., stormwater management). Impacts are considered to be localised within this habitat as the extent of the habitat to be impacted is small and the habitat is well represented within the surrounding landscape.

Rocky Habitat

Approximately 5 ha of the Rocky Habitat (of moderately high floral sensitivity) will be directly impacted by the proposed mining and construction activities through vegetation clearance. Activities resulting in the loss of Rocky Habitat include mining activities (specifically the development of a North WRD). Although the extent of the habitat anticipated to be impacted is small, such activities would result in the loss of specialised habitat. Similar koppies throughout the surrounding area have and/or are currently being lost because of mining associated activities.

Transformed Habitat

Approximately 3524 ha of the proposed activities will be in the Transformed Habitat (of low floral ecological sensitivity and significance).

Floral Ecology within the study area

Negative impacts likely to be associated with the floral ecology within the study area includes, but are not limited to, the following:

- Development footprint creep and placement of infrastructure within natural habitat outside of the authorised footprint;
- Destruction of floral habitat during construction activities;
- AIP proliferation, bush encroachment, and erosion in disturbed areas; and
- Increased human movement, leading to greater pressure on natural floral habitat and increasing the potential for harvesting of protected and medicinal floral species.

Impacts of Floral SCC

Placement of the development infrastructure is likely to have an unfavourable impact on protected floral species (including threatened species as well as nationally protected species (e.g., National Forest Act, 1998 (Act No. 84 of 1998) (NFA)-protected species) and provincially protected species (e.g., as listed under Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA))

Placement of the development infrastructure is likely to have an unfavourable impact on protected floral species (including threatened species as well as nationally protected species (e.g., NFA-protected species) and provincially protected species (e.g., as listed under LEMA).

In particular, the Mixed Bushveld habitat was associated with a moderate abundance of SCC; species confirmed within this habitat included *Huernia* spp*.,* (LEMA-protected), *Scadoxus puniceus* (LC; LEMA-protected), *Boscia albitruca* (LC; NFA-protected), and *Sclerocarya birrea* subsp. *caffra* (LC; NFA-protected).

The Degraded Bushveld was associated with a moderately low diversity and abundance of SCC; species confirmed within this habitat included *Stapelia* spp., (LEMA-protected), and *Sclerocarya birrea* subsp. *caffra* (LC; NFA-protected).

The Secondary Bushveld was associated with a low diversity and abundance of SCC; species confirmed within this habitat included *Sclerocarya birrea* subsp. *caffra* (LC; NFA-protected).

The different constituents of the Freshwater Habitat supported a varying diversity and abundance of SCC. The Seep Wetlands were associated with a low diversity and abundance of SCC – no SCC were recorded within this habitat. Although the Ephemeral Drainage Line habitat provides habitat for several SCC (e.g., LEMA- and NFA-protected species), no SCC were recorded within this habitat. However, SCC were recorded within the Riparian Habitat, namely the threatened *Elaeodendron transvaalense* (NT).

The Erosion Gulley habitat was associated with a moderately low diversity and abundance of SCC; species confirmed within this habitat included *Huernia* spp., (LEMA-protected), and *Boscia albitruca* (LC; NFA-protected).

The Transformed Habitat was associated with a low diversity and abundance of SCC – no SCC were recorded within this habitat.

Only one threatened species (*Elaeodendron transvaalense* (NT)) was recorded within the study area during the field assessment.

Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The proposed mining and construction activities will impact on CBAs and ESAs. Specifically, approx. 688 ha of CBA 1 habitat will be impacted by the proposed activities. CBA1 habitat was confirmed within the Mixed Bushveld Habitat, the Freshwater Habitat (Riparian Habitat), and the Erosion Gulley Habitat.

Approximately 632 ha of ESA 2 habitat will be impacted by the proposed construction and mining activities. ESA 2 habitat was confirmed within the Mixed Bushveld Habitat and the Freshwater Habitat (Ephemeral Drainage Lines and Seep Wetlands).

Cumulative Impacts

Currently, the current greatest threat to the floral ecology and associated landscape features (e.g., CBA and ESA habitat) that are likely to contribute to cumulative impacts on the floral communities within the surrounding areas is the continued expansion of mining activities (including expansion of the Mogalakwena Mine itself among other nearby mines, and resultant expansion of nearby communities), the proliferation of AIP species, and continued bush encroachment resulting in the overall loss of native floral communities and increased fragmentation in habitat (including CBA and ESA habitat) within the local area. Such impacts may result in the cumulative loss of floral habitat and diversity within the surrounding areas.

Table 9-5 provides the impact rating for floral habitat.

9.3.3.2 Fauna

Impact on Faunal Habitat and Diversity

The proposed development activities will result in the fragmentation of habitats and the clearance of vegetation, which will lead to a loss of faunal habitat, diversity and abundance within the study area, displacing species within the direct footprint into surrounding areas.

The landscape in and around the focus area has been severely impacted through anthropogenic activities, previous mining developments and community land uses, limiting and pushing faunal species into the reduced open habitats which is left in the region. Before mitigation measures are implemented the proposed mining development will have **high** to **medium high** impacts on the Freshwater and Rocky Habitats. These habitats are important from a faunal perspective as they provide important niche habitat and have the potential to support several SCC within the focus area. The Freshwater Habitat provides an important drinking resource for fauna as well as habitat for water dependent faunal species like amphibians, aquatic invertebrates, avifauna and some smaller mammal species. The Rocky Habitat in the north-eastern side of the focus area had an increase in faunal diversity and abundance especially favouring reptiles, avifauna and some medium sized mammals. After mitigation measures are implemented these impact scores can be reduced, ranging from **medium high** to **medium.**

The Mixed Bushveld Habitat consisted of areas comprising a higher diversity of floral species, particularly broad-leaf woody species providing, shelter, food resources and habitat for various faunal species within the focus area. This habitat has however been subject to overgrazing in some areas and has a limited grassy layer for the most part limiting food resources for grazers. Impacts to this habitat unit will range from medium high to medium for most activities before mitigation measures are implemented and can be reduced to medium and low levels thereafter.

The Degraded Bushveld, Erosion Gulley and Transformed Habitat units all had pre-mitigation impact scores ranging from medium to low which can be reduced for the most part to low after mitigation measures are implemented. These habitats consist of little to no floral diversity and have been subject to historic and current disturbances which reduce their ability to sustain a diversity of fauna species.

Impacts on Faunal SCC

Placement of the proposed development infrastructure may have an unfavourable impact on potential faunal SCC as a result of habitat loss, loss of movement corridors and loss of foraging grounds. The extent of these impacts on SCC however can be limited, provided impacts are managed and do not extend beyond that of the proposed footprint areas.

A single mammal SCC has previously been confirmed within the focus area, namely *Parahyaena brunnea* (Brown Hyaena, NT). This species may move through the focus area foraging for food but is unlikely to den within the focus area due to the increased anthropogenic activities in and around the focus area. There are five more mammal SCC which have increased POC within the focus area which may be impacted upon through the proposed development.

A *Ciconia nigra* (Black Stork, VU) was observed within the Freshwater Habitat (Seep Wetland) to the north of the focus area. This species will lose foraging habitat through the proposed WRD footprint increase and will be forced out into adjacent areas. There is potential for six more avifaunal SCC to utilise the focus area as they are known to occur in or move through the region. Although avifauna have the ability to escape construction and development activities through flight, foraging and breeding habitat will still be lost.

Although no herpetofaunal SCC were observed there is medium probability for five herpetofaunal SCC to occur within the focus area. The Rocky Habitat provides ideal habitat for reptiles with suitbale shelter and basking opportunities being present. The shallow pools and flowing water in the Groot Sandsloot River provide breeding habitat for various amphibian species and other water dependant species. No invertebrate SCC were observed or are expected to occur within the focus area.

Without mitigation measures implemented the impacts on faunal SCC will be high in the Freshwater and Rocky Habitats, medium high in the Mixed Bushveld Habitat and low in the Secondary Bushveld, Erosion Gulley and Transformed Habitat. If mitigation measures are implemented these scores can be reduced.

Cumulative Impacts

The local area has already been subjected to impacts as a result of historic agriculture, housing, severe bush encroachment, and the existing mining activities, with most of the proposed activities occurring close to existing mining infrastructure. The proposed mining expansion and developments will result in the further loss of habitat within and already ecologically strained environment and locality. This will lead to direct faunal species mortailities or species being displaced from the footprint sites into the remaining adjacent habitats, which are limited. This may lead to increased competition for the remaining space and food resources, which may lead to increased mortality losses and potentially the total displacement of some species from these areas. Edge effects and AIP proliferation are more concerning over the long-term. AIP proliferation will ultimately lead to loss of viable habitat in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost. **Table 9-6** provides the impact rating faunal species.

Table 9-5: Floral Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Construction Phase																					
Terrestrial Biodiversity (Flora) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
• Loss of intact bushveld habitat (including specialised EGH and associated freshwater features) and sensitive RH habitat and FWH; • Loss of functioning CBA 1 habitat (MBH, FWH & EGH) and ESA 2 habitat (MBH, FWH), thus resulting in the loss of ecological processes and function within the landscape, especially habitats of higher sensitivity (e.g., RH and FWH); • Decline in species diversity across the habitat units; • Increased risk of erosion within habitats, especially EGH (erosion-prone), and FWH; • Increased habitat fragmentation (especially within the Bushveld Habitat units); • Increased impact from poorly managed stormwater management and potential downstream impacts on connected freshwater systems (that are protected under the NWA and NEMA); • Contamination of soils because of leaking infrastructure • Potential proliferation of AIP species,	Construction and development of the Mining Activities and associated Infrastructure.	MBH	8	4	2	3	3	5	100		High	Negative	• Develop and implement a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Before any construction activities can occur, a detailed walkdown of the footprint areas must take place, during which all SCC (including LEMA-protected, NFA-protected, TOPS species and/or RDL species) should be marked for possible relocation to suitable habitat outside of the proposed footprint areas. The necessary permits will need to be applied for to remove / cut / destroy these species. ○ Permits from the relevant authorities, i.e., LEDET and DFFE should be obtained before removal, cutting or destruction of SCC before any proposed construction and/or mining related activities may take place. ○ Where feasible, impacts to SCC should be avoided (i.e., through adequate planning and/or rerouting/redesigning layouts (where possible)). This is particularly applicable to OHPL layouts, which should be designed to avoid SCC where possible, i.e., pylons should be placed outside of habitat where SCC are located. ○ If SCC, which are not RDL species, are encountered and will be affected by the construction activities, these species must, as far as is possible, be relocated to suitable habitat surrounding the disturbance footprint – this must follow approval by SANBI and the DFFE of a suitable species plan. If RDL species are encountered, avoidance is the best mitigation. ○ Minimise loss of indigenous vegetation where possible through adequate planning and, where necessary, by incorporating the sensitivity of the biodiversity report as well as other specialist studies (e.g., Freshwater Ecological Assessment (SAS 22-1168, 2023)). ○ Habitat connectivity should be considered during layout development. Connectivity of unique habitat within the landscape will contribute to the functioning of CBA and ESA habitat. ○ Care should be taken during the construction of the proposed development to limit edge effects to surrounding natural habitat. At minimum, this can be achieved by: (i) Demarcating all footprint areas during construction activities, (ii) No construction rubble or cleared AIPs are to be disposed of outside of demarcated areas, and should be taken to a registered waste disposal facility or garden refuse site, (iii) All soils compacted because of construction activities should be ripped and profiled and reseeded, and (iv) manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Any areas that have been left bare because of the construction activities should be rehabilitated using indigenous species. Ensure AIP vegetation cuttings/propagules are disposed of adequately, i.e., it must be ensured that the spread of these species is prevented. Designated spots for cuttings are highly recommended, or potentially make use of registered waste sites. ○ Biweekly (recommended) to monthly (minimum requirement) monitoring and recording of the footprint areas must be undertaken by the Environmental Control Officer and photographic records kept – special attention should also be paid to potential increase and spread of alien vegetation, potential bush encroachment, and habitat loss due to increased erosion. • Develop a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ Design of infrastructure should be environmentally sound, and all possible precautions taken to prevent potential spills and /or leaks. All spills and /or leaks from equipment must be immediately remedied and cleaned up to ensure that these chemicals do not enter the soils. ○ Ensure environmentally sound designs are used for proposed ventilation shafts. Appropriate designs of such features can improve carbon and water resource efficiencies, thus lowering the carbon footprint. ○ If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of	6	4	1	2	2	5	75	
		SBH	4	4	2	2	2	5	70		High	Negative		4	4	1	1	1	5	55	
		DBH	6	4	2	2	2	5	80		High	Negative		4	4	1	1	1	5	55	
		FWH	8	4	3	3	4	5	110		High	Negative		6	4	2	2	3	5	85	
		RH	8	5	2	3	4	5	110		High	Negative		8	5	1	2	3	5	95	
		TH	0	2	2	1	1	5	30		Medium	Negative		0	2	1	1	1	5	25	
	Construction and development of Roads	MBH	4	4	2	2	3	5	75		Medium	Negative		2	4	1	1	2	5	50	
		SBH	2	4	2	2	2	5	60		Medium	Negative		2	4	1	1	1	5	45	
		FWH	8	4	2	3	4	5	105		Medium	Negative		4	3	2	2	3	5	70	
		EGH	6	4	2	2	4	5	90		Medium	Negative		4	4	1	1	4	5	70	
		TH	2	4	2	1	1	5	50		Medium	Negative		0	4	1	1	1	5	35	
	Construction and development associated with the Supporting Infrastructure	MBH	6	4	2	2	3	5	85		Medium	Negative		4	4	1	1	2	5	60	
		SBH	2	4	2	2	2	5	60		Medium	Negative		2	4	1	1	1	5	45	
		DBH	4	4	2	2	2	5	70		Medium	Negative		2	4	1	1	1	5	45	
		FWH	8	4	3	3	4	5	110		Medium	Negative		6	4	2	2	3	5	85	
		EGH	8	4	3	3	4	5	110		Medium	Negative		6	4	2	2	3	5	85	
		TH	0	4	2	1	1	5	40		Medium	Negative		0	4	1	1	1	5	35	
	Construction and development associated with the Mobile Refuelling Stations	SBH	0	4	2	2	2	0	0		Medium	Negative		0	4	1	1	1	0	0	
		DBH	0	4	2	2	2	0	0		Medium	Negative		0	4	1	1	1	0	0	
		FWH	0	4	3	3	4	0	0		Medium	Negative		0	4	2	2	3	0	0	
		TH	0	4	1	1	1	5	35		Medium	Negative		0	4	1	1	1	5	35	
	Construction and development associated with the Stormwater Control Dam	SBH	2	4	2	2	2	5	60		Medium	Negative		2	4	1	1	1	5	45	
		DBH	4	4	2	2	2	5	70		Medium	Negative		2	4	1	1	1	5	45	
		FWH	8	4	3	3	4	5	110		Medium	Negative		6	4	2	2	3	5	85	
		TH	0	4	1	2	2	5	45		Medium	Negative		0	4	1	1	1	5	35	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
	Construction and development associated with the Ventilation Shafts	MBH	4	4	1	1	2	5	60		Medium	Negative	spillage should be practised, preventing the ingress of hydrocarbons into the topsoil. • Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Prior to the commencement of construction activities, the entire construction servitude, including lay down areas, should be fenced off and clearly demarcated. ○ Planned footprint areas must be optimised, ensuring that the layout is as small as possible and does not encroach upon any sensitive habitat areas (where possible, e.g., RH and FWH). ○ The construction footprint must be kept as small as possible to minimise the impact on the surrounding environment (edge effect management). Removal of vegetation must be restricted to what is necessary and should remain within the approved development footprint. ○ Access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat. ○ Clearing of vegetation should take place in a phased manner as to keep bare soil areas as small as possible to limit the erosion potential. Additionally, construction personnel and construction vehicles should be kept to the bare minimal per site to reduce the construction footprint and potential of soil compaction. ○ Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal. ○ No indiscriminate movement of construction vehicles or personnel is allowed in the FWH particularly during intense rainfall events as water may flow within these areas. • Develop and implement a Topsoil Utilisation Management Plan that includes but is not limited to the following: ○ Prior to the commencement of construction activities on site, areas envisioned (and approved) for mining activities should have appropriate plans in place to collect and store the topsoil in stockpiles. ○ Stockpiles should be placed in areas where they will be safeguarded from theft and/or use by external parties (i.e., surrounding community areas). Topsoil stockpiles will aid in rehabilitation activities following construction activities and/or mine closure. Topsoil to be stockpiled in such a way as to limit soil compaction and erosion. ○ Where topsoil stockpiling is envisioned, it should be ensured that stockpiled topsoil is not contaminated by AIP material (especially from cleared vegetation material). Handling of topsoil should follow best-practice standards and must preferably only be done twice, i.e., once to strip and stockpile, and once to replace and level. Topsoil to be stockpiled in such a way as to limit soil compaction and erosion. No personnel and heavy vehicles to move over topsoil stockpiles. The topsoil stockpile should be vegetated with a mix of indigenous grass seeds and while vegetating, measures will be needed to contain erosion of the stockpile during rain events. ○ All exposed soil, including stockpiles, must be protected for the duration of the construction phase (where possible), in order to prevent excessive dust generation, erosion and sedimentation. For topsoil stockpiles, it is recommended that these areas be revegetated with a mix of indigenous grass species such as Mayford Biomosome bushveld reclamation mix. • Develop and implement or upgrade the Alien Invasive Plant (AIP) Species Management Plan, inclusive but not limited to the following: ○ Prior to the commencement of construction activities on site, the existing AIP control plan for the mine should be updated and implemented throughout all phases of the proposed project. The existing AIP control and management plan should be regularly updated by a suitably trained specialist. Implementation of the AIP control and management plan should occur on a regular basis. The following should be components of the AIP plan: (i) Cleared vegetation and removed soil that will not be used again (e.g., in rehabilitation) should be disposed of at a registered waste facility where alien propagules will not spread further into natural habitat, (ii) It is highly recommended that the AIP Management/ Control Plan should be implemented by an experienced professional, and (iii) No chemical control of AIPs to take place within the FWH, and only registered chemicals may be used.	2	4	1	1	1	5	45	
		SBH	2	4	1	1	2	5	50		Medium	Negative		2	4	1	1	1	5	45	
		DBH	2	4	1	1	2	5	50		Medium	Negative		2	4	1	1	1	5	45	
		FWH	6	4	2	3	3	5	90		Medium	Negative		4	4	2	2	2	5	70	
		TH	0	4	1	1	1	5	35		Medium	Negative		0	4	1	1	1	5	35	
	Construction and development associated with the Pipelines and associated Infrastructure	MBH	4	4	1	1	2	5	60		Medium	Negative		2	4	1	1	1	5	45	
		SBH	2	4	1	1	2	5	50		Medium	Negative		2	4	1	1	1	5	45	
		DBH	2	4	1	1	2	5	50		Medium	Negative		2	4	1	1	1	5	45	
		FWH	6	4	2	3	3	5	90		Medium	Negative		4	4	2	2	2	5	70	
		TH	0	4	1	1	1	5	35		Medium	Negative		0	4	1	1	1	5	35	
	Construction and development associated with the Electricity Infrastructure	MBH	4	4	1	1	2	5	60		Medium	Negative		1	4	1	1	1	5	40	
		SMB	2	4	1	1	2	5	50		Medium	Negative		1	4	1	1	1	5	40	
		DBH	2	4	1	1	2	5	50		Medium	Negative		1	4	1	1	1	5	40	
		FWH	6	4	2	3	3	5	90		Medium	Negative		4	4	2	2	2	2	28	
		EGH	4	4	1	2	3	5	70		Medium	Negative		2	4	1	1	2	5	50	
		TH	0	4	1	1	1	5	35		Medium	Negative		0	4	1	1	1	5	35	
• Loss of floral SCC due to poorly managed relocation activities, or additional harvesting pressures due to increased anthropogenic presence in the area.	SCC monitoring and construction-phase activities associated all proposed activities	MBH	6	2	2	3	2	5	75		Medium	Negative		4	2	1	2	1	4	40	
		SBH	2	2	2	2	2	5	50		Medium	Negative		2	2	1	1	1	4	28	
		DBH	4	2	2	2	2	5	60		Medium	Negative		2	2	1	1	1	4	28	
		FWH	8	2	3	3	3	5	95		Medium	Negative		6	2	2	2	2	4	56	
		EGH	8	2	3	3	3	5	95		Medium	Negative		6	2	2	2	2	4	56	
		RH	8	2	3	3	3	5	95		Medium	Negative		6	2	2	2	2	4	56	
		TH	2	2	2	1	1	5	40		Medium	Negative		0	2	1	1	1	0	0	
• Loss of floral diversity and habitat due to construction activities: • Destruction of vegetation due to unplanned fires; and • Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions.	General construction-phase activities associated with all proposed activities	MBH, SBH, DBH, FWH, EGH, RH & T	6	4	2	3	3	4	72		Medium	Negative		4	4	1	2	2	3	39	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
													○ Implement a bush encroachment control plan within impacted habitats to reduce encroachment to surrounding habitats. ○ An AIP control plan and a bush encroachment control plan must be implemented for areas cleared outside of the authorised footprint areas. Roadsides and linear developments serve as common corridors along which alien and invasive floral species are introduced and dispersed. Therefore, an AIP control plan should be implemented along all linear disturbances. • Develop and implement a Concurrent Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Prior to the commencement of construction activities on site, a rehabilitation plan should be developed for implementation throughout the project phases (accommodating concurrent rehabilitation). • Develop and implement a site-specific Waste (general and hazardous) Management Plan, inclusive but not limited to the following: ○ All construction related waste and material is to be disposed of at a registered waste facility and no waste of construction rubble is to be dumped in the surrounding natural habitats. ○ Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area. • Develop and implement a site-specific Stormwater Management Plan, inclusive but not limited to the following: ○ Construction of the storm water control dam must be in line with the requirements and regulations as stipulated in GN 704 of the NWA. Ensure strict implementation of mitigation measures as stipulated in the Freshwater Ecological Assessment (SAS 22-1168, 2023). ○ Ensure that hydrological connectivity within Freshwater features is maintained by using suitably sized culverts and ensuring construction work is conducted during periods of absence and/or lowered flows (winter season).								
Operational Phase																					
• Loss of floral habitat beyond the project footprint due to on-going disturbance of soils from to operational activities and edge effects associated with mining activities (the proliferation of AIPs); • Loss of floral habitat and diversity due to increased erosion because of poorly managed stormwater management systems (especially along mountain slopes); • Failure to concurrently rehabilitate bare areas or disturbed sites as soon as they become available, potentially resulting in loss of viable soils, increasing erosion risk and/or further permitting the proliferation of AIPs; • Dust generated during construction and operational activities accumulating on the surrounding floral individuals, altering the photosynthetic ability of plants, and potentially further decreasing optimal growing/re-establishing conditions.	All proposed activities associated with the proposed Project.	MBH	6	4	2	2	2	4	64		Medium	Negative	• Maintain a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ It must be ensured that no additional natural areas are further impacted or cleared during the operational phase. Ongoing monitoring of footprint areas is essential. No additional habitat may be disturbed beyond the planned footprints. ○ No illicit fires must be allowed during the operational phase of the proposed development. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Adequate stormwater management must be implemented. In this regard, special mention is made of (i) sheet runoff from cleared areas, paved surfaces and access roads must be curtailed, (ii) runoff from paved or compacted surfaces should be slowed down by the strategic placement of berms. • Maintain an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: ○ Manage the spread of AIP species which may affect remaining natural habitat within surrounding areas. ○ Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas. ○ Ongoing bush encroachment control should continue to ensure surrounding habitats do not subsequently become encroached. • Maintain a Concurrent Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Any natural areas beyond the direct footprint, which have been affected by operational activities must be rehabilitated using indigenous species. Floral monitoring should be undertaken annually during operational activities. ○ Manage soil stockpile and analyse quality of soils. • Maintain a site specific Waste (general and hazardous) Management Plan, inclusive but not limited to the following: ○ No dumping of litter or refuse must be allowed on-site. • Maintain a Topsoil Utilisation Management Plan that includes but are not limited to the following:	4	4	2	1	1	3	36	
		SMB	2	4	2	2	2	4	48		Medium	Negative		2	4	2	1	1	3	30	
		DBH	4	4	2	2	2	4	56		Medium	Negative		2	4	2	1	2	3	33	
		FWH	8	4	3	3	3	4	84		Medium	Negative		6	4	2	2	2	3	48	
		EGH	6	4	2	3	3	4	72		Medium	Negative		4	4	3	2	2	3	45	
		RH	8	4	2	3	3	4	80		Medium	Negative		6	4	2	2	2	3	48	
		TH	2	4	2	1	1	4	40		Medium	Negative		0	4	2	1	1	3	24	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
													○ Minimise the risk of erosion by limiting the extent of disturbed vegetation and exposed soil (where possible). This is particularly important within the FWH and EGH. • Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Where possible suppress dust to mitigate the impact of dust on flora within a close proximity of operational mining activities.								
• Loss of floral SCC due to poorly managed and monitored relocation activities, or additional harvesting pressures due to increased anthropogenic presence in the area; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	All proposed activities associated with proposed activities within the focus area.	All habitats	6	4	2	2	2	4	64		Medium	Negative	• Maintain a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Edge effect control needs to be implemented by fencing off or demarcating no-go areas to prevent further degradation and potential loss of floral SCC and their habitat outside of the proposed development footprint area. Also, mining personal should be educated about harvesting impacts. ○ Where applicable, the relocation success of floral SCC should be monitored during the operational phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful. No collection of floral SCC or indigenous vegetation must be allowed by operational personnel. • Implement the Site Induced Migration Plan ○ Discourage influx by maximising local employment and procurement. ○ Identify and implement measures to prevent encroachment into the mine lease area. ○ Undertake proactive engagement with community leaders to discuss impacts of unplanned settlement expansion and strive to agree on approaches to address the impacts	4	4	1	1	1	3	33	
Closure Phase																					
• Loss of floral SCC due to poorly managed and monitored relocation activities, or additional harvesting pressures due to increased anthropogenic presence in the area; and • Additional pressure on floral habitat by increased human populations associated with the proposed mining activities, contributing to increases in the collection of plant material for medicinal purposes and promoting the introduction and spread of AIPs that may displace habitat for SCCs.	All proposed activities associated with proposed activities within the focus area.		6	4	2	2	2	4	64		Medium	Negative	• Maintain a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Monitoring of rescued and relocated floral SCC should continue during the closure and rehabilitation phase until it is evident that the species have successfully relocated. ○ Relocate or plant new SCC into rehabilitated sites where possible. ○ As far as possible, no collection of floral SCC or medicinal floral species within the focus area or adjacent natural habitat must be allowed during the closure and rehabilitation phase.	4	2	1	2	4	2	26	
• Potential poor monitoring of relocated SCC and nursery specimens (where applicable) resulting in the loss of SCC from the focus area and poorly reinstated and represented floral SCC within rehabilitated areas.	All activities associated with closure and rehabilitation within the focus area		6	2	2	2	2	3	42		Medium	Negative	• Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Regular dust suppression must be undertaken on bare soils during the closure and decommissioning phase. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Storm water management measures should be maintained until rehabilitation is complete. • Maintain a Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ All disturbed areas should be ripped to alleviate compaction. ○ Understand soil quality for use • Maintain a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Contractors will not be allowed to harvest any natural resources.	4	3	1	2	2	2	24	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
• Loss of favourable growing conditions for floral communities due to disturbance of soils as part of demolition activities (including further introductions and spread of AIPs); • Insufficient aftercare and maintenance may lead to erosion and sedimentation which, in turn, results in loss of floral habitat and overall species diversity within the area; and • On-going risk of contamination from mining facilities beyond closure. On-going seepage and runoff may affect the groundwater regime beyond closure.	General activities associated with closure and rehabilitation within the focus area		6	2	2	2	2	4	56		Medium	Negative	• Maintain a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC or suitable habitat for such species outside of the proposed development footprint. ○ AIP control plans and bush encroachment control plans should be implemented to ensure continued control of AIP species within the focus area and surrounding areas. • Maintain an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: ○ Follow up with AIP control measures for a period of five (5) years post-closure. • Maintain a site specific Waste (general and hazardous) Management Plan, inclusive but not limited to the following: ○ No dumping of litter must be allowed on-site. As such it is advised that vegetation cuttings of alien invasive species be carefully collected and disposed of at a separate waste facility. • Maintain the Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ Erosion control measures are to be implemented to mitigate downslope sedimentation and the hindrance of revegetation/ rehabilitation activities.	4	3	1	2	3	3	39	

Table 9-6: Faunal Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Terrestrial Biodiversity (Fauna) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
Construction Phase																					
• Vegetation clearance leading to a loss of faunal species diversity and habitat availability within the footprint areas. • Potential faunal collision with vehicles/heavy machinery. • Increased risk of uncontrolled fires (Mixed Bushveld and Degraded Bushveld Habitat Unit). • Hunting and trapping of faunal species. • Human - wildlife conflict. • Loss of sensitive niche faunal habitat through impacting on Freshwater and Rocky Habitats. • Loss of faunal connectivity within the landscape. • Establishment and spread of AIP species. • Dust generated during construction and operational activities accumulating on the surrounding plants making plant material	Mining activities	FWH	8	4	2	4	4	5	110		High	Negative	• Develop and implement a site-specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ Prior to the commencement of mining activities the Biodiversity Action Plan, including the rehabilitation plan should be updated for implementation throughout all the project phases. This plan must investigate feasibly migratory corridors for faunal species movement between the sensitive areas. ○ Vegetation outside of the footprints is not to be cleared. ○ The footprint and daily operation of all mining surface infrastructure areas must be strictly monitored to ensure that edge effects from the operational facilities do not affect the surrounding faunal habitat beyond the approved footprint. ○ The footprint areas of all surface infrastructure must be minimised to what is absolutely essential and within the designated and approved boundary. ○ No hunting/trapping or collecting of faunal species is allowed. ○ No informal fires by construction personnel are allowed. ○ Edge effects of all operational activities, such as erosion and alien plant species proliferation, which may affect adjacent natural vegetation, need to be strictly managed adjacent to the project footprint areas. ○ No collection of faunal SCCs may be allowed by construction personnel. ○ Avoidance should be undertaken first and foremost to avoid high impacts. Following this, and if not completely possible (based on location of the mined resources) a search and rescue should be undertaken just prior to the vegetation clearing activities. This search and rescue should be focused on smaller, less mobile SCC that will not be able to move away from the disturbances. This should be overseen by a suitably qualified specialist or nominated mine personnel in order to ensure that species loss during construction activities is kept to a minimum. ○ All faunal species rescued must be relocated to a suitable area, with similar habitat conditions. The relevant permits must be applied for from the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) prior to the commencement of the construction phase. ○ Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area. An on-site ECO should monitor and mitigate any edge effects throughout the life of the mine.	6	3	2	3	4	4	72	
		RH	8	4	1	5	5	5	115		Medium	Negative		6	3	1	4	5	4	76	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		0	3	1	1	1	4	24	
	Road development	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Supporting infrastructure	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Mobile refuelling points	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Stormwater control dam	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	2	4	36	
	Ventilation shafts	FWH	6	4	2	3	4	4	76		High	Negative		4	3	2	2	4	3	45	
		MBH	4	4	1	3	3	4	60		High	Negative		2	3	1	2	3	3	33	
		DBH	4	4	1	2	2	4	52		High	Negative		2	3	1	1	2	3	27	
		TH	2	4	1	1	1	4	36		High	Negative		2	3	1	1	1	3	24	
	Pipelines	FWH	4	4	2	3	4	5	85		High	Negative		4	3	2	2	4	4	60	
		MBH	2	4	1	3	3	4	52		High	Negative		2	3	1	2	3	3	33	
		DBH	2	4	1	2	2	5	55		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Terrestrial Biodiversity (Fauna) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
less palatable for herbivores. • Potentially poorly managed edge effects can lead to further habitat loss outside of the proposed footprint areas. • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as possible, potentially resulting in loss of viable soils, increased erosion risks and/or the proliferation of AIPs. • Loss of SCC habitat. • Decline of local SCC populations. • Potential persecution of faunal SCC by personnel.	Electricity Infrastructure	FWH	2	4	2	3	2	3	39		High	Negative	○ Smaller species of invertebrates and reptiles are likely to be less mobile during the colder period, as such should any be observed in the study site during clearing and operational activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Operational personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own. • Develop and implement an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: ○ A walkdown of areas of increased sensitivity (Freshwater and Rocky Habitats) should be undertaken to search for potential SCC. Should any protected faunal species be noted within the development footprint a permit will have to be obtained from the relevant provincial or national authority for their translocation if deemed necessary by a suitably qualified specialist. ○ Prior to the commencement of proposed activities the alien vegetation management plan should be updated. ○ An Alien and Invasive Plant Management and Control Plan must be updated and implemented for the new activities in order to monitor and control alien faunal recruitment. Specific mention in this regard is made to Category 1b species identified within the Floral report. ○ Where areas are disturbed during operational activities, spread of alien invasive species within these areas should be continually monitored and controlled throughout the life of the mine as well as during the decommissioning and rehabilitation phases. • Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Where possible, and feasible, access roads should be kept to existing roads so to reduce further fragmentation of existing natural habitat. ○ Fencing should not be erected before the vegetation has been cleared so as to give faunal species a chance to escape into the surrounding areas, away from the disturbance. • Develop and maintain a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ A stormwater management plan should be updated and implemented for all phases of the development, this in order to minimise potential erosion of downslope habitat and sedimentation of watercourses. ○ Stormwater runoff must be managed to recreate natural processes to ensure continued habitat for water dependant species like potential *Pyxicephalus adspersus* (Giant African Bullfrog). • Develop and implement a specific Vehicle and Machinery Maintenance and Management Plan, inclusive but not limited to the following: ○ Design of infrastructure should be environmentally sound and all vehicles in a good working condition, and all possible precautions taken to prevent potential spills and /or leaks. • Maintain the Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ Excavated topsoil must be stored with associated native vegetation debris for subsequent use in rehabilitation. ○ Any stockpiles should be placed within transformed areas or where possible, existing infrastructure should be used. No additional natural areas outside of those which have been planned for should be impacted for stockpiling. ○ All soils compacted as a result of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. • Maintain a site specific Waste (general and hazardous) Management Plan, inclusive but not limited to the following: ○ No dumping of waste on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all dilapidates, rubble and general waste. • Develop a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following:	2	3	2	2	2	2	22	
		MBH	2	4	1	3	2	3	36		High	Negative		2	3	1	2	2	2	20	
		DBH	2	4	1	2	2	3	33		High	Negative		2	3	1	1	2	2	18	
		EGH	2	4	1	2	2	3	33		High	Negative		2	3	1	1	2	2	18	
		TH	2	4	1	1	1	3	27		High	Negative		2	3	1	1	1	2	16	
	SCC	FWH	8	4	2	4	4	5	110		High	Negative		6	3	2	3	4	4	72	
		RH	8	4	2	4	5	5	115		High	Negative		6	3	2	3	5	4	76	
		MBH	4	4	2	3	3	5	80		High	Negative		4	3	2	2	3	4	56	
		DBH	2	4	2	2	2	3	36		High	Negative		2	3	2	1	2	3	30	
		EGH	2	4	2	2	2	3	36		High	Negative		2	3	2	1	2	3	30	
		TH	0	4	2	1	1	2	16		High	Negative		0	3	2	1	1	2	14	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Terrestrial Biodiversity (Fauna) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
													◦ If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder faunal rehabilitation later down the line. Spill kits should be kept on site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised preventing the ingress of hydrocarbons into the topsoil. • Develop and implement an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ◦ The dust management plan must be updated in order to mitigate the impact of dust throughout the construction and operational phases. • Develop and implement a Concurrent Rehabilitation and Closure Plan inclusive but not limited to the following activities: ◦ Any natural areas that have been affected by the construction activities that are no longer in use, must be rehabilitated. It is imperative that the site specific, post closure rehabilitation plan is suitably updated and consideration for faunal assemblages is given within this plan. ◦ Revegetation of disturbed areas should be carried out in order to restore habitat availability and minimise soil erosion and surface water runoff. ◦ When rehabilitating a footprint site, it is imperative that as far as possible the habitat that was present prior to disturbances is recreated, so that faunal species that were displaced by vegetation clearing activities are able to recolonize the rehabilitated area.								
Operational Phase																					
• Vegetation clearance leading to a loss of faunal species diversity and habitat availability within the footprint areas. • Potential faunal collision with vehicles/heavy machinery. • Increased risk of uncontrolled fires (Mixed Bushveld and Degraded Bushveld Habitat Unit). • Hunting and trapping of faunal species. • Human - wildlife conflict. • Erosion activities and stormwater runoff impacting adjacent areas leading to habitat alteration and loss of faunal species diversity and abundance. • Loss of sensitive niche faunal habitat through impacting on Freshwater and Rocky Habitats. • Loss of faunal connectivity within the landscape. • Establishment and spread of AIP species. • Dust generated during construction and operational activities accumulating on the surrounding plants	Mining activities	FWH	8	4	2	4	4	5	110		High	Negative	• Same mitigation measures as per the construction phase.	6	3	2	3	4	4	72	
		RH	8	4	1	5	5	5	115		Medium	Negative		6	3	1	4	5	4	76	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		0	3	1	1	1	4	24	
	Road development	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Supporting infrastructure	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Mobile refuelling points	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		MBH	6	4	1	3	3	5	85		High	Negative		4	3	1	2	3	4	52	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		EGH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Stormwater control dam	FWH	6	4	2	3	4	5	95		High	Negative		4	3	2	2	4	4	60	
		DBH	4	4	1	2	2	5	65		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	2	4	36	
	Ventilation shafts	FWH	6	4	2	3	4	4	76		High	Negative		4	3	2	2	4	3	45	
		MBH	4	4	1	3	3	4	60		High	Negative		2	3	1	2	3	3	33	
		DBH	4	4	1	2	2	4	52		High	Negative		2	3	1	1	2	3	27	
		TH	2	4	1	1	1	4	36		High	Negative		2	3	1	1	1	3	24	
	Pipelines	FWH	4	4	2	3	4	5	85		High	Negative		4	3	2	2	4	4	60	
		MBH	2	4	1	3	3	4	52		High	Negative		2	3	1	2	3	3	33	
		DBH	2	4	1	2	2	5	55		High	Negative		2	3	1	1	2	4	36	
		TH	2	4	1	1	1	5	45		High	Negative		2	3	1	1	1	4	32	
	Electricity Infrastructure	FWH	2	4	2	3	2	3	39		High	Negative		2	3	2	2	2	2	22	
		MBH	2	4	1	3	2	3	36		High	Negative		2	3	1	2	2	2	20	
		DBH	2	4	1	2	2	3	33		High	Negative		2	3	1	1	2	2	18	
		EGH	2	4	1	2	2	3	33		High	Negative		2	3	1	1	2	2	18	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Terrestrial Biodiversity (Fauna) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
making plant material less palatable for herbivores. • Potentially poorly managed edge effects can lead to further habitat loss outside of the proposed footprint areas. • Potential failure to concurrently rehabilitate bare areas or disturbed sites as soon as possible, potentially resulting in loss of viable soils, increased erosion risks and/or the proliferation of AIPs. • Loss of SCC habitat. • Decline of local SCC populations. • Potential persecution of faunal SCC by personnel.		TH	2	4	1	1	1	3	27		High	Negative		2	3	1	1	1	2	16	
	SCC	FWH	8	4	2	4	4	5	110		High	Negative		6	3	2	3	4	4	72	
		RH	8	4	2	4	5	5	115		High	Negative		6	3	2	3	5	4	76	
		MBH	4	4	2	3	3	5	80		High	Negative		4	3	2	2	3	4	56	
		DBH	2	4	2	2	2	3	36		High	Negative		2	3	2	1	2	3	30	
		EGH	2	4	2	2	2	3	36		High	Negative		2	3	2	1	2	3	30	
		TH	0	4	2	1	1	2	16		High	Negative		0	3	2	1	1	2	14	
Closure Phase																					
• Failure to implement and manage a suitable rehabilitation plan; • Proliferation of alien and invasive plant species leading to ongoing faunal habitat loss; • Improper revegetation of the focus area leading to permanent loss of habitat and food resources for fauna;	Mining activities	FWH, MB, TH	8	3	2	4	5	4	88		High	Negative	• Maintain the Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ Where soils have been compacted, they are to be ripped and where necessary reprofiled. • Develop and implement a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Cleared and bare areas are to be rehabilitated and revegetated using an appropriate seed mix that is in line with the current species composition of the vegetation type. ○ All infrastructure and mining footprints should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist. ○ All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective. ○ Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure. • Maintain an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: ○ Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase of the mining development, and the immediate surrounding area (30m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural area. It is important to note that AIP control should have been undertaken for the life of the mining phase so proliferation during decommissioning should be limited/ focused to areas associated with the mining development footprint only. ○ The Alien and Invasive Plant Management and Control Plan designed and implemented as part of the mining operations must include for control and eradication for a period of at least 5 years after decommissioning and closure. • Maintain a site-specific Biodiversity Management Plan, inclusive but not limited to the following activities: ○ No collection of firewood or faunal SCC is allowed by mining personnel/contractors during the decommissioning. ○ No illicit fires must be allowed during the decommissioning and closure phase of the proposed mining development. ○ Fire breaks should be maintained during the decommissioning and closure phase.	6	3	2	3	5	3	57	
	Road development	FWH, MB, TH, DB, EGH	8	3	2	3	4	4	80		High	Negative		6	2	2	2	4	3	48	
	Supporting infrastructure	FWH, MB, TH, DB, EGH	8	3	2	3	4	4	80		High	Negative		6	2	2	2	4	3	48	
	Mobile refuelling points	FWH, MB, TH, DB, EGH	8	3	2	3	4	4	80		High	Negative		6	2	2	2	4	3	48	
	Stormwater control dam	FWH, TH, DB	8	3	2	3	4	4	80		High	Negative		6	2	2	2	4	3	48	
	Ventilation shafts	FWH, MB, TH, DB	6	3	2	3	3	4	68		High	Negative		4	2	2	2	3	3	39	
	Pipelines	FWH, MB, TH, DB	6	3	2	3	3	4	68		High	Negative		4	2	2	2	3	3	39	
	Electricity infrastructure	FWH, MB, TH, DB, EGH	6	3	2	3	3	4	68		High	Negative		4	2	2	2	3	3	39	
	SCC	FWH, MB, TH, RH, DB, EGH	8	3	2	3	4	4	80		High	Negative		6	3	2	2	4	3	51	

