

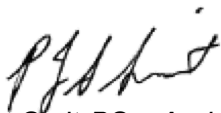
VOLSPRUIT MINING COMPANY (PTY) LTD

Volspruit PGM Mine

Technical Report in support of a Water Use Licence Application

October 2026

Draft for public comment



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Executive Summary

Volspruit Mining Company (Pty) Ltd proposes to develop the Volspruit Platinum Group Metals Mine (VPM) approximately 15 km south-southeast of Mokopane in Limpopo Province. This technical report supports an application for a new water use licence under Section 21 of the National Water Act and consolidates earlier application material with updated specialist studies and information requested by the Department of Water and Sanitation. The project is still in the planning phase and no mining-related construction or operational activities have commenced on site.

Project profile and proposed development. VPM holds a mining right over a 1 335.3 ha area for the extraction of platinum group metals and associated commodities. The mining right commenced on 4 October 2017 and extends to 3 October 2047. Subsequent optimisation and environmental studies resulted in changes to the North Pit, tailings storage facility and waste rock dump layouts, requiring amendments to existing approvals and associated waste and water authorisations. The proposed operation comprises two open pits, a crushing and concentrating plant, run-of-mine and low-grade ore stockpiles, a waste rock dump, a three-cell tailings storage facility, pollution-control and return-water dams, an irrigation dam, a wastewater treatment works, roads, workshops and related support infrastructure. Mining will proceed by conventional truck-and-shovel methods to depths of up to approximately 200 m below ground level. Waste-rock backfilling of the North Pit is planned once sufficient void space becomes available, and is anticipated to start from about year eight, while mining of the South Pit is expected to start later in the mine schedule. The anticipated life of mine is approximately 18 to 20 years.

Water-use licence application. The application covers new water uses as follows:

- Section 21 (a) – abstracting water from a water resource:
 - Pumping water from the Grasvally borehole ~97 500m³/a
 - Pumping water from the open pits ~2 500 000m³/a
- Section 21 (b) – storing water
 - Raw water dam ~2000m³ of storage volume
- Section 21(c) – impeding or diverting the flow of water in a water course
 - Construction of the flood protection levee to the west of North Pit
 - Construction of WRD and WRD PCD within 500m of the wetland
- Section 21(e) – engaging in a controlled activity: Irrigation.
 - At this stage the mine has determined the feasibility of using excess pit water for crop irrigation. Potentially ~1 500 000m³/a
- Section 21(i) – altering the beds and banks of a water course
 - Flood protection berm at the North Pit
 - WRD and WRD PCD within 500m of the wetland
- Section 21(g) – disposing of waste in a manner which may detrimentally impact on a water resource
 - Wastewater treatment works for sewage treatment ~54 000m³/a
 - WRD

- TSF
- PCDs~120 000m³ storage capacity
- RWD~355 000m³ storage capacity
- Irrigation dam~101 000m³ storage capacity
- Waste rock backfill to North Pit
- Open Pit~20 000m³ storage capacity
- Ore stockpiles
- Waste rock roads
- Dust suppression with pit water~6 200m³/a
- Section 21(j) removing, discharging or depositing of the water found underground if it is necessary for the efficient continuation of an activity or for the safety of people
 - Fissure water flowing into the pit, pumped to re-use as process water~2 500 000m³/a

Environmental setting and sensitivities. The site lies in quaternary catchment A61E on the eastern side of the Nyl River and within the Nyl and Dorps River Valley strategic groundwater source area. Surface drainage is generally towards the Nyl River and its wetland system. The affected river reach is regarded as ecologically modified but remains environmentally sensitive, and the wetland's hydrology is characterised by seasonal and episodic flooding, sheet flow and low-permeability clay-rich soils. The underlying fractured-rock aquifer is classified as a major aquifer because surrounding users rely heavily on groundwater for irrigation, potable supply and livestock watering. Specialist work indicates that the aquifer is reasonably vulnerable to contamination and requires a high level of protection. Groundwater yields are locally high, abstraction is already intensive and recharge is estimated at approximately 2.6% to 4.8% of mean annual precipitation. Baseline monitoring has also identified naturally occurring and land-use-related water-quality concerns, including elevated salinity, nitrate, arsenic and hexavalent chromium.

Key risks and engineering controls. The principal water-related risks are pit flooding; groundwater drawdown and possible pollution effects on surrounding groundwater users; seepage or contaminated runoff from the tailings storage facility, waste rock dump, ore stockpiles and dams; alteration of wetland and floodplain processes; and deterioration of water or soil quality where excess mine water is irrigated. A flood-protection berm is proposed along the western side of the North Pit, where part of the pit footprint lies within the flood line. The berm is designed to accommodate a 1:100-year flood with one metre of freeboard and will require construction and maintenance in accordance with the approved design. Clean and dirty water systems will be separated through diversion channels, concrete-lined contact-water drains, silt traps and lined containment facilities. The tailings storage facility will use a Class C-equivalent barrier system with monitored drainage above and below the geomembrane, while the return-water, irrigation and pollution-control facilities will be lined and monitored. Waste-rock testing indicates low acid-generation potential. Irrigation can reduce discharge and treatment requirements, but the predicted salinity and high nitrogen concentrations require salt-tolerant crops, controlled application rates, routine water and soil monitoring, and provision for treatment or suspension of irrigation if quality limits are approached.

Regulatory and management commitments. All identified water uses are new and require authorisation; no generally authorised water uses are proposed. Exemptions from Regulation 704 are sought for infrastructure and mining within prescribed flood-line or watercourse setbacks, backfilling the North Pit with waste rock and using waste rock in roads, berms or other construction. General and hazardous wastes will be separated, securely stored, tracked and removed by

authorised contractors, with reuse and recycling prioritised where practicable. Before construction, VPM should finalise accountable organisational responsibilities, emergency and incident procedures, water-quality objectives, trigger/action response plans, monitoring locations and frequencies, and auditable reporting arrangements.

Overall conclusion. The applicant presents a practicable closed-loop water-management concept in which affected water is contained, reused and monitored, supported by engineered barriers and flood-protection infrastructure. The project nevertheless occupies a sensitive hydrogeological and wetland setting and will add dewatering, storage and water-quality pressures to an area already heavily dependent on groundwater. The water use licence should therefore be implemented through enforceable conditions requiring regular updates of the site water balance and predictive models with monitoring data.

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ABBREVIATIONS

ABA	Acid Base Accounting
BGL	Below ground level
BPG	Best Practise Guidelines
BTEX	Benzene, toluene, ethylbenzene and xylene
CA	Competent Authority
CALMET	Meteorological modelling system
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
Cr	Chromium
CrVI	Hexavalent Chromium
DMR	Department of Mineral Resources
DMPR	Department of Mineral and Petroleum Resources
DMS	Dense medium separation
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EC	Electrical conductivity
ECA	Environmental Conservation Act of 1989
ECO	Environmental Control Officer
EI	Ecological Importance
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ES	Ecological Sensitivity
FEPA	Freshwater Ecosystem Priority Area
GN	Government Notice
HDPE	High-density polyethylene
HMS	Heavy media separation
I&AP	Interested and Affected Party
IHAS	Integrated Habitat Assessment System
IWML	Integrated waste management license
IWWMP	Integrated Water and Waste Management Plan
LCT / LCT0	Leachable Concentration Threshold / threshold level 0

LED	Local Economic Development
LOM	Life of Mine
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
MR	Mining Right
NEMA	National Environmental Management Act, (Act 107 of 1998) as amended
NEM:WA	National Environmental Management: Waste Act
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act 36 of 1998)
PCD	Pollution Control Dam
PES	Present Ecological State
PGM	Platinum Group Metals
PPE	Personal Protective Equipment
pH	Power of hydrogen – measure of acidity
R	Regulation
RLS	Rustenburg Layered Suite
ROD	Record of Decision
ROM	Run of mine
RWD	Return water dam
RQO	Resource Quality Objective
SEI	Site Ecological Importance
SLP	Social and Labour Plan
SQR	Sub-quaternary reach
SS	Suspended solids
SWSA / SWSA-gw	Strategic Water Source Area / groundwater Strategic Water Source Area
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons
TSF	Tailings storage facility
TWQR	Target Water Quality Range
VMC	Volspruit Mining Company
VPM	Volspruit PGM Mine
WRD	Waste rock dump
WUL	Water use licence

WULA	Water Use License Application
WWTW	Wastewater Treatment Works

1 INTRODUCTION

1.1 APPROACH AND LAYOUT

This document describes the issues specific to the water uses being applied for as required under Section 21 of the National Water Act. Specifics to the planned water uses and supporting specialist views are discussed, including motivations for the applicants' activities.