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	HABITAT UNIT	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Terrestrial Biodiversity (Fauna) MBH = Mixed Bushveld Habitat, SBH = Secondary Bushveld habitat, DBH = Degraded Bushveld Habitat, RH = Rocky Habitat, FWH = Freshwater Habitat, EGH = Erosion Gulley Habitat, TH = Transformed Habitat																					
													• Maintain a site-specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ Following heavy rains, access roads are to be inspected for signs of erosion, which if found must be immediately rectified through appropriate erosion control measures.								

9.3.4 Freshwater and Aquatic

The impact assessment has been compiled utilizing the Freshwater and Aquatic Assessment as part of the Environmental Authorisation and Planning Process for the Proposed Expansion of the Mogalakwena Platinum Mine near Mokopane, Limpopo Province. Complied by Scientific Aquatic Services dated June 2023.

There are four key ecological impacts on freshwater ecosystems that are anticipated:

- Loss of freshwater ecosystem habitat and ecological structure;
- Changes to the sociocultural and service provision;
- Impacts on the hydrology and sediment balance of the freshwater ecosystems; and
- Impacts on water quality within the freshwater ecosystems.

Table 9-7: Summary of the Extent of Modifications to the identified freshwater ecosystems (SAS, 2023)

Extent of modification to the Mohlosane River.	Infrastructure that will potentially encroach within the Mohlosane River and impact on the system via edge effects include the N11 Access Road Corridor, Infrastructure Areas, Powerline Buffers and Point of Distribution Sub-station Alternatives. This may result in some impacts on the Mohlosane River which include: loss of vegetation, increased risk of proliferation of alien vegetation due to the disturbances, loss of biota, loss of freshwater habitat, significantly increased sedimentation of the system as a result of disturbances to the soils, altered soil profiles leading to altered hydraulic processes within the system.
Extent of modification to the Groot-Sandsloot River.	Infrastructure that will potentially encroach within the Groot-Sandsloot River and impact on the system via edge effects include the Truck Workshop Area, Changes in WRD Height, Exploration Decline, Backfill Pipeline, Zwartfontein Pushback, Vent Shaft Corridors, and the Underground Mining Area. Potential impacts on the Groot-Sandsloot River due to the development of this infrastructure include the formation of a cone of depression and reduction in flow levels, changes in the riparian structure, formation of preferential flow paths including incision of the river, contamination of the river resulting in loss of aquatic biota and increased sedimentation resulting in increased turbidity of the river.
Extent of modification anticipated to the Witrivier.	The potential impacts on the Witrivier which may result in the modification of the system include increased sediment runoff and dispersion from the WRD due to steeper slopes and material load, salinisation of the system and general salt loading which has the potential to enter the system and impact on the riverine habitat. Furthermore, this may lead to additional stress on the receiving environment and pose a toxicological risk to the aquatic ecology of the system.
Extent of modification anticipated to all seep wetlands.	The extent of modification to the seep wetlands is considered to be high given that the seep wetland will be completely covered with waste rock material. This will result in a complete loss of habitat and ecological functioning for these freshwater ecosystems, unless suitable mitigation measures such as the relocation of the WRD to avoid encroachment, and application of an appropriate butter are adhered to. However, even with application of the suitable buffer, the continued disposal of waste rock material will likely result in increased sediment runoff and dispersion as a result of steeper slopes and material load which will ultimately impact the freshwater environment. In addition, the salinisation of the freshwater habitat and general salt loading has the potential to impact on the freshwater habitat and this may in addition pose a toxicological risk to the aquatic ecology of the freshwater ecosystems.
Extent of modification to the unnamed tributary of the Witrivier and Mohlosane Rivers.	The proposed “New Stormwater Control Dam for Waste Rock Dump Run-Off Water” will encroach within the central portion of the southern unnamed tributary of the Witrivier. As such, this will result in modifications of the system as the construction may require that the affected reach of the system be diverted temporarily. The northern tributary of the Witrivier is located downgradient of the proposed waste rock dump and is considered at risk due to runoff from the waste rock facility which may result in formation of preferential flow paths and contamination of water quality due to residue from blasting material. Potential modifications to the unnamed tributary of the Mohlosane River will likely occur due to the construction of the “Access Road Corridor” along the central portion of the focus area. The construction activities associated with the infrastructure may result in increased sediment runoff and loss of hydraulic connectivity of the riverine systems.
Extent of modification to the EDLs.	The extent of modification anticipated on the EDLs is considered to be low. Potential impact on the EDLs will occur as a result of edge effects associated with the construction of stormwater channel infrastructure.

Based on the outcome of the risk assessment, most of the activities associated with the construction and operation of the proposed project, will pose a low to medium-high risk significance to the delineated freshwater ecosystems within the focus area. Activities considered to pose highest risk impacts to the freshwater ecosystems include the proposed waste rock dumps along the northern portion of the focus area. The continued disposal of waste rock material will likely result in increased sediment runoff and dispersion as a result of steeper slopes and material load. In addition, the salinisation of the freshwater habitat and general salt loading has the potential to impact on the freshwater habitat and this may in addition pose a toxicological risk to the aquatic ecology of the Witrivier and its associated unnamed tributary. These proposed activities will pose a higher risk to the seep wetlands given that the waste material will be disposed around the seep wetlands resulting in a loss of ecological functionality. The proposed "New Stormwater Control Dam for Waste Rock Dump Run-Off Water" will also pose a significant impact on the unnamed tributary of the Witrivier given that this infrastructure will traverse the tributary directly. The potential impacts associated with the freshwater resources are provided in **Table 9-8**.

Table 9-8: Freshwater Impact Assessment

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
	Construction Phase																				
Access Road development, Pipelines Infrastructure Development and Electricity Infrastructure	• Increased runoff and erosion leading to sedimentation of the of the freshwater habitat. • Smothering of freshwater biota due to increased sedimentation. • Decreased ecoservice provision.	Site clearing prior to commencement of construction activities for the proposed linear infrastructure.	6	2	2	3	1	4	56		Medium	Negative	• Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Operational and non-operational areas must be clearly demarcated prior to any site preparation activities. It must also be ensured that sediment control devices are installed prior to any activities within the site. ○ Pollution prevention through infrastructure design, in order to prevent, eliminate and/or control potential pollution of soils, groundwater and surface water should be implemented (applicable primarily to pipelines). ○ Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the delineated freshwater ecosystems and applicable setback areas. ○ The sensitive areas outside of the construction/upgrade areas in which no proposed activities/where authorisation for construction has not been granted must be clearly demarcated by an ECO and marked as a no-go area. ○ All construction phase activities must be undertaken as far as practically possible in the dry winter season when surface flow is absent or limited. This will decrease the severity of impacts expected; All development footprint areas to remain within the approved development footprint and vegetation clearing to be limited to what is essential for the proposed linear infrastructure (i.e. infrastructure footprint and essential working areas around the footprint). ○ Storage facilities and all other non-essential activities (e.g. contractor laydown area) must be located outside the freshwater systems and 32 m NEMA regulated zone to minimise surface and groundwater contamination and impacts relating to sedimentation of the freshwater ecosystems; and no indiscriminate movement of construction vehicles or personnel is allowed in the freshwater ecosystems. Careful planning of the required project footprint must be undertaken beforehand to ensure that the minimum.	4	2	2	2	1	2	22	
Access Road development, Pipelines Infrastructure Development and Electricity Infrastructure	• Disturbances to soil leading to increased alien vegetation proliferation and further bush encroachment in the vicinity of the riverine systems. • Further altered runoff patterns and alteration to flow patterns in the landscape, leading to change in potential recharge of the riverine systems. • Possible contamination of soil and surface water which is likely to eventually report to the riverine systems. • Possible incision and sedimentation of the riverine systems. Disturbances of soils leading to sedimentation and alien vegetation proliferation in the vicinity of the riverine systems. • Compaction of soil as a result of movement of construction equipment leading to formation of preferential flow paths in the landscape.	Construction activities associated with the linear infrastructure.	8	3	2	4	2	4	76		Medium	Negative	• Develop and implement a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ Silt/sediment traps are to be used during the construction phase, to limit additional sediment associated with construction activities from reaching the riverine systems. ○ For the haul road, a pioneer layer should be constructed out of a porous material or form material which is coarse enough to ensure infiltration can still take place, although timing is likely to be different from natural landscape to a degree. ○ Adequately sized culverts be used for the haul road in order to ensure that flow from the surrounding landscape is redirected to the riverine systems in a diffuse manner. The design of the culverts must also ensure that they allow for adequate space suitable for migration of faunal species. • Develop and implement a Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ All exposed soil must be protected for the duration of the construction phase (where possible) in order to prevent erosion and sedimentation of the riverine habitat which may be located in close proximity to the stockpiles. ○ During excavation activities, any topsoil as well as the vegetation (should any indigenous vegetation be present) that may need to be removed must be stockpiled outside of the delineated riverine system and associated buffer zones. ○ Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up with stockpiles. This material can later be used as backfill material. • Develop and implement a Dangerous Goods and Hazardous Substances Storage, Handling Management Plan inclusive but noy limited to: ○ Control measures specific to concrete works: ▪ Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal should minimise or eliminate discharges into the watercourses. High alkalinity associated with cement, can dramatically affect and contaminate both soil and ground water. The following measures must be adhered to:	6	2	2	3	1	3	42	

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
													• Fresh concrete and cement mortar should not be mixed near the watercourses. Mixing of cement may be done within the construction camp, however, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete. ▪ No mixed concrete shall be deposited directly onto the ground within the watercourses (outside of the designated area) or associated riparian habitat. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; A washout area should be designated outside of the watercourses, and wash water should be treated on-site or discharged to a suitable sanitation system. ▪ Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of through the hazardous substance waste stream. ▪ Spilled or excess concrete must be disposed of at a suitable landfill site. Chain of custody documentation must be provided								
Zwartfontein Haul Road	• Temporary loss of hydrological connectivity between the upstream and downstream reaches of the Mahlosane River where the proposed access road crosses. • Altered runoff patterns within the local catchment of the Mahlosane River.	Construction activities associated with the access road to the Zwartfontein Pit.	8	3	2	4	4	4	84		Medium High		• Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Construction of the access road and associated activities must take place outside of the wet season (during winter) in order to minimise the risk of significant sedimentation. As such planning must be done to ensure the relevant timeframes are adhered to. ○ All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential for the access Zwartfontein Pit Road. • Develop and implement a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ A pioneer layer should be constructed out of a porous material or form material which is coarse enough to ensure infiltration can still take place, although timing is likely to be different from natural landscape to a degree. ○ Adequately sized culverts be used for the access road in order to ensure that flow from the surrounding landscape is redirected to the riverine systems in a diffuse manner. The design of the culverts must also ensure that they allow for adequate space suitable for migration of faunal species.	6	3	2	3	3	3	51	
Development of Storm Water Control Dam for Waste Rock Dump Runoff	• Physical disturbance to aquatic biota such as macro-invertebrates and amphibious species. • Sedimentation and erosion and increased suspended solids as a result of the movement of construction vehicles and removal of sediments within the unnamed tributary. • Sedimentation and erosion and increased suspended solids as a result of the movement of construction vehicles and removal of sediments within the unnamed tributary. • Increased risk of pollution of surface water which may affect the unnamed tributary, leading to impaired water quality including an altered pH regime, salinisation of soils and increased contaminants in the unnamed tributary.	Diversion of unnamed tributary of the Witrivier to facilitate construction work. Construction activities related to construction of the North west Polllution Control Dam- Navada Dam wall utilising excavated material from the basin of the proposed dam.	8	3	2	4	2	4	76		Medium High	Negative	• Develop and implement a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ The North west Polllution Control Dam- Navada Dam construction activities must preferably be undertaken during periods when flow is absent within the unnamed tributary. ○ Embankment cutting and general footprint clearing will potentially result in bank de-stabilisation, and cause bank incision and sedimentation of the river, therefore, sediment control devices (such as silt traps) should be installed prior to diverting the flow. ○ Sandbags should be used to create a coffer dam around the construction area which can then be dewatered. Water must be diverted into the downstream reach of the river around the coffer area and allowed to always flow to the downstream reach. ○ The diversion sandbags utilised for the dewatered area/coffer dam should be filled with in situ material so as to prevent foreign materials being introduced into the unnamed tributary. ○ Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the construction site. ○ It is recommended that a suitably qualified freshwater specialist ECO monitor any coffer dam areas created on site as well as sediment traps at least bimonthly during the construction period to monitor the river conditions during construction and after the removal of the diversion. • Develop and implement a Topsoil Utilisation Management Plan that includes but are not limited to the following: ○ The material excavated intended for use in the construction of the dam must be stockpiled outside of the unnamed tributary, preferably on the downgradient slope to avoid runoff into the tributary. These stockpiles	6	3	2	3	1	3	45	

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
	• Altered geomorphology, leading to altered runoff patterns and formation of preferential flow paths which may result in rill and gully formation.												may not exceed 2 m in height and must be covered with a suitable geotextile if the stockpiles will be on site for longer than 30 days. o All materials used to construct the dam should not generate toxic leachates or lead to significant changes in pH or dissolved salt concentrations. • Maintain an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: o AIPs must be managed, and annual removal/chemical treatment must be undertaken. An AIP control plan must be developed for the unnamed tributaries within the larger subject property (and not only the footprint area associated with the proposed dam expansion activities) and must consider clearing and management of AIPs for at least 3 years post construction of the dam.								
Ventilation shafts, mobile refuelling points, parking areas, truck workshop, infrastructure areas, South entrance	• Exposure of soil, leading to increased runoff and erosion, and thus increased sedimentation of the applicable freshwater ecosystem. • Soil compaction. • Further proliferation of alien vegetation as a result of disturbances; and Loss of or diminished ecoservices provisioning • Stockpiling of sediment adjacent to riverine systems. • Construction edge effects. • Potential impacts associated with working with cement in the vicinity of the unnamed tributary. • Construction can cause unnatural concentration of flow, unnatural ponding occurs due to a lack of runoff potential, changing the water retention and distribution in the landscape. • Potential impacts from soil erosion and creation of areas of preferential flow paths. • Possible contamination of soil and surface water, leading to further reduced ability to support biodiversity.	Construction activities associated with the development of the mobile refuelling points. Establishment of new ventilation shaft, surface main fans, electrical rooms, and bulk air cooler. Excavation to facilitate preparation of the infrastructure areas foundation, and parking areas.	6	3	2	3	2	3	48		Medium	Negative	• Develop and implement a site specific Storm Water Management Plan, inclusive but not limited to the following activities: o Careful planning must take place to ensure a free draining landscape that allows water to drain in a natural manner with specific mention of the following: ▪ All stormwater management and attenuation facilities should be constructed using materials defined by a suitably qualified engineer, sloped to a ratio not steeper than 3:1 and lined with rocks and cobbles to assist with energy dissipation and prevent sedimentation and erosion as well as improve the aesthetic appeal of the water management features. ▪ Ensure that runoff occurs in a natural diffuse manner with no unnatural concentration of flow. ▪ Ensure that no areas of unnatural ponding occur due to a lack of runoff potential. ▪ In steep areas ensure that energy dissipation takes place to ensure that water leaving the site does so without reaching critical levels which would lead to erosion. ▪ Ensure that runoff does not lead to excessive sedimentation in area. ▪ Drip trays must be located beneath any parked and leaking equipment along with lubricant/fuel absorbing media (moss or sawdust type products) within the drip trays to contain spilt material and avoid groundwater pollution. ▪ Dust suppression measures must be put into place during site clearing and vegetation removal activities. ▪ Vegetation clearing to be limited to the approved development footprint areas including those associated with any stormwater infrastructure, and vegetation outside of the focus area, particularly to the south, must remain intact to retain a natural buffer zone. ▪ It must be ensured that where berms and/or cut off trenches (if any) are developed they are sufficient in design and size to capture any sediment and water runoff and stop such spreading into the surrounding soil in line with the requirements of GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998). • Develop and implement a Topsoil Utilisation Management Plan that includes but are not limited to the following: o Topsoil stripped must be stockpiled for rehabilitation. Topsoil stockpile slope monitoring should be carried out regularly to manage the slope angle and height. The slope of the stockpile areas should not be excessively steep in order minimise erosion risk. o The topsoil stripped within the footprint of the WRD and RoM stockpile must be stockpiled for rehabilitation of the footprint areas. o Topsoil stockpile slope monitoring should be carried out regularly to manage the slope angle and height. The slope of the stockpile areas should not be excessively steep in order minimise erosion vulnerability.	4	2	2	2	2	2	24	

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			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
Mining Activities	• Increased runoff and erosion leading to sedimentation of the freshwater ecosystems in the vicinity of the focus area. • Smothering of freshwater biota due to increased sedimentation. • Decreased ecoservice provision. • Increased likelihood of dust generation. • Removal of vegetation and topsoil and associated stockpiling. • Loss of catchment yield resulting from stormwater containment, leading to reduced volume of water entering freshwater environment. • Increased risk of sediment transport in surface runoff from the overburden stockpile into the riverine habitat.	Site clearing, topsoil removal and associated stockpiling prior to commencement of the deposition of WRD material and RoM stockpile.	8	3	2	4	2	4	76		Medium	Negative	• Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ All site preparation activities must remain outside of riparian freshwater systems (Witrivier and associated tributary). This includes the 100m zones of regulations or the 1:100-year flood lines for the Witrivier and the associated tributary (whichever is greatest). ○ All development footprint areas to remain within the approved development footprint and vegetation clearing to be limited to what is essential for the proposed WRD and RoM stockpile footprint areas and areas associated with any proposed stormwater infrastructure. ○ Storage facilities and all other non-essential activities (e.g., contractor laydown area) must be located outside the freshwater systems and the associated regulated areas. • Develop and implement an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Dust suppression measures must be put into place during site clearing and vegetation removal activities. ○ Dust suppression measures must be implemented throughout the project to prevent excessive dust which may smother freshwater vegetation. • Develop and implement a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ Silt/sediment traps around the western decline footprint are to be used during the construction phase, to limit additional sediment associated with construction activities from reaching the freshwater habitat. ○ Excavation activities should be carried out with extreme caution to avoid impacting on the hydropedological properties of the surrounding area. ○ Should it be deemed necessary, clean water should be diverted and discharged back into the freshwater habitat which is located downgradient of the proposed decline in an attenuated manner to minimise recharge lost. ○ Strict erosion control measures must be implemented to limit loss of soil and sedimentation of the freshwater habitat located downgradient of the decline. ○ No indiscriminate movement of vehicles is allowed in the riparian freshwater ecosystems. Careful planning of the required project footprint must be undertaken beforehand to ensure that the minimum impact on the freshwater ecosystems occurs	6	3	2	3	2	3	48	
Operational Phase																					
Access Road, Pipelines, Electricity Infrastructure	• Increased dust generation due to operations within the site. • Potential flooding of freshwater ecosystems and temporary change to hydrological regime due to pipeline failure. • Minor impact to freshwater vegetation, leading to exposed/ compacted soils, leading to increased runoff and erosion.	Movement of heavy machinery on the haul road within the site; Miscellaneous activities by construction personnel associated with maintenance of the proposed infrastructure; Potential failure of water supply or associated pipeline infrastructure.	6	3	2	3	2	3	48		Medium	Negative	• Develop and maintain a specific Infrastructure Maintenance and Management Plan, inclusive but not limited to the following: ○ Should any maintenance of the proposed water supply infrastructure entailing ground-breaking and trenching activities within the freshwater ecosystems be required, mitigation measures as per construction phase will apply. • Maintain the Emergency Response Management Plan inclusive but not limited to the following: ○ An emergency plan must be developed to manage any infrastructure failure, particularly the water supply pipeline which may impact on the Mohlosane and Groot-Sandsloot Rivers the freshwater ecosystem should any fault resulting in the leakage of the pipeline not be attended to with urgency. • Maintain a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ All culverts (if constructed) associated with the haul road must be maintained in operational order and it must be ensured that no back flooding or blockages occur, especially after a heavy rainfall event. In the event of blockages or failed infrastructure, a suitable waste removal plan must be put in place to attend to the removal of blockages efficiently and timeously. • Maintain an Alien Invasive Plant Species Management Plan, inclusive but not limited to the following: ○ An alien and invasive species control and management plan must be developed by a suitably qualified ecologist, and this must be used as guidance for managing spread of alien species in the vicinity of the proposed infrastructure.	4	2	2	2	1	2	24	

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			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
Stormwater control dam for WRD runoff water.	• Reduced water quality with specific mention of increased dissolved salt concentrations and potentially introducing toxins into the system due to accidental spills and potential seepage. • Potential desiccation of reaches of the riverine habitat as a result of loss of recharge due to containment of process water. • Limited reduction in volume of water entering the riverine habitat due to the loss of catchment yield created by the formation and management of the dirty water containment areas, leading to loss of recharge of the downstream riverine habitat.	Operation and maintenance of stormwater control dam for WRD runoff water.	6	3	2	3	2	3	48		Medium	Negative	• Maintain a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ The North west Polllution Control Dam- Navada Dam must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs in line with the requirements of GN 704 of 1999. ○ It must be ensured that regular inspections of all stormwater infrastructure are conducted. During the inspection data must be recorded and kept for the purposes of tracking and reporting. ○ Water quality, with special mention of pH, dissolved salts and specific problematic chemical constituents of concern need to be managed and monitored on a monthly basis. ○ Management of water quality must be done by monitoring water quality in the rivers in support of Resource Quality Objectives of rivers in the region. According to the water quality report, parameters such as sulphates, calcium and manganese occur above recommended limits in the region, therefore the development of the infrastructure should not result in cumulative impacts on water quality and quantity in the area. ○ Mitigation measures recommended by a surface water specialist must be adhered to in order to ensure that any catchment yield losses are minimised. • Establishment of an Emergency Response Plan ○ Provide impacted communities with alternative water supply for domestic consumption.	4	2	2	2	1	3	24	
Ventilation shafts, mobile refuelling points, parking areas, truck workshop, infrastructure areas, South entrance	• Contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts (decreased water quality). • Increased run-off from increased extent of hard surfaces may affect hydrological function in the freshwater ecosystems. (e.g., altered flow patterns that may also alter in-stream habitat and result in bank erosion and instability) • Changes in the runoff patterns within the site due to increase impervious surfaces; and Contamination of freshwater environment due to unattended spills.	Operation and maintenance of surface Infrastructure (vent shaft infrastructure, new entrance, truck workshop, and infrastructure areas). Operation and maintenance of the mobile refuelling points.	6	3	2	3	2	3	48		Low	Negative	• Maintain a site specific Storm Water Management Plan, inclusive but not limited to the following activities: ○ Any dirty water runoff containment facilities must, as far as practical, remain outside of the defined riverine areas and the associated setback zones / zones of regulation as a measure to minimise the impact on the receiving environment. ○ All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs and must adhere to the requirements of GN704 of 1999. • Maintain a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ Any spills to be immediately cleaned up and treated accordingly. An emergency spill kit must be available at the at the plant and must take cognisance that there are riverine systems in the vicinity of the infrastructure. ○ A spill management plan must be compiled, and a copy thereof must be retained in all refuelling vehicles, and regular checks of the mobile refuelling infrastructure must be conducted in order to ensure that any leaks are detected before any adverse impacts on the receiving environment. • Establishment of an Emergency Response Plan ○ Provide impacted communities with alternative water supply for domestic consumption.	4	2	2	2	1	3	24	
Sandsloot Underground	• Alteration (increase) of flow regimes, reduction in water quality (increase in salts and specific contaminants of concern and reduced pH); and • Subsequent loss of biodiversity of the freshwater ecosystems.	Underground Mining Activities	10	4	3	4	4	4	100		High	Negative	• Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Dust suppression measures must be implemented routinely throughout the mining period in order to limit dust and associated smothering of freshwater habitat; • Maintain a site specific, suitably designed, groundwater monitoring programme. ○ Drilling of groundwater monitoring boreholes into the underground workings to monitor water levels and quality as the groundwater rebounds; and ○ The recommendations made by such qualified specialist supersede recommendations made by the freshwater ecologist in this report and must be implemented; and ○ All measures as stipulated by suitably qualified geologist and the geohydrologist to mitigate against subsidence and dewatering, formation of a pollution plume and decant respectively, must be implemented.	6	3	3	3	3	3	54	

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
RoM Stockpiles, North Waste Rock Dump Phase 3	• The coarse-grained WRD deposited material is typically porous with high hydraulic conductivity and as such, the permeability of the feature is high. • Increased risk of pollution of groundwater, potentially leading to the formation of a contaminated groundwater plume. • Addition of metals and metal salts in the receiving freshwater environment which could lead to additional stress and pose a toxicological risk. • Sulphate has the potential to impact on pH of water in the receiving environment; and Nitrate from blasting residue has the potential to increase the risk of eutrophication of the receiving environment. • Increased sediment runoff and dispersion from the WRD due to increased heights, steeper slopes and material load. • This may enter the receiving environment and lead to changes in the riverine habitat affecting both the riparian zone and in channel habitats as well as the availability of surface water and refugia.	Continued deposition of waste rock material within the WRD footprint area and RoM stockpiles.	6	3	2	4	4	4	84		Medium	Negative	• Maintain a site specific, suitably designed, groundwater monitoring programme: ○ Water quality, with special mention of pH, dissolved salts and specific problematic chemical constituents of concern need to be managed, and monitored in order to ensure that reasonable water quality occurs downgradient of the areas where waste rock material has been deposited. ○ Management of water quality must be done by monitoring water quality on the Witrivier in support of Resource Quality Objectives of rivers in the region. ○ The toxicological risk to the receiving environment should be determined by using acute toxicity assessment principles. If screening assessments indicate that there is a significant risk to biota, this should be further refined with tests run according to the Direct Estimate of Ecological Effect Potential (DEEEP) Method. ○ The installation of adequate underdrains must be considered in order to control potential impacts from seepage associated with the WRD. In addition, this must include a seepage monitoring plan, which outlines the frequency of record-taking (recommended is monthly) and a procedure for action in the event of seepage taking place. ○ Regular monitoring should be undertaken to assess the footprint area of the WRD and to measure the degree of sedimentation and soil disturbance in order to allow for adaptive management. • Maintain a Concurrent Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ It must be ensured that the slope ratio of the WRD is not excessively steep which may induce slope failure or implement mechanisms to improve slope stability where necessary. ○ Slope monitoring must be carried out regularly to manage the slope angle and height with variation in material properties. ○ The slopes of the waste rock stockpiles can be stabilised by using buttressing. The effect of the buttress is to flatten the slope and reduce the slope height thereby improving slope stability. • Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Dust from WRD areas must be managed in accordance with the requirements on dust control as regulated by Mine Health and Safety Act, 1996 (Act No. 29 of 1996) and in terms of the National Environmental Management Air Quality Act, 2004 (Act No. 39 of 2004). • Establishment of an Emergency Response Plan ○ Provide impacted communities with alternative water supply for domestic consumption.	6	3	2	3	3	3	51	
Closure Phase																					
Access Road, Pipelines, Electricity Infrastructure	• Further altered runoff patterns and alteration to flow patterns in the landscape, leading to change in potential recharge of the riverine systems; • Possible contamination of soil and surface water which is likely to eventually report to the riverine systems; and • Possible incision and sedimentation of the riverine systems.	Removal, decommissioning and demolition of linear infrastructure.	6	3	2	3	2	3	48		Medium	Negative	• Mitigation measures as per pre-construction and construction phases.	4	2	2	2	2	2	24	
Stormwater control dam for WRD runoff water.	• Compaction of soil/ impacts to the channel. • Physical disturbance to aquatic biota such as macro-invertebrates and amphibious species; and • Increased risk of pollution of surface water, leading to impaired water quality.	Removal, decommissioning and demolition of stormwater infrastructure.	6	3	2	3	2	3	48		Medium	Negative	• Mitigation measures as per the construction phase	4	2	2	2	2	2	24	

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
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Freshwater																					
Ventilation shafts, mobile refuelling points, parking areas, truck workshop, infrastructure areas, South entrance	• Contamination of freshwater ecosystems with hydrocarbons in runoff due to vehicle impacts (decreased water quality) and unattended spills.	Removal, decommissioning and demolition of infrastructure	6	3	2	3	2	3	48		Medium	Negative	• Mitigation measures as per the construction phase	4	2	2	2	2	2	24	
Sandsloot Underground	• Compaction of soil, latent impacts of vegetation losses. • Increased likelihood of dust generation; and • Increased risk of transportation of sediment from exposed.	Decommissioning including the removal of surface infrastructure.	6	2	2	3	3	3	48		Medium	Negative	• Develop and implement a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Impacts associated with the removal of infrastructure are considered similar to those arising during the construction phase although impacts will be reduced due to the already impacted landscape, as such, mitigatory measures as outlined in the construction phases above must be considered; ○ Demolition footprint must be clearly demarcated and no related activities, including the movement of vehicles, must be permitted to occur outside of the already impacted footprint area; ○ All related waste and rubble must be removed from site and disposed of according to relevant SABS standards. No waste must be permitted to enter freshwater ecosystems; ○ All areas affected by stockpiling during the operational phase of the mine must be rehabilitated and stabilised using cladding or a suitable grass mix to prevent sedimentation of the freshwater ecosystems in the area; ○ Ensure that soils are replaced in the correct layers, ripped and re-reprofiled post-closure, and that vegetation is restored to a point where succession will lead to the same conditions as the pre-mining state as a minimum; and ○ Rehabilitation measures must be implemented. Implementation must be overseen by a suitably qualified Environmental Site Officer (ESO) with freshwater experience and the ESO must sign off the rehabilitation before the relevant contractors leave site.	4	2	2	2	2	2	24	
	• Decant from mine pits post closure. • Seepage from ore stockpile. • Increased risk of sediment transport in surface runoff from the mine areas to riverine systems leading to altered water quality and sedimentation.		8	3	2	4	4	4	84		Medium	Negative	• Develop and implement a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Cover systems must be used over waste material in order to reduce percolation of rain into mine waste and reduce effluent seepage volumes. • Maintain a site specific, suitably designed, groundwater monitoring programme: ○ Strict monitoring throughout LOM and post-closure is required in order to ensure the health and functioning of the watercourses is retained and monitoring data must be proactively utilised to identify any emerging issues. ○ Should it be deemed necessary by the geohydrologist, drilling of dewatering boreholes to prevent decant/seepage into springs. Pumped water to be treated to baseline quality levels and discharged; and ○ Decant must be treated to the quality as stipulated by the Water Use licence and released to the environment in a controlled manner, mimicking natural conditions. Sufficient budget must be made available to ensure that decant can be treated to the required values until such time as decanting water reaches values that can support the Resource Quality Objectives of the receiving environment.	6	3	2	3	3	3	51	
RoM Stockpiles, North Waste Rock Dump Phase 3	• Possible failure, seepage and runoff from WRD post-closure.	Rehabilitation and re-vegetation	8	3	2	3	2	4	72		Medium	Negative	• Develop and implement a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Ensure that rehabilitation during closure does not allow for possible failure of the WRD or seepage. ○ Implement monitoring plan in line with the recommendations of the Rehabilitation Plan • Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: ○ Dust suppression measures must be implemented throughout the project to prevent excessive dust which may smother freshwater vegetation. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Silt/sediment traps are to be used during the construction phase, to limit additional sediment associated with construction activities from reaching the freshwater ecosystems. ○ Strict erosion control measures must be implemented to limit loss of soil and sedimentation of the freshwater ecosystems adjacent to the decline.	6	3	2	3	2	3	48	

Project	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Freshwater																					
													○ It must be ensured that where berms and/or cut off trenches are developed and appropriately sized, these are sufficient in design to capture any sediment and water runoff and stop such spreading into the surrounding areas in line with the requirements of Regulation GN704 of 2016.								

9.3.5 Hydrogeology

More than 90% of the surrounding communities use shallow groundwater as their domestic water supply classifying this resource as a sole-use aquifer and strictly non-degradational. Seepage into the current pits due to passive dewatering is estimated at >600 m3/day during the dry season (groundwater) although this is higher in the wet season (>28000 m3/day) due to stormwater subsurface flows and runoff.

The hydrochemical results confirm that the WRDs and TSF are sources of contamination to groundwater in both the shallow weathered rock aquifer and to a lesser extent in the deeper fractured rock aquifer. The high runoff and overland flow in the vadose zone is > 25% of the mean annual precipitation and is the mechanism that transports shallow subsurface contamination from the waste rock dump facilities. The contamination is partially captured in the open pits but a component of flow has migrated off-site and is impacting shallow groundwater in the alluvial aquifers along the non-perennial streams which flow intermittently following rainfall events and are losing to groundwater.

The MINEDW numerical groundwater flow model was developed by Itasca and the FEFLOW contaminant transport model by KP based on the Conceptual Hydrogeological Model.

- In general, open-pit bedrock-induced seepage will remain relatively constant within the Super Pit as it is progressively deepened, due to the low K values of the deep bedrock. As the open-pit mining cuts laterally expand, (the surface area of the open pits), the bedrock seepage rate will increase to a predicted maximum of 6000 m3/day and thereafter stabilising at 4000 m3/day to LOM.
- The ingress to the Sandsloot Underground will increase to a maximum of 13400 m3/day if the Sandsloot pit lake is not drained and thereafter decreases to about 7000 m3/day after LOM. If Sandsloot pit is drained prior to the underground development and maintained dry, the ingress to the underground to be managed is 7000 m3/day.
- Seepage predictions do not account for the evaporation and absorption of water in loosened material. Due to the large evaporation rate at the Mine, bedrock seepage would likely be reduced by as much as 40% during the dry season. In the wet season, it is anticipated that the loss due to evaporation and absorption would be lower. The reduction in bedrock seepage due to evaporation and absorption loss may be negligible during the wet season when the ground is saturated.
- Model simulations show that sulphate and nitrate concentrations are elevated near the Sandsloot, Mohlosane, and Witrivier Rivers. The elevated concentrations are related to the solute loadings from the TSFs, RWDs, and waste-rock facilities.
- The model confirmed that model has confirmed nearly 25% of rainfall reports to the rivers through runoff and overland and subsurface flow in the vadose zone.
- Constituent concentrations (i.e. nitrates and sulphate) increase in areas where the TSFs and RWDs expand through time.
- The primary receptor of the simulated contaminant plumes is the open pits and Sandsloot Underground.
- However, along the western and southern boundaries of the WRDS, nitrate concentrations above the WUL permit limits of 20 mg/L are impacting on the aquifers along the Sandsloot river and shallow weathered boreholes used by local communities. The sulphate plume, although elevated on-site remains below the 450 mg/L concentration as stipulated in the WUL permit at compliance monitoring points.
- After the pit-lake infilling, the pit-lake water elevation will still be below the groundwater level. Pit lakes are simulated to be terminal sinks for the groundwater system due to low groundwater seepage and high evaporation. A terminal sink would result in continuous solute loading from the groundwater system. Due to the pit lakes becoming terminal hydraulic sinks for the groundwater system, it is expected that the constituent concentrations will continue to rise through time during closure until they reach saturation and equilibrium conditions.
- No fatal flaws were identified in terms of impacts on groundwater quality and quantity.

Mitigation includes the implementation of a stormwater capturing system around the current and future waste rock dumps with shallow drains to reduce the overland flow from the waste rock dumps and scavenger boreholes as required. The potential impacts associated with hydrogeology are provided in **Table 9-9**.

Table 9-9: Hydrogeology Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Hydrogeology																				
Construction Phase																				
Construction of North WRD and North-west PCD could potentially impact receptors in close proximity i.e. Witrivier, wetland and communities.	North Waste rock Dump Phase 3 \ with stormwater channels and North-west PCD	4	5	3	4	4	5	100		High	Negative	• Develop and implement a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Final technical design and construction of new WRDs, considering zones of deeper weathering and runoff to prevent seepage to wetland and Witrivier. ○ Design and implement clean water/dirty water infrastructure to contain all dirty water runoff and seepage from the waste rock dump in appropriately designed facility. ○ Should design specification change significantly, obtain approval from DWS - Civil Design. • Develop and implement a site specific suitably designed groundwater monitoring programme. • Develop and implement a Blast Management Plan to optimise blasting procedures to minimise explosive residues. • Grievances to be handled in accordance with the Grievance Management Procedure. • Establishment of an Emergency Response Plan ○ Provide impacted communities with alternative water supply for domestic consumption.	2	2	2	2	2	5	50	
Site clearing of vegetation and stockpile of topsoil resulting in increased runoff and less recharge from rainfall	North Waste rock Dump Phase 3 and Zwartfontein Pushback	4	3	2	2	3	4	56		Medium	Negative	• Development and implementation of a site specific "Master Layout Plan" aligned with the Life of Asset Mine Plan which: ○ Restrict areas to be cleared of vegetation to minimum and avoid or minimise construction. • Develop and implement a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Adequate storm water management to be implemented to contain all waste/dirty water.	2	2	2	2	3	1	11	
Water egress due to flooding into Sandsloot Underground from Sandsloot Pit Lake and after high precipitation events	Sandsloot Underground	4	2	3	3	1	4	52		Medium	Negative	• Develop and implement a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Flood Plan ○ Sufficient pumping capacity to cater for 1:100 storm year events. • Develop and implement a site specific Dewatering Management Plan inclusive but not limited to the following: ○ Ensure the dewatering of the Sandsloot pit lake level is below the Sandsloot exploration and decline levels to prevent flooding of construction of Sandsloot UG infrastructure. ○ Active dewatering of elevated phreatic surface on western side of Sandsloot ahead of mining	2	2	2	2	3	1	11	
Use, handling, transport and storage of hazardous materials (hydrocarbons & chemicals) - Pollution of soil, surface and groundwater with hazardous materials should spillages occur.	All projects	3	2	3	4	3	4	60		Medium	Negative	• Develop and implement a site specific Waste (general and hazardous) Management Plan, inclusive but not limited to the following: ○ Prevention of contamination through hazardous material spills and leaks. • Develop and implement a site specific Vehicle and Machinery Maintenance and Management Plan, inclusive but not limited to the following: ○ Implementation of vehicle maintenance plan. ○ Effective mechanical maintenance on all critical equipment to prevent leaks, abnormalities, and risk of failure. • Develop a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ Effective, timeous spills management and clean-up - Implement a staff and contractor awareness training programme. ○ Adequate secondary containment measures associated with pollution point sources.	2	3	1	1	2	2	18	
Operational Phase																				
Potential contamination of shallow groundwater resources and surface drainages due to long term liner integrity, as well as the effectiveness of the preparation of the base of the North Waste Rock Dum p Extension 3	North Waste Rock Dump Extension 3, Stormwater Infrastructure and Pollution Control Dam (Navada Dam)	8	5	3	3	3	5	110		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme. ○ Update contaminant flow and transport model with monitoring data. ○ Pending spatial and temporal trend analysis, investigate and implement alternative mitigation measures if and when required. ○ Should it be required, alternative water supply to be provided to impacted communities. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Maintenance of stormwater infrastructure and North West PCD (Navada Dam). • Maintain a Concurrent Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Concurrent rehabilitation and intra-benching of the WRDs as to reduce run-off. • Grievances to be handled in accordance with the Grievance Management Procedure. • Establishment of an Emergency Response Plan ○ Provide impacted communities with alternative water supply for domestic consumption.	4	3	1	2	2	2	24	
Additional ingress/flooding along Platreef strike from backfilled Anthropogenic Aquifers	Zwartfontein and Sandsloot Anthropogenic Aquifer	8	4	4	3	3	4	88		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Monitoring of Anthropogenic Aquifer water balance (pumped in and out volumes) versus water levels in Sandsloot pore pressures and piezometers. ○ Measure ingress volumes during construction and monitor water quality as indicator of hydraulic connectivity to Anthropogenic Aquifers.	5	4	4	3	3	2	38	

												○ Update numerical flow model with measured ingress to confirm limited connection to Sandsloot Underground development. ○ Pore pressure input to geotechnical models for crown pillar stability including neighbouring mines. ○ Cover drilling to lower risks of water inrush. ○ Reduce volume of water stored in Anthropogenic Aquifers if ingress higher than predicted. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Emergency response plan to flooding								
Contaminated seepage into the Sandsloot UG anthropogenic aquifers and paste backfill, requiring higher pumping and treatment costs of nitrate and sulphates	Sandsloot Backfill, Anthropogenic Aquifers	6	4	4	3	3	5	100		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Static and kinetic testing of backfill material used into Sandsloot Underground for stability. ○ Hydrochemical testing of cover holes to evaluate potential connectivity of RS03 to underground based on elevated salts and isotopes. ○ Geochemical reactant transport models to predict groundwater ingress/egress quality to be managed in water treatment • Grievances to be handled in accordance with the Grievance Management Procedure.	4	3	3	2	3	2	30	
Reduction in groundwater quantity (real or perceived) due to increased ingresses and the dewatering (active and passive) of the Super Pit and Sandsloot Underground which will be deeper and therefore higher hydraulic gradient towards the voids	Sandsloot Underground	8	5	3	3	3	5	110		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Undertake door to door hydrocensus annually within 1 km radius biennially (every two years) to identify and quantify groundwater users in close proximity to the mine. ○ Replace monitoring boreholes as they are mined out in the Super Pit. ○ Consider installing monitoring boreholes within communities with real time data loggers to quantify localised drawdown due to increasing usage from community boreholes. ○ Update numerical flow model with data and update dewatering strategy to correlate with the mine plans and schedule. ○ Monitoring network must be consistent with mine development and as monitoring boreholes are mined out, they must be replaced to ensure that there are always monitoring points between the mine pits and potential groundwater users in the communities. ○ Alternative water supply to be provided to downgradient communities that might be impacted. • Maintain a site specific Dewatering Management Plan inclusive but not limited to the following: ○ Develop a dewatering strategy to harvest the clean water around the pit area prior to mining to prevent the groundwater from becoming contaminated should it end up as fissure water in the Super Pit and Sandsloot Underground.	5	3	3	3	3	3	51	
Communities use the groundwater resources on the mine as potable water supply	Zwartfontein and Sandsloot Anthropogenic aquifers, Sandsloot Underground Mine	6	4	4	3	4	5	105		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Implement Interception and Pumping Management System (scavenger wells). • Grievances to be handled in accordance with the Grievance Management Procedure. • Annual hydrocensus within 1 km radius to quantify impacts of densification on groundwater resources. • Develop improved on-site sanitation with Municipalities to reduce pit latrines.	2	4	2	3	3	3	42	
Cumulative impact on water quality and quantity of neighbouring mines mining the Platreef along strike (Proposed Akanani, Platreef)	Zwartfontein and Sandsloot Anthropogenic aquifers, Sandsloot Underground Mine	6	5	3	3	3	4	80		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Groundwater monitoring plan between adjacent mines. ○ Encourage the development of joint water forum. ○ Develop long term strategy by incorporating other neighbouring mine plans into flow and transport model including impacts of anthropogenic aquifers on adjacent underground mine (potential risk of flooding). ○ Update the regional water balance	4	5	2	3	3	3	51	
Use, handling, transport and storage of hazardous materials (hydrocarbons & chemicals)	All projects	3	2	3	4	3	4	60		Medium	Negative	• Maintain a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ Prevention of contamination through hazardous material spills and leaks - Implementation of vehicle maintenance plan. ○ Effective, timeous spills management and clean-up - Implement a staff and contractor awareness training programme. • Maintain a site specific Vehicle and Machinery Maintenance and Management Plan, inclusive but not limited to the following: ○ Effective mechanical maintenance on all critical equipment to prevent leaks, abnormalities, and risk of failure.	2	3	1	1	2	2	18	

												○ Adequate secondary containment measures associated with pollution point sources								
Deterioration of groundwater quality and quantity due to densification of unplanned settlements surrounding mine and expansion of mine operations towards the western and northern boundary resulting in cumulative impact as deterioration in regional water quality and quantity.	All projects	6	5	5	4	4	5	120		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Update of groundwater flow and transport models. ○ Maintain and update the Interception and Pumping Management System (scavenger well) plan. ○ Biennial (every two years) hydrocensus within 1 km radius to quantify impacts of densification on groundwater resources. ○ Develop improved on-site sanitation with Municipalities to reduce pit latrines. • Maintain a site specific Dewatering Management Plan. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Implementation of stormwater plan to manage runoff along western and northern boundary and update the stormwater management plan. ○ Stormwater management plan and PCD required for southern and southwestern boundary. • Implement the Site Induced Migration Plan ○ Discourage influx by maximising local employment and procurement. ○ Identify and implement measures to prevent encroachment into the mine lease area. ○ Undertake proactive engagement with community leaders to discuss impacts of unplanned settlement expansion and strive to agree on approaches to address the impacts	3	4	3	3	2	3	45	
												Closure									
Communities use the groundwater resources on the mine as potable water supply	Clouse & rehabilitation	6	4	4	3	4	5	105		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Decommission Interception and Pumping Management System (scavenger wells). ○ Develop a long-term handover strategy of the wellfields and anthropogenic aquifers (Zwartfontein and Sandsloot Pits) to communities as part of corporate social investment (CSI) projects. ○ Evaluate sustainable usage of pit lakes as resource and possibly managed aquifer recharge (MAR), depending on final pit lake water quality • Grievances to be handled in accordance with the Grievance Management Procedure.	2	4	2	3	3	3	42	
Post closure impacts on groundwater and rivers associated with waste disposal activities – WRDs	Clouse & rehabilitation	6	5	5	3	2	5	105		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Maintain an effective groundwater monitoring programme for an adequate time period to be confident in the determination of impact. ○ Demonstrating, through review of monitoring data and/or predicted modelling, if required, that the effect of contaminant plumes that could be arising and/or are already evident from disposal areas could be remediated by natural attenuation. • Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Ensure effective surface and stormwater management post closure.	4	5	3	3	2	3	51	
Rebound of groundwater table and formation of terminal pit lakes with possible decant to river sources	Clouse & rehabilitation	6	5	3	3	3	5	100		Medium	Negative	• Maintain a site specific suitably designed groundwater monitoring programme inclusive but not limited to the following: ○ Improved understanding of groundwater flow and flow regimes - Continued understanding of impacts to groundwater resources. ○ Modelling of closure scenarios. ○ Maintenance of monitoring programme for an adequate period of time to be confident in the determination of impact.	4	5	3	3	2	3	51	

9.3.6 Surface Water

The surface Water Assessment assessed the proposed infrastructure in relation to the surface water regime. The proposed infrastructure Impacts associated with surface water include siltation of surface water resource – transportation of disturbed soils and contamination of surface water resources.

Based on the findings of the ecological assessment, various freshwater ecosystems (seep wetlands and riverine systems) were identified within the focus area and observed to have been subjected to several historical and current impacts, thus decreasing the ecological integrity of these freshwater systems, particularly the riverine systems. The freshwater ecosystems within the focus area were largely considered to be moderately modified and to be of low/moderate ecological importance and sensitivity. As such, it is important that efforts must be made to retain the ecological status of these ecosystems and prevent further deterioration of the functionality and integrity of the ecosystems.

The majority of the proposed activities associated with the Mogalakwena expansion will pose a low to medium risk on the freshwater ecosystems within the focus area. Some activities will pose a medium high risk, these specifically include the construction of the North west Polllution Control Dam- Navada Dam for WRD water runoff, the expansion of the of the north NWRD footprint which will impact significantly on the seep wetlands. Similarly, the construction of surface infrastructure which has the potential to result in edge effects to the Groot-Sandsloot River.

Particular attention must be paid to optimisation of layout wherever possible, ensuring that the water management systems meet the minimum requirements stipulated by GN704 as it relates to the National Water Act, 1998 (Act No 36 of 1998) and ensuring that impacts arising from mining such as base flow reduction, formation of a cone of depression and decant are assessed by a suitably qualified geohydrologist. MM strives towards zero-discharge on site. This is aimed at ensuring that GN704 regulations as it relates to Regulation 6 and 7 are adhered to and that all contaminated water on site is contained within suitable containment facilities designed to ensure a zero release to the environment.

The containment of the contaminated run-off from the Waste Rock Disposal Areas through the implementation of a number of canals have been designed and will be constructed around the open pit areas and the Waste Rock Disposal Areas. These canals have been designed to intercept seepage from the disposal areas as well as collect runoff water in order to prevent pit flooding.

The contaminated run-off water will be collected in the North-west PCD (Navada Dam) for re-use in process via the Buffer dam as to allow for the operating of this facility as empty as possible. The facility has been designed to manage 1 :50 year stim event and will have a north and south compartment with a capacity of 1,0Mm^3 (North) and 1,15Mm^3 (South).

The Buffer Dam is already licenced for 1,5 mil m^3 storage from various sources and water used for concentrators. Allowance is made for 30 - 40 000m^3 per day pumping capacity back to the Buffer Dam.

The potential impacts associated with surface water are provided in **Table 9-10**.

Table 9-10: Surface Water Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Surface Water																				
Construction Phase																				
<u>Siltation of watercourses</u> Impacts may arise from migrating of particles (erosion) during rainfall events, resulting in increased suspended solids in run-off water, reporting to the local watercourses.	• Clearing of vegetation, removal of topsoil and stockpiling of topsoil • Construction of surface infrastructure • Construction of subsurface infrastructure	6	2	1	3	3	5	75		Medium	Negative	• Development and implementation of a site specific Stormwater Management Plan, inclusive but not limited to the following: o Construct surface water and safety berm around excavation perimeter with slopes of at least 1(V): 3 (H) and vegetate. o Construct berm for access at entrance of box cut. This berm must have up and downstream slope of least than 1 (V):3 (H) o Construct storm water management infrastructure (canals, contours, stilling basins) around construction areas to ensure controlled run-off with reduced energy. o Designed storm water structures next to construction roads. o Design construction roads to ensure controlled run-off. o Ensure regular maintenance and checks on equipment to ensure no oil leaks. • Develop a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: o Oil spill kits available and are adequately stocked. Oils spills to be addressed immediately after occurrence or when observed.	2	2	1	1	3	2	18	
<u>Contamination of surface water and soil</u> Surface run-off may be contaminated by activities on site due to spillage of hydrocarbons or other hazardous material	• Use of construction vehicles and equipment. • Construction of surface infrastructure • Storage and handling of chemicals, fuels, oil, lubricants etc.	6	2	1	3	3	5	75		Medium	Negative		2	2	1	1	3	2	18	
Flooding of the box cut and shaft	• Box cut excavation and construction. • Construction of infrastructure around the shaft	10	3	1	2	5	4	84		Medium	Negative	• Development and implementation of a site specific Stormwater Management Plan, inclusive but not limited to the following: o Construct surface water and safety berm for box cut around excavation perimeter with slopes of at least 1(V): 3(H) and vegetate. o Ensure standby mobile pumps for dewatering the box cut. o Ensure box cut design to facilitate a sump for storm water away from entrance. o Ensure standby mobile pumps for dewatering of water inside area of safety berm. o Ensure surface area level design to facilitate a sump for storm water away from shaft	2	2	1	1	3	2	18	
Operational Phase																				
Reduced catchment yield	Mining and related activities	4	5	1	1	5	6	96		Medium	Negative	• Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: o Implement clean dirty water separation systems as part of the storm water management plan- Ensure through effective implementation that clean water is allowed to exit the site clean and that clean water is not allowed to spill into a dirty water system and vice versa. o Confine unpolluted water to clean water system, away from dirty areas	2	3	1	1	1	3	24	
Siltation of watercourses Impacts may arise from erosion during rainfall events, resulting in increased suspended solids in run-off water, reporting to the local watercourses	Mining and related activities	4	5	1	4	3	5	85		Medium	Negative	• Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: o Inspections and maintenance of all drainage structures o Clearing and cleaning of all drains, traps, trenches • Maintain a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: o Ensure regular maintenance and checks on equipment to ensure no oil leaks. o Ensure oil spill kits are available and are adequately stocked. Oils spills to be addressed immediately after occurrence or when observed. o Ensure regular maintenance and checks on equipment to ensure no oil leaks. o Ensure oil spill kits are available and are adequately stocked. Oils spills to be addressed immediately after occurrence or when observed	2	2	1	2	3	2	20	
Contamination of surface water resources Surface run-off may be contaminated by activities on site due to spillage of hydrocarbons or other hazardous material	Mining and related activities	6	3	1	2	3	5	75		Medium	Negative		2	2	1	1	3	2	18	
Spillage of the dam resulting in increased suspended solids and contaminated run-off water entering the watercourse	Operation of the Stormwater control dam	8	4	2	4	3	5	105		Medium	Negative	• Develop and implement a site specific Water and Salt Balance o Ensure water balance of the mine is applied and the dam is operated as per design / operation manual. • Development and implementation of a site specific Stormwater Management Plan, inclusive but not limited to the following: o Dam embankment must be maintained, and erosion reduced.	2	2	1	1	3	4	36	

												○ Desilting of the dam when required									
Flooding of the box cut open pit area and declines	Mining activities as a result of increased open pit area.	10	5	1	4	5	4	100		Medium	Negative	• Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Maintain the surface water and safety berm around excavation perimeter of box cut. ○ Maintain low slope berm for access by equipment but diversion of surface run-off. ○ Ensure/maintain standby mobile pumps for dewatering the box cut. ○ Ensure/maintain box cut design to facilitate a sump for storm water away from entrance. ○ Construct surface water and safety berm around pit with slopes of at least 1(V): 3(H) and vegetate. ○ Ensure existing standby mobile pumps for dewatering of water inside area of safety berm is sufficient for increased area of the pit. ○ Ensure surface area level design to facilitate a sump for storm water away from working area. ○ Maintain storm water management infrastructure (canals, contours, stilling basins) around infrastructure to ensure controlled run-off with reduced energy. ○ Maintain storm water structures next to construction roads. ○ Maintain construction roads to ensure controlled run-off. • Maintain a Dangerous Goods and Hazardous Substances Storage, Handling Management Plan inclusive but not limited to: ○ Laydown areas must be bunded and covered where hazardous substances are store. ○ Ensure regular maintenance and checks on equipment to ensure no oil leaks. ○ All large mining trucks and equipment when parked must have a drip tray placed underneath areas where oil leaks could occur • Maintain a site specific Chemical and Hydrocarbon Spill Clean-up Procedures that include but are not limited to the following: ○ Ensure oil spill kits are available and are adequately stocked. Oils spills to be addressed immediately after occurrence or when observed	4	3	1	1	2	2	22	
Closure																					
Siltation of watercourses Impacts may arise from erosion during rainfall events, resulting in increased suspended solids in run-off water, reporting to the local watercourses	Demolishment of surface infrastructure, rehabilitation of disturbed areas	6	5	2	5	3	4	84		Low	Negative	• Maintain a site specific Stormwater Management Plan, inclusive but not limited to the following: ○ Maintain surface water and safety berm around excavation perimeter with slopes of at least 1(V): 3(H) and vegetate around box cut. ○ Evaluate safety of box-cut wall stability when saturated and ensure level of water in pit to be below risk level (Water to community). ○ Maintain storm water management infrastructure (canals, contours, stilling basins and sloping of the access area) around areas to ensure controlled run-off with reduced energy until all is shaped to be free draining. ○ Ensure stormwater control measures are kept intact to prevent concentrated runoff from the footprint resulting in erosion. ○ Ensure surface water is diverted at a reduced energy past the excavation surface. ○ Ensure maintenance and clearance of all remaining drains/culverts/trenches • Maintain a Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: ○ Maintain security fence around perimeter of infrastructure. ○ All infrastructure removed, with concrete to 500mm below surface demolished, areas ripped, compacted, made free draining without ponding and re-vegetated to natural local vegetation. ○ Stock: Ensure execution of farm planning with Stock watering systems and planned access route. ○ Entrance to declines sealed with concrete. ○ Area to be rehabilitated for informal grazing as per the closure plan. ○ RoM stockpiles removed at closure. ○ Ensure existing waste rock rehabilitation measures (below RoM stockpiles adhere to closure plan implementation).	2	2	1	1	3	2	18	

9.3.7 Air Quality

This section has been compiled using the the Air Quality Assessment to Support the Proposed Future Mining at the Mogalakwena Platinum Mine – Specifically Focusing on the Transition of The Sandsloot Mine from An Open Pit to Underground Mining Method. Complied by uMoya-NILA Consulting dated June 2023.

9.3.7.1 Dispersion Model

The CALPUFF dispersion model was used to estimate ambient concentrations of particulates (TSP, PM_{10} and $PM_{2.5}$) and dust fallout (DFO) rates resulting from the estimated emissions from proposed future mine operations.

A comprehensive emissions inventory has been developed for four of the proposed future projects the mine intends to undertake as part of its expansion. Two emission scenarios are presented for each of the projects. In the case of the Sandsloot Combination Mining – Open Pit and Underground Mining Project, the initial phase emission scenario is based on a production rate of 3 Mtpa during the initial stages of the Sandsloot Underground Mine. The operational phase emission scenario is based on a production rate of 6 Mtpa, following the ramp up period. The current and future emission scenarios for the Zwartfontein Mine Pushback and North Waste Rock (Phase 3) Disposal Facility Projects are based on a production rate of 13 Mtpa (based on 2018 and 2019 figures) and a future production rate of 22 Mtpa respectively. It is assumed there will be no change in the rate of development of the Anthropogenic Aquifer Development Project for the current and future case.

The total emission of TSP for all the proposed projects that the mine intends to undertake is estimated to be approximately 3 472 and 4 506 tonnes per annum for the current and future emission scenarios respectively. The total PM10 and PM2.5 emission is approximately 993 and 103 tonnes per annum respectively for the current emission scenario and 1 288 and 133 tonnes per annum respectively for the future emission scenario. Unpaved haul roads are expected to be the largest source of TSP, PM10 and PM2.5 at the mine.

Dispersion modelling was used to estimate ambient PM10 and PM2.5 concentrations and dust fallout resulting from each of these scenarios. In all modelled scenarios, the predicted dust deposition is below the limit value for acceptable dust fallout in residential areas and well below the limit value for acceptable dust fallout in non-residential areas.

In the case of the modelled scenario for the North WRD, predicted ambient PM10 and PM2.5 concentrations are very low and well below the respective NAAQS throughout the surrounding environment and nearby residential areas, and also very low along haul roads. There are no exceedances of the annual average and 24-hour NAAQS for PM10 and PM2.5 throughout the study area.

In the case of the modelled scenarios for the Sandsloot Underground Project, Zwartfontein Mine Final Pushback Project and Anthropogenic Aquifer Development Project, PM10 and PM2.5 concentrations are relatively low and well below the respective NAAQS throughout the surrounding environment and nearby residential areas, however, the high emissions from haul roads results in predicted ambient concentrations that exceed the annual average and 24-hour NAAQS for PM10 and PM2.5 over the south to central parts of the mine.

With regard to construction dust, the extent of the impact is expected to be localised except in strong winds and will endure for the period of construction. In strong winds the dust may impact beyond the mine site. The intensity is expected to be low as dust is mostly a nuisance reducing visibility temporarily and manifesting as the deposition of particulates on vegetation and other surfaces on the site. Some respirable particulates may result, but generally, dust from mechanical processes such as construction is coarse. It is highly unlikely that ambient air quality standards or guidelines will be exceeded. Even so, the impacts will be negative. Due to the remote nature of the mine, the localised effect, the short duration and improbability that ambient standards or guidelines are exceeded, the significance of the impact is expected to be low.

9.3.7.2 Impact Assessment

Construction Phase

The construction of the supporting infrastructure at the mine will initially involves site clearing and preparation, including clearing of vegetation, removal of rocks and levelling. This is followed by the construction infrastructure such as site roads, electricity, water supply and fencing. The construction of the mine offices and stores and process infrastructure required for mining include the head gear at the portal, crusher, concentrator, conveyor system, etc. The construction activities involve cranes, mixers, tipper trucks, the handling and processing of construction products and activities such as welding and possibly piling.

A range of vehicles and equipment are used in the construction including heavy duty vehicles, mobile cranes, generators, welding machines and fabrication equipment. The activities during the initial preparation are associated with the movement of a range of vehicles and equipment including bulldozers, excavators, cranes, mixers and tipper trucks. These activities inherently generate dust that depends on a number of factors, including:

- *The nature of the activity:* The physical movement of soil through digging, grading, loading and tipping, loosens otherwise bound fine particles allowing entrainment into the atmosphere through mechanical processes and wind.
- *Equipment operation and vehicles:* Equipment and vehicle movement on unpaved surfaces pulverise particles to a fine dust, which may be entrained into the atmosphere by their movement. Dust entrainment is a function of vehicle size and speed, with heavier vehicles and faster travel generating more dust.
- *Silt content of the soil and other materials*: Soils and materials with high silt content have a higher percentage of fine material that is easily entrained into the atmosphere when it is disturbed.
- *The size of the denuded construction area:* Larger exposed areas are naturally greater sources of wind-generated dust.
- *The frequency of strong wind and rainfall:* Strong winds easily entrain dust from open areas, from storage piles and during operational activities. Rainfall on the other hand suppresses the generation of dust.

The dust abatement programme: Dust can be suppressed at the point where it is generated in a number of ways. Diligent management of an abatement programme can have a marked effect on reducing dust from all construction activities.

The extent of the impact is expected to be localised except in strong winds and will endure for the period of construction. In strong winds the dust may impact beyond the mine site. The intensity is expected to be low as dust is mostly a nuisance reducing visibility temporarily and manifesting as the deposition of particulates on vegetation and other surfaces on the site. Some respirable particulates may result, but generally, dust from mechanical processes such as construction is coarse. It is highly unlikely that ambient air quality standards or guidelines will be exceeded. Even so, the impacts will be negative. Due to the remote nature of the mine, the localised effect, the short duration and improbability that ambient standards or guidelines are exceeded, the significance of the impact is expected to be low.

Operational Phase: Sandsloot Underground Project, Zwartfontein Mine Final Pushback Project, Anthropogenic Aquifer Development Project, Cumulative Emission Scenario

Dust Fallout

The predicted dust deposition is low and well below the limit value for acceptable dust fallout in non-residential areas. The magnitude of the current impact is therefore low. The duration of the impact will be for the life of the operations and is therefore long term. The extent of the impact is small and is limited to within 5 km of the site and mainly along the haul road and is therefore classified as local. The impact of exposure of dust on vegetation is through deposition on leaf surfaces and inhibiting transpiration. The predicted dust fallout is low compared to the limit value for acceptable dust fallout in non-residential areas and is localised. With no irreplaceable resources in the zone of impact, there is deemed to be a very low or no potential for the loss of irreplaceable resources. If the impacts described occur, they will be reversible if exposure ceases.

There is a low probability of the potential impacts occurring as a result of the proposed future projects considering the low predicted dust fallout and generally low measured dust fallout. The significance of the impact of the proposed operations on air quality is low with a score of 24.

Respirable particulates (PM_{10} and $PM_{2.5}$)

Although predicted ambient PM10 and PM2.5 concentrations are relatively low and well below the respective NAAQS throughout the surrounding environment and nearby residential areas, the high emissions from haul roads results in predicted ambient concentrations that exceed the annual average and 24-hour NAAQS for PM10 and PM2.5 over the south to central parts of the mine. The magnitude of the impact is therefore very high. The duration of the impact will be for the life of the operations and is therefore long term. The extent of the impact is generally limited to within 1 km of the haul roads and is therefore classified as local. The human health impact of exposure to PM10 and PM2.5 is primarily through inhalation. Although the predicted exceedances do not extend into the commercial and residential areas around the MM site, there is a moderate potential for the loss of irreplaceable resources. If the impacts described occur, they will be reversible if exposure ceases. There is a medium probability of the potential impacts occurring considering the predicted extent and magnitude of the high concentrations.

Domestic wood burning and other mining activities are the only other source of PM10 and PM2.5 in the area. The extent of the predicted impact is localised. It is therefore unlikely that emissions from activities at the MM will add significantly to ambient concentrations beyond the mining area. The cumulative impact is therefore considered to be negligible and is scored low.

The significance of the impact of operations on air quality is medium with a score of 60. The impact scores for the proposed operations are shown in Table 10 3. This assessment considers the current dust control measures. These however need to be expanded in order to reduce the emission and lower the impact significance to low with mitigation.

Operational phase: North Waste Disposal Facility (Phase 3)

Dust Fallout

The predicted dust deposition is very low and well below the limit value for acceptable dust fallout in non-residential areas. The magnitude of the current impact is therefore low. The duration of the impact will be for the life of the operations and is therefore long term. The extent of the impact is small and is limited to within 5 km of the site and mainly along the haul road and is therefore classified as local.

The impact of exposure of dust on vegetation is through deposition on leaf surfaces and inhibiting transpiration. The predicted dust fallout is low compared to the limit value for acceptable dust fallout in non-residential areas and is localised. With no irreplaceable resources in the zone of impact, there is deemed to be a very low or no potential for the loss of irreplaceable resources. If the impacts described occur, they will be reversible if exposure ceases. There is a low probability of the potential impacts occurring as a result of the proposed future project considering the low predicted dust fallout and generally low measured dust fallout. The significance of the impact of the proposed operations on air quality is low with a score of 24.

Respirable particulates (PM10 and PM2.5)

Predicted ambient PM10 and PM2.5 concentrations are very low and well below the respective NAAQS throughout the surrounding environment and nearby residential areas, and also very low along haul roads. There are no exceedances of the annual average and 24-hour NAAQS for PM10 and PM2.5 throughout the study area.

The magnitude of the impact is therefore low. The duration of the impact will be for the life of the operations and is therefore long term. The extent of the impact is generally limited to within 1 km of the haul roads and is therefore classified as local. The human health impact of exposure to PM10 and PM2.5 is primarily through inhalation. Although the predicted exceedances do not extend into the commercial and residential areas around the MM site, there is a low potential for the loss of irreplaceable resources. If the impacts described occur, they will be reversible if exposure ceases.

There is a low probability of the potential impacts occurring considering the predicted extent and magnitude of the low concentrations. Domestic wood burning and other mining activities are the only other source of PM10 and PM2.5 in the area. The extent of the predicted impact is localised. It is therefore unlikely that emissions from activities at the MM will add significantly to ambient concentrations beyond the mining area. The cumulative impact is therefore considered to be negligible and is scored low. The significance of the impact of operations on air quality is medium with a score of 26.

Operational phase: Stormwater Management Infrastructure Project, Supporting Infrastructure related to the Zero Emissions Haulage Solution, N11 Access Road Project, Permit to Innovate Project

No significant impacts are expected during the operational phase for each of these projects. For example, after construction, the N11 access road will be tarred and will no longer be a significant source of particulate emissions. After construction of the stormwater management infrastructure, the infrastructure will mainly require routine inspection and maintenance which will not be a source of significant particulate emissions.

Decommissioning and Closure

Dust generated through the closure activities will be generally coarse and impacts will manifest as a nuisance rather than a health issue. The magnitude of the impact is likely to be very low. The decommissioning and closure activities are likely to endure for 6 to 12 months and impacts might only occur during this period. The duration is therefore short-term. The pollutants are released close to ground level with little or no buoyancy. This implies that their dispersion is limited and the extent of potential impacts will be limited to the site.