1.2 ACTIVITY BACKGROUND

Volspruit Mining Company (Pty) Ltd (Volspruit) is planning to start the Volspruit PGM Mine (VPM) near the town of Mokopane in the Limpopo Province (see Figure 1 for a location plan of the project). It is the holder of a mining right (MR) over the farm Volspruit 326 KR, a Portion of Portion 1 and Portion 2 of the farm Zoetveld 294 KR, situated in the Mogalakwena Magistral District in the Limpopo Province of South Africa. The MR area covers 1335.3 ha and relates to the mining of Platinum Group Metals (PGM). MR came into effect on 4 October 2017. After the issuing of the MR, and based on various optimisation and environmental studies, Volspruit has decided to change the layouts of the North Pit, the tailings storage facility (TSF) and waste rock dump (WRD) from what was approved. No water use licence application (WULA) was submitted after the MR was granted. Due to the mentioned changes, an amendment application to the environmental authorisation (EA) as well as a waste licence application have been submitted.

Prescali Environmental Consultants originally started an application for a water use licence and completed a draft application document, but this was never submitted. This technical report is an updated document using information from previous applications (Prescali, 2015) as well as updated specialist reports as requested by the Department of Water and Sanitation during the Phase 1 and Phase 2 site visits and pre-application meetings.

1.3 CONTACT DETAILS

1.3.1 Name and Contact Details of Applicant

Holding company:	Volspruit Mining Company (Pty) Ltd
Operation: Trading Name	Volspruit PGM Mine
Business Registration Number	2009/022451/07
Physical Address:	Constantia Park, Cycad House
	Cnr 14th Avenue & Hendrik Potgieter Road
	Weltevreden Park, 1709
Contact person	Albert Jordaan
Telephone number:	+27 11 673 1171
Cellphone number	+27 82 307 7364
Postal address	PO Box 976, Florida Hills, 1716
E-mail address:	albert@sylvania.co.za

1.3.2 Particulars of the Consultant

Kara Nawa Environmental Solutions has been appointed to compile the IWWMP for the mining operation.

Name of Company		Kara Nawa Environmental Solutions
Postal Address		P O Box 8522 Rustenburg 0300
Telephone Number		+264 81 706 3051 (NAM) +27 82 786 5881 (RSA)
E-Mail Address		pietjlsmit@gmail.com
Name	Qualifications	Summary of experience
Piet Smit	BSc. Agric (Hons.) Land Rehabilitation Specialist (LaRSSA) Environmental Manager (EAPAN)	Piet Smit has over 25 years of environmental management experience in various minerals, including extensive involvement in water management, waste management and rehabilitation projects. Offering expertise in the fields of environmental compliance; mine closure and rehabilitation; and mine water management. He is past president of both EAPAN and LaRSSA, and a professional member of both organisations.

1.4 REGIONAL SETTING AND LOCATION OF ACTIVITY

The VPM site falls within Mogalakwena Magistral District of the Limpopo Province of South Africa. It falls within the Mogalakwena Local Municipality of the Waterberg District Municipality. The central coordinates of the site are 24°20'40.28"S; 28°58'19.86"E (WGS84). The site is situated approximately 15 km to the south-southeast of the town of Mokopane (Figure 1). The N1 national highway runs to the northwest of the site while the N11 road runs to the northeast of the site. The Nyl River flows in a north easterly direction, towards Mokopane to the northwest of the site. Mokopong lies 30km to the southwest and Polokwane 70km to the northeast of the site.

The planned mine will be on the following properties:

- Farm Volspruit 326 KR, portions 1, 2, 3, 4
- A portion of Portion1 and Remaining Extent of the Farm Zoetveld 294 KR
- Portions RE of 4, 5, 18, 27 (of 4), 30 (of 4), 52 (of 4), 53 (of 4), 54 (of 4) & Remaining Extent of the Farm Grasvally 293 KR

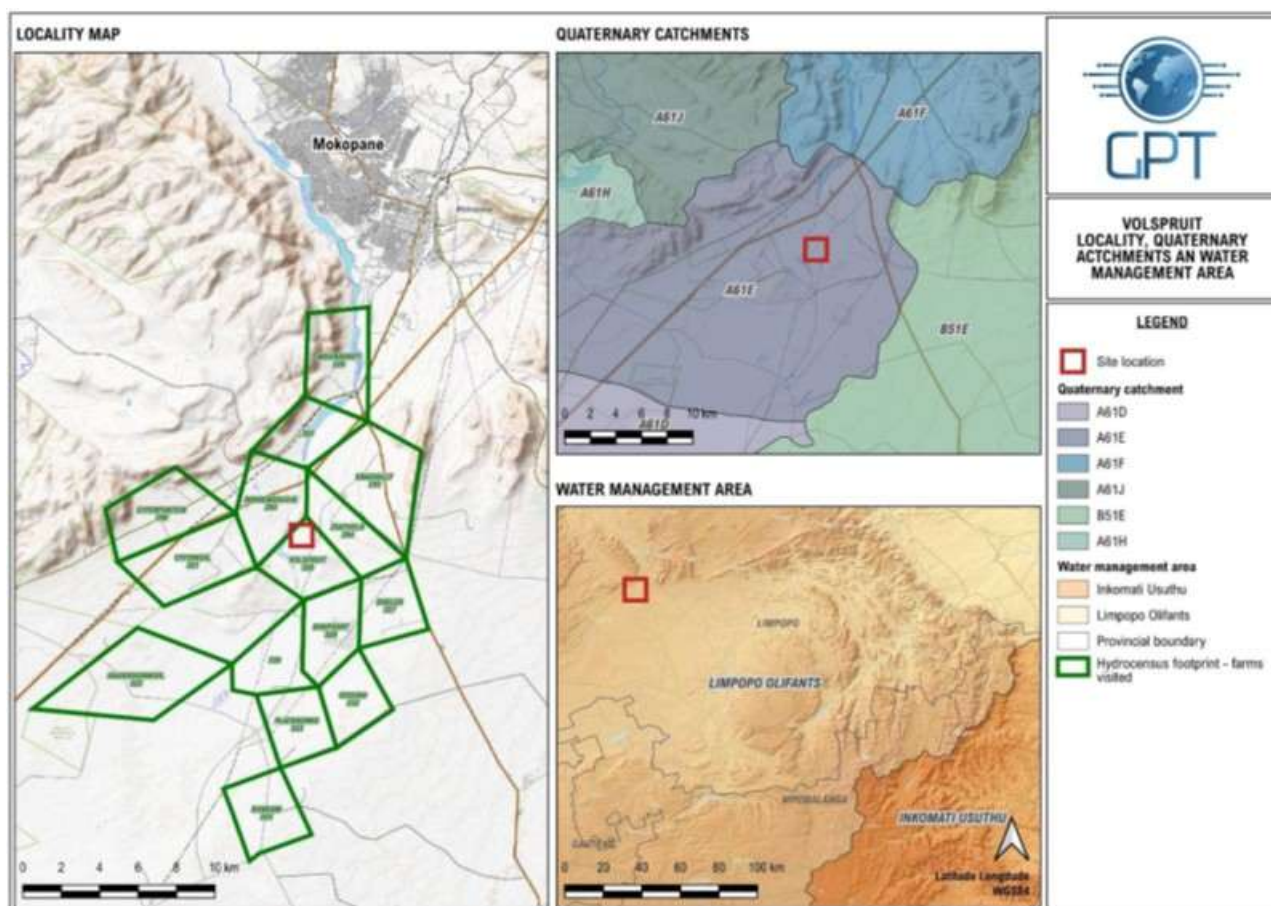


FIGURE 1: THE LOCATION OF VPM INDICATED BY THE RED RECTANGLE (GPT, 2026)

1.4.1 River Catchment

Locally the surface drainage is in a western direction, towards the Nyl River. Regionally the drainage is in a north easterly direction. The area of interest forms part of the A61E Quaternary catchment (Figure 1).

1.5 PROPERTY DESCRIPTION

All the properties applicable to the Volspruit Mine project are privately owned land and the holders of surface rights within and around the project area, as well as title deeds are given in Table 1.

1.5.1 Property Owners

TABLE 1: A LIST OF PROPERTY NAMES AND RELEVANT OWNERS (ECOPARTNERS, 2024)

Farm	Portion	Owner	Comment	Title Deed	Area (ha)
Volspruit 326 KR	1	Faer Glen Properties No 55 (Pty) Limited	Negotiating with owner to purchase farm	T55790/2001	208.3262
	2	Elizabeth de Beer		T34721/1984	497.2761
	5	Sylvania Prop Pty Ltd	Owner is a property holding company of the Sylvania group	T39040/2011	158.4584
	7	Sylvania Prop Pty Ltd		T39040/2011	156.2369
Zoetveld 294 KR	0 (RE)	Zoetveld Mining & Prospecting (Pty) Ltd	N.A	T3438/2013	1292.5839

Farm	Portion	Owner	Comment	Title Deed	Area (ha)
	2	H C Keet	N.A	T128822/2002	59.1712
	3	S A National Road Agency Limited	N.A	T140640/2005	5.5327
	4	S A National Road Agency Limited	N.A	T140640/2005	5.5327
Grasvally 293 KR	0 (RE)	Zoetveld Mining & Prospecting (Pty) Ltd	N.A	T3438/2013	72.2373
	2			T3438/2013	414.4315
	4 (RE)			T3438/2013	758.3628
	5 (RE)			T3438/2013	258.5227
	18			T3438/2013	171.1888

1.6 PURPOSE OF THIS DOCUMENT

This submission document lists the basic requirements for an Integrated Water and Waste Management Plan for the purposes of applying for a new water use licence under Section 21 of the National Water Act.

2 CONTEXTUALISATION OF ACTIVITY

2.1 DESCRIPTION OF ACTIVITY

2.1.1 Mining Right

The mining right (MR) area covers 1335,2770 ha on the farms Volspruit 326 KR, a portion of Portion 1 and Portion 2 of the farm Zoetveld 294 KR. The minerals approved for mining relates to Platinum Group Metals (platinum (Pt), palladium (Pd), rhodium (Rh), ruthenium (Ru), osmium (Os) and iridium (Ir)), gold (Au) nickel (Ni), chrome (Cr) and Copper (Cu) and came into effect on the 4th of October 2017 (being the date on which the Environmental Management Programme (EMPr) was approved in terms of Section 39(4) of the Minerals and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002). The MR was awarded for a period of 30 years ending on the 3rd of October 2047 and is subject to conditions set out in the MR that was issued by the Regional Manager of the Limpopo region of the Department of Mineral Resources (DMR), now the Department of Mineral and Petroleum Resources (DMPR).

2.1.2 Activities

After the issuing of the MR, and based on various optimisation and environmental studies, VPM changed the layout and location of the waste rock residue stockpile (WRRS), and the layout of the north pit and the tailings residue stockpile (TRS) from what was previously approved. It should be noted that mining activities have not commenced in the MR area.

For this MR open pit mining has been authorised where the minerals are removed from the earth by digging a hole and loading the material onto trucks (truck and shovel operations). The minerals occur between surface and 200m below surface. The eastern boundary of the north pit was modified as a part of the mine's optimisation studies. In addition, the western boundary of the north pit was moved further away from the wetland as an extra mitigation step, in accordance with the most recent delineation of the wetland. The mine has applied in terms of Section 102 of the Minerals and Resources Development Act (Act 28 of 2002) for the amendment of their mining right to include the additional area needed for optimisation. The waste rock dump (WRD) on Volspruit mine will comprise

the overburden or natural rock from the area (waste rock) removed in order to access the mineral containing rock (ore) which will be processed for recovery of the saleable products. The tailings storage facility (TSF) on Volspruit mine will comprise the left-over material after recovery of minerals (crushed and treated through the mineral recovery plant), commonly referred to as tailings. A waste management license needs to be obtained for the construction of the WRD and the TSF, the application for which have already been submitted.

2.1.3 Planned mining operations

Open pit mining has been authorised for the planned mine, where the minerals are removed from the earth by loading and hauling the material to the various stockpile areas. The minerals occur between surface and 200m below ground level (bgl).

The waste rock dump (WRD) on VPM will comprise the overburden or natural waste rock removed in order to access the ore, which will be processed for recovery of the PGMs. The tailings storage facility (TSF) will contain the left-over material from the concentrator plant after removal of PGM containing material (concentrate).

Two open pits are planned, referred to as the 'North Pit' and the 'South Pit', due to its geographical location. Before mining starts, indigenous vegetation will be stripped from the pit footprint areas. Topsoil will be stripped and moved to be stockpiled at the designated area for use during rehabilitation. Direct backfilling of waste rock residue (into the open pit) will be possible from year 8 of mining. The hard overburden and ore will be drilled, blasted and loaded into haul trucks, which will deposit it onto the WRD. Ore will be trucked onto a Run of Mine (RoM) stockpile adjacent to the primary crusher area.

The northern ore body will be mined through three consecutive phases of mining from east to west; where the proposed floodwater diversion berm would form the western boundary of the proposed pit. Both pits will be mined leaving benched sides to ensure safe highwall conditions.

Part of the planned North Pit falls within the 1:50-year flood line and a flood diversion berm will be constructed to prevent flooding of this pit. The flood diversion berm has been designed to safely accommodate a 1:100-year return period flood with one meter of freeboard. The current berm design measures it to be 1 410m long and seven meters high at the highest point with the crest being 3.5m wide. The flood berm area will be excavated and then backfilled with a clay core and competent rock before building the outer compacted layer and rock-pitched stability layer. A "semi-porous clay core" (which will extend approximately seven meters above ground and approximately 2.5mbgl) will be surrounded by compacted rockfill slopes at a gradient of 1h:1.5v. The base of the berm will be 10m wide. Berm slopes will be properly vegetated. A five-meter-wide service road with a two-meter-wide verge will be constructed for vehicle access along the wetland-side of the berm.

2.1.4 Planned processing operations

RoM ore is reclaimed from the stockpile or fed into a primary crusher. The RoM ore is regarded as a Type 3 waste and will be stored on a Class C lined pad and its own PCD (EcoElementum, 2026). The product is then conveyed and screened. The oversize product is fed into a cone crusher. The screen undersize and cone crusher product is conveyed to further screening before being fed into

the mill. Crushed ore is withdrawn at a controlled rate into the mill. An atomised fog dust suppression system is included. Scats and coarse spillage are returned to the mill feed by a front-end loader via the scats reclaim bin that discharges onto the mill feed conveyor. The stockpile area is provided with a spillage pump for recovery of water and fine solids to the mill. The ball mill discharges slurry via a trommel screen while the oversize scats discharge into the scats bunker for reclaim by a front-end loader. The mill trommel undersize slurry goes to the mill cyclone cluster for size classification. The Cyclone underflow gravitates to the mill for further grinding, whilst the cyclone overflow gravitates to the rougher floatation. Vertical spindle pumps are provided in the milling area for spillage handling.

Primary rougher feed reports to the first of two conditioner tanks and then flows into the six rougher float cells, finally gravitating into the rougher tailings tank. Promoter, collector and depressant are added to the first conditioner. Frother and collector are added to the first rougher cell and depressant to the third rougher cell. Low pressure air is supplied to each of the rougher cells as is spray water to the concentrate launders for each cell. Facility is provided to pump the concentrate from the first rougher cell to final concentrate should the grade be sufficiently high. The rougher concentrate is pumped to primary cleaning feed. The rougher flotation tailings are pumped to the tailings feed tank and then disposed to the TSF. A bunded spillage floor with vertical spindle pump is provided to collect and return spillage in this area to the first conditioner.

2.1.5 Waste Rock Dump

Waste rock is a rock layer removed from the top of the ore as well as from the sides to improve pit wall stability. Waste rock from the North Pit will be hauled to surface and deposited onto a dedicated WRD, which will be constructed above ground on the farm Zoetveld 294 KR. The deposition of waste rock to the WRD will end about eight years after mining has started – from this time onward, sufficient space will be available in the North Pit to accommodate the backfilling of subsequent waste rock generated through the mining of both pits. Mining of the South Pit will commence approximately 10 years after the start of mining at the North Pit.

The WRD will have the following in place:

- Clean storm water diversion channels
- Concrete lined contact stormwater channels
- A silt trap with bunded drying pads
- Pollution Control Dam (PCD) consisting of 2 cells with a Class C barrier each

None of the LCT concentrations exceeded the LCT0 limits from the waste classification analyses done on the waste rock material. Only the norite and pyroxenite waste rock will be disposed of at the designated site. No acid generation from the waste rock is expected based on Acid-Base Accounting (ABA) tests that were conducted for Volspruit samples; thus, no acidic leaching is expected (EcoElementum, 2026). Section 7(6) of GN R635, as amended by Government Notice 5522 of 2024, classifies waste as Type 4 where all leachable concentrations are at or below LCT0, provided the waste is also stable over time, free of organics and pesticides above prescribed limits, and disposed of without any other waste. Applying this test, the Pyroxenite and Norite waste rock reclassify from Type 3 to Type 4 and may be disposed of at a Class D barrier system (EcoElementum, 2026).

2.1.6 Tailings storage facility

Tailings generated from the concentrator plant will be used to construct a dedicated, tailings storage facility (TSF). The tailings will be pumped from the concentrator plant to the TSF for deposition by means of on-wall hydrocycloning using a spray bar for overflow deposition. The average monthly tailings disposal rate over the life of the mine will be approximately 243 ktpm (expected Life of Mine 18 – 20 years) at an in-situ dry density of 1.6 t/m³. The footprint will be developed in phases meeting the development requirements of the mine, but to limit the exposed surface of the barrier material (HDPE liner) and to limit evaporative losses from the pool. The focus is to sequentially initiate the three cells with each rising within the acceptable rate of rise while allowing each cell to grow to gradual consolidation. Cells 1 and 2 will consolidate, rise together to a level that Cell 3 will consolidate. The operations will however remain as individual cells with each having its own penstock. The TSF is lined with a Class C equivalent inverted barrier: a 1.5 mm double textured HDPE geomembrane on a prepared receiving face, with the fine tailings slimed directly over it, a leachate drainage network above and a sub-surface drainage network below. The equivalence is motivated under regulation 3(2)(d) of GN R636. The RWD, the irrigation dam and the WRD and RoM PCDs are lined with a 2 mm HDPE geomembrane under a soilcrete cover. Every barrier has a monitored sub-surface drainage system, and acceptable and action leakage rates are set for each facility (EcoElementum, 2026). See Appendix B for the design report.