Ambient concentrations of particulates is expected to be very low from decommissioning and closure, and potential air quality impacts are expected to be limited to the site. With no irreplaceable resources in the zone of impact, there is deemed to be a very low or no potential for the loss of irreplaceable resources. If the impacts described occur, they will be reversible if exposure ceases. Furthermore, there is a low probability of the potential impacts occurring. With the ceasing of mining and hauling activities relating to the future proposed projects, domestic wood burning and other mining activities in the area will be the only source of ambient PM10 and PM2.5 in the area. The limited duration and extent of the potential impact associated with decommissioning and closure activities at the site is unlikely to add significantly to ambient concentrations. The cumulative impact is therefore considered to be negligible and is scored low. The significance of the impact of the decommissioning phase on air quality is low with a score of 18.

Table 9-11: Impacts Associated with Air Quality

PROJECT	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Air Quality																					
Construction Phase																					
• Sandsloot Combination Mining – Open Pit and Underground Mining • Zwartfontein Final Pushback • Anthropogenic Aquifer • Stormwater Management Infrastructure • North Waste Rock Disposal Facility (Phase 3) • Supporting Infrastructure related to the Zero Emissions Haulage Solution • N11 Access Road & Zwartfontein Haul Road • Permit to Innovate	Increase in ambient PM_{10} and $PM_{2.5}$ concentrations	PM10 and PM2.5 emitted from mining activity and haul roads	4	2	1	1	1	2	18		Low	Negative	• Develop and implement an Air Quality Monitoring and Management Plan inclusive but not limited to the following: o Dust control measures, i.e., spraying of mine roads and haul road. o Continue with the current monthly dust fallout programme. o Enforcement of speed limits on all mine roads. Adherence to speed control signage. o Traffic calming measures where appropriate. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides Air Quality monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	2	2	1	1	1	2	14	
	Increase in dust deposition	TSP emitted from mining activity and haul roads	4	2	1	1	1	2	18		Low	Negative		2	2	1	1	1	2	14	
Operational Phase																					
• Sandsloot Combination Mining – Open Pit and Underground Mining • Zwartfontein Final Pushback • Anthropogenic Aquifer • Stormwater Management Infrastructure • Infrastructure related to the Zero Emissions Haulage Solution • N11 Access Road • Permit to Innovate	Increase in ambient PM10 and PM2.5 concentrations	PM10 and PM2.5 emitted from mining activity and haul roads	10	4	2	3	1	3	60		Medium	Negative	• Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: o Dust control measures, i.e., spraying of mine roads and haul road. o Continue with the current monthly dust fallout programme. o Enforcement of speed limits on all mine roads. Adherence to speed control signage. o Traffic calming measures where appropriate. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides Air Quality monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	4	4	2	1	1	3	36	
	Increase in dust deposition	TSP emitted from mining activity and haul roads	4	4	2	1	1	2	24		Low	Negative		2	4	2	1	1	2	20	
Zwartfontein haul Road	Increase in dust deposition	PM10 and PM2.5 emitted from the proposed New Haul Road	10	4	2	3	1	4	80		Medium	Negative		4	4	2	1	1	3	36	
North Waste Rock Disposal Facility Phase 3	Increase in ambient PM10 and PM2.5 concentrations	PM10 and PM2.5 emitted from mining activity and haul roads	4	4	2	1	1	2	24		Low	Negative		2	4	2	2	1	2	22	
	Increase in dust deposition	TSP emitted from mining activity and haul roads	4	4	2	1	1	2	24		Medium	Negative		2	4	2	1	1	2	20	
Closure																					

• Sandsloot Combination Mining – Open Pit and Underground Mining • Zwartfontein Final Pushback • Anthropogenic Aquifer • Stormwater Management Infrastructure • North Waste Rock Disposal Facility (Phase 3) • Supporting Infrastructure related to the Zero Emissions Haulage Solution • N11 Access Road • Permit to Innovate	Increase in ambient PM10 and PM2.5 concentrations	PM10 and PM2.5 emitted from mining activity and haul roads	4	2	1	1	1	2	18		Low	Negative	• Maintain an Air Quality Monitoring and Management Plan inclusive but not limited to the following: o Dust control measures, i.e., spraying of mine roads and haul road. o Continue with the current monthly dust fallout programme Enforcement of speed limits on all mine roads • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides Air Quality monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	2	2	1	1	1	2	14	
	Increase in dust deposition	TSP emitted from mining activity and haul roads	4	2	1	1	1	2	18		Low	Negative		2	2	1	1	1	2	14	

9.3.8 Noise

This section has been compiled utilizing the Environmental Noise Impact Assessment for Anglo-American Platinum Limited Rustenburg Platinum Mines Mogalakwena Complex Integrated Authorisation Process. Complied by dBAcoustics dated March 2023.

The noise levels at the noise sensitive areas were added in a logarithmic manner to determine the overall sound exposure at the receptor. The increase in the prevailing ambient noise level was then calculated (dBAcoustic, 2023).

The criterion for assessing the magnitude of a noise impact is illustrated in Table 9-12.

Table 9-12: Noise level intrusion criteria

Increase Δ-dBA	Assessment of impact magnitude	Color code
0 <Δ≤ 1	Not audible	
1 <Δ≤ 3	Very Low	
3 <Δ≤ 5	Low	
5 <Δ≤ 10	Medium	
10 <Δ≤ 15	High	
15 <Δ	Very High	

Distances from the project area and the communities are provided in Table 9-13.Noise level intrusion criteria

Table 9-13: Distances (m) between project area and the receptors

SANDSLOOT COMBINATION MINING								
Noise receptors	Pit	Opening in high wall to underground mine	Waste rock	Vent shaft 1	Vent shaft 2	Vent shaft 3	Vent shaft 4	Laydown area
Sandsloot	2 282	1 477	1 143	6 030	4 472	3 292	2 916	1 615
Danisane	1 996	1 259	2 052	5 405	3 797	2 770	2 310	2 159
Skimming	3 849	3 748	2 932	3 008	1 876	2 604	2 593	4 818
Seritaria Secondary School	3 615	4 017	3 245	2 402	1 797	2 595	2 610	4 926
Hans Masibe Primary School	4 274	4 238	3 262	5 099	4 021	4 024	3 700	5 516
Madikwe Secondary School	3 155	2 375	2 279	6 475	4 859	3 909	3 467	2 937

ZWARTFONTEIN FINAL PUSHBACK		
Noise receptors	Zwartfontein open pit - South	Zwartfontein open pit - North
Skimming	1 349	1 236
Seritaria Secondary School	950	850
Hans Masibe Primary School	3 729	3 578
Ga- Molekana	3059	3 187
Danisane	4 212	4 212

ANTHROPOGENIC AQUIFER (SANDSLOOT AND ZWARTFONTEIN)		
Noise receptors	Sandsloot Aquifer	Zwartfontein Aquifer
Skimming	3 485	1 551
Seritaria Secondary School	3 434	1 503
Hans Masibe Primary School	4 338	3 407
Ga- Molekana	2 947	2 938

ANTHROPOGENIC AQUIFER (SANDSLOOT AND ZWARTFONTEIN)		
Noise receptors	Sandsloot Aquifer	Zwartfontein Aquifer
Danisane	1 993	3 267
Sandsloot	2 201	4 001

STORMWATER CONTROL DAM				
Noise receptors	Stormwater control dam	Storm water channels	Access Road	Pumps
Mesopotamia	515	606	625	650
Ga-Chaba	1041	1 005	1225	1 420
Skimming	4 201	4 130	4 150	4 260
Mapela Junior Primary	2 186	2 292	2 420	2 580
Matopa	1 710	1 510	1 750	1 810
Fothane	1 784	1 495	1 795	1 855
Kwakalata	1 238	1 348	1 576	1 710

ZERO EMISSIONS HAULAGE SOLUTION				
Noise receptors	Hydrogen Power line	Hydrogen pipeline	Roads	Substation
Ga-Molekana	485	90	3 161	1 844
Ga-SekaoleloGa-Sekoalelo	2 065	2 990	2 800	4 325
Sekuruwe	3 438	3 147	3 416	4 432

NORTH WASTE ROCK DISPOSAL FACILITY	
Noise receptors	North waste rock dump
Sekuruwe	3 318
Ga--Rawele	3 030
Phafola	1 128
Mesopotamia north west	150
Mesopotamia middle	150
Ga-Chaba	1 445
Fothane	2 764

N11 ACCESS ROAD	
Noise receptors	Access road to MM Complex
Ga-Molekana	1 340
Ga-Sekaolelo	2 046
Sekuruwe	2 311

PERMIT TO INNOVATE	
Noise receptors	Innovate project area
Ga-Molekana	1 623
Machikiri Primary School	3 172
Machikiri	3 952

The following sound levels were used in determining the noise intrusion level during the following phases:

9.3.8.1 Construction Phase

The following sound levels were used in determining the noise intrusion level during the construction phase at the different project construction areas:

- ***Sandsloot Combination Mining***
  - Opencast preparation – 85.0dBA;
  - Construction activities at the workshops and administration buildings – 81.0dBA;
  - Construction activities at the access road – 82.0dBA;
  - Construction activities at the internal haul roads – 86.0dBA;
  - Raise bore tunnel drilling at the mine adit – 70.0dBA;
  - Raise bore drilling for the ventilation shaft openings at ventilation shaft pad – 90.0dBA; and
  - Construction activities at the waste rock dump – 86.5dBA.

- ***Zwartfontein Final Pushback***

- Preparation of the push-back section areas – 85.0dBA;
    - Removal of Overburden – 86.0dBA;
    - Earth drilling – 90.5dBA
- ***Anthropogenic Aquifer (Sandsloot and Zwartfontein)***
    - Preparation of the proposed aquifer pit – 85.0dBA;
    - Deposition of unsaturated rock into the aquifer pit – 86.0dBA;
    - Hauling vehicles noise – 87.0dBA; and
    - Installation of pumps and pipelines – 90.5dBA.
- ***Stormwater Control Dam and Associated Infrastructure***
    - Preparation of ground for the proposed stormwater control dam – 85.0dBA;
    - Construction of stormwater channels – 86.0dBA;
    - Construction of access road – 87.0dBA; and
    - Installation of pumps and pipelines – 90.5dBA.
- ***North Waste Rock Dump Phase 3***
    - Preparation of the proposed increase in height – 85.0dBA;
    - Construction of soft noise barriers – 86.0dBA;
    - Earthmoving machinery – 87.0dBA; and
    - Tipping of soil/waste rock for construction activities – 90.5dBA.
- ***Zero Haulage Emissions Solution***
    - Clearing and grubbing of topsoil and vegetation – 85.0dBA;
    - Transportation of building material – 86.5dBA
    - Earthmoving machinery – 87.0dBA;
    - Construction activities at each site – 86.0dBA;
    - Construction activities at the internal haul roads; and
    - Construction activities at the OHP and pipelines – 80.5dBA.
- ***N11 Access Road***
    - Clearing and grubbing of topsoil and vegetation – 85.0dBA;
    - Transportation of building material – 86.5dBA
    - Earthmoving machinery – 87.0dBA;
    - Civil construction activities – 80.0dBA;
    - Construction activities of the new tarred road – 80.5dBA;
    - Reverse signal– 89.0dBA.
- ***Permit to Innovate***
    - Clearing and grubbing of topsoil and vegetation – 85.0dBA;
    - Transportation of building material – 80.5dBA
    - Earthmoving machinery – 87.0dBA
    - Civil construction activities – 86.5dBA
    - Construction infrastructure – 86.0dBA; and
    - Construction of new buildings – 86.5dBA.

The noise intrusion levels at the abutting communities during the operational phase for the Sandsloot combination mining are provided in Refer to Table 9-12 for the noise intrusion criteria indicated on Table 9-14.

Table 9-14.

Sandsloot Combination Mining - The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors. The calculated noise intrusion levels for the rehabilitation phase will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Zwartfontein Final Pushback - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at MM Complex. The calculated noise intrusion levels for the operational phase will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors. The calculated noise intrusion levels for the rehabilitation phase will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Anthropogenic Aquifer (Sandsloot and Zwartfontein) - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at the project area.

Stormwater Control Dam and Associated Infrastructure - The construction of the stormwater control dam will be located west of the North pit (south of the Mesopotamia community) and the storm water channels, access road, pumping system, at ground level in the vicinity of the North pit. The diversion channels/pipelines/tunnels/canals will route the collected water to the Storm Water Control Dam for re-use within the operations.

North Waste Rock Dump Phase 3 - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA except at Mesopotamia (north west) during the day and at Mesopotamia (middle) during the night. The noise from the proposed construction activities at Mesopotamia will be audible at the abutting noise receptors but insignificant at Sekuruwe, Ga-Rafele, Ga-Chaba and Fothane due to the existing mining activities at the project area.

Infrastructure in support of the Zero Emission Haulage Solution - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at the project area.

N11 Access Road - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at the project area.

Permit to Innovate - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at the project area. The calculated noise intrusion levels for the operational and rehabilitation phase will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

9.3.8.2 Operational Phase

The following sound levels were used in determining the noise intrusion level during the operational phase of the mining activities:

- ***Sandsloot Combination Mining***
  - Underground activities at the adit – 87.5dBA;
  - Mobile machinery at the adit – 90.0dBA;
  - Removal of ore and loading in the pit – 86.5dBA;
  - Hauling of ore to the plant – 95.0dBA;
  - Waste rock activities – 85.0dBA;
  - ROM – 86.5dBA;
  - Upcast ventilation shaft – 105.0dBA; and
  - Emergency generator – 95.0dBA.

- ***Zwartfontein Final Pushback***
    - Removal of waste rock – 85.0dBA;
    - Removal of Ore – 86.5dBA;
    - Hauling vehicle noise – 87.0dBA;
    - Earth drilling – 90.5dBA.
- ***Anthropogenic Aquifer (Sandsloot and Zwartfontein***
    - Pumps to remove water from the aquifer pit – 85.0dBA;
    - Pump stations – 86.5dBA; and
    - Water reticulation system – 87.0dBA.
- ***Stormwater Control Dam and Associated Infrastructure***
    - Pumps to remove water from the stormwater channels – 85.0dBA;
    - Pump stations – 86.5dBA;
    - Motor vehicles – 87.0dBA; and
    - Siren – 90.5dBA.
- ***North Waste Rock Dump Phase 3***
    - Tipping of waste rock – 90.0dBA;
    - Hauling vehicles – 86.5dBA; and
    - Reverse signal – 89.0dBA.
- ***Zero Haulage Emissions Solution***
    - Pumping of water to the plant – 90.0dBA;
    - Sub-station to supply power – 86.5dBA;
    - Delivery of Hydrogen to the fuel stations; and
    - Reverse signal – 89.0dBA.
- ***N11 Access Road***
    - Motor-vehicles travelling along the is road – 80.0dBA; and
    - Maintenance activities – 86.5dBA.
- ***Permit to Innovate***
    - Testing of Innovate projects – 85.0dBA;
    - HVAC systems – 87.0dBA; and
    - Testing bay activities – 86.5dBA.

The noise intrusion levels at the abutting communities during the operational phase for the project are illustrated in Refer to Table 9-12 for the noise intrusion criteria indicated on Table 9-14.

Table 9-14.

Anthropogenic Aquifer (Sandsloot and Zwartfontein) -. The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Stormwater Control Dam and Associated Infrastructure - The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at the project area. The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors. The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

North Waste Rock Dump Phase 3 - The calculated noise intrusion levels will exceed the threshold level of 7.0dBA at Mesopotamia (north west) during the day and Mesopotamia (middle) during the night. The noise intrusion will be insignificant at Sekuruwe, Ga-Rafele, Ga-Chaba and Fothane respectively. The calculated noise intrusion levels will be insignificant during the rehabilitation phase and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Infrastructure in support of the Zero Emission Haulage Solution - The calculated noise intrusion levels for the operational and rehabilitation phases will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

N11 Access Road - The calculated noise intrusion levels for the operational and rehabilitation phase will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

9.3.8.3 Rehabilitation Phase

- ***Sandsloot Combination Mining***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.
- ***Anthropogenic Aquifer (Sandsloot and Zwartfontein***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.
- ***Stormwater Control Dam and Associated Infrastructure***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.
- ***North Waste Rock Dump Phase 3***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.
- ***Zero Haulage Emissions Solution***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.
- ***N11 Access Road***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA
- ***Permit to Innovate***
  - Rehabilitation of disturbed areas – 86.5dBA;
  - Planting of grass and vegetation – 84.5dBA.

Refer to Table 9-12 for the noise intrusion criteria indicated on Table 9-14.

Table 9-14: Calculated cumulative noise intrusion levels during the various project Phases

	Construction Phase					Operational Phase					Decommissioning & Closure				
Position	Cumulative noise levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night-time	Cumulative noise levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night-time	Cumulative noise levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night-time
SANDSLOOT COMBINATION MINING															
Sandsloot	24.3	42.5	38.7	0.1	0.2	30.5	42.7	39.1	0.3	0.6	14.3	49.0	46.7	0.0	0.0
Danisane	24.6	42.5	38.7	0.1	0.2	30.3	42.7	39.1	0.3	0.6	15.8	36.8	42.1	0.0	0.0
Skimming	18.6	46.7	47.1	0.0	0.0	29.9	46.8	47.2	0.1	0.1	16.3	27.9	31.9	0.3	0.1
Seritaria Secondary School	19.1	46.7	45.8	0.0	0.0	31.6	46.8	46.0	0.1	0.2	16.3	36.6	37.4	0.0	0.0
Hans Masibe Primary School	17.3	47.8	45.1	0.0	0.0	26.4	47.8	45.2	0.0	0.1	12.5	27.0	31.1	0.2	0.1
Madikwe Secondary School	20.4	47.8	45.1	0.0	0.0	27.1	47.8	45.2	0.0	0.1	12.8	26.6	33.9	0.2	0.0
ZWARTFONTEIN PUSHBACK															
Skimming	26.7	47.8	46.6	0.0	0.0	12.8	49.0	46.7	0.0	0.1	22.0	49.0	46.7	0.0	0.0
Seritaria Secondary School	29.8	46.8	47.3	0.1	0.1	25.2	37.1	42.2	0.2	0.2	25.1	36.8	42.1	0.0	0.0
Hans Masibe Primary School	17.9	39.4	46.5	0.0	0.0	22.7	28.8	32.3	0.0	0.0	13.2	27.6	31.8	0.0	0.0
Ga- Molekana	19.6	40.9	40.2	0.0	0.0	30.3	37.5	38.2	0.0	0.0	14.9	36.6	37.4	0.0	0.0
Danisane	16.9	45.0	38.9	0.0	0.0	20.2	42.4	38.6	0.0	0.1	12.1	42.4	38.5	0.0	0.0
ANTHROPOGENIC AQUIFERS- SANDSLOOT															
Skimming	21.1	39.5	44.1	0.1	0.0	21.8	46.7	45.8	0.0	0.0	13.8	46.7	47.1	0.0	0.0
Seritaria Secondary School	21.2	47.8	46.6	0.0	0.0	21.9	47.8	45.1	1.1	0.0	13.9	46.7	45.8	0.0	0.0
Hans Masibe Primary School	19.2	47.8	46.6	0.0	0.0	19.9	47.8	45.1	0.0	0.0	11.9	47.8	45.1	0.0	0.0
Ga- Molekana	22.6	41.0	40.3	0.1	0.1	20.7	46.7	38.6	0.0	0.1	15.2	46.7	45.1	0.0	0.0
Danisane	26.0	45.1	39.1	0.1	0.2	26.5	42.5	38.8	0.1	0.3	18.6	42.4	38.5	0.0	0.0
ANTHROPOGENIC AQUIFERS - ZWARTFONTEIN															
Skimming	28.1	39.7	44.2	0.3	0.1	28.7	46.8	45.9	0.1	0.1	20.8	46.7	47.1	0.0	0.0
Seritaria Secondary School	28.4	47.8	46.7	0.0	0.1	28.9	47.9	45.2	1.2	0.1	21.1	46.7	45.8	0.0	0.0
Hans Masibe Primary School	21.3	47.8	46.6	0.0	0.0	22.0	47.8	45.1	0.0	0.0	14.0	47.8	45.1	0.0	0.0
Ga- Molekana	22.6	41.0	40.3	0.1	0.1	20.7	46.7	38.6	0.0	0.1	15.3	46.7	45.1	0.0	0.0
Danisane	21.7	45.0	39.0	0.0	0.1	22.3	42.4	38.6	0.0	0.1	14.3	42.4	38.5	0.0	0.0
Sandsloot	19.9	42.5	39.2	0.0	0.1	20.6	42.4	38.6	0.0	0.1	20.8	46.7	47.1	0.0	0.0
STORMWATER MANAGEMENT INFRASTRUCTURE															
Mesopotamia	33.8	44.7	40.7	0.4	1.0	35.6	44.8	41.1	0.5	14	30.6	44.5	40.2	0.2	0.5

Ga-Tshaba	28.2	39.7	44.2	0.3	0.1	30.2	39.9	44.4	0.5	0.2	25.3	39.6	44.3	0.2	0.1
Ga-Masenya	17.0	39.4	44.1	0.0	0.0	18.7	47.8	45.1	0.0	0.0	13.1	47.8	45.1	0.0	0.0
Mapela Junior Primary	21.8	47.8	46.3	0.0	0.0	23.7	39.5	44.2	0.1	0.0	18.5	39.4	44.2	0.0	0.0
Matopa	24.8	39.5	44.2	0.1	0.1	26.9	44.4	39.9	0.1	0.2	16.5	44.3	39.7	0.0	0.0
Fo-thane	24.7	44.3	39.8	0.0	0.1	26.8	46.7	47.2	0.0	0.0	17.8	46.7	47.2	0.0	0.0
Kwakalata	26.2	44.4	39.9	0.1	0.2	28.0	44.4	40.0	0.1	0.3	23.3	44.3	39.8	0.0	0.1
NORTH WASTE ROCK DISPOSAL FACILITY															
Sekuruwe	19.3	44.7	49.0	0.0	0.0	20.5	44.7	43.1	0.0	0.0	13.3	44.7	43.1	0.0	0.0
Ga--Rawele	20.0	39.2	39.4	0.1	0.0	21.3	39.2	39.5	0.1	0.1	14.1	39.1	39.4	0.0	0.0
Phafola	28.5	39.7	44.2	0.3	0.1	29.9	44.5	40.1	0.2	0.4	22.6	44.3	39.8	0.0	0.1
Mesopotamianorth west	46.0	46.9	48.2	7.5	4.1	47.4	48.0	49.1	8.6	4.9	40.2	42.8	45.6	3.4	1.4
Mesopotamia middle	46.0	48.2	46.9	3.9	7.2	47.4	49.1	48.1	4.8	8.4	40.2	45.7	43.0	1.4	3.3
Ga-Chaba	26.4	39.6	44.2	0.2	0.1	27.7	39.7	44.3	0.3	0.1	20.5	39.5	44.2	0.1	0.0
Fothane	20.8	39.5	44.1	0.1	0.0	23.3	44.3	39.8	0.0	0.1	16.1	44.3	39.7	0.0	0.0
ZERO EMISSIONS HAULAGE SOLUTIONS															
Ga-Molekana	49.6	51.1	49.9	3.9	12.8	33.3	44.6	46.0	0.3	0.2	28.9	44.4	40.0	0.1	0.3
Ga-SekoaleloGa-Sekaolelo	22.6	37.2	37.0	0.0	0.0	23.3	46.7	43.1	0.0	0.0	7.2	46.7	45.8	0.0	0.0
Sekuruwe	19.0	37.9	37.8	0.0	0.0	19.5	44.7	43.1	0.0	0.0	4.4	44.7	43.1	0.0	0.0
N11 ACCESS ROAD															
Ga-Molekana	26.9	45.8	37.2	0.1	0.4	26.9	45.8	37.2	0.1	0.4	26.2	44.4	39.9	0.1	0.2
Ga-Sekaolelaelo	23.3	37.2	37.0	0.2	0.2	23.3	37.2	37.0	0.2	0.2	22.5	46.7	45.8	0.0	0.0
Sekuruwe	22.2	37.9	37.8	0.1	0.1	22.2	37.9	37.8	0.1	0.1	21.4	44.7	43.1	0.0	0.0
PERMIT TO INNOVATE															
Ga-Molekana	26.4	45.8	37.2	0.1	0.4	26.6	46.7	47.1	0.0	0.0	20.4	46.7	47.1	0.0	0.0
Machikiri Primary School	19.5	37.1	36.9	0.1	0.1	26.9	46.7	45.9	0.0	0.1	14.6	46.7	45.8	0.0	0.0
Machikiri	17.6	37.8	37.7	0.0	0.0	19.9	47.8	45.1	0.0	0.0	12.7	47.8	45.1	0.0	0.0

Table 9-15: Impacts Associated with Noise

PROJECT	POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
			M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Noise																					
Construction Phase																					
Sandsloot Combination Mining		• Clearing and stripping of topsoil and vegetation. • Construction activities of the offices, ablution workshops, buildings. • Upgrade of the access road and internal roads leading to the box cut. • Construction activities at the ventilation shafts through the raise bore drill method. • Construction of laydown areas.	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
Zwartfontein Final Pushback		• Upgrade of the existing haul roads and the construction of new haul roads. • Earthworks at strategic areas at the push-back footprint	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
Anthropogenic Aquifer		• Preparing the open cast pit – Sandsloot and Zwartfontein. • Tipping of unsaturated rock into the open cast pits. • Haulage of unsaturated rock. • Construction of pipelines	4	2	2	3	3	3	42		Medium	Negative	• Develop and implement a site-specific Noise Management Plan inclusive but not limited to the following: o Construction activities for daytime and nighttime provided that the prevailing ambient noise levels at the boundary of the mine is not exceeded. o Upgrade activities for daytime and nighttime to be undertaken provided that the prevailing ambient noise levels is not exceeded. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides noise monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	2	2	2	3	3	3	36	
Stormwater Control Dam and Associated Infrastructure	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	• Clearing and stripping of topsoil • Construction of stormwater channels and access road.	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
N11 Access Road		• Clearing and stripping of topsoil and vegetation of the access road footprint. • Construction of culverts and access road	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
Zero emission haulage solution		• Transportation of building material • Earthmoving machinery • Construction activities of the OHP lines, roads, truck workshop and pipelines	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
Permit to Innovate		• Clearing and grubbing of topsoil and vegetation. • Transportation of building material. • Construction of the buildings	4	2	2	3	3	3	42		Medium	Negative		2	2	2	3	3	3	36	
North Waste Rock Dump Phase 3		• Preparation of the new area where waste rock will be constructed. • Preparation of the new area where waste rock will be constructed. • Preparation of the new area where waste rock will be constructed.	8	2	2	4	3	4	76		Medium	Negative	• Develop and implement a site-specific Noise Management Plan inclusive but not limited to the following: o Construction activities for daytime and nighttime to be undertaken provided that the prevailing ambient noise levels is not exceeded. o Construction of the soft bund wall during daytime and if the prevailing ambient noise level will not be exceeded during night-time (where possible). o Earthmoving machinery activities to be allowed during daytime and nighttime provided that the prevailing ambient noise levels at the boundary of the mine is not exceeded.	6	2	2	4	3	4	68	
Operational Phase																					

Sandsloot Combination Mining	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	• Mining activity from machinery and equipment at the mining pad at the Adit.	6	3	2	4	3	3	54	Medium	Negative	• Maintain a site-specific Noise Management Plan inclusive but not limited to the following: o Noise monitoring to identify noise intrusion levels on a pro-active basis. o Noise surveys to be done to identify noise sources on a pro-active basis. o Tipping activities to be controlled by the installation of a soft bund wall to prevent rocks from rolling down the discard dump. o Tipping of ROM to be done during daytime and nighttime provided that the prevailing ambient noise levels is not exceeded. o Maintenance activities to be done during daytime and nighttime provided that the prevailing ambient noise levels is not exceeded o Implementation of noise reducing measures on equipment, where possible. o o Regular maintenance of vehicles and equipment. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides noise monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	6	3	2	3	3	3	51
		• Hauling of ore by means of conveyor and/or hauling vehicles. • Run of Mine stockpiling. • Upcast ventilation shafts. • Use of an emergency generator.	3	3	2	3	3	3	42	Medium	Negative		2	3	2	3	3	3	39
Zwartfontein Final Pushback		• Hauling of waste rock from the final push-back footprint to the waste rock dump. • Earth drilling at the final pushback	3	3	2	3	3	3	42	Medium	Negative		2	3	2	3	3	3	39
		• Tipping of waste rock at the WRD.	6	3	2	4	3	3	54	Medium	Negative		6	3	2	3	3	3	51
Anthropogenic Aquifer		• Pumping of water from the aquifers. • Maintenance activities	3	3	2	3	3	3	42	Medium	Negative		2	3	2	3	3	3	39
Stormwater Control Dam and Associated Infrastructure		• Pumping of water to the stormwater control dam. • Pumping of water to the stormwater control dam	6	3	2	4	3	3	54	Medium	Negative		4	2	2	2	3	3	39
N11 access road		• Traffic along the access road	6	3	2	4	3	3	54	Medium	Negative		6	3	2	3	3	3	51
		• Maintenance activities	6	3	2	4	3	3	54	Medium	Negative		4	3	2	2	2	3	39
Zero emission haulage solution		• Pumping of water	6	3	2	4	3	3	54	Medium	Negative		4	2	2	2	3	3	39
Permit to Innovate		• Testing of projects indoors and/or outdoors	6	3	2	4	3	3	54	Medium	Negative		6	3	2	3	3	3	51
		• HVAC systems	6	3	2	4	3	3	54	Medium	Negative		4	2	2	2	3	3	39
North Waste Rock Dump Phase 3		• Hauling activities to and from the waste rock site. • Tipping of waste rock.	8	2	2	4	3	4	76	Medium	Negative	• Maintain a site-specific Noise Management Plan inclusive but not limited to the following: o Noise monitoring to identify potential noise intrusion levels on a pro-active basis. o Tipping of waste rock facing the residential areas must adhere to Noise and vibration management plan. o Noise sources in excess of 85.0dBA to be acoustically screened off. o Hauling of waste rock undertaken along the boundary of the waste rock dumps facing the residential areas to be in line with the prevailing ambient noise level.	6	2	2	4	3	4	68
Closure																			
Sandsloot Combination Mining	Noise increase in excess of the threshold value for a noise disturbance of 7.0dBA above the ambient noise level at the boundary of the mine footprint and at the abutting residential areas	• Removal of structures and buildings. • Rehabilitation of disturbed areas.	4	2	2	3	3	3	42	Medium	Negative	• Maintain a site-specific Noise Management Plan inclusive but not limited to the following: o Decommissioning and rehabilitation activities to be undertaken in line with the prevailing ambient noise level. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides noise monitoring and management on site. o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	2	2	2	3	3	3	36
Zwartfontein Final Pushback			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
Anthropogenic Aquifer			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
Stormwater Control Dam and Associated Infrastructure			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
N11 Access Road			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
Zero emission haulage solution			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
Permit to Innovate			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36
North Waste Rock Dump Phase 3			4	2	2	3	3	3	42	Medium	Negative		2	2	2	3	3	3	36

9.3.9 Paleontological

This section has been compiled utilizing the Paleontological Impact Assessment for Mogalakwena Mining Complex. Complied by Banzai Environmental dated April 2023.

No fossiliferous outcrops and no karstic weathered outcrop areas were detected in the proposed development area. The rarity of fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in paleontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to damaging impacts on the paleontological resources of the area.

The potential impacts associated with paleontological resources is provided in **Table 9-16**.

Table 9-16: Paleontological Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Paleontological																				
Construction Phase																				
Loss of fossil heritage	Mining Activities	6	2	1	5	5	3	57		Medium	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ Development and implementation of a "Chance Find Procedure". ○ Should fossils be unearthed the Contractor shall notify the Provincial Heritage Resource Agency Limpopo. ○ The area must be fenced off with a 30m barrier and the construction workers must be informed that this is a no-go area. ○ If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Mogalakwena Mining Complex's Chance Find Protocol must be implemented by the ECO/site manager in charge of these developments.	2	2	1	5	5	1	15	
Operational Phase																				
Loss of fossil heritage	Mining Activities	6	2	1	5	5	3	57		Medium	Negative	• Same as the construction phase	2	2	1	5	5	1	15	
Closure																				
Loss of fossil heritage	Mining Activities	6	2	1	5	5	3	57		Medium	Negative	• Maintain a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ Should fossils be unearthed the Contractor shall notify the Provincial Heritage Resource Agency Limpopo. ○ The area must be fenced off with a 30m barrier and the construction workers must be informed that this is a no-go area. ○ if fossil remains are discovered during any decommissioning or earth work excavations during closure, the Mogalakwena Mining Complex's Chance Find Protocol in association with the Chance Find Protocol must be implemented by the ECO/site manager in charge of these developments	2	2	1	5	5	1	15	

9.3.10 Heritage

This section has been compiled with reference to Heritage Impact Assessment for the Proposed Mogalakwena Mine Integrated EIA Project. Complied by PGS Heritage dated May 202.

According to the Heritage Impact Assessment, sites of cultural and heritage significance were found within the project area. These sites have been described in Chapter 7.10 of this report. The following potential impacts have been identified:

- Destruction / disturbance of burial grounds and graves.
- Destruction / disturbance of homesteads or other structural remains with the risk for containing graves.
- Destruction / disturbance of initiation schools.
- Destruction / disturbance of Stone Age sites.
- Destruction / disturbance of unmarked graves associated with the former settlement at Sandsloot and the few buildings from the Mesopotamia Community.

The majority of the sites identified are situated with the proposed development footprint. It is important that prior to the commencement of construction activities on site, an archaeologist accompany the project team to site to indicate where sensitive cultural heritage and archaeological sites are located. An impact assessment has been undertaken for the pre-construction phase as mitigation for this aspect is required prior to the commencement of construction activities.

The potential impacts associated with heritage resources is provided in **Table 9-17** .

Table 9-17: Heritage Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Heritage																				
Pre-Construction Phase																				
Disturbance of burial grounds and graves	Mining Activities	10	5	4	4	4	4	108		Medium	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ A grave relocation process must be undertaken. ○ A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation. ○ Bilingual site and newspaper notices indicating the intent of the relocation. ○ Permits from all the relevant and legally required authorities. ○ An exhumation process that keeps the dignity of the remains and family intact. ○ An exhumation process that safeguards the legal rights of the families as well as that of the mining company. ○ The process must be done by a reputable company well versed in the mitigation of graves. ○ Consideration of intangible heritage through: ▪ Respecting norms, values and customs of surrounding communities ▪ All workers to operate in accordance with AAP's Code of Conduct ▪ Ongoing engagements with local communities	8	5	3	3	3	4	88	
Disturbance of homesteads or structural remains with the risk for unmarked graves	Mining Activities	8	5	3	4	4	3	72		Medium	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ A social consultation process to assess whether any local residents or the wider public is aware of the presence of graves at these sites. ○ Depending on the outcome of the social consultation process, three different outcomes would be the result, namely: ▪ Outcome 1: The social consultation absolutely confirms that no graves are located here. ▪ Outcome 2: The social consultation absolutely confirms that graves are located here. ▪ Outcome 3: The social consultation does not yield any confident results. ○ The following mitigation measures would be required for sites falling under Outcome 1: ▪ No further grave-related mitigation would be required. ▪ The following mitigation measures would be required for sites falling under Outcome 2: ▪ A grave relocation process must be undertaken. ▪ A detailed social consultation process, at least 60 days in length, comprising the attempted identification of the next-of-kin in order to obtain their consent for the relocation. ▪ Bilingual site and newspaper notices indicating the intent of the relocation. ▪ Permits from all the relevant and legally required authorities. ▪ An exhumation process that keeps the dignity of the remains and family intact. ▪ An exhumation process that safeguards the legal rights of the families as well as that of the mining company. ▪ The process must be done by a reputable company well versed in the mitigation of graves. ○ The following mitigation measures would be required for sites falling under Outcome 3: ▪ Test excavations to physically confirm the presence or absence graves. ▪ If no evidence for graves is found, the site will fall within Outcome 1 as outlined above. This means that no further mitigation measures would be required. ▪ If evidence for graves is found, the site will fall within Outcome 2 as outlined above. This means that a full grave relocation process must be implemented. ○ Additionally, the following mitigation measures must be undertaken for all these sites: ▪ All structures and site layouts from each site must be recorded using standard survey methods. The end result would be site layout plans for all these sites. ▪ A mitigation report must be compiled for these sites within which all the mitigation measures and its findings will be outlined. ▪ The recorded drawings from the previous item must also be included in this mitigation report. ▪ The completed mitigation report must be submitted to the relevant heritage authorities.	6	5	2	3	3	2	38	
Destruction of Initiation schools	Mining Activities	8	5	3	4	3	3	69		Medium	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ Stakeholder engagement must be undertaken with knowledgeable and elderly former residents of nearby homesteads. This stakeholder engagement must be aimed at confirming the presence of initiation schools at these sites. ○ Once confirmed, meetings must be scheduled with the associated traditional authority. The aim of these meetings would be to inform the traditional authority regarding the identified initiation schools and secondly request the traditional authority to provide guidance on how these sites may be mitigated. ○ Consideration of intangible heritage through: ▪ Respecting norms, values and customs of surrounding communities ▪ All workers to operate in accordance with AAP's Code of Conduct ▪ Ongoing engagements with local communities	6	5	3	3	2	2	38	
Destruction of Stone age sites	Mining Activities	6	5	2	2	3	3	54		Low	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ The sites must be assessed in the field by a suitably qualified Stone Age specialist. ○ The recommendations made by the Stone Age specialist must be adhered to. Such recommendations may include the archaeological recording of a surface layout plan, surface collection of lithics, etc.	4	5	2	2	2	2	30	

Risk of Unmarked Graves at Old Settlements and Newer Buildings	Mining Activities	8	5	3	4	4	3	72		Medium	Negative	• Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: ○ Stakeholder engagement with the former residents of the two settlements and the current residents of the buildings regarding the risk for unmarked graves. ○ Once individual homesteads are identified, the mitigation measures as outlined for disturbance of homestead should be followed.	6	5	2	3	3	2	38	
Construction, Operational, & Closure																				
Uncovering and destruction of sensitive artefacts / Graves.	Mining Activities	6	5	2	2	3	3	54		Medium	Negative	○ Implementation of the Chance Find Procedure	4	5	1	1	2	2	26	

9.3.11 Visual and Sunlight

This section has been compiled with reference to the Visual Impact Assessment and Sunlight Impact Assessment for Anglo American Platinum: Rustenburg Platinum Mines. Mogalakwena Mine Complex. Complied by Alta van Dyk Environmental Consultants dated March 2023.