The following will be in place on the TSF:

- Clean storm water diversion channels
- Concrete lined contact stormwater channels
- A silt trap with bunded drying pads
- Three separate penstock inlets decanting water from each of the cells respectively
- Return Water Dam (RWD) consisting of 3 cells with Class C barrier.
- Irrigation Dam with a Class C Liner

2.1.7 Planned irrigation with excess mine water

The mine plans to use excess water from its operations for irrigation of agricultural crops on the land owned by the mine. A centre pivot system producing crops adapted to the water quality predicted by the geochemical modelling will be used. Irrigation water will be collected in the lined irrigation dam next to the TSF. Assessment by Prof J. Annandale indicated that the water quality as modelled by Mills Water would be suitable for different crop rotations, such as Maize/beans or Sorghum/Wheat. Irrigation to utilise excess mine waters and reduce treatment costs at Volspruit Mine, is certainly worth pursuing as an option. Some of the predicted water qualities are not the most suitable for irrigation, so regular monitoring of water quality is essential, in order to adjust the irrigation management strategy, or to initiate partial treatment to irrigable standards. The waters are predicted to be quite saline, so it will be prudent to focus on the production of crops that are quite salt tolerant. Nitrogen levels are generally very high, and although much of the N can be used to replace expensive fertilisers, excessive levels will be seen as problematic from an environmental impact perspective (Annandale, 2025). See Appendix C

The water in the irrigation dam classifies as Type 3 water based on the geochemical modelling done by Mills Water (EcoElementum, 2026) and hence will have a Class C liner constructed. See Appendix D for the Mills Water report.

2.1.8 Water Balance

See Section 5.2.2.2. of this document and Appendix E for the Water Balance report.

2.2 ACTIVITY INFRASTRUCTURE DESCRIPTION

The main activities to be undertaken as part of the VPM operations include:

- Waste Rock to be dumped on the WRD and some of it to be used for construction of starter walls, roads and berms
- Ore to be stockpiled and re-handled during the Life of Mine: over 12 Mt
- Backfilling of North Pit with waste rock
- Oxide ore (Low grade ore) is scheduled to be stockpiled separately for possible future processing
- Processing of Ore
- Disposal of tailings onto the TSF
- Irrigation with excess water

Key activities and their process and products are as follows:

- Opencast mining:
 - Clearing of vegetation
 - Topsoil stripping and stockpiling
 - Removal of overburden to WRD
 - Removal of RoM ore
 - Stockpiling ore:
 - Main ore body (high grade)
 - Oxide Ore (low grade)
 - Backfilling of opencast sections
 - Construction of a flood protection berm west of the North Pit
- Processing of ore will occur using the following processes:
 - Processing Plant
 - Crushing and screening plant
 - Concentrator plant;
 - Temporary ore stockpiles
- The following major volumes of waste will be generated:
 - Pollution control dams
 - Return water dam with paddocks
 - Waste rock dump and
 - Tailings storage facility
- Construction, operation and maintenance of supporting infrastructure:
 - Storm water diversion berms

- Access and Internal roads
- Fencing
- General surface infrastructure: Offices, Workshops, Lamp room, Change rooms, parking areas, stores
- Waste Water Treatment Works
- Electrical substation and power lines
- Potable and process water pipelines
- Explosives bay

Figure 2 shows the master layout of the site with a sensitivity map of the area as backdrop.

2.3 STATUS OF ACTIVITIES AT VPM

All activities are still in the planning phase. No activities have been initiated on site for the start of VPM.

2.4 KEY WATER USES AND WASTE STREAMS

2.4.1 Water Use Activities

The following key water uses is planned to occur on site:

- Raw water:
 - Abstraction of raw water
 - Storage of raw water
- Waste/process water:
 - Pumping of water from the opencast areas, PCDs and RWDs to process water
 - Sewage is contained in a Waste Water Treatment Works (WWTW) – effluent returned to process water
 - Dirty storm water is contained in several storm water dams / pollution control dams
 - Waste rock will be used as backfill material in opencast areas; and
 - Recirculation of process water in the plant

Other areas that may require a license are:

- Oxide ore stockpile
- ROM Stockpile
- Road construction with waste rock

2.4.2 Waste Streams

The identified general waste types to be generated on site are the following:

- Scrap metal
- Timber
- Cans, paper, plastics and cardboard
- Garden waste

Hazardous waste types most likely to be generated on site:

- Used oil, degreaser, brake fluid, transmission fluid
- Neon light tubes
- Hydrocarbon contaminated material
- Explosives waste

Mineralised waste streams:

- Waste rock

- Tailings

See Figure 3 indicating the location of different section 21 water uses planned for VPM.

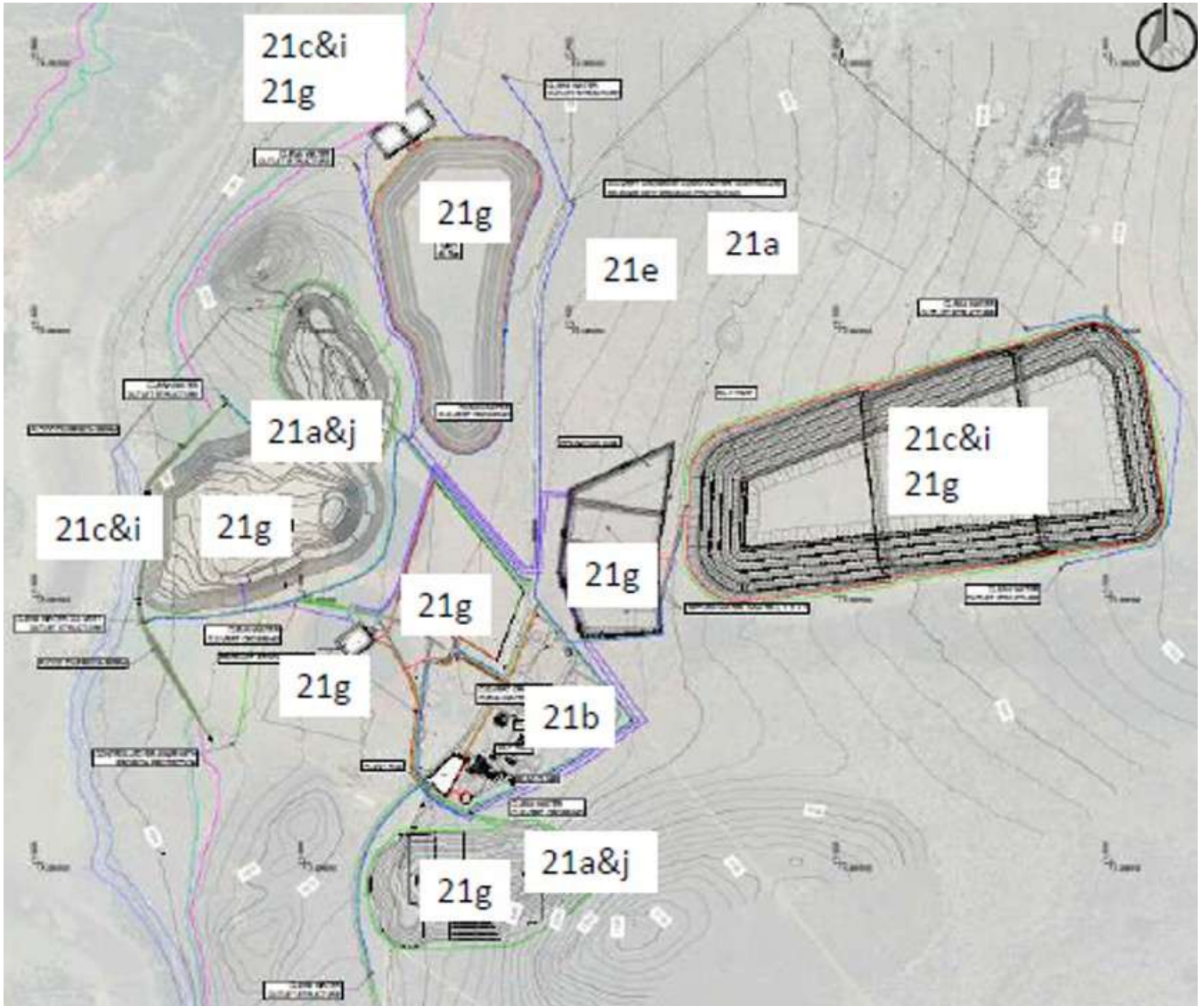


FIGURE 3: A LAYOUT PLAN OF THE VPM SITE INDICATING THE LOCATION OF DIFFERENT SECTION 21 WATER USES

2.5 ORGANISATIONAL STRUCTURE

The mine has not become operational yet and no definite management structure has been put forward for the mining operations. Figure 4 shows a typical structure that most mining operations would have in place. This section will be updated during updates of the IWWMP in future, once the mine has become operational and the best operational structure for the specific site has been devised.