Visual

The initial establishment of the MM operations and its associated infrastructure has already altered the visual landscape of the area. The highly sensitive receptors that surround the mining operation have already been visually impacted upon and the sense of place drastically altered due to the initial establishment of infrastructure that is not congruent to that of the visual backdrop.

The establishment of the NWRD Full Extent within close proximity of the surrounding community will significantly contribute to an additional impact as this facility has not yet been constructed and will be implemented at a proposed height that will be close to triple the existing facility approved height. The communities residing north of NWRD will at its full extent lose sign of the Motlhotlo Hills, although the full development of WRD020 will already impact this line of sight.

Sunlight

The impact of shadow projection from the initial establishment of the MM operations and its associated infrastructure (Waste Rock Disposal Facilities) has already impacted upon the surrounding communities.

As the sun rises in the east and sets in west in the afternoon, shadow projection is experienced mostly to the west (sunrise) and east (sunset).

The establishment of the NWRD Full Extent within close proximity of the surrounding community will significantly contribute to an additional impact as this facility has not yet been constructed and as such the community has not yet experienced shadow projection during the morning and afternoon golden hours.

The potential impacts associated with visual, and sunlight is provided in **Table 9-18.**

Table 9-18: Visual & Sunlight Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Visual																				
Construction, Operational and Closure Phase																				
Visual Impact on visual receptors	The visual impact of the construction of the North Waste Rock Disposal Area taking into consideration VAC, Visual Sensitivity, Visual Receptors and Visual Exposure (final height - full extent).	10	5	2	5	5	5	135		High	Negative	• Develop and implement a Concurrent / Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: o Implementation of the final footprint areas of the facilities as to ease concurrent rehabilitation (commencement of the final footprint of the areas to allow effective concurrent rehabilitation - no end-tipping). o Develop the waste disposal facilities with closure in mind. o Design of the waste disposal facilities for Life of Asset as to implement proper benching as to promote easier rehabilitation and vegetation cover to ease visual intrusion and promote visual absorption capacity. o Concurrent rehabilitation of the previous bench whilst a new bench is being developed. o Develop the first (1st) bench of the disposal facility to its full footprint extent as to allow for the rehabilitation of the 1st bench once the 2nd bench is being developed. This early implementation of rehabilitation will act as a visual screen and also prevent social unease. o Implementation of benching that allows for proper stormwater management on side slopes of the Waste Rock Disposal Facilities that promotes rehabilitation and vegetation cover and reduce risk of erosion and gully formation (minimum of 1:3 slope). • Develop and implement a Continuous Encroachment Forewarning Mechanisms inclusive but not limited to the following: o Surveillance should be in place to prevent the encroachment of houses onto the footprint area of the facility. • Develop and implement a Topsoil Utilisation Management Plan that includes but are not limited to the following: o Remove the existing topsoil stockpile prior to the construction of the waste rock disposal facility as to prevent the sterilization of valuable topsoil that need to be available for rehabilitation purposes. o Ensure that sufficient topsoil is stripped from the area prior to the development of the waste rock disposal area. Ensure the correct storage of the topsoil as to be available for rehabilitation purposes. • Develop and implement an Air Quality Monitoring and Management Plan inclusive but not limited to the following: o The implementation of air quality mitigation measures as to reduce fugitive dust generation and possible additional visual intrusion thereof. • Develop and implement a site specific Biodiversity Management Plan, inclusive but not limited to the following activities: o Focus vegetation regrowth efforts on the visual side of the affected communities (sensitive visual receptors).	8	5	2	4	5	4	96	
Sunlight																				
Construction, Operational and Closure Phase																				
Impact on available sunlight	Impact on available sunlight on receptors living in close proximity of the new waste rock disposal area North Waste Rock Disposal Facility (final height - full extent).	6	1	2	1	1	4	44		Low	Negative	• Develop and implement a Concurrent / Final Rehabilitation and Closure Plan inclusive but not limited to the following activities: o Implementation of concurrent rehabilitation and vegetation regrowth in order to reduce heat reflection from the bare rock surfaces and the subsequent impact of raised temperatures in the late afternoon (western side of the mine). • Maintain a Continuous Encroachment Forewarning Mechanisms inclusive but not limited to the following: o Implement a Continuous Encroachment Forewarning Mechanisms - Surveillance should be in place to prevent the encroachment of houses onto the footprint area of the facilities.	6	1	2	1	1	4	44	

9.3.12 Traffic

Mine internal access roads will be used for the haulage of material. Vehicles and delivery trucks will use the existing public road network such as the Bakenberg Road, N11, and the Ga-Molekana road. The transport of materials will likely increase the vehicle traffic volumes on the mine internal roads and the surrounding road network. Such should include heavy motor vehicles and abnormal load transport specifically for the construction phase of the project. During the operational phase the project is unlikely to contribute to the increase in traffic on the public road network as no significate material/manufactured products will be required. New personnel will be recruited for the underground mining operations; however, the south entrance and associated access road will be able to accommodate such traffic.

In terms of cumulative impacts, safety risks associated with mining traffic utilising the adjacent road network, include pedestrian and vehicle accidents due to the increased frequency of vehicular movement and higher traffic volumes.

The potential impacts associated with traffic is provided in **Table 9-19**.

Table 9-19: Traffic Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Traffic																				
Construction Phase																				
Increased Road congestion, road safety and emissions (internal and external roads)	Mining Operations /influx of workers	4	2	2	3	2	4	52		Medium	Negative	• Develop and implement a site-specific Traffic Management Plan inclusive but not limited to the following: ○ Discourage the routing of vehicles through populated areas. ○ Drivers of all trucks to be equipped with specialised road safety and driving training. ○ Ensure that heavy vehicles and abnormal load vehicles comply with limitations on vehicle dimensions and axle and vehicle masses and safety standards set out in the Road Traffic Act, 1996 (Act No 93 of 1996) and the National Road Traffic Regulations (2000) for vehicles using a public road. ○ For all abnormal loads needing transportation to the site conduct the requisite abnormal load planning and implement the plan fully. ○ Adherence to road traffic rules and speed restrictions ○ Develop and implement a traffic management plan, including traffic calming measures where necessary. ○ Design roads to limit unnecessary blind corners, and steep inclines / declines. ○ Provide workers and contractor workers with training on road safety including running road safety and awareness campaigns at the mine	4	2	2	2	2	2	24	
Operational Phase																				
Increased Road congestion, road safety and emissions (internal and external roads)	Mining Operations /influx of workers	2	2	2	3	2	2	22		Low	Negative	• Maintain a site-specific Traffic Management Plan inclusive but not limited to the following: ○ All permanent staff, visitors and contractors to adhere to traffic speed limits. ○ Drivers of all trucks to be equipped with specialised road safety and driving training. ○ Pedestrian sidewalks to be constructed alongside access road as well as within site boundary to mitigate man / machinery interaction. ○ Appropriate road safety traffic signage to be implemented on site. ○ Develop and implement a traffic management plan, including traffic calming measures where necessary. ○ Ensure that roads are maintained at all times to an acceptable standard. ○ Provide workers and contractor workers with training on road safety including running road safety and awareness campaigns at the mine	2	2	2	3	1	2	20	
Closure																				
Increased Road congestion, road safety and emissions (internal and external roads)	Decommissioning activities	2	2	2	3	2	2	22		Low	Negative	• Maintain a site specific Traffic Management Plan inclusive but not limited to the following: ○ All permanent staff, visitors and contractors to adhere to traffic speed limits. ○ Drivers of all trucks to be equipped with specialised road safety and driving training. ○ Pedestrian sidewalks to be constructed alongside access road as well as within site boundary to mitigate man / machinery interaction. ○ Appropriate road safety traffic signage to be implemented on site. ○ Develop and implement a traffic management plan, including traffic calming measures where necessary.	2	2	2	3	1	2	20	

9.3.13 Blast

The information in this section was obtained using the Blast Impact Assessment Mogalakwena Complex, March 2023.

Blasting operations are required to break rock for excavation to access the targeted ore material. Explosives in blast holes provide the required energy to conduct the work. Ground vibration, air blast and fly rock are a result of the blasting process. The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500 m from the mining area considered. The range of structures observed is typical roads (tar and gravel), low-cost houses, corrugated iron structures, industrial buildings, brick and mortar houses and power lines/pylons.

Ground Vibration

Ground vibration is measured in velocity with units of millimetres per second (mm/s). Ground vibration can also be reported in units of acceleration or displacement if required. Different types of structures have different tolerances to ground vibration. A steel structure or a concrete structure will have a higher resistance to vibrations than a well-built brick and mortar house. A brick-and-mortar house will be more resistant to vibrations than a poorly constructed or a traditionally built mud house. Different limits are then applicable to the different types of structures.

The location of structures around the Pit area is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the Mine Buildings/Structures, Pipeline, Road, Heritage Site Structures, Hydrocensus, Power Lines/Pylons and community structures. The ground vibration levels predicted for these POI's ranged from very low levels – less than 1 mm/s to 56 mm/s. The Zwartfontein pushback operation showed the highest levels expected. Based on the Anglo American Platinum standards there is one community structure exceeds the limit of 5 mm/s for the maximum charge for the Zwartfontein Pit evaluation. The Sandsloot underground operation and the box-cut showed no ground vibration influences of concern. The expected levels of ground vibration for some of these structures are higher than the limits and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.

Establishment of the box-cut was evaluated for ground vibration impacts at the various POI's identified. Ground vibration levels ranges between 0.1 and 35.1 mm/s for the POI's noted. All levels are within the respected limits for the specific POI applicable.

Air Blast

Air blast or air-overpressure is a pressure wave generated from the blasting process. Air blast is measured as pressure in pascal (Pa) and reported as a decibel value (dBL). Air blast is normally associated with frequency levels less than 20 Hz, which is at the threshold for hearing. Air blast can be influenced by meteorological conditions such as, the final blast layout, timing, stemming, accessories used, blast covered by a layer of soil or not, etc. Air blast should not be confused with sound that is within the audible range (detected by the human ear). A blast does generate sound as well but for the purpose of possible damage capability the assessment is concerned with air blast.

Air blast predicted showed more concerns for opencast blasting. The current general accepted limit on air blast is 134 dBL. The Anglo American standard limits range between 115 dB and 120 dB. Damages are only expected to occur at levels greater than 134dB. Predictions show that air blast will be greater than 134 dB at distance of 430 m and closer to Zwartfontein pit specifically. Based on the Anglo American Platinum limit of 120 dB this range extents significantly further. Seventy-one identified POI's shows air blast levels just greater than 120 dB. In general it is observed that non-community identified points did not show significant levels greater than limits. The box-cut operation showed only one POI of concern with regards to air blast. The Sandsloot underground operations were not evaluated for surface air blast due to the type of operation.

It is maintained that if stemming control is not exercised in the opencast operations this effect could be greater with greater range of complaints or damage. The opencast areas are located such that “free blasting” – meaning no controls on blast preparation – will not be possible. Infrastructure such as roads, pipelines and power lines/pylons are present, but air blast does not have any influence on these installations.

Fly rock

Fly rock remains a concern for blasting operations. Based on the drilling and blasting parameters values for a possible fly rock range with a safety factor of 2 was calculated to be 590 m for the Zwartfontein pushback. The absolute minimum unsafe zone is then the 590 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated.

Roads

The Bakenberg road is located next to the Zwartfontein Pit. Traffic management process will be required when blasting closer than 590 m from the road.

Legislative Review

Specific actions will be required for the Zwartfontein pushback area such as Mine Health and Safety Act requirements when blasting is done within 500 m from structures and mining with 100 m for structures. The Pipeline, Power lines/Pylons, Road, Hydrocensus, Heritage and Structures falls within the 500 m range from the pit area.

Hydrocensus boreholes

There are fifty Hydrocensus wellfields/boreholes identified within the mining rights area and it is uncertain what the long-term plan will be for these boreholes. A mitigation plan will be required to determine if these boreholes will be retained or replaced.

Mitigation

Based on the evaluations undertaken as part of the Blast Impact Assessment, it is certain that specific mitigation will be required with regards to ground vibration, air blast and fly rock. Ground vibration is the primary possible cause of structural damage and requires more detailed planning in preventing damage and maintaining levels within accepted norms. Air blast and fly rock can be controlled using proper charging methodology irrespective of the blast hole diameter and patterns used. Ground vibration requires more detailed planning and forms the focus for mitigation measures.

Specific impacts are expected at the following POI’s identified. Table 9-20 shows list of POI’s that will need to be considered. Figure 9-1 provides for the location of these POI’s in relation to the pit area.

Table 9-20: Structures identified that may be impacted upon by ground vibration

Tag	Description	Classification	Y	X	Ground Vibration Limit (mm/s)	Distance (m)
29	Pipeline	12	9341.54	2654657.23	50	163
30	Pipeline	12	9347.95	2654776.78	50	154
31	Pipeline	12	9311.58	2654904.07	50	183
70	School (Seritarita Secondary)	2	10629.37	2653533.07	5	696

Tag	Description	Classification	Y	X	Ground Vibration Limit (mm/s)	Distance (m)
73	Road	14	10010.03	2653813.00	150	46
74	Mine Activity	6	9477.19	2654339.86	200	77
78	Structures	2	10298.12	2654587.02	12.5	203
84	Mine Buildings/Structures	3	9371.15	2655262.74	25	129
160	Heritage (MMIEP 11 - potential presence of graves)	8	9155.68	2655360.14	6	328

Table 9-21: Structures identified as problematic with regards to air blast

Tag	Description	Classification	Y	X	Air Blast Limit (dB)	Distance (m)
70	School (Seritarita Secondary)	2	10629.37	2653533.07	120	696
72	Village Houses	2	11048.48	2653720.25	120	1028
78	Structures	2	10298.12	2654587.02	134	203
84	Mine Buildings/Structures	3	9371.15	2655262.74	134	129
85	Mine Buildings/Structures	3	9193.03	2655640.50	134	417
95	House	2	8314.88	2658770.10	120	3618
96	House	2	8122.31	2658714.40	120	3634
98	School	2	9099.82	2658627.36	120	3295
100	Houses	2	9208.20	2658542.75	120	3197
101	Houses	2	9586.89	2658606.20	120	3239
102	Houses	2	9641.93	2658828.43	120	3462
103	Houses	2	9357.72	2658751.82	120	3392
104	Houses	2	9495.53	2659010.05	120	3644
105	Houses	2	10261.42	2658221.24	120	2934
106	Houses	2	10633.07	2658356.67	120	3168
107	Houses	2	10258.14	2658475.59	120	3181
108	School	2	10439.29	2658605.64	120	3350
109	Houses	2	10166.61	2658803.87	120	3486
110	Houses	2	9929.08	2658458.42	120	3111
111	Houses	2	10564.52	2658181.26	120	2980
112	School	2	11052.94	2658673.45	120	3613
113	Houses	2	10845.15	2658402.32	120	3285
114	School (Creche)	2	12794.54	2656920.74	120	3390
172	Informal Housing	1	8365.58	2650763.35	120	3236
173	Informal Housing	1	9432.71	2650498.50	120	3231
174	Informal Housing	1	9415.38	2650726.67	120	3005
175	Structure	2	9702.81	2650664.59	120	3054
176	House	2	9467.12	2650844.50	120	2883
177	Informal Housing	1	9679.00	2651213.71	120	2505
181	Sports Terrain	2	11795.54	2653525.37	120	1799
182	Village Houses	2	11670.88	2653009.10	120	1862
183	Village Houses	2	11812.59	2652701.04	120	2140
184	School	2	12208.87	2653271.05	120	2269
185	Village Houses	2	12526.10	2653088.86	120	2625
186	Village Houses	2	11941.87	2653125.29	120	2061

Tag	Description	Classification	Y	X	Air Blast Limit (dB)	Distance (m)
187	Village Houses	2	12309.80	2654072.86	120	2195
188	Village Houses	2	12348.48	2653650.38	120	2297
189	Village Houses	2	12708.55	2653558.67	120	2669
190	Village Houses	2	13387.38	2653706.73	120	3307
191	Village Houses	2	13164.54	2653351.81	120	3162
194	Village Houses	2	13311.73	2654275.45	120	3187
195	Village Houses	2	13115.62	2654523.40	120	3002
196	Village Houses	2	13331.04	2654743.17	120	3237
197	School	2	13148.48	2654937.88	120	3073
198	School	2	13139.56	2655078.86	120	3079
200	Village Houses	2	11746.82	2653849.87	120	1666
201	Village Houses	2	11275.47	2653908.72	120	1194
202	Informal Housing	1	11195.82	2654137.85	120	1080
204	Village Houses	2	12531.74	2654522.89	120	2420
205	Village Houses	2	12463.26	2654782.32	120	2376
206	Village Houses	2	12825.87	2654979.07	120	2756
207	Village Houses	2	12990.14	2655272.13	120	2960
208	Village Houses	2	13240.99	2655617.23	120	3277
209	Village Houses	2	12708.11	2655577.85	120	2752
210	Village Houses	2	12596.11	2655856.95	120	2729
211	Village Houses	2	13117.19	2655998.32	120	3267
212	Village Houses	2	12821.66	2656190.76	120	3063
213	Village Houses	2	13174.25	2656185.48	120	3387
215	Village Houses	2	12681.14	2656701.55	120	3178
217	Sports Terrain	2	6952.24	2655698.25	120	2556
218	Village Houses	2	6038.03	2655367.53	120	3434
219	School	2	6049.83	2655076.20	120	3417
220	Village Houses	2	6346.85	2654724.12	120	3149
221	Building (Community Centre)	2	6070.79	2654746.46	120	3420
222	Village Houses	2	6174.43	2654592.10	120	3331
223	Building (Old Age Centre)	2	6451.83	2654273.66	120	3067
224	School	2	6401.93	2654247.07	120	3120
225	Village Houses	2	6690.88	2654605.78	120	2814
226	Village Houses	2	6694.23	2654187.24	120	2836
227	Village Houses	2	6274.79	2653848.14	120	3305
228	Village Houses	2	6582.48	2653648.60	120	3005
229	Village Houses	2	6163.97	2653429.61	120	3444
230	Village Houses	2	6022.92	2654205.03	120	3501

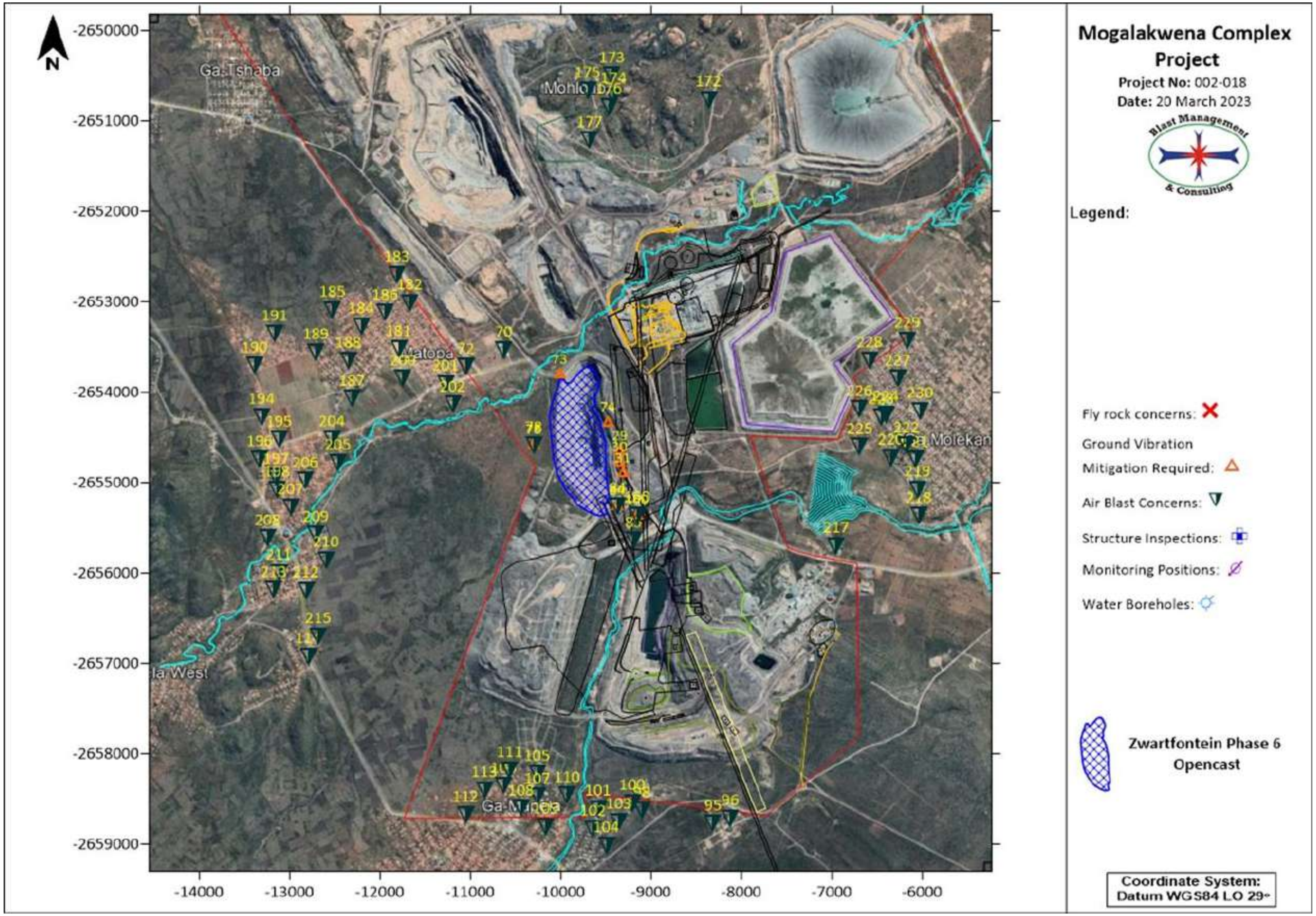

Figure 9-1: Mitigation POI's

Based on the modelling done, high levels of influence are specifically observed up to 328 m from the pit boundary. There are influences further but to lesser extent. The following specific mitigations may be considered.:

- Changes to drill and blast design to mitigate ground vibration.
- Changes to charging designs to mitigate air blast and fly rock.

Air blast and Fly rock:

Air blast and fly rock is mitigated by the following means:

- Increasing the stemming length ratio to blasthole diameter – either changing to a smaller diameter blasthole or increasing the actual stemming length.
- The use of aggregate stemming material of correct size ratio – 10 % of the blasthole diameter.

Ground Vibration:

Mitigation of ground vibration for this can be done applying the following methods:

- Do blast design that considers the actual blasting, and the ground vibration levels to be adhered too.
- Change to bench heights with smaller diameter blastholes can be considered.
- Multiple charge decks in a blastholes initiated separately to reduce the charge mass per delay can be considered.
- Only apply electronic initiation systems to facilitate single hole firing.
- Do design for smaller diameter blast holes that will use fewer explosives per blast hole.

The identified POI's of concern is found in proximity of the actual operations. In order to give indication of the possibilities of mitigation to consider two basic indicators are presented. Firstly, the maximum charge per delay that can be allowed for the shortest distance between blast and POI. Secondly the minimum distance between blast and POI to maintain ground vibration limits for minimum and maximum charge per delay. These table gives indication for planning of blasts when blasts at shortest distance to the POI's.

Table 9-22 shows mitigation in the form of maximum charge mass that will be allowed to maintain safe levels of ground vibration.

Table 9-22: Mitigation measures: Maximum charge per delay for distance to POI

Tag	Description	Y	X	Ground Vibration Limit (mm/s)	Distance (m)	Maximum allowable charge for current distance (kg)
29	Pipeline	9341.54	2654657.23	50	163	597
30	Pipeline	9347.95	2654776.78	50	154	534
31	Pipeline	9311.58	2654904.07	50	183	755
73	Road	10010.03	2653813.00	150	46	182
74	Mine Activity	9477.19	2654339.86	200	77	726
78	Structures	10298.12	2654587.02	12.5	203	172
84	Mine Buildings/Structures	9371.15	2655262.74	25	129	161
160	Heritage (MMIEP 11 - potential presence of graves)	9155.68	2655360.14	6	328	185

Table 9-23 shows the minimum distance required between blast and POI for the minimum and maximum charge per delay to maintain the ground vibration limits applied.

Table 9-23: Mitigation measures: Minimum distances required

Example POI	Specific Limit (mm/s)	Distance (m)	Total Mass/Delay (kg)
Minimum charge per delay			
Heritage (MMIEP 11 - potential presence of graves)	6	335	193
Structures	12.5	214	193
Mine Buildings/Structures	25	141	193
Pipeline	50	93	193
Roads	150	48	193
Mine Activity	200	40	193
Maximum charge per delay			
Heritage (MMIEP 11 - potential presence of graves)	6	784	1060
Structures	12.5	503	1060
Mine Buildings/Structures	25	330	1060
Pipeline	50	217	1060
Roads	150	111	1060
Mine Activity	200	94	1060

Table 9-24: Blast Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Blast																				
Construction Phase																				
No blasting will be undertaken during the construction phase; therefore, no impacts are expected.																				
Operational Phase																				
Damage to Mine Structures & Private Structures	Construction Underground Box-Cut: Blasting - Ground Vibration & Air Blast	6	1	2	3	1	3	39		Medium	Negative	• Develop and implement a Blast Management Plan inclusive but not limited to the following: ○ Specific blast design to be done, shorter blast holes, smaller diameter blast hole, using electronic initiation instead of shock tube systems to obtain single hole firing. ○ Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths. ○ Ensure the MM operations and the adjacent communities are provided with sufficient notice in terms of when blasting will take place	2	3	1	3	1	2	20	
Damage to Pipeline	Operational Zwartfontein: Blasting - Ground Vibration	8	3	1	3	1	4	64		Medium	Negative		2	3	1	3	1	2	20	
Damage to Road	Operational Zwartfontein: Blasting - Ground Vibration	10	3	2	3	1	4	76		Medium	Negative		2	3	2	3	1	2	22	
• Damage to Mine Buildings/Structures • Damage to Heritage (MMIEP 11 - potential presence of graves) • Damage to Power Lines/Pylons • Damage to Hydro census	Operational Zwartfontein: Blasting - Ground Vibration, Air Blast & Fly Rock	8	3	2	3	1	4	68		Medium	Negative		2	3	2	3	1	2	22	
Damage to Houses	Sandsloot Underground: Blasting Ground Vibration	0	3	2	1	1	0	0		None	None		0	3	2	1	1	0	0	
Closure																				
No blasting will be undertaken during the closure phase, therefore no impacts are expected.																				

9.3.14 Network Assessment

This section was compiled using the Specialist Assessment of Impact from Waste Rock Disposal Facilities and Tailings Storage Facilities on Network Coverage for Mogalakwena Mine Complex. Complied by The Council for Scientific and Industrial Research (CSIR) dated June 2022.

FM Radio broadcast

The data from the numerical model on coverage indicated the following:

- There are possibly at most 14 operational FM stations with likely strong signals around the area of interest.
- There are strong indications that the services from the transmitter at Mokopane (1 station operational) has been lost completely or its coverage has been significantly reduced for the following communities:
    - Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, Leruleng.
- The coverage of the FM broadcast services from the transmitters at Blouberg (5 stations), Haenertsburg (2 stations and 4 spares), and Louis Trichardt (8 operational, 1 spare and 1 licensed stations) varied for a number of communities but not significantly.
- No significant changes for coverage provided by other stations.

The field measurements have shown that, except for Ga-Modipane and Ga-Seema, the rest of communities immediately adjacent to the mine where the measurements were made had a reasonable number of FM stations available (6 to 12, out of 14 estimated theoretically).

Satellite TV broadcast

The theoretical estimation based on a trapezoidal prism model of a WRD showed that the satellite TV signals will not be blocked with the proposed North Waste Rock Dump Phase 3.

Mobile Networks

Overall, there is a downlink speed of at least 10 Mbps in the surrounding communities, except in the areas which are in close proximity to the WRD facilities, such as Ga-Chaba and Leruleng. The speed of 10 Mbps (equivalent to 1.25 MB/s) may be acceptable for home usage per user; however, it is not sufficient for multiple users and business usage.

There is generally network coverage in the mine and surrounding communities, which is corroborated by CellMapper. However, the network coverage is dependent on the service provider and radio type. The coverage thus changes based on the service provider and radio type.

The precise information about the mobile networks is proprietary to the mobile network operators. As the mobile operators are separate private entities and independently decide where to build the base stations and how much to invest in ensuring a high quality of service, it is not viable to only associate the availability of the quality of service with current or proposed WRDs. Inasmuch as the mine's facilities can generally affect the mobile network signal propagation, it is equally dependent on the mobile operators and their distribution of cell towers, including repeaters and relevant technologies.

In cases of limited mobile network coverage, it would be more pragmatic and cost-effective to install cell towers and/or repeaters to increase the coverage.

As the distribution of network infrastructure is decided by network operators, it is worth keeping the operators informed with respect to expansion plans, so that they can timeously take action to ensure that the necessary network infrastructure remains available.

Wi-Fi networks

The mine’s facilities have no impact on the short-range Wi-Fi network and local Wi-Fi point-to-point links communicating within a community. Such links are line-of-sight between antennas in the same community and would not be affected by obstructions outside the community.

Point-to-point links could possibly have been affected in the past. However, these links would be hard to identify, as they will have been decommissioned when obstructions appeared in their path.

There is a slim possibility that such links could be disturbed by future expansion. However, this occurrence is regarded as unlikely, as few links are likely to span across existing or proposed dumps.

Table 9-25: Network Impact Assessment

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Network																				
Operational Phase																				
Obstruction to reception of the FM Radio Signals in to Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, and Leruleng communities.	North Waste Rock Dump Phase 3	8	3	3	2	2	5	90		Medium	Negative	• Consider Installing gap filler transmitters or provide alternative means of accessing FM radio stations	2	3	2	1	2	2	20	
Obstruction to reception of the FM Radio Signals in surrounding communities other than Phafola, Ga-Chaba, Hans, Skimming, Mmamala, Fothane, Matopa, Mesopotamia, Ga-Modipane, Masoge, Kwakwalata, Ditlotswana, Malokong, and Leruleng communities.	North Waste Rock Dump Phase 3	4	3	2	1	2	2	24		Medium	Negative	• If required, install gap filler transmitters or provide alternative means of accessing FM radio stations	2	3	2	1	1	2	18	
Obstruction to reception of satellite TV	North Waste Rock Dump Phase 3	0	1	1	0	1	0	0		No Impact	Negative	• Further increase of the height from 200m may require considering the increase of the buffer zone. The elevation angles of other satellites may require consideration.	0	1	1	0	1	0	0	
Obstruction to reception of mobile network signals	North Waste Rock Dump Phase 3	4	2	2	0	1	2	18		Low	Negative	• MM to notify the mobile operators on the mine's future Life of Asset Mine Plan.	0	1	0	0	0	0	0	
Obstruction to reception of community point to point and long-range Wi-Fi Signal	North Waste Rock Dump Phase 3	4	2	2	0	1	2	18		Low	Negative	• Repositioning of antennas and/or consideration of alternative network solution	0	1	0	0	0	0	0	
Obstruction to reception of community point to point and short-range Wi-Fi Signal	North Waste Rock Dump Phase 3	0	1	0	0	0	0	0		No Impact	Negative	none	0	1	0	0	0	0	0	

9.3.15 Socio-Economic

This section has been compiled with reference to the Mogalakwena Mine Social Impact Assessment June 2023.

Mining is a key economic sector in the Limpopo Province, within both the Waterberg District Municipality (WDM) and the Mogalakwena Local Municipality (MLM). The WDM and MLM Integrated Development Plan (IDP) and Spatial Development Framework (SDF) highlight the importance of mining and the need for economic development and job creation. The MM is also located within an area that is identified as a mining area. Mining is therefore supported by key policy and planning documents for the study area.

Based on the findings of the SIA the proposed project will result in both positive and negative impacts during the project phases.

The potential impacts associated with socio-economic landscape is provided in **Table 9-26.**

A summary of the associated impacts is provided below.

9.3.15.1 Construction Phase Impacts

Potential positive impacts

Creation of employment and business opportunities

Sandsloot UG mine

During construction, a labour contingent of skilled, semi-skilled and unskilled workers will be required to build both the underground and surface infrastructure. As indicated above, the Sandsloot UG mine will be developed in two Phases, namely, Phase 1: Exploration Declines and Phase 2: Mine Development. Both phases essentially form part of the construction or establishment phase of the Sandsloot UG mine. Based on available information Phase 1 will extend over a period of 2 years and Phase 2 will commence thereafter. While Phase 2 involves the development of the mine, it will also involve the production of ore. Phase 2 therefore also forms part of the operational phase and is discussed under the operational phase section.

A detailed construction labour profile is still being developed by AAP. However, based on information contained in the Sandsloot Underground Mining Pre-Feasibility A Study, Section 16 Corporate Relations Report (November 2022) Phase 1 will create between 250 and 320 employment opportunities. Given the nature of the work most of the opportunities will be for skilled and semi-skilled workers. The construction related employment opportunities for local community members, specifically community members from the Doorstep Area 1 villages, are therefore likely to be limited. The potential to enhance employment opportunities through the implementation of training and skills development programs is also likely to be limited due to the short time span for Phase 1, namely 2 years.

Given the technical nature of underground mining certain aspects of the construction operations will be contracted out. However, given the key role played by mining in the WDM and MLM there are likely to be a number of suitably qualified and experienced local engineering companies and contractors in Mokopane and towns such as Polokwane and Thabazimbi that could benefit from the project. AAP procurement policies are compliant with Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry, as required by the Department of Mineral Resources. Where possible, locally based contractors will be appointed to undertake the work required. However, some of the components associated with the project are likely to be provided by contractor/s based outside of the MLM and Limpopo Province. These benefits would therefore accrue to large engineering companies and suppliers based in the larger centres, such Gauteng. Anglo's newly released Contractor Performance Procedure, and relevant local tools are in the process of being implemented. Contractors will be assessed to determine their social materiality based on the extent of potential impacts and opportunities associated with the work packages. Maximising use of local labour is required by contractors; this is being pro-actively addressed to increase benefits and opportunities to local communities. Implementing the enhancement measures listed below can enhance opportunities for local employment and economic development.

North west Polllution Control Dam- Navada Dam

The construction of the North west Polllution Control Dam- Navada Dam and associated infrastructure is expected to extend over a period of 36 months and create in the region of 150 employment opportunities. Based on the information provided by AAP 47% (70) will be low skilled, general workers, 33% (50) will be semi-skilled workers, and 20% (30) will be skilled workers. The objective will be to source most general and semi-skilled workers and where possible skilled workers from the local Host Communities. The total capital expenditure for the North west Polllution Control Dam- Navada Dam component of the project is in the region of R 450 million (2023 Rand values). Estimated that 30% (R135 million) of the capital expenditure will benefit locally based service providers.

N11 connection

The construction of the connection road to the N11 will take approximately 12 months and create ~ 30 employment opportunities. The capital expenditure will be ~ R 56 million (2023 Rand value).

The creation of local employment opportunities was raised as a key issue at the Open House Meetings and focus group meetings with members from the local communities. The importance of creating employment opportunities for members from the doorstep communities is highlighted by the findings of the Digby Wells survey (2021) which found that 66% of the respondents felt that newcomers were taking jobs that could have gone to locals.

The creation of employment opportunities, even if they are temporary, would therefore represent a social benefit. The MLM IDP and the findings of the Digby Wells survey (2021) highlight the high unemployment levels in the area. However, due to the technical nature of the underground mining component the opportunities for local employment are likely to be limited during the construction phase.

The local service and hospitality sector will also benefit from the construction/ establishment phase. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, services etc. associated with the meeting the needs of the construction workers. Providing these services will create opportunities for local SMMEs and entrepreneurs.

Potential negative impacts

Impacts associated with the presence of construction workers on local communities.

While the presence of construction workers does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on local communities. The most significant negative impacts are associated with the disruption of existing family structures and social networks. The potential risks are linked to:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of partners to construction workers.
- An increase in teenage and unwanted pregnancies.
- Increase in gender violence.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.

In addition, potential impacts relating to dust, air quality, groundwater and noise related activities have been assessed and ranked within the respective sections of Chapter 9.

9.3.15.2 Operational Phase Impacts

Potential positive impacts

Employment opportunities

The operational phase of the Sandsloot underground mine project will create approximately 860 employment opportunities. Approximately 50-60% of the employment opportunities could benefit residents from the MLM, including members from the doorstep communities. However, due the specialised nature of underground mining the skills required are likely to be in short supply in the area. This will pose challenges in meeting local employment targets. However, in terms of AAP recruitment policies, the recruitment of members of doorstep and local communities will be priority.

Wages

The annual wage bill associated with the additional 860 employees will be in the region of R 462 million. ~ 40% of the R 462 million (R 185 million) will be earned by people living in the MLM, including members from the doorstep communities. This percentage is likely to increase overtime and with AAPs commitment to training and skills development. A percentage of this total is spent in the local economy and benefits local businesses and the MLM in the form of rates, taxes, and utility bills etc. The Sandsloot underground mine project will therefore create significant socio-economic benefits for the local and provincial economy.

Procurement and socio-economic opportunities

In addition to the socio-economic benefits associated with wage spend in the local, provincial, and national economy, MMs annual local procurement budget is in the region of R 8.25 billion. Of this total between R1 billion and R2 billion is spent annually on local procurement within the doorstep and host communities. Procurement linked to the Sandsloot underground mine project will increase, which in turn will create opportunities for local businesses and suppliers.

Reduced Impact of Mining on Doorstep Communities

The Sandsloot UG mine component of the project has the potential to reduce the social impacts associated with open pit mining due to the reduced volume of waste rock and the impacts associated with rock waste dumps, including loss of land, dust, and noise. Underground crushing will also reduce noise and dust impacts. The use of processed tailings to fill underground voids will also reduce the impact of surface tailings facilities on the environment and adjacent communities, including impacts associated with tailings dam failures (although this is highly unlikely given the construction method using waste rock and a move towards dry stacking). However, within the context of the continued open cast mining operations the overall reduction of mining related impacts on the adjacent Doorstep communities is likely to be limited and is reflected as a Low Positive improvement. The existing impacts associated with open cast mining will continue as long as open cast mining operations take place. The potential for the Sandsloot UG mining to reduce the impact of mining on doorstep communities is therefore likely to be negligible.

Reduce Water Loss

The development of anthropogenic aquifers to store water within the Sandsloot and Zwartfontein Pits using waste rock will improve water security and reduce water losses through evaporation. The man-made aquifers will be used as storage areas, allowing for natural improvement of water, which is planned to be used in the operations. Waste rock will be utilised to construct anthropogenic aquifers within the Sandsloot and Zwartfontein pits which will reduce the extent of waste rock dumps and the associated impacts on the doorstep communities. In an area where water security is a key issue this represents an ongoing positive social benefit. MM does not rely on municipal water. The mine uses water from processes (e.g. plant, tailings, stormwater), as well as treated effluent that is piped from Mokopane town and treated on site for use. Should MM have a positive water balance, there may be opportunities to explore alternate uses for surplus water. However, this falls outside the scope of this study and forms part of the broader Social Water Strategy.

Loss of grazing land and impact on Initiation Schools associated with the North Waste Rock Dump

The NWRD is also likely to result in loss of grazing land. However, the affected area is located within the mining area and a lease agreement is in place that permits members from the local community to use the area for grazing until such time as the mine requires to accommodate mining related activities, such as the NRWD.

In terms of initiation schools, two initiation school sites were identified by a community member in in the area located on Farm Overysel 815 LR affected by the NWRD.

Community safety impacts associated with the Navada Stormwater Control Dam

The stormwater control dam is located in the north-western corner of the mining lease area within the mining area. Potential impacts linked to safety, specifically for children and the threat of drowning, and the potential flooding threat posed by dam failure were considered and assessed as part of the SIA.

Other identified impacts

In addition, the following potential impacts were also identified:

- Impact on air quality on doorstep communities
- Impact of noise on doorstep communities
- Impact of blasting on doorstep communities.
- Impact on groundwater.

Separate specialist assessments were undertaken in support of the aforementioned potential impacts. The impacts have been assessed and ranked within the respective sections of Chapter 9.

Cumulative Impacts

In terms of cumulative impacts, the most significant impacts is linked to the cumulative impact on local services, such as water, sanitation and waste collection, hospitals, clinics, and emergency services etc. associated with the influx of workers and job seekers to the area. Tensions between job seekers and local communities, specifically doorstep and host communities will also be exacerbated by competition for scarce jobs. The influx of workers job seekers can also result in anti-social behaviour and result in tension and potential conflicts and undermine and disrupt traditional leadership structures. These impacts are exacerbated by the current limited capacity of the MLM to meet its mandate and provide services.

However, Mokopane has been identified as a place of opportunity, specifically amongst communities in the Limpopo Province. The influx of workers and job seekers is therefore not only linked to the MM and likely to continue. The challenges associated with the influx of workers and the growth of the town will therefore need to be addressed by the MLM in consultation with key stakeholders, including the Provincial Government of Limpopo, local businesses, including mining companies, and local communities.

Table 9-26: Socio-Economic Impacts

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								CUMULATIVE	STATUS	RECOMMENDED MITIGATION MEASURES / REMARKS	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION							
		M	D	S	I	R	P	TOTAL	SS				M	D	S	I	R	P	TOTAL	SS
Social																				
												Construction Phase								
Creation of local employment and business opportunities	• Construction related activities associated with the development of the Sandsloot UG mine. • Construction of the North west Polllution Control Dam- Navada Dam and associated infrastructure. • Construction of the link to the N11.	6	2	3	0	0	4	44		Medium	Positive	• Development (if not already in place), update (if in place) and implementation of a Local Recruitment and Procurement Plan/Procedure that includes but is not limited to: o Implement AAP employment policies and procedures to maximise employment of community members from doorstep communities. o To provide local SMMEs with assistance to understand AAP procurement requirements and submit tender forms and associated information that meet AAP requirements. o Provide support to doorstep communities to enable them to understand AAP Employment procedures and policies and how to meet their requirements. o Contractors to prioritise the employment of successful training attendees (from Anglo Community Training Programme). o AAP investigate the option of extending the training and skills development programme prior to the commencement of the construction phase in order to enhance opportunities to recruit members from the local community. o Implementation of a training and skills development programme prior to the commencement of the construction phase. o To enhance the opportunities to employ members from the local community. o Before the construction phase commences, the proponent should meet with representatives from the MLM, Business Forum and local TCs to establish the existence of a skills database for the area. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure • Development (if not already in place), update (if in place) and implementation of the AAP employment Equity Plan inclusive but not limited to: o The recruitment selection process should seek to promote gender equality and employment of women wherever possible.	8	2	4	0	0	4	56	
Potential Impacts on Family structures and social networks associated with the presence of construction workers: • An increase in alcohol and drug use. • An increase in crime levels. • The loss of partners to construction workers. • An increase in teenage and unwanted pregnancies. • Increase in gender violence. • An increase in prostitution. • An increase in sexually transmitted diseases (STDs), including HIV.	• Presence of construction workers due to construction related activities	4	2	2	3	3	3	42		Medium	Negative	• Consideration should be given to Mogalakwena's most current Community Health and Safety Plan/Procedure, for the assessment of any addition required mitigation measures (where deemed necessary and feasible), This Plan/Procedure includes but is not limited to: o AAP in consultation with the contractor/s appointed should implement or update the HIV/AIDS awareness programme for all construction workers at the outset of the construction phase. o A programme should be initiated to support the growth and enhancement of local accommodation facilities within the Area 1 and Area 2 communities for accommodation of non-local workers. These facilities must comply with specified minimum standards. • Development (if not already in place), update (if in place) and implementation of a Local Recruitment and Procurement Plan/Procedure that includes but is not limited to: o Implement AAP Employment and Contractor Performance policies and procedures to maximise direct and indirect employment of community members from doorstep communities, specifically those directly affected by the approved activities. o Implement AAP Local Procurement/ Contractor Performance policies and procedures to maximise appointment of local service providers and suppliers from doorstep communities, specifically those directly affected by the approved activities. • Implement recommendations of AAP Platinum MM Health Impact Assessment Report First Draft (30 March 2022). Implement where appropriate when finalised. • Implement approved Site Induced Migration Management Plan. • Implement recommendations of Mogalakwena Site Induced Migration Assessment, Plexus Energy Ltd, 2022) *(where appropriate and feasible)* • Develop Standard Operating Procedures for construction workers for the duration of the construction phase of the project: o The contractor/s should provide daily transport to and from the site for construction workers. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site. o The contractor/s should ensure that construction workers remain on site during work hours. This will enable the contactor to effectively manage and monitor the movement of construction workers on the site.	4	2	1	3	3	3	39	

												○ Contractors to adopt and apply Anglo's Code of Conduct for all contractor employees and provide regular training. Disciplinary procedures to be implemented in case of non-compliance. ○ Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence ○ Where necessary, the contractor should make the necessary arrangements for workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks. • All grievances to be handled in accordance with the Grievance Management Procedure.									
Operational Phase																					
Creation of employment opportunities associated with project	Underground Mining Operations	6	4	3	0	0	4	52		Medium	Positive	• Development (if not already in place), update (if in place) and implementation of a Local Recruitment and Procurement Plan/Procedure that includes but is not limited to: ○ Implement AAP Employment and Contractor Performance policies and procedures to maximise direct and indirect employment of community members from doorstep communities, specifically those directly affected by the approved activities. ○ Provide support to doorstep communities to enable them to understand AAP Employment procedures and policies and how to meet their requirements. ○ Implement AAP Local Procurement/ Contractor Performance policies and procedures to maximise appointment of local service providers and suppliers from doorstep communities, specifically those directly affected by the approved activities. ○ Provide support to local services providers and suppliers from doorstep communities to enable them to understand AAP Local Procurement/ Contractor Performance policies and procedures and how to meet their requirements. ○ Contractors to prioritise the employment of successful training attendees (from Anglo Community Training Programme). ○ AAP investigate the option of implementing a training and skills development programme prior to the commencement of the operational phase in order to enhance the opportunities to employ members from the local community. ○ Before the construction phase commences, the proponent should meet with representatives from the MLM, Business Forum and local TCs to establish the existence of a skills database for the area. ○ The recruitment selection process should seek to promote gender equality and employment of women wherever possible. ○ Ensure early engagement with doorstep communities, host communities, business forum/s and MLM and inform them of the project and potential employment opportunities. The engagement process should also inform stakeholders of education and skills requirements for different UG job categories. ○ Assess the availability of local skills to participate in both construction and operations and develop a skills training plan to build a local pool of suitable skills for employment, aligned with the timelines for execution of the project. Focus of skills should be on mechanized mining and associated engineering skills. ○ Identify suitable and willing local open-cast candidates to be re-trained and transitioned to the underground mine coupled with a recruitment plan to fill their positions. ○ In consultation with doorstep communities, doorstep communities, host communities, business forum/s and MLM identify skills development and training requirements to for local communities, specifically members from doorstep communities. ○ Develop an UG-focussed Training Centre at the MM and implement required training and capacity building programmes. ○ Develop an action plan, in alignment with the BU Bursary Programme, to source and recruit local candidates for the AAP Bursary Programme in fields specific to mechanised/ autonomous mining and electrical engineering. ○ Develop an UG-focussed Training Centre at the MM. • All grievances to be handled in accordance with the Grievance Management Procedure.	8	4	4	0	0	5	80	

											• Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence. • Development (if not already in place), update (if in place) and implementation of the AAP employment Equity Plan inclusive but not limited to: o The recruitment selection process should seek to promote gender equality and employment of women wherever possible. • The implementation of an approved Social and Labour Plan that includes but is not limited to: o The implementation of a Social and Labour Plan which is compliant with the guidelines as published under the Mineral and Petroleum Resources Development Act, 2002. (Act No. 28 of 2002). o Consideration of the community needs and requests as well as the local and district municipalities Spatial Development Framework o Consideration of education and skills requirements to support current and future operations/projects. o Consideration of growth and enhancement initiatives for local accommodation facilities. o The Social and Labour Plan to be updated when and if deemed necessary and should take into consideration the onsite changes to the mine (inclusive of new developments/projects)								
Creation of training and skills development opportunities associated with the proposed project	• Underground Mining Operation • nuGen™ zero-emission haulage solution • Permit to Innovate	6	4	3	0	0	4	52		Medium	Positive	• Development (if not already in place), update (if in place) and implementation of a Local Recruitment and Procurement Plan/Procedure that includes but is not limited to: o Consultation with doorstep communities, host communities, business forum/s and MLM identify skills development and training requirements to for local communities, specifically members from doorstep communities. o Assess the availability of local skills to participate in both construction and operations and develop a skills training plan to build a local pool of suitable skills for employment, aligned with the timelines for execution of the project. o MM to develop a short- to long-term employment profile and plan that outlines most effective approach to resourcing UG and open pit opportunities. This may include upskilling of existing workers and transitioning them into UG roles and hiring new people for open pit jobs. o Up-grade and expand current training facility to provide UG mining related training programmes. If required establish dedicated UG-focussed Training Centre at the MM and implement required training and capacity building programmes. o Identify suitable and willing local open-cast candidates to be re-trained and transitioned to the underground mine coupled with a recruitment plan to fill their positions. o Develop an action plan, in alignment with the BU Bursary Programme, to source and recruit local candidates for the AAP Bursary Programme in fields specific to mechanised/ autonomous mining and electrical engineering. o Assess the capacity of the FoM Community Training Programme to conduct training for semi-skilled positions for construction. • All grievances to be handled in accordance with the Grievance Management Procedure. • Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	8	4	4	0	0	5	80	

Creation of socio-economic opportunities and procurement associated with project	Mining Operations	6	4	3	0	0	4	52		Medium	Positive	• Develop a Procurement Operating Plan (POP) and Construction Operation Plan (COP) for the Project inclusive but not limited to ○ Implement AAP Employment and Contractor Performance policies and procedures to maximise direct and indirect employment of community members from doorstep communities, specifically those directly affected by the approved activities. ○ Provide support to doorstep communities to enable them to understand AAP Employment procedures and policies and how to meet their requirements. ○ Implement AAP Local Procurement/ Contractor Performance policies and procedures to maximise appointment of local service providers and suppliers from doorstep communities, specifically those directly affected by the approved activities. ○ Provide support to local services providers and suppliers from doorstep communities to enable them to understand AAP Local Procurement/ Contractor Performance policies and procedures and how to meet their requirements. ○ Ensure early engagement with doorstep communities, host communities, business forum/s and MLM and inform them of the project and nature of potential procurement opportunities. The engagement process should also inform stakeholders of AAPs procurement procedures and requirements. ○ In consultation with doorstep communities, host communities, business forum/s and MLM, identify potential suppliers and service providers. ○ In consultation with doorstep communities, host communities, business forum/s and MLM identify capacity needs and interventions required to enhance opportunities for local suppliers and service providers. ○ Develop and implement required training and capacity building programmes for local suppliers and service providers. ○ Ensure early engagement with AAP and MM Inclusive Procurement Departments to maximise opportunities for local vendors with the requisite capability and capacity. ○ A programme should be initiated to support the growth and enhancement of local accommodation facilities within the Area 1 and Area 2 communities for accommodation of non-local workers. These facilities must comply with specified minimum standards. ○ Use the AAP Preferential Procurement function (including Local Supplier Development Manager) to identify local companies that can qualify for local procurement contracts to ensure AAP's Preferential Procurement Objectives are met, and meaningful participation of local business enterprises maximised. ○ The tendering and procurement process must be made more accessible to local companies by increasing levels of support provided (e.g. by Zimele), and removing barriers to entry, as far as reasonably possible. • Grievances to be handled in accordance with the Grievance Management Procedure. • Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence. • The implementation of an approved Social and Labour Plan that includes but is not limited to: ○ The implementation of a Social and Labour Plan which is compliant with the guidelines as published under the Mineral and Petroleum Resources Development Act, 2002. (Act No. 28 of 2002). ○ Consideration of the community needs and requests as well as the local and district municipalities Spatial Development Framework ○ Consideration of education and skills requirements to support current and future operations/projects. ○ Consideration of growth and enhancement initiatives for local accommodation facilities. ○ The Social and Labour Plan to be updated when and if deemed necessary and should take into consideration the onsite changes to the mine (inclusive of new developments/projects)	8	4	4	0	0	5	80	
Reduce water loss	• Development of anthropogenic aquifers to store water within the Sandsloot and Zwartfontein Pits.	4	4	2	0	0	3	30		Medium	Positive		6	4	3	0	0	4	52	
Potential of underground mining to reduce the social impacts associated with open pit mining due to the reduced volume of waste rock and the potential impacts associated with Waste Rock Dumps including loss of land, dust and noise.	Mining Operations	0	4	1	0	0	3	15		Medium	Positive	• Implement recommendations of specialist studies, including Air Quality and Noise Assessments. • Update and implement the Life of Asset Mine Plan inclusive but not limited to: ○ Implement measures to reduce volume of material deposited to rock waste dumps. ○ Reduce amount of waste rock dumped at NWRD; use waste rock to develop anthropogenic aquifers and for other viable purposes (e.g. future TSF construction). ○ Maximise use of processed tailings to fill underground voids; thus, minimising surface tailings storage and the associated potential adverse impacts	2	4	1	0	0	3	21	

Impacts resulting from dust, noise, freshwater quality, and groundwater quality	Mining Operations	8	6	4	0	0	5	90		Medium	Negative	• Implement an Environmental nonconformity and incident management procedure • All EMP recommended mitigation measures as applicable for Terrestrial Ecology (Faunal & Floral) must be adhered to • All EMP recommended mitigation measures as applicable for Surface Water must be adhered to • All EMP recommended mitigation measures as applicable for Groundwater must be adhered to • All EMP recommended mitigation measures as applicable for Noise must be adhered to • All EMP recommended mitigation measures as applicable for Visual must be adhered to • All EMP recommended mitigation measures as applicable for Air Quality must be adhered to • All EMP recommended mitigation measures as applicable for Archaeological (Heritage/Cultural) must be adhered to • All EMP recommended mitigation measures as applicable for Soil, Land Use & Land Capability must be adhered to • All EMP recommended mitigation measures as applicable for Traffic must be adhered to	6	6	3	0	0	4	60	
Loss of area available for grazing and initiation school sites associated with establishment and operation of NWRD.	Establishment of the North Waste Rock Dump Phase 3	6	3	1	0	0	4	40		Medium	Negative	• Adherence to the Mine health and Safety Act (Act 29 of 1996) o Ensure safety and security by maintaining a safety buffer. o MM to ensure that future unplanned residential development does not take place in areas that may be impacted by the NWRD by installation of a security fence. • Implement conditions contained in the lease agreement regarding access to land for grazing. • Develop and implement a Cultural Heritage Resources Management Plan inclusive but not limited to the following: o Implement recommendations contained in Heritage Impact Assessment and engage with affected parties to identify suitable alternative sites for establishment of initiation schools. • Grievances to be handled in accordance with the Grievance Management Procedure. • Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	2	3	1	0	0	4	24	
Safety impacts associated with stormwater collection dam: • Threat of drowning • Potential flooding threat posed by dam failure	Operation of the Navada Pollution Control Dam	6	3	2	0	0	3	33		Medium	Negative	• Adherence to the Mine Health and Safety Act (Act 29 of 1996) o Ensure safety and security by maintaining a safety buffer. • Adherence to the North west Polllution Control Dam- Navada Dam Operations and Maintenance Manual o Ensure that North west Polllution Control Dam- Navada Dam is fenced off and secured. o Place signage regular intervals in Sepedi indicated no swimming or drinking of water. o Place life buoys and safety ropes at strategic locations (worker and community safety). • Grievances to be handled in accordance with the Grievance Management Procedure. • Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence.	4	3	1	0	0	3	24	
Closure																				
Loss of employment and business opportunities	• Decommissioning of Infrastructure	8	6	4	0	0	5	90		Medium	Negative	• Implement the Social and Labour Plan Commitments with regards to decommissioning and closure. • Downscaling, decommissioning and closure planning to fully account for loss of local employment and business opportunities. • Develop/ review and extend programmes that offer transferrable and non-mining training and opportunities to support long-term economic and livelihood initiatives • The Final Rehabilitation and Closure Plan to take into consideration the needs of the community as it related to the end land use. o Implement strict access control to the site. • Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure o Incidents with social causes and/or consequences to be investigated in accordance with the Learning From Incidents (LFI) Procedure; the root causes must be identified and suitable remedies implemented to reduce likelihood of recurrence. • Maintain an Environmental nonconformity and incident management procedure	6	6	3	0	0	4	60	

MOGALAKWENA COMPLEX

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

10 Environmental Management Programme

A site-specific Environmental Management Programme (EMPr) has been prepared for the management of all activities at the MM Complex.

The environmental objectives, commitments and mitigatory measures for each of the anticipated environmental, socio-economic and cultural impacts, for each phase of the mining operation, has been detailed below in the sections to follow and tie in with the impact assessments that were highlighted in Chapter 9 where the likely environmental issues that may arise from the activities were identified and the likely harm that these activities may pose on the surrounding environment were quantified.

This section puts forth the manner in which these activities will be managed as to minimise any harm to the environment.

10.1 OBJECTIVES OF THE EMP

An "*Environmental Management Plan*" (EMP) is a plan or programme that sets out guidelines that describe how activities that have or could have an adverse impact on the environment, will be mitigated, controlled, and monitored and subsequently achieve a required operational and/or end state.

The purpose of the EMP is to provide for preventative, corrective and best practice measures to ensure that activities are undertaken in an environmentally responsible manner and that such activities are sustainable in the long term.

The primary objectives of the EMP, include, but are not limited to the following:

- Describe actions that, when implemented, will achieve mitigation of environmental impacts, or result in approved management of activities thereby reducing the probability of impacts occurring.
- Define organisational and administrative arrangements for environmental management and monitoring, including defining the responsibilities of staff and co-ordination, liaison and reporting procedures.
- Ensuring that discussions are held with the site supervision staff, regarding pro-active environmental management, such that potential problems can be identified, and mitigation measures adopted prior to any work being carried out.
- Define the procedures to be followed as to ensure environmental control, in the event of pollution occurring that may require actions.

10.2 IMPLEMENTATION OF THE EMP

The implementation of the EMP with specific reference to the identified mitigation measures will lie with the below mentioned team members:

- Construction Manager
- Construction Contractors
- Environmental Control Officer (ECO)
- Environmental Manager/Superintendent

The Compliance to the EMPr commitments and the implementation of mitigation measures put forth will follow a hierarchy approach as it relates to responsibility and accountability.

The ***Environmental Manager*** /***Superintendent*** (Highest level of control) on site will ultimately be responsible for overseeing the Compliance Monitoring that will be performed by the Environmental Control Officer (ECO) during the construction and closure phase of the development.

During the operational phase of the development, the Environmental Manager will be ultimately responsible to:

- Ensure continuously workshopping of the EMPr commitments with the site to ensure full understanding of responsibilities and actions to ensure compliance.
- Setting aside a budget for maintenance
- Ensure that allocated responsible resources maintain facilities and infrastructure in good working order to effectively fulfil its intended purpose and to prevent negative environmental impacts.
- Immediately remedy any aspects that contribute to negative environmental impacts.

The ***Environmental Control Officer (ECO)*** will be responsible for Compliance Monitoring on site (Construction & Closure Phase). This includes:

- Collaborating with the permanent employees, contractors and condition owners on the identification, communication, execution, verification, validation and follow up on implementation of EMPr commitments.
- Workshopping of EMPr commitments with the site as to ensure full understanding of conditions / commitments as well as the assignment of responsibilities and actions to ensure compliance.
- Reporting to the Environmental Manager on a frequent basis the Compliance Status of the site.

The *Contractor Manager* (first level of control) on site will be responsible as the first line of communication between the site and the Construction Contractors. In conjunction with the ECO, the Contractor Manager will be responsible to ensure:

- The EMPr is available on site at all times.
- Provide the Environmental Manager/ Superintendent and ECO with a "Method Statement" which will indicate the procedures that will be applied in order to meet the requirements of any aspect of the EMPr.
- Ensure that EMPr commitments are highlighted to the Construction Contractors prior to work commencing on site.
- Ensure that all problems identified during environmental inspections, are addressed and rectified as soon as reasonably possible.
- Ensure Implementation of EMPr Commitments and Mitigation measures by contractors on site.

10.3 INDUCTION PROGRAMS[216]

MM requires that the Project is completed as smoothly and efficiently as possible by ensuring that the Site has a stable, well trained, productive work force operating within a well-managed, safe, secure and accident - free environment and in a climate of harmonious labour relations.

In order to achieve these objectives, MM must ensure that sound industrial relations, health, safety and security practices, policies and procedures are implemented by the Contractors on the construction site.

It is acknowledged by all the parties to the Project that every Contractor has its own established industrial relations policies, procedures and systems and that various collective bargaining systems, statutory instruments and Industry Agreements are already in effect which differ between the various industries, Contractors and trade unions involved. Contractors shall provide the Project Industrial Relations Manager with workplace policies and procedures applicable to their respective Employees once the Commercial Agreement has been signed prior to site access.

The Contractors will be required to deliver world-class performance in every aspect of the Project, including the management of their human resources and industrial relations. To ensure this, Contractors will observe and comply with, inter alia, this IRG, all Relevant Laws, their respective policies, procedures and practices, applicable

[216] *AAP, 2022. Future of Mogalakwena. Infrastructure Optimisation and Third Concentrator Expansion. Feasibility Study. Section 17. HR Guideline for Contractors. Doc No: FM3-2020F-17-03.*

Industry Agreements and any collective agreements applicable to them as employers of the Employees on the Project.

The Contractors will ensure that there are sufficient resources available for the Project to manage industrial relations at the Site on a daily basis and as matters arise. The Contractors will be required to manage all industrial and/or human resources functions in relation to their respective Employees, which will include but are not limited to ensuring that qualified persons are appointed to represent their interests and attend any industrial relations meetings held from time to time.

Nothing shall diminish the responsibilities of the Contractors to implement and manage their own industrial relations, in compliance with Relevant Laws, Industry Agreements, any existing collective agreements and their policies and procedures.

10.3.1 Mogalakwena Mine Employees

MM has established induction programs which the Engineering, Procurement, and Construction Management (EPCM), all Contractors, and their Employees will be required to attend. MM reserves the right to conduct additional induction programs as may be warranted during the course of the Project. Attendance at such programs is compulsory.

The induction program shall occur before Site mobilization and shall cover, amongst others, the following topics:

- Industrial Relations Guide (IRG),
- Site procedures,
- Safety, health, environmental etc. procedures and
- General Site rules and regulations.
- Common objectives of MM, Contractors, and the Project Manager; and
- any other topic deemed relevant to the discretion of MM.

10.3.2 Contractors

Contractors are required to provide their respective Employees with their own internal induction program to amongst other things, ensure that Employees are aware of the policies and procedures applicable to them. Contractors are required to brief their Employees on:

- their respective applicable industrial relations procedures, including but not limited to
    - grievance management processes,
    - dispute resolution procedures and
    - disciplinary procedures;
- the communications channels available and applicable to Employees for the duration of the Project; and
- the conditions of employment (including employee benefits and benefit funds) applicable to the Employees.

The Contractors shall provide the induction to their Employees in order for Site access to be obtained and such induction shall be conducted no later than 1 week prior to the date on which Employees are required to commence work on the Project.

At least 5 days prior to the date on which the Employees are required to commence work, the Contractor must provide MM and/or the Project Manager with written confirmation that each of its Employees attended the induction envisaged herein. Written confirmation must include a list of names of the Employees who attended such induction. In the event of new Employees commencing work at Site during the course of the Project, such induction must be carried out prior to that Employee commencing work on the Project, failing which the Employee will not be granted access to Site.

MM shall not be liable for any costs incurred by the Contractor in the event that Site access is not timeously granted for reasons related to such induction program not being conducted. Further, such refusal of access to Site shall not be regarded as justification for failure of the Contractor to render its required services to RPM on the Project in terms of the Commercial Agreement.

10.4 PROCEDURES

A summary of the procedures developed to date for implementation at the Mogalakwena Complex relating to the management of chemical and hazardous substances is provided in Table 10-1.

Table 10-1: MM Procedures developed and adopted for the management of chemical and hazardous substance[217]

Procedure and Revision Date	Purpose of the Procedure
Hydrocarbon / Chemical Spill Procedure, September 2019 (Document Ref MS-SHE-ENV-PRO-0015)	To ensure the correct containment and clean-up of oil, fuel and chemical spillage and leakages and to ensure correct and safe disposal of contaminated soil and other material
Environmental nonconformity and incident management procedure, January 2018 (Document Ref CTR-SHE-ENV-PRO-OO4)	This procedure aims to identify, classify and control all actual and potential environmental nonconformities and incidents that can cause harm to the environment.
Oil and silt traps clean out, August 2019, (document ref MS-MIN-ENV-PRO-0013)	The objective of this operating procedure is to ensure the safe clean out of oil and silt traps, ensure that all silt traps and oil traps are cleaned out on a regular basis, maintain all silt and oil traps in a good working order and report any spillage, blocked or broken silt and / or oil trap.
Storage, handling and disposal of used oil and hydrocarbon/degreaser drums, August 2019. (Document Ref MS-MIN-ENV-PRO-0014)	The objective of this operating procedure is to ensure the safe disposal of oil, coolant, grease and degreaser drums and ensure that the drums are disposed of, into the correct waste stream.
Handling, storage and disposal of hazardous waste, March 2021 (Document Reference MS-SHE-ENV-PRO-0010)	The objective of this task procedure is to: • Ensure that all hazardous waste is handled correctly; • Ensure temporarily stored hazardous waste is held/stored correctly until disposal; • Ensure that all hazardous waste at Mogalakwena and both Concentrators, is disposed of correctly by the relevant contractor at a registered hazardous materials landfill site; and • Report any deviations or incidents of wrong handling, holding and disposal of hazardous waste to the Environmental Department.
Hazardous materials management, February 2020 (Document Ref MS-SHE-HLH-STD-0002)	The aim of this standard is to ensure that persons and the environment are not exposed to hazardous materials to such an extent as to cause unacceptable risk during their life cycle.

[217] *AAP, 2022. Future of Mogalakwena. Sandsloot Underground Mine. Sandsloot pre-Feasibility A Study. Section 14.4. Environmental Report. Doc No: PB22053-2021A-14-04.*

Table 10-2: Environmental Management Programme

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
Topography		

Altered natural topography (landscape) and land use capability.	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which require bulk excavations, earthworks soil profiling, levelling, and continuous disposal to land.
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management & disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.
	• Remaining of permanent mining related infrastructure after mine closure (inclusive but not limited to voids, residue disposal areas, surface infrastructure, services, linear activities and waste management/disposal areas).
		Mitigation Objective:
		• To limit impacts on drainage and the aesthetic quality of the environment due to changes in the topography.
		• Rehabilitating of topography to landscape that is visually acceptable.
		
		Construction Phase:
		• Development (if not already in place), update (if in place) and implementation of a site specific "Master Layout Plan/Procedure" aligned with the Life of Asset Mine Plan/Procedure that includes but are not limited to:
		    o Optimisation of mine related surface infrastructure areas.
		    o Minimisation of footprint disturbances.
		    o Demarcates laydown areas.
		    o Demarcation of construction areas.
		    o Demarcation of development areas.
		    o Demarcation of stormwater management infrastructure.
		    o Demarcation of no-go zones and sensitive areas.
		    o Demarcation of mineral residue disposal areas.
		    o Demarcation of topsoil stockpiling areas.
		    o Demarcation of areas restricted in terms of vehicular movement within no-go zones and sensitive areas; and
		    o Aligns with the site-specific Closure and end Land Use Plan/Procedure.
		• Development (if not already in place), update (if in place) and implementation of a site-specific Concurrent Rehabilitation Plan/Procedure aimed at achieving a Final Rehabilitation and Closure Plan/Procedure aligned with the Life of Asset Mine Plan/Procedure and achievable End Land Use Development Framework.
		• The beneficial utilization of waste rock for the development of mining related infrastructure, surface infrastructure, services and linear activities on site (inclusive but not limited to road, terracing, dams, dam embankments, anthropogenic aquifers, stormwater management infrastructure, walls and other management measures).
		• The alternative utilization of tailings material on site i.e., backfilling of underground voids.
		
		Operational Phase:
		• Update, implement and maintain the Master Layout Plan/Procedure through the operational life cycle of the mine aligned with the Life of Asset Mine Plan/Procedure.
		• Update, implement and maintain the Concurrent Rehabilitation Plan/Procedure aimed at achieving a Final Rehabilitation and Closure Plan/Procedure aligned with the Life of Asset Mine Plan/Procedure and achievable End Land Use Development Framework.
		
		Decommissioning & Closure Phase:
		• Develop and implement the Final Rehabilitation and Closure Plan/Procedure based on the End Land Use Development Framework at least 5-years prior to when closure needs to be obtained inclusive but not limited to.
		    o Ensuring that Mineral Residue Disposal Facilities that will remain post closure are at a stable slope as to allow for vegetation re-growth and the prevention of erosion through gully formation.
		    o In agreement and in consultation with relevant stakeholders, return the area, as far as possible, to a topography aligned with the End Land Use Development Framework/Objectives.
		    o Demolish and remove structures, infrastructure such as the concentrators, shafts, terracing, foundations and other mining related infrastructure without any post mining use and rehabilitate the footprint and associated disturbed areas from which these have been removed.
		
		All Phase:
		• Implement all EMP recommended mitigation measures as applicable for Biodiversity Management.
		• Implement all EMP recommended mitigation measures as applicable for Surface Water Management.
		• Implement all EMP recommended mitigation measures as applicable for Soils, Land Use and Land Capability Management.
		• Disturbance and movement should be kept to the areas as demarcated in the "Master Layout Plan/Procedure" only.
		• Concurrent Rehabilitation Plan/Procedure aimed at achieving a Final Rehabilitation and Closure Plan/Procedure.
		    o Permanent remaining mining related infrastructure (remaining after mine closure) such as residue disposal areas and waste disposal areas should be constructed (continuous disposal) with end land use in mind and should be constructed to be visually acceptable while promoting visual absorption capacity of remaining facilities and community safety.
		    o Rehabilitated areas must be ensured to be free draining.
		• The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary).
		