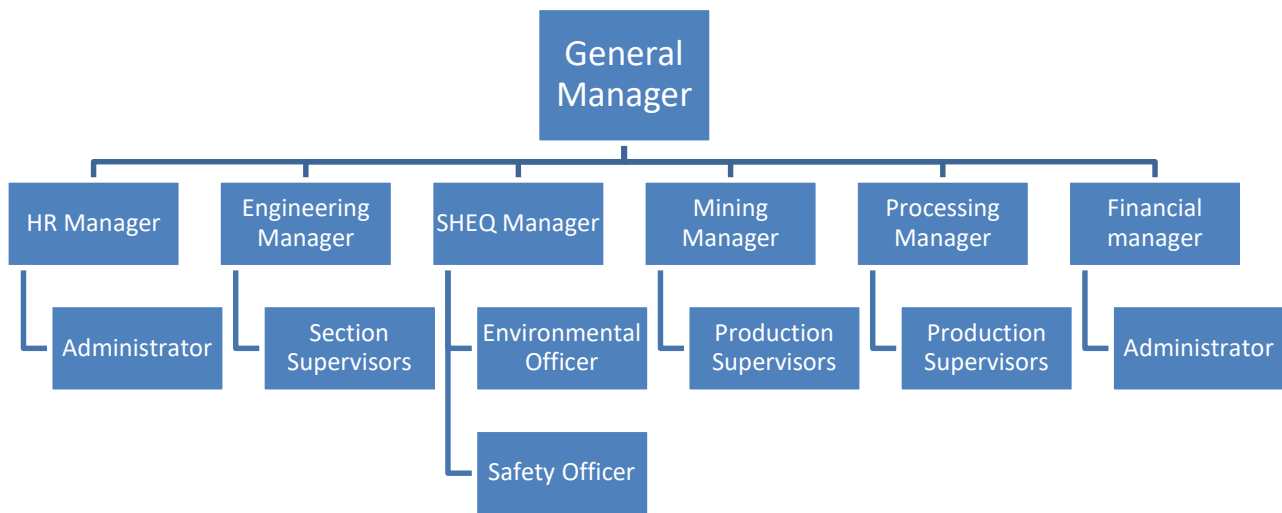


FIGURE 4: AN ORGANOGRAM OF A TYPICAL MINING OPERATION ORGANISATIONAL STRUCTURE

2.6 BUSINESS AND CORPORATE POLICIES RELATED TO THE ENVIRONMENT

The holding company group website indicates the following values:

- We value the safety and health of all
- We value the fundamental rights of all people
- We value honesty and integrity
- We respect the environment
- We value the culture, traditional rights and society in which we operate

VPM will develop a mine specific environmental management system and will have its own environmental policy for setting environmental targets in line with the above values. Such policy documents will be available for updates of the IWWMP in future.

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

VPM is currently applying for an integrated waste management license (IWML) and is still awaiting the outcome of the process.

3.1 WATER AVAILABLE AND GENERAL AUTHORISED WATER USE

3.1.1 WATER ALLOCATIONS TRANSFERRED

It was recommended that VPM approach the current water users in the area and verify the amount they currently use and to transfer any unused allocations for use by the mine. Currently registered water uses on the applicable properties are listed in Table 2, based on the available information received from DWS.

TABLE 2: A LIST OF CURRENTLY REGISTERED WATER USES IN THE VPM AREA (DWS 2025)

Number	Status	Name	WU status	Sector	Source	Volume (m³/a)	Farm
27056275	Closed	Freek Wagner Trust	Closed	Agriculture: Irrigation	Borehole	50 400	Volspruit KR 326/5
27056934	Active	CM Genis	Registered	Agriculture: irrigation	Borehole	6 810	Grasvally KR 293 ptn 16
27057746	Active	E de Beer	Registered	Agriculture: irrigation	Borehole	828 895	Volspruit KR 326/2
27059637	Active	Terra Nominees	Registered	Mining	Borehole	39 015	Grasvally KR 293 Ptn 18
27057489	Active	Faer Glen Properties No 55	Registered	Agriculture: Irrigation	Borehole	453 500	Volspruit KR 326/1
27075138	Active	Samancor Manganese	Registered	Agriculture: Irrigation	Borehole	58 548	Grasvally KR 293 Ptn 4
27111769	Active	Wiepe 7 Boerdery (Pty) Ltd	Registered	Agriculture: Irrigation	Borehole	833 920	Vaalkop KR 325
27105338	Active	Zoetveld Mining and Prospecting (Pty) Ltd	Registered	Mining	Borehole	160 600	Zoetveld KR 294 RE
27100823	Active	Zoetveld Mining and Prospecting (Pty) Ltd	Registered	Agriculture: Irrigation	Borehole	81 475	Grasvally KR 293 ptn 4
27056257	Active	Abdul Kader Tayob Holding Trust	Registered	Agriculture Irrigation	Borehole	680 658	Rondeboschje KR 778
27056934	Active	S. Van der Hoven	Registered	Agriculture Irrigation	Borehole	6 810	Grasvaly KR 294 ptn 16
27104071	Active	Tswalanang Trading (Pty) Ltd	Registered	Agriculture Irrigation	Borehole	580 014	Zoetfontein KR 330
27107979	Active	Bokpoort Beleggings Gedeelte 2 (Pty) Ltd	Registered	Agriculture Irrigation	Borehole	973 658	Bokpoort KR 328
27056391	Active	Bokpoort Beleggings Gedeelte 1 (Pty) Ltd	Registered	Agriculture Irrigation	Borehole	960 608	Bokpoort KR 328 ptn 1
27106015	Active	H. C. Keet	Registered	Agriculture Irrigation	Borehole	15 750	Doelen KR 327 ptn 2

3.2 SUMMARY OF CONCEPTUAL WATER USE REQUIREMENTS FOR VPM

Raw water will be pumped from the Grasvally borehole initially to ensure water supply. Future pit dewatering boreholes might replace this supply but can only be verified when mining operations starts.

Process water will be stored in tanks as required for the different processing areas and top-up water will be supplied to these tanks from the pollution control dams and the return water dam.

Groundwater pumped from the pits and extracted from boreholes (if necessary) will be pumped to the pollution control dam or irrigation dam. The water in the irrigation dam will be used for crop irrigation. A geochemical model was done by Mills Water to try and predict the potential water quality for the irrigation dam. The current prediction shows high levels of nitrate to be expected due to the high nitrate levels already in the groundwater (Mills Water, 2026). Annandale (2025) indicated that the high nitrate water is still suitable for certain crop rotations under the correct management.

Process water will be used as follows:

Mine:

- Dust suppression

Concentrator:

- Plant washing
- Spray water for floatation cells
- Dust suppression
- Wet screening
- Milling

TSF:

- Dust suppression

3.2.1 WATER USES TO BE LICENSED UNDER SECTION 21 OF THE NATIONAL WATER ACT

The following water uses have been identified for licensing:

- Section 21 (a) – abstracting water from a water resource:
 - Pumping water from the Grasvally borehole ~97 500m³/a
 - Pumping water from the open pits ~2 500 000m³/a
- Section 21 (b) – storing water
 - Raw water dam ~2000m³ of storage volume
- Section 21(c) – impeding or diverting the flow of water in a water course
 - Construction of the flood protection levee to the west of North Pit
 - Construction of WRD and WRD PCD within 500m of the wetland
- Section 21(e) – engaging in a controlled activity: Irrigation.
 - At this stage the mine has determined the feasibility of using excess pit water for crop irrigation. Potentially~1 500 000m³/a
- Section 21(i) – altering the beds and banks of a water course

- Flood protection berm at the North Pit
- WRD and WRD PCD within 500m of the wetland
- Section 21(g) – disposing of waste in a manner which may detrimentally impact on a water resource
 - Wastewater treatment works for sewage treatment~54 000m³/a
 - WRD
 - TSF
 - PCDs~120 000m³ storage capacity
 - RWD~355 000m³ storage capacity
 - Irrigation dam~101 000m³ storage capacity
 - Waste rock backfill to North Pit
 - Open Pit~20 000m³ storage capacity
 - Ore stockpiles
 - Waste rock roads
 - Dust suppression with pit water~6 200m³/a
- Section 21(j) removing, discharging or depositing of the water found underground if it is necessary for the efficient continuation of an activity or for the safety of people
 - Fissure water flowing into the pit, pumped to re-use as process water~2 500 000m³/a

3.3 RELEVANT EXEMPTIONS

The project requires exemption for compliance with certain Sections of Regulation 704 (GN704) as listed below (also see Table 3):

- Regulation 4 (a): development within 1:50 year flood line – a small part of the North Pit and the flood protection berm falls within the 1:50 year flood line, as well as some clean water outlets
- Regulation 4 (b): mining within 1:50 year flood line – a small part of the North Pit is located within the 1:50 year flood line
- Regulation 4 (c): backfilling of mining pit – the North Pit will be completely backfilled with waste rock
- Regulation 5: using waste rock for construction – waste rock could be used for construction of roads and berms on-site

TABLE 3: A LIST OF EXEMPTION FROM GN704 TO BE APPLIED FOR BY VPM (ADAPTED FROM PRESCALI, 2015)

Section	Reason for Exemption	Motivation	Performance assessment and Monitoring technique
4. Restrictions on locality			
No person in control of a mine or activity may-			
(a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any	The flood berm will be erected within the 1:100 year flood line. Part of the North Pit	The flood berm is needed to ensure that the mining area is secure and to	The ECO and contractors as well as VPM will need to ensure that the

Section	Reason for Exemption	Motivation	Performance assessment and Monitoring technique
other facility within the 1:100 year flood-line or within a horizontal distance of 100 m from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;	also falls within the 1:100 year flood line. Exemption is applied for with this application.	prevent flood risks (health and safety). Due to the limited space existing between the ore reserve (northern pit) and the watercourse (Nyl), a flood berm will be needed to prevent flooding of the pit during the Life of Mine (LOM).	Berm is located, constructed and maintained as per the approved design for the berm.
(b) 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 metres from any watercourse or estuary, whichever is the greatest	Part of the North Pit mining will take place inside the 1:50year flood line, due to the location of the ore reserve.	To be able to access the ore reserve, the mining has to take place inside the 1:50 year flood line. A flood protection berm will be constructed to prevent flood water from entering the pit.	The ECO and contractors as well as VPM will need to ensure that the Berm is located, constructed and maintained as per the approved design for the berm.
(c) place or dispose of any residue or substance which causes or is likely to cause pollution of a water resource, in the workings of any underground or opencast mine excavation, prospecting diggings, pit or any other excavation; or	The backfill of the opencast areas will be within the 1:100 year flood line and required as part of the rehabilitation of the open pits, also the flood berm will be constructed from overburden as removed from the open pit section.	The rock used to construct the flood berm will be overburden rock and has been categorised as Type III rock, which is not expected to cause pollution, indicating a minimal risk. The flood berm will be the new flood line and therefore all deposits such as the backfill will be behind the “new” flood line. The material used to construct the flood berm will be waste rock from the footprint	Monitoring of groundwater resources needs to be undertaken as outlined in the monitoring plan to determine the potential impact of the Waste rock on the groundwater resources.
5. Restrictions on the use of materials			
No person in control of a mine or activity may use any residue or substance	For the construction of the starter walls of the tailings dams	This will assist the mine in reducing and reusing waste rock	The volume of waste rock may be recorded as part of

Section	Reason for Exemption	Motivation	Performance assessment and Monitoring technique
which causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road or railway, or for any other purpose which is likely to cause pollution of a water resource.	and the flood berm using waste rock for road construction and storm water culverts. All waste rock has been classified as Class III – not expected to cause pollution	on site and reducing quantity of waste rock to be stored in the WRD. It will also lead to cost reductions. Excellent way to re-use and recycle	license conditions and be reported as per WUL audits

3.4 GENERALLY AUTHORISED WATER USES

No generally authorised water use will be applied for.

3.5 SUMMARY OF NEW WATER USES TO BE LICENSED

All water uses listed in Section 3.2.1 above are new and needs to be licensed.

3.6 EXISTING LAWFUL WATER USES

There are a number of water uses registered for agricultural use on the properties involved which needs further verification. There are also two allocations for mining related activities. See section 3.1.1. for more information. The applicant is aware of at least one water use license application from another mine on a neighbouring property, still being in process.

3.7 WASTE MANAGEMENT ACTIVITIES AND WASTE RELATED INFORMATION

3.7.1 WASTE MANAGEMENT ACTIVITIES

3.7.1.1 General and Domestic Waste

General (office and plant) waste will be generated through normal operational and maintenance activities associated with the proposed mining activities. This waste will include, inter alia, the following streams:

- Paper and cardboard Wastepaper and product packaging
- Plastic Food / beverage and product packaging
- 'Clean' scrap metal Beverage and product packaging, as well as maintenance activities
- Rubber waste Mine work areas / conveyers / workshops
- Glass Beverage and product packaging, as well as maintenance activities
- Wood waste Product packaging and maintenance activities
- Food waste Offices and canteen/s
- Garden clippings/cuttings Garden maintenance

- Waste tyres Vehicle workshops
- Miscellaneous Redundant PPE, tyres, etc.

The above-mentioned general waste streams will require the provision of suitable temporary storage at their respective points of generation, prior to being disposed of offsite at an appropriately licensed landfill site (i.e. where such waste cannot feasibly / practically be recycled, reused or recovered).

3.7.1.2 Hazardous Waste

Numerous hazardous waste streams will be generated through normal operational activities associated with the proposed mining activities. This waste will include, inter alia, the following streams:

- Used oil/lubricants Plant, equipment and vehicle maintenance/repair
- Oily/contaminated rags Plant, equipment and vehicle maintenance/repair
- Fuel and oil filters Plant, equipment and vehicle maintenance/repair
- Contaminated metal scrap Plant, equipment and vehicle maintenance/repair
- Empty chemical / reagent containers, bags and drums
- Medical Waste Clinic
- Waste from Electrical and Electronic Equipment
- Printer cartridges Offices
- Contaminated soil Anywhere where spillages of hazardous chemicals and substances to bare soil surfaces has occurred.
- Contaminated absorbents Anywhere where spillages of hazardous chemicals and substances to hard surfaces and bare soil surfaces has occurred.
- Fluorescent tubes/bulbs Offices, plant and shaft areas
- Contaminated PPE Workshops, change-houses

Most of the above-mentioned hazardous waste streams will require the provision of suitable temporary storage at the respective points of generation, prior to being collected regularly by an appropriately licensed waste management contractor for disposal at an appropriately authorised hazardous waste landfill (i.e. where such waste cannot feasibly/practically be recycled, reused or recovered).

The waste will be stored in terms of the Norms and Standards for the storage of hazardous waste (GN 926 of 2013) and the storage would need to ensure:

- The prevention of potential storm water, soil and/or groundwater contamination;
- The containment of the waste to prevent wind-blown losses; and
- That neither human health, nor safety, is compromised.

Provision will be made at the respective plant complexes for hazardous waste skips. These skips will be used to temporarily contain hazardous materials such as oily rags, contaminated soils, oil filters, empty chemical containers and similar such hydrocarbon contaminated waste, prior to the

collection thereof by a suitably licensed waste disposal contractor for disposal.

All waste items that can potentially be reused, or recycled, in an environmentally acceptable manner will be temporarily stored on an impermeable base within the proposed salvage yard at the plant complex. Waste oil, for example, will be stored in a temporary holding tank contained within an appropriately bunded area, for regular collection by a waste oil recycler. The ingress of 'clean' stormwater into the salvage yard will be minimised through the appropriate establishment of either cut-off trenches or diversion berms on the up-slope of the yard. Rainwater falling on the yard surface itself will be diverted to a 'dirty' storm water dam for reuse as make-up water in the concentrator. Manifests will be maintained by the mine for all wastes leaving the mine site, irrespective of the ultimate end use thereof (Ecopartners, 2024).

3.7.1.3 Salvage yard

In reality, even though they fall within the definition of 'waste', as provided for in the Waste Act (NEM:WA), many of the aforementioned general and hazardous waste streams have remaining / salvageable 'resource' value. A salvage yard is thus proposed at the plant complex to cater to sorting and storage requirements for such items. Concrete platforms, coupled with appropriate storm water management and separation controls, will be established to cater for the temporary storage of salvageable and recyclable waste items generated through activities associated with the project. It is anticipated that the cumulative requirements for the temporary storage of general- and hazardous wastes will exceed 100m³ and 80 m³ respectively and these facilities will be registered with the relevant CA under the Norms and Standards for the storage of general and hazardous waste (GN 926 of 2013). Items to be stored could vary from inter alia redundant plant, vehicles or equipment such as electric motors, gear units, piping and valves to rubber conveyer belting (EcoPartners, 2024).

3.7.1.4 Sewage treatment

Sludge from WWTW will be disposed of as compost on the TSF.

3.8 OTHER AUTHORISATIONS AND REGULATIONS (EIA, EMP, ROD)

The mine currently has a valid Mining Right LP30/5/2/2/1/10068MR granted after an application process in 2014. This included an Environmental Authorisation granted as part of this process. The mine is currently applying for an integrated waste management license (IWML), a water use license and an amendment to the granted mining right.

4 ENVIRONMENTAL STATUS

This section provides a summary of the project area environmental and socio-economic baseline conditions. Information was obtained from the various specialists' studies and summaries in the EcoPartners submission documents of 2024.