		*Note all documentation (Plan/Procedure) development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
		* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Soils, Land Use and Land Capability		

Loss of future soil utilisation potential.	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which requires bulk excavations, earthworks soil profiling, levelling, continuous disposal to land, waste, chemical and hydrocarbon management.
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.
		Mitigation Objective:
		• Soil, land use & land capability protection through:
		  o Minimisation and management of soil erosion, compaction, and contamination.
		  o Protection of topsoil in terms of its future soil utilisation potential.
		• Manage soil as a non-renewable resource, as it is non-replaceable in one lifetime and more
		
		Construction Phase:
		• Development (if not already in place), update (if in place) and implement a Topsoil Utilisation Management Plan/Procedure, that includes but is not limited to:
		  o Alignment with the site-specific Biodiversity Management Plan/Procedure, Alien and Invasive Plant Species Management Plan/Procedure and Concurrent Rehabilitation Plan/Procedure aimed at achieving a Final Rehabilitation and Closure Plan/Procedure aimed at the prevention of erosion and loss of soil quality as to promote rehabilitation.
		  o Promoting the single handling of topsoil, where practically possible as to protect soil structure.
		  o Stripping of topsoil, and other soil layers, inclusive of vegetation cover/organic matter, prior to the development of any infrastructure and the stockpiling/storage thereof in dedicated topsoil stockpile areas located outside the 1:100-year flood line and flood plains of watercourses. Stockpiling utilisable soil (as defined) separately from the soft overburden.
		• Development (if not already in place), update (if in place) and implementation of a site specific "Master Layout Plan/Procedure" aligned with the Life of Asset Mine Plan/Procedure limiting the areas of impact to as small a footprint as possible wherever possible.
		
		Operational Phase:
		• Update and maintain the Topsoil Utilisation Management Plan/Procedure that includes but are not limited to the following:
		  o Implementation and maintenance of protection measures to protect the topsoil/soil stockpiles from water and wind erosion.
		  o Continual alignment with the Master Layout Plan/Procedure which coincides with the Life of Asset Mine Plan/Procedure aimed at the protection of utilisable topsoil.
		• Development (if not already in place), update (if in place) and implement a Concurrent Rehabilitation and Closure Plan/Procedure based on the End Land Use Development Framework aimed at the most suitable utilisation of topsoil.
		
		Decommissioning & Closure Phase:
		• Implementation of a Final Rehabilitation and Closure Plan/Procedure aligned with the End Land Use Development Framework, inclusive but not limited to:
		  o The contouring of topsoil/soil on rehabilitated areas to prevent erosion through gully formation and ponding of water.
		  o The vegetation of rehabilitated area either by natural succession or through a suitable seed mix to protect soils from water and wind erosion.
		  o Where required, provide for the loss of nutrients in the soil through addition of organic matter during final rehabilitation placement.
		
		All Phase:
		• Implement all EMP recommended mitigation measures as applicable for Biodiversity Management.
		• Implement all EMP recommended mitigation measures as applicable for Groundwater Management.
		• Implement all EMP recommended mitigation measures as applicable for Surface Water Management.
		• The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary).
		
		*Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.
		
		* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.

Biodiversity		

Biodiversity destruction (loss of faunal & floral species).
Proliferation of Alien Invasive Species and Weeds
Permanent loss of disturbed footprint rehabilitation capability and ecosystem services.
Loss of aquatic biodiversity, aquatic habitat and riparian area.
	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which require habitat destruction through the clearance of vegetation and continuous disposal to land.
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas
		Mitigation Objective:
		• To demonstrate active stewardship of land and biodiversity.
		• Minimisation of biodiversity destruction as far as practically possible, by the adoption of the biodiversity hierarchy.
		• Management of Alien Invasive Species and Weeds proliferation within dedicated footprint area.
		• Rehabilitation of disturbed footprint areas.
		• Encouragement of indigenous biodiversity regrowth.
		Construction Phase:
		• Development (if not already in place), update (if in place) and implementation of a site-specific Biodiversity Management Plan/Procedure which includes but are not limited to:
		  o Demarcation of no-go zones and sensitive (protected) areas.
		  o Compilation of a Rescue and Relocation Strategy for encountered Species of Conservation Concern (SCC) (including the Limpopo Environmental Management Act, 2003 (Act No.7 of 2003) (LEMA)-protected, National Forest Act, 1998 (Act No. 84 of 1998) (NFA) protected, the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) threatened or protected (TOPS) species and/or Red Data Listed (RDL)) species.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
	(concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development. • Remaining of permanent mining related infrastructure after mine closure (inclusive but not limited to voids, residue disposal areas, surface infrastructure, services, linear activities and waste management / disposal areas).	o Setting forth measures to restrict footprint creep and edge effect. o Ensureing that protected species are identified, and a relocation permit secured prior to its removal and relocation should avoidance not be possible. • Development (if not already in place), update (if in place) and implement a site-specific Alien and Invasive Plant Species Management Plan/Procedure (centered around the identification, eradication, and management of Alien Invasive Species and Weeds) - inclusive of management on stockpiles. • Development (if not already in place), update (if in place) and implement a site-specific Concurrent Rehabilitation and Closure Plan/Procedure which: o Sets forth timeframes and priority areas for rehabilitation. o Promotes concurrent rehabilitation of disturbed areas. o Reduces soil erosion. o Promotes Visual Absorption Capacity and reduces Visual Intrusions of facilities on community facing sides. o Promotes natural succession of indigenous vegetation; and o Aligns with the Mine Closure Plan/Procedure **Operational Phase:** • Update and maintain the site-specific Biodiversity Management Plan/Procedure which includes but is not limited to: o The auditing of disturbed footprint areas as to prevent footprint creep and edge effect with sound record keeping. o The management of firebreaks to prevent destruction and damage to vegetation. • Update, implement and maintain the Alien and Invasive Plant Species Management Plan/Procedure inclusive but not limited to: o The establishment and maintenance of a monitoring and alien and invasive eradication (record keeping) programme. • Update, implement and maintain the Concurrent Rehabilitation and Closure Plan/Procedure inclusive but not limited to: o The establishment and maintenance of a concurrent rehabilitation record/audit programme which also supports the annual quantum calculation for financial provision. ***Decommissioning & Closure Phase:*** • Maintain the Biodiversity Management Plan/Procedure until monitoring/sustainability and legislative requirements have been achieved inclusive but not limited to the following: o The monitoring and auditing of vegetation coverage on rehabilitated areas as to confirm the need for additional intervention. o The prevention of the illegal use of the rehabilitated areas as grazing land, harvesting of plants for medicinal use, wood harvesting, agriculture and human settlement. o The prevention / minimisation of harvesting of medicinal plant species until full sustainable vegetative coverage has been achieved. • Maintain the Alien and Invasive Plant Species Management Plan/Procedure until monitoring/sustainability and legislative requirements is achieved. ***All Phases:*** • All EMP recommended mitigation measures as applicable for Surface Water Management must be adhered to. • All EMP recommended mitigation measures as applicable for Air Quality Management must be adhered to. • Implement all EMP recommended mitigation measures as applicable for Groundwater Management. • Implement and maintain a Training and Awareness programme as to foster biodiversity awareness amongst permanent employees and third-party contractors regarding biodiversity EMP objectives and expected interaction with biodiversity. • No informal fires should be allowed within the demarcated mine area as to prevent veld fires. • Adequate firefighting equipment should be provided on-site for permanent employees and third-party contractors. • No faunal species may be hunted, trapped, snared, or captured for any purpose except the safe removal of the faunal species off site. Snares and traps encountered on site as well as along the site boundaries and fences must be removed. • Where practical, allow for small naturally occurring faunal species such as birds, snakes, and rodents to move through fences. • In areas where natural plant succession is not effective, consideration should be given to the use of an appropriate seed mix to stimulate vegetation regrowth as to prevent topsoil loss through water and wind erosion. • Grazing animals should be discouraged from entering operational and rehabilitated areas - areas to restrict community grazing animals. • Any action taken to control and eradicate invasive plant species must be executed with caution and in a manner that causes the least possible harm to indigenous biodiversity and damage to the receiving environment. • The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Surface Water		
Water resource degradation (water quality and quantity). Loss of aquatic species. Surface water quality degradation.	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which requires continuous disposal to land, waste, chemical and	***Mitigation Objective:*** • Surface water resource protection through: o National Water Act (Act 36 of 1998) GN704 Regulation Compliance (dirty/clean water separation management). o Effective general & hazardous waste management. o Effective chemical & hydrocarbon management.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
Surface water degradation (quantity and quality) which supports community's domestic, and livestock needs.	hydrocarbon management and could result in transportation of disturbed soils. • Raw water (surface water) supply requirements to meet development water demands. • Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which could reduce catchment yield (containment of surface water run-off on site). • Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development. • Remaining of permanent mining related infrastructure after mine closure (inclusive but not limited to voids, residue disposal areas, surface infrastructure, services, linear activities and waste management / disposal areas).	o Protection of catchment yield. o Effective water demand management.
		Construction Phase: • Development (if not already in place), update (if in place) and implementation of a site-specific Stormwater Management Plan/Procedure which meets the requirements of the National Water Act (Act 36 of 1998) GN704 Regulations inclusive but not limited to: o The design and implementation of effective clean and dirty water separation systems on site. o The design and implementation of suitable barrier systems for dirty water conveyance and storage facilities in accordance with the requirements of the National Environmental Management Waste Act, (Act 59 of 2008), Waste Act Norms and Standards and as approved through the design requirement of the Department of Water and Sanitation (approved Design Drawings) in the Water Use Licence approval process. o The design and implementation of the minimum design requirements to adhere to the capacity requirements for dirty water containment facilities in terms of GN704. o The design and implementation of suitable energy dissipating structure where clean storm water enters the natural receiving water resource. o Aimed at the protection of topsoil stockpiles aimed at curbing soil erosion and siltation ▪ The site-specific Stormwater Management Plan/Procedure should take into consideration when facilities were approved (under which legislation) ▪ The site-specific Stormwater Management Plan/Procedure should take into consideration the approved technical design of the facilities (according to which existing and new facilities should adhere to) • Development (if not already in place), update (if in place) and implementation of a site-specific suitably designed Surface Water Quality Monitoring Programme (including Biomonitoring (Inclusive but limited to the latest South African Scoring System (SASS), Habitat Integrity Index (HII) and Riparian Vegetation Assessment)) which meets the requirements of the National Water Act (Act 36 of 1998) and approved Water Use Licences. • Development (if not already in place), update (if in place) and Implementation of a site-specific Waste (General and Hazardous) Management Plan/Procedure • Development (if not already in place), update (if in place) and implementation of a site-specific Dangerous Goods and Hazardous Substances Storage and Handling Management Plan/Procedure aimed at the protection of soils and watercourses against spills and leaks. • Development (if not already in place), update (if in place) and implementation of a site-specific Chemical & Hydrocarbon Spill Procedure which: o Sets forth an Emergency Protocol for Surface Water Contamination. o Sets forth clean-up and protection of soils against accident and incidents. • Development (if not already in place), update (if in place) and implementation of a site-specific Water and Salt Balance. • Development (if not already in place), update (if in place) and implementation of a site-specific Vehicle and Machinery Maintenance and Management Plan/Procedure which: o Ensures maintenance is undertaken to prevent spills and leaks (from maintenance related activities, pipelines, vehicles, and electrical reticulation), performance abnormalities and/or failures. • Development (if not already in place), update (if in place) and implement a hazard specific Emergency Preparedness and Response Plan as well as a hazard specific Recovery Plan (where intervention is deemed necessary) that addressed surface water degradation (quantity and quality) which supports community's domestic, and livestock needs. ***Operational Phase:*** • Update, implement and maintain site specific Stormwater Management Plan/Procedure. • Update, implement and maintain site specific Surface Water Quality Monitoring Programme. • Update, implement and maintain site specific Waste (General and Hazardous) Management Plan/Procedure. • Update, implement and maintain site specific Chemical & Hydrocarbon Spill Procedure. • Update, implement and maintain site specific Water and Salt Balance. • Update, implement and maintain site specific Vehicle and Machinery Maintenance and Management Plan/Procedure. • Update, implement and maintain site specific Dangerous Goods and Hazardous Substances Storage and Handling Management Plan/Procedure • Update, implement and maintain hazard specific Emergency Preparedness and Response Plan. • Update, implement and maintain hazard specific Recovery Plan. ***Decommissioning & Closure Phase:*** • Implement and maintain a site-specific Surface Water Quality Monitoring Programme until monitoring/sustainability and legislative requirements is achieved. • Implement site specific Waste (General and Hazardous) Management Plan/Procedure until activities have ceased on site. • Implement site specific Chemical & Hydrocarbon Spill Procedure until activities have ceased on site. • Implement site specific Vehicle and Machinery Maintenance and Management Plan/Procedure until activities have ceased on site. • Implement site specific Stormwater Management Plan/Procedure (specifically aimed at closure specific stormwater management), monitoring/sustainability and legislative requirements. • Implement and maintain site specific Dangerous Goods and Hazardous Substances Storage and Handling Management Plan/Procedure. • Implement and maintain hazard specific Emergency Preparedness and Response Plan. • Implement and maintain hazard specific Recovery Plan. ***All Phases:*** • Where possible above ground chemical/hazardous storage tanks and containers should be designed, constructed, and maintained with adequate secondary containment measures. • Maintenance of vehicles and machinery shall only be undertaken in dedicated workshop areas which have been constructed with adequate pollution containment measures.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
		• Where possible developments should be designed and constructed to ensure maximum effective diversion of clean water to the environment, minimal surface water runoff contamination and effective maximum containment of dirty water runoff. • The site to implement a water management hierarchy of avoid, reuse, recycle as far as practically possible. • Developments, equipment, and activities to remain outside of the Regulated Zones of watercourses unless specifically authorised to be there under the National Environmental Management Act, 1998 (Act 107 of 1998), the National Water Act (Act 36 of 1998) and GN704 Regulations. • The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMPr objectives and commitments/mitigation measures to all permanent employees, contractors and visitors (where deemed necessary). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management from the date of being promulgated. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Groundwater		

Water resource degradation (water quality and quantity).
Groundwater quality degradation.
Groundwater degradation (quantity and quality) which supports community's domestic, and livestock needs.
	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which requires continuous disposal to land, waste, chemical and hydrocarbon management.
	• Raw water (groundwater) supply requirements to meet development water demands.
	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which could reduce catchment yield (containment of surface water run-off on site).
	• Operational practices which require the storage of mine residue within open pits and underground workings.
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.
	• Remaining of permanent mining related infrastructure after mine closure (inclusive but not limited to voids, residue disposal areas, surface infrastructure, services, linear activities and waste management / disposal areas).
		Mitigation Objective:
		• Implementation of Water Conservation and Water Demand Management measures
		  o Groundwater resource protection through:
		    ▪ National Water Act (Act 36 of 1998) GN704 Regulation Compliance (dirty/clean water separation management).
		    ▪ Effective general & hazardous waste management.
		    ▪ Effective chemical & hydrocarbon management.
		    ▪ Protection of groundwater quality.
		    ▪ Protection of groundwater yield (quantity).
		
		Construction Phase:
		• The design and implementation of suitable barrier systems for dirty water conveyance and storage facilities in accordance with the requirements of the National Environmental Management Waste Act, Waste Act (Act 59 of 2008) Norms and Standards and as approved through the design requirement of the Department of Water and Sanitation (approved Design Drawings) in the Water Use Licence approval process.
		    ▪ This should take into consideration when facilities were approved (under which legislation).
		    ▪ This should take into consideration the approved technical design of the facilities (according to which existing and new facilities should adhere to).
		• Development (if not already in place), update (if in place) and implementation of a site-specific Groundwater Quality Monitoring Programme which meets the requirements of the National Water Act (Act 36 of 1998), approved Water Use Licences
		• Development (if not already in place), update (if in place) and implementation of a site-specific Dewatering Management Plan/Procedure which takes into consideration the Life of Asset Mine Plan/Procedure.
		• Development (if not already in place), update (if in place) of "Hydrogeological Numerical Flow Model" which takes into consideration the Life of Asset Mine Plan/Procedure.
		• Development (if not already in place), update (if in place) of site specific "Contamination Transport Model" which takes into consideration the Life of Asset Mine Plan/Procedure.
		• Development (if not already in place), update (if in place) and implementation of appropriate barrier systems on dirty water containment facilities.
		• Development (if not already in place), update (if in place) and implement a hazard specific Emergency Preparedness and Response Plan as well as a hazard specific Recovery Plan (where intervention is deemed necessary) that addressed groundwater degradation (quantity and quality) which supports community's domestic, and livestock needs.
		
		Operational Phase:
		• Update the Hydrogeological Numerical Flow and Contaminant Transport Model, if and when required, in order to monitor site specific groundwater impacts.
		• Update, implement and maintain site specific Groundwater Quality Monitoring Programme.
		• Development (if not already in place), update (if in place), implement, and maintain a site-specific Interception and Pumping Management System in order to curb the movement of any contamination plume that may impact downstream water users supporting by the site-specific groundwater monitoring programme. This system may include interventions such as interception trenches, sumps, and interception boreholes. The effectiveness of the intervention measure must be monitored through the site-specific Groundwater Quality Monitoring Programme and Contamination Transport Model. The site to also take into consideration alternative management measures such as wetland off-set projects where deemed necessary and feasible.
		• Update, implement and maintain site specific Dewatering Management Plan/Procedure aimed at the dewatering of groundwater prior to contact within mining related activities.
		• Maintain suitable barrier systems for dirty water conveyance and storage facilities in accordance with the requirements of the National Environmental Management Waste Act, Waste Act (Act 59 of 2008) Norms and Standards and as approved through the design requirement of the Department of Water and Sanitation (approved Design Drawings) in the Water Use Licence approval process.
		
		• Update, calibrate and maintain a site-specific Water and Salt Balance
		
		• Undertake a hydrocensus within 1 km radius to quantify impacts of densification on groundwater resources (should be updated when and if required and when deemed outdated).
		• Update, implement and maintain hazard specific Emergency Preparedness and Response Plan.
		
		• Update, implement and maintain hazard specific Recovery Plan.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
		Decommissioning & Closure Phase: • Maintain a site-specific Groundwater Quality Monitoring Programme until such time as water quality remains fit for recognized water uses and are aligned with legislative requirements. • Update site specific Hydrogeological Numerical Flow and Contaminant Transport Model to confirm post closure groundwater impacts. • Maintain a site-specific Interception and Pumping Management System in order to curb the movement of any contamination plume that may impact downstream water users supporting by the site-specific groundwater monitoring programme. • Implement and maintain hazard specific Emergency Preparedness and Response Plan. • Implement and maintain hazard specific Recovery Plan. ***All Phases:*** • All EMP recommended mitigation measures as applicable for Surface Water Management must be adhered to. • The site to implement a water management hierarchy of avoid, reuse, recycle as far as practically possible. • The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Noise		

Increased ambient noise levels above legislative acceptable levels (elevated noise levels).	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which requires the utilisation of heavy machinery (intermittent and continuous noise pollution).
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.
		Mitigation Objective:
		Management of elevated noise levels
		
		Construction Phase:
		• Development (if not already in place), update (if in place) and implementation of a site-specific Noise and Vibration Management Monitoring Plan/Procedure which:
		    o Meets the requirements of the South African National Standard (SANS) 10103:2008 guidelines.
		    o Sets for Personal Protective Equipment requirements for site specific areas.
		    o Sets forth mitigation measures such as operating hours and acoustic screening at site boundary for excessive noise exceedances.
		    o Give consideration to noise reduction measures in terms of equipment.
		• Development (if not already in place), update (if in place) and implementation of a site-specific Vehicle and Machinery Maintenance and Management Plan/Procedure which
		    o Ensures maintenance and repairs are undertaken to prevent performance abnormalities and/or failures.
		
		Operational Phase:
		• Update, implement and maintain site specific Noise and Vibration Management Monitoring Plan/Procedure.
		• Update, implement and maintain site specific Vehicle and Machinery Maintenance and Management Plan/Procedure.
		
		Decommissioning & Closure Phase:
		• Implement site specific Vehicle and Machinery Maintenance and Management Plan/Procedure until activities on site have ceased.
		• Implement site specific Noise and Vibration Management Monitoring Plan/Procedure until activities on site have ceased.
		
		All Phases:
		• All EMP recommended mitigation measures as applicable for Traffic Management must be adhered to
		• Implement and enforce Personal Protective Equipment (PPE) to all permanent and third-party contractors in working areas with elevated noise levels.
		• The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary).
		
		*Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.
		
		* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.

Visual		
Loss of sense of place. Visual structural intrusions. Light intrusions.	• Development/operation of mining related infrastructure, surface infrastructure, services and linear	***Mitigation Objective:*** • Minimisation and management of loss of sense of place. • Minimisation and management of visual intrusions. • Encouragement of visual absorption capacity.

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
	activities which are not congruent to the original natural landscape. • Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development. • Remaining of permanent mining related infrastructure after mine closure (inclusive but not limited to voids, residue disposal areas, surface infrastructure, services, linear activities and waste management / disposal areas).	• Minimisation and management of visual particulate matter emissions. • Minimisation and management of light intrusions. ***All Phases:*** • All EMP recommended mitigation measures as applicable for Biodiversity Management must be adhered to. • All EMP recommended mitigation measures as applicable for Air Quality Management/dust must be adhered to. • Where practically possible light fixtures to be strategically placed to avoid/reduce visual intrusion (glare and light trespass) on community facing sides. • Where practically possible high light masts and high pole security lighting should be avoided along the periphery of the site. • Where practically possible uplighting of mine related surface infrastructure must be avoided/reduced. • Where practically possible lighting to be installed at a downwards angle (precise directed illumination). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management from the date of being promulgated. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management.
Air Quality		
Air Emission (contributor to air pollution) Increased emissions (Particulate Matter) Increased fugitive dust	• Construction/operation of mining related infrastructure, surface infrastructure, services and linear activities which requires the utilization of machinery that generates greenhouse gases. • Construction/operation of mining related infrastructure, surface infrastructure, services and linear activities which result in particulate matter emissions. • Development/operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management/disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.	***Mitigation Objective:*** • Minimisation and manage Total Suspended Particulates (TSP), PM10, and PM2.5 • Minimisation of carbon emissions and Greenhouse Gases (GHG) ***Construction Phase***: • Development (if not already in place), update (if in place) and implementation of a site specific "Air Quality Monitoring and Management Plan/Procedure" which sets forth appropriate Emissions and Dust Control Management. Dust management can be undertaken by means of dust suppressants or spraying of water, speed and reduction measures. • Development (if not already in place), update (if in place) and implementation of a site specific "Vehicle and Machinery Maintenance and Management Plan/Procedure" which ensures maintenance and repairs are undertaken to prevent performance abnormalities and/or failures. ***Operational Phase:*** • Update, implementation and maintain site specific Air Quality Monitoring and Management Plan/Procedure (Emissions and Dust Control Management) • Update, implement and maintain site specific Vehicle and Machinery Maintenance and Management Plan/Procedure. ***Decommissioning & Closure Phase***: • Implement site specific Air Quality Monitoring and Management Plan/Procedure until monitoring/sustainability and legislative requirements is achieved. • Implement site specific Vehicle and Machinery Maintenance and Management Plan/Procedure until activities on site have ceased. ***All Phases:*** • All EMP recommended mitigation measures as applicable for Traffic Management must be adhered to. • All EMP recommended mitigation measures as applicable for Biodiversity Management must be adhered to. • All EMP recommended mitigation measures as applicable for Soils and Land Capability must be adhered to. • The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Cultural Heritage Resources		

Destruction/disturbance of cultural heritage resources.
 	
Loss of access to cultural heritage resources.
 	
Lack of respect for local norms, customs, and traditional practices
	• Development/operation of mining related infrastructure, surface infrastructure, services and linear activities which results in the disturbance of undisturbed land.
	• Development/operation inclusive but not limited to open pit and underground mining, residue disposal
		Mitigation Objective:
		• Cultural heritage resource protection through:
		  o Through effective identification, avoidance and mitigation of cultural heritage resources.
		Construction Phase:
		• Development (if not already in place), update (if in place) and implement a Cultural Heritage Resources Management Plan/Procedure inclusive but not limited to the following:
		  o Development (if not already in place) and update (if in place) of Cultural Heritage Resources Master Layout Map/Procedure inclusive of fenced buffer areas (sensitive cultural heritage sites).
		  o Development (if not already in place), update (if in place) and implementation of a Chance Find Procedure inclusive of the required public consultation requirements.

<table>
<tr><th>POTENTIAL ENVIRONMENTAL IMPACT</th><th>ACTIVITY</th><th>ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)</th></tr>
<tr><td>(Intangible heritage and cultural aspects).</td><td>areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.</td><td>
Development (if not already in place) and update (if in place) of a Grave Relocation Procedure inclusive of the required public consultation requirements.
Development (if not already in place), update (if in place) and implement a record and document control management procedure/system.
Operational Phase:
Update, implement and maintain the Chance Find Procedure.
Update and maintain the Cultural Heritage Resources Plan and Master Layout Map.
Update and maintain the Grave Relocation Procedure.
Update and maintain the document control management system, as and when required.
Decommissioning & Closure Phase:
Implement and maintain the Chance Find Procedure until all decommissioning and closure activities have ceased.
All Phases:
Continuous implementation of an awareness programme to ensure that permanent employees are equipped to recognize cultural heritage resources.
Continuous workshopping of the "Chance Find Procedure" to ensure protocol implementation is embedded.
Ensuring that any destruction, removal or relocation of cultural hearitage resources are undertaken under the correct legislative and social consultation process.
Ensuring that cultural heritage resources that will remain on site are clearly marked, deemed no-go zones on site specific Master Layout Plan/Procedure and adequately protected against any mine related activities.
The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary).
Ensuring that cultural norms and standards are adhered to where feasibly and practically possible.
*Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.

* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.</td></tr>
<tr><td colspan="3">Traffic</td></tr>
<tr><td rowspan="2">Increased road traffic/congestion.
Increased risk to road and pedestrian safety.
Increased emissions.
Anti-social driving behavior.</td><td rowspan="2">
Development/operation of mining related infrastructure(projects), surface infrastructure, services and linear activities which results in increased people (Influx) and vehicular movement on and around site.
Development/ operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops, processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.
The utilisation of public transportation routes for the conveyance of services and goods to and from the site
The utilization of public transportation routes for the transportation of contractors, visitors and contractors to site.</td><td>
Mitigation Objective:
Management of increased road traffic/congestion.
Effective road and pedestrian safety.
Management of emissions.</td></tr>
<tr><td>
Construction Phase:
Development (if not already in place), update (if in place) and implement a Traffic Management Plan/Procedure inclusive but not limited to:
Implementation of adherence to traffic speed limits (All permanent staff, visitors and contractors).
Development and implementation of specialized road safety and driving training where necessary.
Development of pedestrian sidewalks that minimize and mitigate man / machinery interaction.
Ensuring implementation of appropriate road safety traffic signage on site.
Implements traffic calming measures where necessary and allows for the design of roads in such a manner to limit unnecessary blind corners, and steep inclines / declines where possible.
Ensuring that roads are maintained at all times to an acceptable procedure.
Ensuring that routing on site is so that it discourages vehicles through populated and no-go areas.
Ensuring that all heavy/abnormal road vehicles comply with the specifications, limitations and permitting requirements as set out in the Road Traffic Act, 1996 (Act No. 93 of 1996) and the National Road Traffic Regulations (2000).
Operational Phase:
Update, implement and maintain the Traffic Management Plan/Procedure through the operational life cycle of the mine.
Decommissioning & Closure Phase:
Update, implement and maintain the Traffic Management Plan/Procedure throughout the decommissioning and closure cycle of the mine.
Demolish and remove road structures and associated infrastructure without any post mining use and rehabilitate the footprint and associated disturbed areas from which these have been removed.
All Phases:
Implement all EMP recommended mitigation measures as applicable for Topography Management must be adhered to
Implement all EMP recommended mitigation measures as applicable for Biodiversity Management must be adhered to
Implement all EMP recommended mitigation measures as applicable for Surface Water Management must be adhered to
Implement all EMP recommended mitigation measures as applicable for Noise Management must be adhered to
Implement all EMP recommended mitigation measures as applicable for Visual Management must be adhered to
Implement all EMP recommended mitigation measures as applicable for Air Quality Management must be adhered to</td></tr>
</table>

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
		• Implement all EMP recommended mitigation measures as applicable for Cultural Heritage Resources Management must be adhered to • Implement all EMP recommended mitigation measures as applicable for Soil, Land Use & Land Capability Management must be adhered to • Implement a Traffic Management Plan • The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary). *Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management. * Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.
Socio-economic		

<u>Job Opportunities / Employment & Procurement</u>
• Creation of local employment and business opportunities due to the development/operation of new mining related infrastructure (projects), surface infrastructure, services and linear activities.
• Creation of socio-economic opportunities and procurement opportunities due to the development/operation of new mining related infrastructure (projects), surface infrastructure, services and linear activities.
• Loss of employment and business opportunities due to the downscaling, decommissioning of mining related infrastructure (projects), surface infrastructure, services and linear activities.
<u>Health & Safety</u>
• Potential Impacts on family structures and social networks associated with the presence of construction workers (influx of workers/job seekers) due to the development/operation of new mining related infrastructure (projects), surface infrastructure, services and linear activities:
  o An increase in alcohol and drug use.
  o An increase in crime levels.
  o The loss of partners to construction workers.
  o An increase in teenage and unwanted pregnancies.
  o Increase in gender violence.
  o An increase in prostitution.
  o An increase in sexually transmitted diseases (STDs), including HIV.
• Health and safety impacts due to the development/operation of new mining related infrastructure (projects), surface infrastructure, services and linear activities (e.g. drowning, flooding, traffic, air quality, noise, visual, cultural, groundwater, surface water, soils etc.)
<u>Training & Skills Development</u>
• Creation of training and skills development opportunities due to the development/operation of new mining related infrastructure (projects), surface infrastructure, services and linear activities.
<u>Environmental Impacts</u>
• Loss of area available for grazing and initiation school sites associated with establishment and operation of mining related infrastructure (projects), surface infrastructure, services and linear activities.
• Reduce water loss, carbon footprint and mining impact due to the implementation of various alternative/ initiative projects on site.
<u>Cultural</u>
• Lack of respect for local norms, customs, and traditional practices (Intangible cultural heritage aspects).
<u>Social/Community Perception</u>
• Misalignment between specialist assessment outcomes and community perception of experienced impacts (real vs perceived).
		Mitigation Objective:
		• Management of doorstep community expectations and understanding (job opportunities, job opportunity timeframes, project context, project related impacts, community health & safety).
		• Management of affected doorstep communities (project related impacts).
		• Realization of social benefits that meet doorstep community needs.
		
		Construction Phase:
		• The implementation of an approved Social and Labour Plan that includes but is not limited to:
		  o The implementation of a Social and Labour Plan which is compliant with the guidelines as published under the Mineral and Petroleum Resources Development Act, 2002. (Act No. 28 of 2002).
		  o Consideration of the community needs and requests as well as the local and district municipalities Spatial Development Framework
		  o Consideration of education and skills requirements to support current and future operations/projects.
		  o Consideration of growth and enhancement initiatives for local accommodation facilities.
		  o The Social and Labour Plan to be updated when and if deemed necessary and should take into consideration the onsite changes to the mine (inclusive of new developments/projects)
		• Development (if not already in place), update (if in place) and implementation of a Local Recruitment and Procurement Plan/Procedure that includes but is not limited to:
		  o Implementation of AAP employment policies and procedures aimed at maximizing employment of community members, local service providers and suppliers from doorstep communities and ensures maximization of meaningful participation from local business enterprises.
		  o Allows for clear understanding of AAP procurement requirements and tender submission requirements.
		  o Allows for the establishment of a skills database for the area.
		  o Allows for the identification of local companies that qualify for local procurement contracts.
		  o Allows for informed engagement with interested parties on education and skills requirements.
		  o Allows for the establishment of skills shortages, capacity needs and intervention requirements (in consultation with interested and affected parties) as to guide possible skills development programs / capacity building programs were deemed necessary.
		  o Allows for a recruitment selection process that promotes gender equality and employment of women were possible.
		  o Allows for consideration of candidates for Bursary Programmes (where deemed possible) and Community Training Programmes.
		• Development (if not already in place), update (if in place) and implementation of a Standard Operating Procedure for construction that includes but is not limited to:
		  o Monitoring and management of the movement and transportation of construction workers on and off site.
		  o Monitoring and management of construction workers' working hours.
		  o Implementation and adoption of AAP Code of Conduct on contractors and construction workers.
		• Development (if not already in place), update (if in place) and implementation of lease agreements on community owned land that is beneficial to both parties.
		  o The development of a monitoring mechanism to ensure adherence of lease agreement conditions by both parties.
		• Development (if not already in place), update (if in place) and implementation of a Grievance Register / Management Procedure which guides Biodiversity, Surface Water, Groundwater, Noise, Visual, Air Quality, Cultural Heritage Resources, Soil, Land Use, Land Capability, Traffic and social monitoring and management on site.
		  o This Grievance Register / Management Procedure should take into consideration the AAP Learning from Incident (LFI) Procedure where root causes are identified, and suitable mitigations are identified and implemented to reduce the likelihood of recurrence.
		• Development (if not already in place), update (if in place) and implementation of a Continuous Encroachment Forewarning Mechanism. This mechanism to take into consideration:
		  o The discouragement of settlement development within mining rights area; and
		  o The engagement (where deemed necessary) with communities on unplanned settlement expansion and possible ways to address this.
		• Consideration should be given to Mogalakwena's most current Community Health and Safety Plan/Procedure, for the assessment of any addition required mitigation measures (where deemed necessary and feasible), This Plan/Procedure includes but is not limited to:
		  o Development and implementation of health and safety awareness training.
		  o Takes into consideration the most-up-to-date Health Impact Assessment Report
		  o Takes into consideration the most-up-to-date Site Induced Migration Assessment
		  o Adherence to the Mine Health and Safety Act (Act 29 of 1996)
		• Adherence to facility's Operating and Maintenance Manuals (which should be inclusive of access control, appropriate warning signage and safety equipment placement where appropriate)

<table>
<tr><th>POTENTIAL ENVIRONMENTAL IMPACT</th><th>ACTIVITY</th><th>ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)</th></tr>
<tr><td></td><td></td><td>Operational Phase:
• Implement and maintain the Social and Labour Plan.
• Update, implement and maintain the Local Recruitment and Procurement Plan/Procedure.
• Update, implement and maintain the Community Health and Safety Plan/Procedure.
• Update, implement and maintain the Grievance Register.
• Update, implement and maintain the Continuous Encroachment Forewarning Mechanism.
• Implement and maintain a monitoring mechanism to ensure adherence of lease agreement conditions.

Decommissioning & Closure Phase:
• Implement and maintain the Social and Labour Plan.
• Implement and maintain the Local Recruitment and Procurement Plan/Procedure.
• Consideration to be given to the Community Health and Safety Plan/Procedure.
• Implement and maintain the Grievance Register.
• Update, implement and maintain the Continuous Encroachment Forewarning Mechanism.
• Implement and maintain a monitoring mechanism to ensure adherence of lease agreement conditions.
• Development and implementation of a Standard Operating Procedure for decommissioning and closure that includes but is not limited to:
o Monitoring and management of the movement and transportation of construction workers on and off site.
o Monitoring and management of construction workers’ working hours.

All Phases:
• Implement all EMP recommended mitigation measures as applicable for Topography Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Biodiversity Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Surface Water Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Groundwater Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Noise Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Visual Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Air Quality Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Cultural Heritage Resources Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Soil, Land Use & Land Capability Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Traffic Management must be adhered to
• Implement all EMP recommended mitigation measures as applicable for Blasting Management must be adhered to

• The development (if not in place), update (if in place) and implementation of awareness & training on this subject matter, EMP objectives and commitments to all permanent employees, contractors and visitors (where deemed necessary).
• Engagement with surrounding community (when deemed necessary) and action plan development (where deemed necessary) as to address and management community perceptions on perceived vs experienced impacts and commitments.

*Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.

* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management from the date of being promulgated.</td></tr>
<tr><td colspan="3">Blasting</td></tr>
<tr><td>Experienced air blast shock waves.
Experienced ground vibration.
Increased possibility for fly rock.</td><td>• Development/operation of mining related infrastructure(projects), surface infrastructure, services and linear activities which requires blasting activities.

• Development/ operation inclusive but not limited to open pit and underground mining, residue disposal areas, waste management / disposal areas, workshops,</td><td>Mitigation Objective:
• Minimization and management of safety risks associated with the undertaking of blasting activities.

All Phases:
• Development (if not already in place), update (if in place) and implementation of a Blast Management Plan.

*Note all documentation development must take into consideration the recommendations as made by the most-up-to-date specialist assessments taken in that regard as well as all relevant legislation governing its management.