4.1 CLIMATE, RAINFALL AND EVAPORATION

Limpopo is one of the warmest regions in South Africa, with an average daily maximum temperature of 26°C. For several months of the year, it is warm to hot at temperatures continuously above 25°C,

sometimes up to 29 °C. The summers are long, warm, and have some days that are partly cloudy and the winters are short, cool, dry, and mostly clear skies. Over the course of the year the temperature typically varies from 6°C to 29°C and is rarely below 3°C or above 33°C (EcoPartners, 2024). Rainfall and evaporation data from the DWS Doorndraai Dam weather station shows the average annual rainfall is 612.3mm and annual evaporation is 1740.6mm (GPT, 2023).

Wind data from the Mokopane SAWS were used as baseline for the Volspruit mine site, but showed some anomalies related to wind speed and direction, when compared to CALMET modelling outcomes. The CALMET modelling package was used by EScience Associates (2022) to simulate the prevailing wind direction and strength more appropriately over the VPM site. The prevailing wind direction is for winds from the northwest on the site (Figure 5).

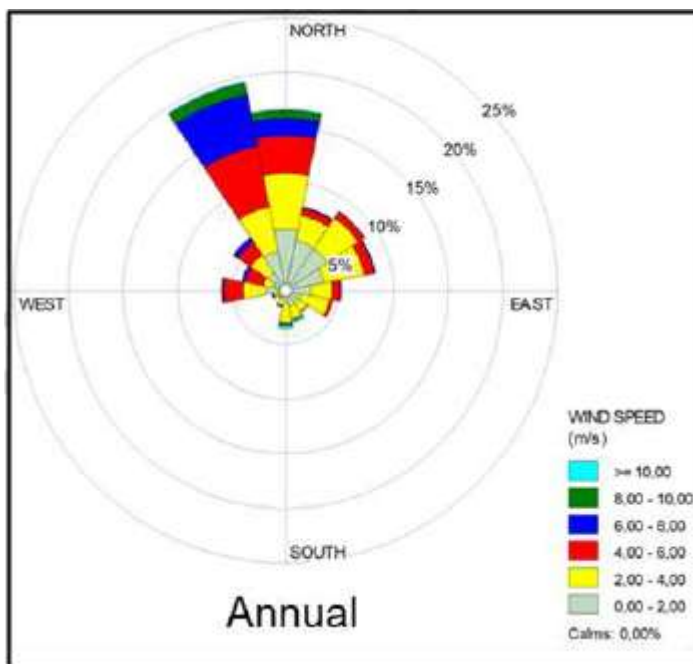


FIGURE 5: MODELLED AVERAGE ANNUAL WINDROSE (ESCIENCE, 2022)

4.2 TOPOGRAPHY

The site is described as having a gentle hillslope on the east side of the Nyl River (EcoPartners, 2024). The hillslope is the steepest at the crest and gradually flattens out past the foot slope towards the floodplain (Figure 6). There are two isolated hill-tops (koppies) to the north and south of the main planned infrastructure, with much steeper slopes than the general terrain in the area (EcoPartners, 2024).

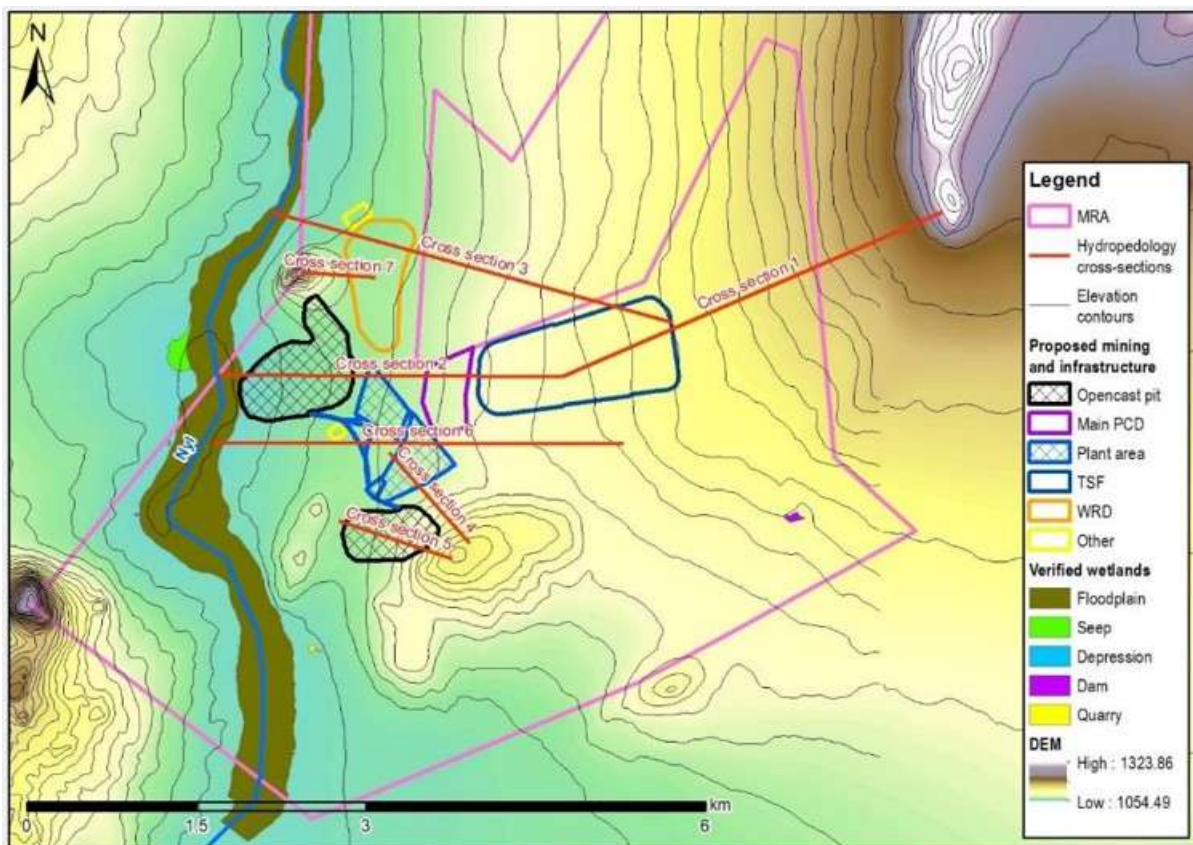


FIGURE 6: A MAP SHOWING THE CONTOURS FOR THE PLANNED MINE SITE (WCS, 2022)

4.3 GEOLOGY

Volspruit Mine falls within the 2428 Nylstroom 1:250 000 geology series maps. According to the geological map sheet 2428 Nylstroom, the mine area is underlain mainly by rocks of the Lower Zone of the Rustenburg Layered Suite, Bushveld Complex. The total estimated extent of the Bushveld Complex is some 66 000km² of which about 55% is covered by younger formations. The mafic rocks of the Bushveld Complex host layers rich in Platinum Group Metals (PGM), chromium and vanadium, and constitute the world's largest known resource of these metals. The Rustenburg Layered Suite is divided into four zones namely the Upper Zone, Main Zone, Critical Zone and the Lower Zone. Volspruit farm is situated on the Lower Zone, which comprises pyroxenite and harzburgite. The Critical Zone and Main Zone occur north of the site. The reason for the absence of the Main Zone and Critical Zone on Volspruit farm is due to faulting which caused upliftment of the Lower Zone in this area. The Rustenburg

Layered Suite is bounded in the south with underlying rocks of the Transvaal Supergroup which comprises quartzite and shale of the Pretoria Group, Silverton Formation. The Zebediela fault occurs on the southern boundary of Volspruit farm and forms the contact between the Bushveld Complex and the basalt of the Karoo Supergroup (EcoPartners, 2024).

4.4 SOILS

Prof Claassens conducted a soil study, including investigation of the clay layer of the Nyl River on the Farm Volspruit 326 KR (See Appendix F for a copy of the report). The soil survey consisted of an intensive survey on the cultivated lands which are under irrigation, where hand auguring was done on transects through the areas. A more extensive survey was conducted on the uncultivated

areas which are currently used for cattle or game farming and consisted of one auger hole on a grid of 150 m intervals. Figure 7 shows the soil map for the site.