* Note all documentation (Plan/Procedure) should be updated <u>when and if required</u> and should take into consideration the inclusion of new developments, changes to existing developments and the most-up-to date relevant specialist studies, guidelines and legislation governing its management.</td></tr>
</table>

POTENTIAL ENVIRONMENTAL IMPACT	ACTIVITY	ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
	processing areas (concentrators), laydown areas, construction areas, treatment works, surface infrastructure, services, linear activities and any other mining related surface infrastructure development.	

11 MONITORING AND MAINTENANCE PROGRAMME

11.1 WATER QUALITY MANAGEMENT

MM has an extensive monitoring program which includes all water and waste management facilities and has been aligned with BPG G3 (DWAF, 2006), as well as the objectives set out in the Anglo Water Management Guideline (GTG 21). According to the Anglo guideline this program must include as a minimum:

- responsibility for the monitoring program;
- locations of routine samples to be taken and purpose;
- required sampling and preservation guidelines (surface / groundwater);
- analytical parameters required per sample;
- frequency of sampling;
- sample quality/custody controls; and
- data management, and reporting.

Sampling of surface water and groundwater is done by MM staff and external appointed companies.

Water resources are currently monitored in the Mohlosane and Groot Sandsloot (Pholotsi) River, upstream and downstream of mining activities and on Vaalkop Dam. Samples are submitted to an approved laboratory for analyses and check samples are sent to the SABS laboratories to verify results. Surface, process and groundwater are monitored monthly, and rest water levels are measured biannually.

The sampling protocol is reviewed every two years and all parties involved in the monitoring are informed of updates (Groundwater and Surface water Monitoring Procedures MS-SHE-ENV-PRO-0009 and MS-SHE-ENV-PRO-0004, respectively).

MM’s WULs identifies the groundwater and surface water monitoring points required to be sampled.

11.1.1 Surface Water Quality

In-stream surface water sampling can only be undertaken if and when flow occurs as per the current Licenced Surface Water Compliance Monitoring Points as per the requirement of the Water Use Licence, Licence No 07/A61G/ABCGIJ/9887 dated 4 December 2020 or any subsequent amendments.

Table 11-1: Receiving Water Resource Monitoring Points

Locality	*Monitoring Point*	*Co-ordinates*	
VDW	Vaalkop Dam Wall	E28^{0}55’46.96”	S24^{0}00’01.51”
VDS	Vaalkop Dam Source	E28^{0}56’40.56”	S24^{0}00’04.27”
RCU	River above Commando Drift	E28^{0}50’01.28”	S23^{0}57’22.03”
RCD	River below Commando Drift	E28^{0}48’32.35”	S24^{0}00’54.60”
MRU	Mohlosane River upstream	E28^{0}57’47.14”	S24^{0}58’22.41”
MRD	Bridge: Mohlosane River	E28^{0}53’57.28”	S23^{0}59’09.47”
MRDD	Mohlosane river downstream discharge	E28^{0}52’21.7”	S24^{0}00’21.03”
MRO	Mohlosane river upstream	E28^{0}56’25.53”	S23^{0}57’6.42”
GMB	Bridge: Ga-Molekana Stream	E28^{0}56’49.68”	S23^{0}57’6.42”
SGB	Bridge: Sandsloot	E28^{0}54’51.51	S23^{0}59’54.53”
SS	Sandsloot River: south of pit	E28^{0}56’06.34”	S24^{0}02’05.15”
Bwet	Blinkwater wetland	E28^{0}56’13.063”	S23^{0}57’4.275”

Table 11-2: Surface Water Quality variables to be sampled when flow occurs (WUL, 2020)

Surface Water Variables to be sampled	Frequency
pH (range)	Monthly If, and when flow occurs. Impact indicated as a % of change
Electrical Conductivity (EC) in mS/m	
Calcium (Ca) in mg/l	
Chloride (Cl) in mg/l	
Sodium (Na) in mg/l	
Sulphate (SO_4) in mg/l	
Nitrate (NO_3) as N in mg/l	
Fluoride (F) in mg/l	

11.1.1.1 Biomonitoring

Stream assessment scoring system (SASS5) aquatic biomonitoring is not undertaken at MM due to the intermittent flows experienced in the rivers only during rainfall events and the main river flow being subsurface.

DWS removed the requirement of biomonitoring as a Licence condition. As a result, biomonitoring is not conducted regularly at MM, however, habitat assessments of the rivers have been undertaken during specialist field investigations.

11.1.2 Groundwater Quality

Figure 11-2 indicates the locality of the groundwater compliance monitoring points as per the requirement of the Water Use Licence, Licence No 07/A61G/ABCGIJ/9887 dated 4 December 2020 or any subsequent amendments.

Table 11-3: Groundwater Compliance Monitoring Points (WUL, 2020)

Compliance Monitoring Point ID	Co-ordinates	
Witrivier Catchment Area		
New Monitoring Borehole 2	28° 52' 53.08" E	23° 55' 16.39"S
P138	28° 51' 48.28" E	23° 56' 31.74"S
AEC1290	28° 54' 07,9" E	23° 56' 08,1"S
P141	28° 52' 03,3" E	23° 55' 50,1"S
New Monitoring Borehole 3	28° 52' 13.66" E	23° 57' 28.89"S
Mohlosane Catchment Area		
New Monitoring Borehole 4	28° 53' 13.07" E	23° 58' 45.32"S
RWD22	28° 56' 17.49" E	23° 56' 49.24"S
RWD26	28° 56' 48.8" E	23° 57' 56.7"S
New Monitoring Borehole 5	28° 53' 55.92" E	23° 59' 18.21"S
New Monitoring Borehole 7	28° 56' 14.33" E	23° 56' 29.19"S
Zwartfontein Catchment Area		
P116 S	28° 55' 25.0"E	23° 59' 52.4"S
P115 D	28° 55' 25.2"E	24° 00' 01.8"S
P115 S	28°55' 25.5"E	24° 00' 01.7"S
P144	28° 55' 39.92" E	24° 00' 19.30"S
P143	28° 55' 42.0" E	24° 01' 03.30"S
P128	28° 54' 17.74" E	24° 1' 26.72"S
New Monitoring Borehole 6	28° 53' 40.89" E	24° 00' 22.48"S
RWD 24 or New Monitoring Borehole 1	28° 56' 10.12" E	23° 59' 0.26"S

Table 11-4: Groundwater Compliance Limits set at site boundary (WUL, 2020)

Variable	*Limit*
pH	6 – 9.5
Electrical Conductivity (EC) in mS/m @ 25°C	200 mS/m
Sodium (Na) in mg/l	200 mg/l

Calcium (Ca) in mg/l	150 mg/l
Chloride (Cl) in mg/l	300 mg/l
Sulphate (SO_4) in mg/l	450 mg/l
Nitrate (NO_3) as N in mg/l	20 mg/l
Fluoride (F) in mg/l	3.0 mg/l

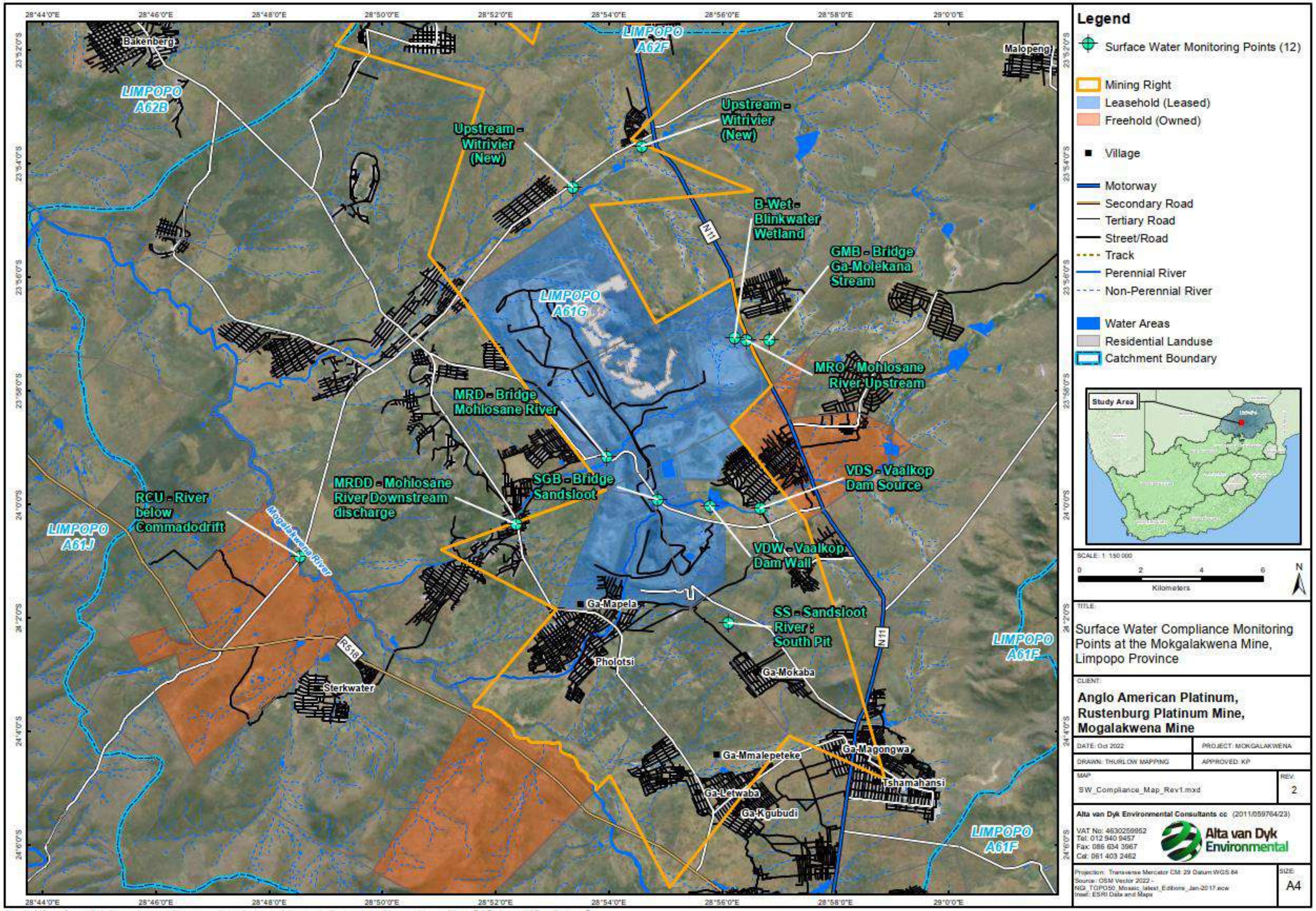

Figure 11-1: Surface Water Monitoring Points (WUL, 2020)

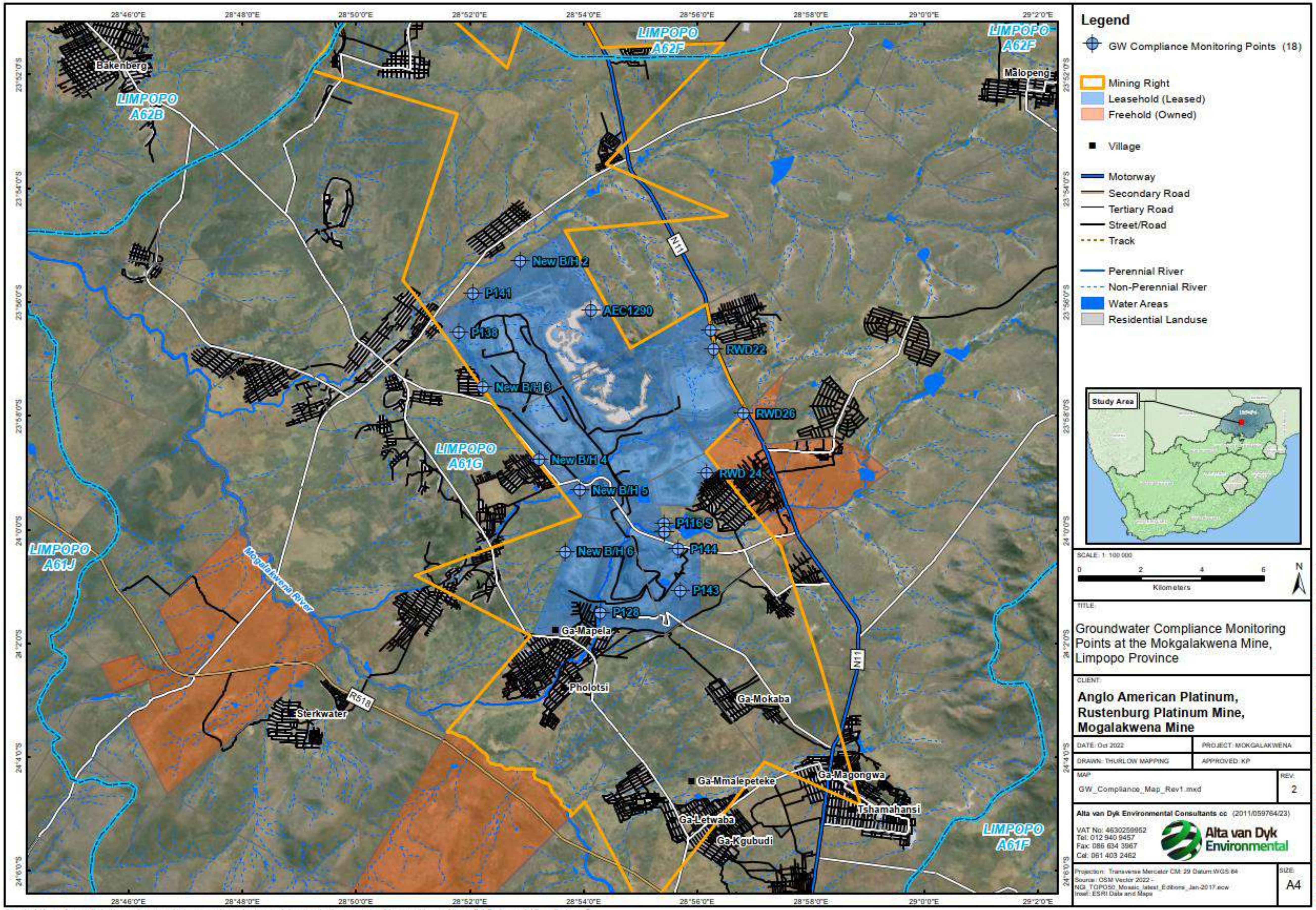

Figure 11-2: Groundwater Compliance Monitoring Points (WUL, 2020)

11.2 AIR QUALITY

A total of 32 dust fallout sampling stations have been installed in and around the MM project area. Eighteen are Residential Area dust fallout units and fourteen are Non-residential Area dust fallout units. Three PM10 sampling stations have been installed within the Mogalakwena project area.

Table 11-5: Air Quality Monitoring Points

Name	Parameter	X	Y
P34	DFO	28.92500	-24.00240
P46		28.89850	-23.98570
GTS		28.86400	-23.95280
Morgan		28.86920	-23.96070
P9		28.91550	-23.99170
TS		28.93350	-23.98530
TEXS		28.93560	-23.98340
TES		28.93570	-23.97790
P21		28.92510	-23.97380
P31		28.91830	-23.97380
ZWNDS		28.89840	-23.98450
PPRN		28.88920	-23.97440
GTRDS		28.87150	-23.95570
NB		28.86350	-23.93970
Hans Langa		28.87108	-23.99244
Manamela HSE no 385		28.85464	-23.94231
Mashishi		28.86558	-23.95767
House 100559		28.84453	-23.95022
Nyaatlo 020169		28.85228	-23.98153
Mahlanya 100068		28.87411	-23.91872
Matso 010290		28.87425	-24.00478
PUKA-444		28.99549	-23.94385
PAPO-19		28.96724	-23.97352
RAMMUTLA-95		28.94327	-23.94315
MALOKA KGORO-10019		28.87884	-23.91166
MPHELA-132		28.90722	-23.95878
DOLO-20120		28.93960	-23.98302
MORUDI-10278		28.94652	-23.99186
Kgwetsana Daycare		28.87413	-24.01452
Modikwe Secondary		28.89118	-24.03016
PM1	PM10	28.88620	-23.96690
PM2		28.92820	-24.01610
PM3		28.91983	-23.96710
Camp 5	PM10 occupational exposure monitoring	28.90119	-23.99224
Camp 7		28.89605	-23.96321
Camp 10		28.88549	-23.94317

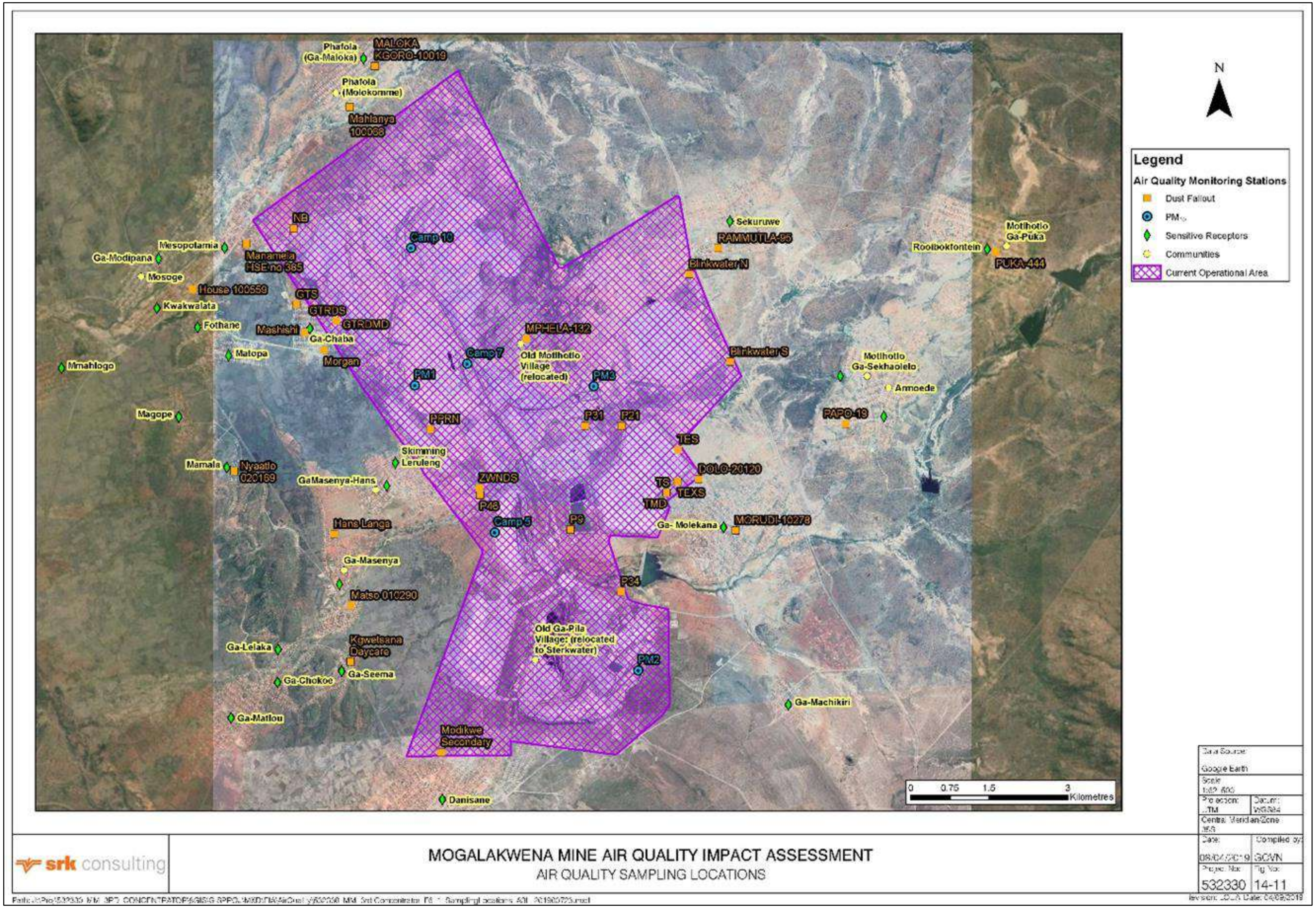

Figure 11-3: Air Quality Monitoring Stations (SRK, 2020)

11.3 MATERIALS

The Table below indicates additional monitoring with regards to material handling:

Table 11-6: Materials Monitoring

Indicator	Definition	Period	Unit
Oils and hydraulic fluids	Total quantity of lubricating and hydraulic oil added to all types of equipment	Production month	Tonnes
Greases	Total quantity of all types of grease used in all types of equipment	Production month	Litres
Fuel (Diesel)	Total quantity of fuel used per month	Production month	Litres

11.4 WASTE GENERATION

The Table below indicates additional monitoring with regards to waste generation on site.

Table 11-7: Generated Waste Monitoring

Indicator	Definition	Period	Unit
Non-hazardous waste to landfill	Refer to applicable legislation for classification of waste as non-hazardous. Total volume of non-hazardous (general) waste material accepted into licensed landfill sites (whether managed by the operation itself or by a third party) designed and operated to contain the wastes and resultant products in a manner compliant with legislation or internationally accepted practice.	Quarterly	Cubic Metres/tonnes
Solid hazardous waste	Refer to applicable legislation for classification of solid waste as hazardous. Total quantity of hazardous waste material accepted into licensed hazardous waste sites designed and operated to contain the wastes and resultant products in a manner compliant with legislation or internationally accepted practice	Quarterly	Cubic Metres/tonnes
Liquid hazardous waste	Refer to applicable legislation for classification of liquid waste as hazardous. Total quantity of hazardous waste material (excluding hydrocarbons which is captured under "Used oil/grease sent for recycling" and "Re-used oil/grease") accepted into licensed hazardous waste sites designed and operated to contain the wastes and resultant products in a manner compliant with legislation or internationally accepted practice	Quarterly	Litres
Cardboard / Paper sent for recycling	Quantity of paper removed from the operation (whether sold or donated) for use by a third-party paper-recycling enterprise.	Quarterly	Tonnes
Metal Recycling	Quantity of metal removed from the operation (whether sold or donated) for use by a third-party metal-recycling enterprise.	Quarterly	Tonnes
Lead acid batteries sent for recycling/re-use	Quantity of lead-acid batteries removed from the operation (whether sold or returned) for use by a third-party re-use or recycling enterprise.	Quarterly	Number
Industrial Plastic sent for recycling/re-use	Quantity of plastic removed from the operation (whether sold or donated) for use by a third-party plastic re-use or recycling enterprise.	Quarterly	Tonnes
Toner/Ink Cartridges sent for recycling	Number of recycled printer cartridges, irrespective of the type of cartridge, removed from the operation for use by a third-party cartridge re-use or recycling enterprise.	Quarterly	Number

Indicator	Definition	Period	Unit
E-waste: Electrical and electronic items sent for recycling/re-use	Quantity of electrical, electronic and computer components removed from the operation for use by a third-party re-use or recycling enterprise.	Quarterly	Tonnes

11.5 INCIDENT REPORTING

An environmental incident is an unwanted event that has an actual or potential (near-hit) negative impact on the environment, affecting the quality of air, land or water, fauna, or flora, and / or causing stakeholder concern. A causal link must be able to be made between an operational activity and the event.

Environmental Incidents are monitored to establish the following:

- Which repeat incidents occur;
- Has the incident been investigated, and the root cause been identified;
- Effectiveness of implementation of preventative and corrective actions;
- To monitor trends to check the effectiveness of the Environmental Management System (EMS).
- The MM use their Environmental nonconformity and incident management procedure, January 2018 (Document Ref CTR-SHE-ENV-PRO-OO4), to manage incidents on site.

11.6 AUDIT REPORT

Auditing of environmental authorisation, environmental management programme and closure plan must be done in accordance with the Regulation 34 and Appendix 7 of the EIA Regulations (2014) *as amended*, under the NEMA (1998). EIAR/EMPr audits shall be in accordance with the period specified in the approved EMPr, every 5 years or as agreed in writing by the Competent Authority. The audits will be undertaken by an independent third party.

11.7 REPORTING TO THE REGULATORY AUTHORITY

The Environmental Impact Assessment (EIA) Regulations of 2014 (amended in 2017) as promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) requires compliance auditing of Environmental Authorisations (EA), Record of Decision's (RoD), Environmental Management Programmes (EMPr's) and Closure Plans (CP), with the results to be submitted to the Competent Authority (CA) at intervals as indicated in the Environmental Authorisation.

Reporting that may be required in terms of the National Water Act, 1998 (Act 36 of 1998) will be undertaken to the Department of Water Affairs and Sanitation (DWS) as per the requirements stipulated in the Licence conditions.

Reporting that may be required in terms of the National Environmental Management Waste Act, (Act 59 of 2008) specific to the Norms and Standards for the storage of waste, will be undertaken.

11.8 RECORD KEEPING

Record keeping will be aligned with the mine's existing Control of EMS Documents and Records Procedure.

11.9 UPDATING OF THE EMPR

An EMPr is a working document. As management methods are improved and as the mine operations change, requiring new methods and allowing others to fall away, the EMPr needs to be adjusted to reflect these changes.

12 FINANCIAL PROVISION

12.1 CORPORATE CLOSURE STANDARDS[218]

The Anglo American Mine Group Technical Standard for Closure (AA TS 701 001) defines the minimum requirements for mine closure to ensure that all Anglo American projects and managed operations pro-actively plan for closure to manage risks and opportunities.

The Standard incorporates the following requirements:

12.1.1 Planning and Design

- Development of a closure plan that is fundamentally aligned with the Mine Closure Toolbox (MCT).
- A closure vision established and maintained with associated specific closure objectives and land-use plans.
- A risk assessment and gap analysis aligned with the MCT undertaken in all updates of the closure plan.
- Closure plans considering and addressing regulatory conditions and community and stakeholder commitments.
- Where appropriate, closure liabilities minimised through proactive integrated planning throughout the operational life cycle, involving formal opportunities analysis.
- Closure requirements integrated into the Business Planning and LoM planning processes.
- Sites to have a five-year concurrent rehabilitation plan with clearly defined targets.

12.1.2 Implementation and Management

- Promoting the beneficial re-use of infrastructure post closure wherever possible.
- Demonstrating the existence of a proven rehabilitation technique that meets the closure vision and associated land-use.
- Concurrent rehabilitation planned based on the availability of disturbed areas no longer required for ongoing operations.
- Optimising progressive rehabilitation and develop success criteria as early as possible.
- Minimising post closure active treatment requirements through integrated closure planning.
- Manage and reduce the dependency of relevant surrounding communities through the life cycle of the operation in order to leave behind a positive post closure legacy.
- Include social costs in closure planning as an operational expense until the site is closed when it should be provisioned.
- Calculate both premature and planned closure liabilities utilising the remaining Life of Mine from the approved Life of Mine plan.
- Review and update closure liability estimates (accounting provision) internally at least annually and externally every three years (approval from the Technical Services Mine Closure Department is required for exemptions from the independent review that would only be appropriate for low risk operations or those whose liability has not materially changed).
- Provide a financial provision (cash, guarantee, trust fund) to cover premature closure costs as required by the regulatory requirements of the relevant country.

[218] *AAP, 2022. Future of Mogalakwena, Sandsloot Underground Mine. Sandsloot Pre-Feasibility A Study. Section 14.4. Environmental Closure Strategy. Reference 580172.*

12.1.3 Performance Monitoring

- Include all post production monitoring and maintenance costs in the closure liability estimates and allow sufficient time for realistic lease relinquishment (minimum of 10 years post the decommissioning phase unless otherwise agreed with the Group closure team).

In addition to the Anglo Technical Standards for rehabilitation of disturbed land, a guidance tool was launched in 2008 called Anglo Mine Closure Toolbox. The toolbox details what is needed to achieve a successful mine closure that leaves the positive and sustainable legacy for the host communities after our operations have closed.

12.1.4 Closure Objectives

The closure objectives which will drive the closure criteria for the Sandsloot underground project are:

- Adhere to all statutory and other legal requirements.
- To develop landforms and land-uses that are stable, sustainable, and aesthetically acceptable on closure.
- Ensure safety and health of all stakeholders during closure and post closure and that communities using the site after closure are not exposed to unacceptable risks.
- Ensure that closure enables productive uses considering pre-mining and post-mining conditions and agree with commitments to stakeholders.
- Physically and chemically stabilise remaining structures to minimise residual risks.
- Promote biodiversity and biological sustainability to the maximum extent practicable.
- Utilize closure strategies that enables a self-sustaining condition with little or no need for ongoing care and maintenance.
- To achieve agreed quality targets set by the Catchment Management Authority (CMA) and the DWS as far as practical relative to impacts and reasonability to achieve.

12.1.5 Post Closure Land Use

Post closure land use (PCLU) is determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of the closure plan. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation. As specific consultation regarding PCLU has not been undertaken at this stage of the closure process, for purposes of current planning and liability costing, various assumptions relating to closure have been developed.

Given the extent of the disturbance within the lease area, with the majority of the disturbance remaining post closure in the form of mine residues (tailings and waste rock) and various open pits, post closure land use is unlikely to contain alternatives that could be utilised sustainably by the community. This will however be further investigated through further iterations of the closure plan.

Should infrastructure be demolished, there are opportunities that the footprints could be utilised for sustainable post closure uses.

Some of the open pits will remain post closure and will fill up with rain and fissure water and form pit lakes. The pit lakes will be safeguarded by the installation of security fencing at safety berm.

Based on the limitations presented by the permanence of the disturbances associated with the mining activities, the overall post closure land use for the mine has been determined to be:

- Landforms, that sustain indigenous vegetation which limits water and wind erosion.
- Mosaic of nodes where existing infrastructure is utilised by stakeholders for a variety of post closure activities surrounded by areas rehabilitated back to a land capability possible of supporting indigenous vegetation. This may include land capable of supporting the various community initiatives in which the mine is involved. In addition, heritage sites will be preserved as far as practical during operations and closure so that these can be accessible to communities post closure.

12.2 FINANCIAL QUANTUM CALCULATION

This section has been compiled utilizing the Financial Provisioning for the Rehabilitation and Remediation, HEES, May 2023.

This report support the Open pit to underground project including Zero Emission Haulage Solution (Hydrogen), Permit to Innovate, additional access roads (N11& Zwartfontein), Storm water Dam (Nevada Dam) with the financial provisioning of the existing mine executed during 2021 by Golder (Chabalala & Bothma, 2021) and Conceptual Closure strategy with financial provisioning of the Sandsloot underground executed by SRK Consulting (Lake & Lake, 2022).

On 20th November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA. The regulations aim to regulate the determine and making of financial provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. Although the Regulation 1147[219] is still in effect, it is very likely that the 2022 regulations will come into effect from 23 September 2023. This report will follow the requirements of Regulations No. R2272[[2]] still to be promulgated under NEMA.

The 2022 regulations [220] (*not yet promulgated*) require that the costing for the rehabilitation of a new project to be determined from the rehabilitation actions after the first 12months (annual rehabilitation measures) of operations (closure after 12 months) plus the cost of latent liability.

A LiDar survey with the aerial image was used and imported into CAD. This was used to determine and measure bill of quantities in support of financial provision calculations.

The financial provision calculation for the additional infrastructure to be established are presented in Table 12-1. The required and estimated yearly financial provisioning was calculated for annual and final rehabilitation until 2024.

It should be noted that the NWRD was modelled to a height of 1m for the full footprint and scaled for the required ±3.6 million m³ material that is estimated to be stockpiled in the first year of production. This first 1-meter-high terrace needs to be correctly sloped to allow for rehabilitation whilst the second terrace is being constructed.

The rehabilitation of the North west Polllution Control Dam- Navada Dam and the conveyance (canals) to this dam are postponed, to the maintenance period, after the rehabilitation of the mine has stabilised.

The remainder of the infrastructure associated with the development of the underground mining project will form part of the rehabilitation and closure of the entire MM project.

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[219] *National Environmental Management Act, 1998 (Act 107 of 1998), Government Notice Regulation 1147 dated November 2015*

[220] *National Environmental Management Act (Act NO. 107 of 1998), Regulation NO. 2272, Proposed regulations pertaining to financial provisioning for the mitigation and rehabilitation of environmental damage caused by reconnaissance, prospecting, exploration, mining or production operations.*

The rates were obtained from previous similar projects and compared to the Financial Closure document by Golder for 2021 (Kumari, 2021). The following assumptions were made:

- The concurrent rehabilitation of the first terrace of the NWRD will be executed in the 2024-2026 financial year,
- A contingency of 20% is allowed,
- Preliminary and General cost of 30% is allowed; and
- VAT of 15% is excluded in the summary cost.

Table 12-1: Financial Provision Summary

Section	Annual Rehab (R)	Final (R)
	2024	2025
Plant		95 797 368
Steel buildings		3 137 022
Concrete buildings		778 132
Roads		12 049 416
Railways		
Housing		2 485 608
Opencast		
Sealing of shafts, adits and inclines,		11 838 149
Rehabilitation of overburden and spoils and processing plant waste: basic, salt-producing,	258 975	49 088 214
Subsided areas		
Surface		9 411 346
River diversions		
After care		13 937 537
Sub Total	258 975	198 522 792
P&Gs	77 693	59 556 838
Contingencies	51 795	39 704 558
Sub Total	388 463	297 784 188
VAT	58 269	44 667 628
Total	446 732	**342 451 816**

The Financial provisioning for the annual liability assessment determined during 2022 (R3 037 878 915) was updated with the CPI of 6.9% for 2023 and with this project provisioning added, the total required provisioning is determined as R 3 449 053 231 with P&Gs, Contingencies and excluding VAT.

13 PROFESSIONAL OPINION OF THE EAP AND IMPACT STATEMENT

MM received an integrated (NEMA and NEM:WA) environmental authorisation (LP30/5/1/2/3/2/1 (050) EM) on 13 August 2020 and a Water Use Licence (WUL) No. 07/A61G/ABCGIJ/9887 on 4 December 2020 supporting the current open pit operations and all associated infrastructure.

It is the intention of MM to undertake a full Environmental Impact Assessment (EIA) Process in support the future projects allowing not only for the development of the Sandsloot Underground Mine, continued opencast mining and waste rock disposal, but also for the implementation of new technologies and supporting projects to the mining operations.

The proposed project will take place within the existing mining rights area. The landscape in and around the study area has been severely impacted through anthropogenic activities, previous mining developments and community land use.

The Environmental Impact Report has provided a comprehensive assessment of the potential impacts associated with the proposed activity. These impacts have been identified by the EAP and the specialist studies undertaken for the proposed development. The proposed project includes several activities of varying size and extent, and which subsequently vary in their associated impacts to the receiving environment.

The proposed mining and construction activities will impact on CBAs and ESAs. The proposed project will however lead to the permanent, direct loss of intact floral and faunal habitat and the identified seep wetlands. Taking into consideration the findings of the environmental impact assessment, the project benefits outweigh the negative impacts identified provided that mitigation measures are applied effectively.

The MM is responsible for a large portion of the region’s Gross Value Added (GVA) and the generation of direct employment opportunities. As the proposed project entails the development of the Sandsloot Underground Mine resulting in continued production at the operations. The development of the underground project will extend the life of the mine. Should the proposed project not be realized, the estimated life of mine will be significantly reduced and possible job losses. Additional local economic development opportunities as well as procurement of local goods and services to support the mine activities will not be realised.

It must be noted that there are certain sensitivities on site that are unavoidable. In order to protect biodiversity and conserve sensitive environments during development, steps that should be followed are to firstly avoid, then minimize, then repair or restore, and finally compensate for, or offset (where possible) the negative effects of any development on biodiversity. Thus, where the impact is unavoidable, the impacts must be minimized and the unavoidable and unforeseen impacts restored or rehabilitated.

It is recommended that the recommendations and mitigation measures as provided through the Heritage Impact Assessment be adhered to and that documentation and record keeping of features of Cultural and Heritage significant be undertaken. Exclusion zones identified should be respected and access to the sites be provided.

Existing mining operations within the area already significantly contribute to visual, noise, dust, ground and surface water impacts and social strain. Although the proposed project will have a cumulative impact on the already impacted surrounding environment based on all information that was captured in this report, the proposed Project will not lead to unacceptable/unmanageable impacts or fatal flaws and should be considered plausible in the framework of NEMA.

14 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

UNDERTAKING REGARDING LEVEL OF AGREEMENT

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

____

Signature of the Candidate EAP

DATE

I, Kirthi Peramaul, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

____

Signature of the EAP

DATE:

I, Alta van Dyk, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

____

Signature of the EAP

DATE:

:

15 REFERENCES

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