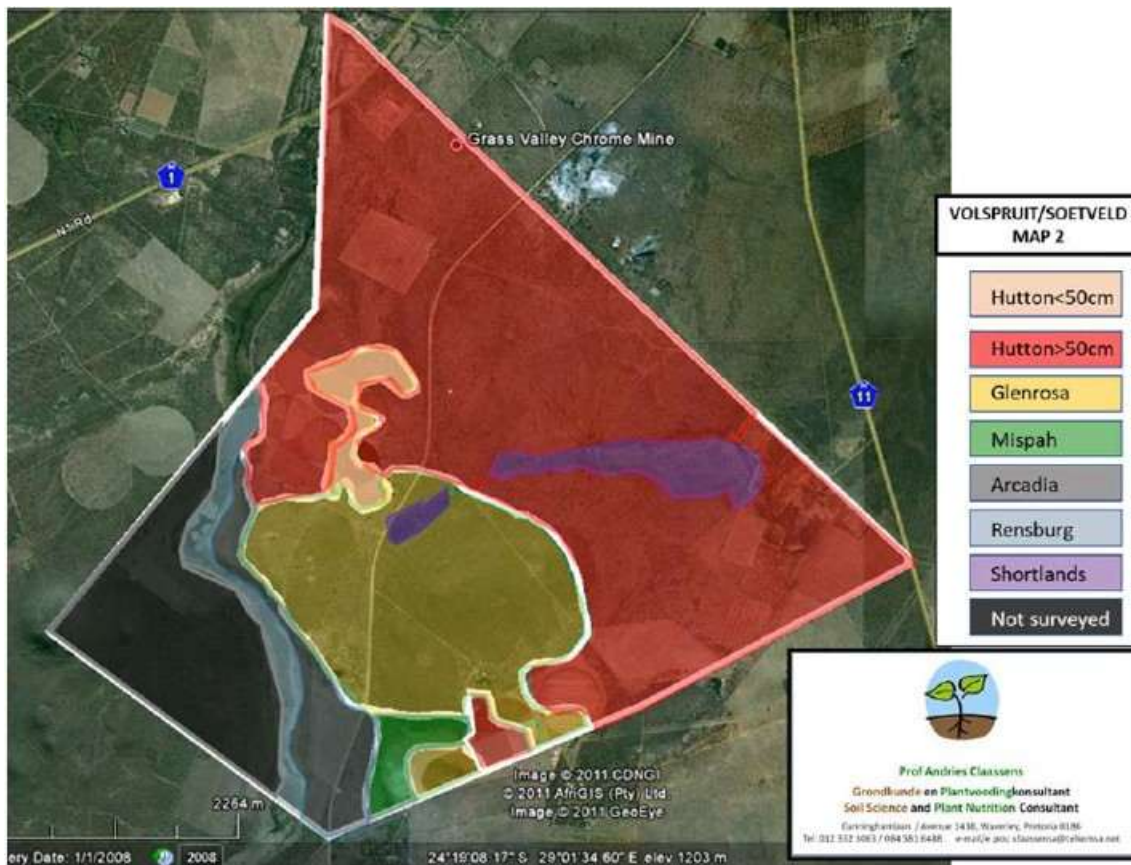


FIGURE 7: A SOIL MAP FOR THE VPM SITE (CLAASSENS, 2014)

4.4.1 Hutton Soil

The Hutton soil was divided into two categories: soil with less than 50cm and soil with more than 50cm effective depth. According to Claassens, these soils are ideal for cultivation while the texture varied between loamy sand to sandy loam. Under irrigation, the deep Hutton soils (> 50 cm) can be classified as high agricultural potential, whereas the potential is only moderate under dry land conditions because of the relatively low rainfall of the area and the sandy texture. The deeper Hutton soils compensates for the sandy nature of these soils in terms of total water holding capacity.

4.4.2 Glenrosa soil form

The Glenrosa soil form represents the areas which cannot be cultivated and are presently used for grazing either cattle or game. This soil form has variable agricultural potential. Where loose rock or gravel are found beneath the soil, which will allow roots to penetrate between the loose stones or gravel, the soil has a higher agricultural potential than where fewer loose rocks or gravel is found. The Glenrosa soil form is mostly found on the rocky quartzite hills (Claassens, 2014).

4.4.3 Mispah soil form

The Mispah soil has a low plant growth potential and is found in certain areas of the quartzite hills.

Claassens (2014) indicates that certain areas, which are demarcated as Glenrosa soil, could possibly be Mispah soil since the survey was not intensive enough to do a fine differentiation between the two soil forms.

4.4.4 Rensburg soil form

This Rensburg soil form profile consists of a soil layer which indicates permanent waterlogged conditions. The Rensburg soil form is found in the riverbed and the waterlogged soil/clay layer can be up to more than 200cm. This soil falls within the wetland area. Claassens (2014) determined that this soil has low hydraulic conductivity. The clay soil seals the river from ground layers below the river.

4.4.5 Arcadia soil form

This soil is known for its swell and shrink properties. This form was found along the riverbed and it differ from the Rensburg form in that it has no hydromorphic properties (the physical soil characteristics was not changed due to extended periods of waterlogged conditions). The profile is not very deep, but the hydraulic conductivity is low and similar to the Rensburg soils (Claassen, 2014).

4.4.6 Shortlands soil form

Claassens (2014) demarcated a water way from the Google map, however the area could not be classified as a wetland because no hydromorphic properties were observed. According to Claassens the area serves as a waterway at times of relatively high rainfall and the soils in the waterway could probably identify as Shortlands.

4.4.7 The clay layer

To investigate the stream enveloping clay layer in the Nyl River floodplain, identified during initial surveys, 14 transects were made across the width of the riverbed. The soil was examined to a dept of up to 2.5 meters. Although the deeper part of the sediment could not be examined, drilling of boreholes for groundwater monitoring piezometer installation found that sedimentary gravels were absent from the study area. Claassens (2014) pointed out that it is the surface layers of soil that determines the hydraulic conductivity of the profile. The clay layer investigation determined that the G horizon (which indicates waterlogged soil) on the western side of the river, was closer to the surface than in the main river flow path. According to Claassens, this indicates that water flow from the west, which cause the permanent wetness to be closer to the surface in the profiles on the western side. From the survey results and test done, it indicates that water flowing through the larger extent of the clay layer would be minimal.

There is adequate areas with arable soil for irrigation outside the planned disturbed footprints.

4.5 SURFACE WATER

African Environmental Development (AED) compiled a hydrology study (see Appendix G) for the planned mining area. These comprised a number of reports and an updated study from 2022, which

were summarised by EcoPartners in the Scoping report submitted for the amendment application of the mining right as well as a waste licence application.

4.5.1 Catchment

VPM is located within the Limpopo River Catchment (Primary Catchment A) within quaternary catchment A61E. The catchment is drained by the Nyl River and its tributary, the Andriesspruit. Other catchments contributing towards the Nyl River flowing across the larger study area include A61A, A61B, A61C, and A61D. The affected sub-quaternary reach (SQR) of the Nyl River was categorized Largely Modified (Present Ecological State of D) and of Moderate ecological importance (EI) and Moderate ecological sensitivity (ES) during the 2014 desktop Present Ecological State (PES) assessment, undertaken by the Department of Water and Sanitation. A prior assessment was undertaken as part of the National Freshwater Ecosystem Priority Areas (NFEPA) Project. It considered the Nyl River within the affected reach to be Moderately Modified (PES C). VPM is located on the eastern bank of the Nyl River (EcoPartners, 2024).

Downstream of the mine area the Nyl River becomes the Mogalakwena River after the confluence of the Dorps River, Rooisloot and Groot Sandsloot, which enters the Nyl River from the eastern side. It should be noted that these are, in fact, the first streams entering the Nyl River from the east, all other streams up to this point enter the river from the west, flowing off the Waterberg Mountain range towards the Nyl River. Historical geological faulting episodes created the river basin within which the Nyl River flows today, which was subsequently in-filled by deposition of alluvial material, eroded off the Waterberg Mountain range. Prior to the faulting that created the trough, surface water flow occurred in an easterly to southeasterly direction, i.e., from the Waterberg towards the Olifants River in the east, likely via the Grass Valley River. This hypothesis is supported by the fact that there is a large fan of transported material, spreading out from where the Nyl River flows at present, across the western parts of the Springbok Flats. At some stage in the past, the southwest to northeast trough formed, which cut off this flow and re-directed it to the upper reaches of the Mogalakwena River (AED, 2022 as cited in EcoPartners, 2024).

Material washed down from the west and from upstream sources, contains fine clay particles, which formed the clay layer that is present at the Volspruit mine area. The Mogalakwena River feeds into the Glen Alpine Dam and eventually drains into the Limpopo River approximately 50 km upstream of the Mapungubwe National Park. The Nylsvley Ramsar Wetland is located approximately 35 km (straight line) upstream from the mine (EcoPartners, 2024).

4.5.2 Surface water flow

An average of only 30% of the water entering the Nyl wetland reaches the outflow end of the wetland and this ensures that the water leaving the wetland does not have sufficient energy to cause erosion in these parts of the wetland. The river channels entering the wetland from the Nyl River, as well as from the other tributaries flowing off the Waterberg Mountains, soon cease to exist as the floodplain is reached and floodwater is spread over the entire surface of the wetland in the form of sheet flow. The energy in the streams decreases so much that only the finest material will be kept in suspension for prolonged distances into the wetland. The coarser material is deposited at the edges of the floodplain and along the remaining river channels. Only the finest suspended matter and particles are transported onto the surface of the floodplain. When these fine suspended particles are

eventually deposited it forms thin clayey layers which are all but impervious to water movement (EcoPartners, 2024).

The Volspruit mine area falls to the east of the river with the topography generally falling towards the watercourse. Surface water is expected to flow away from the study area towards the southwest, west and northwest. Rainwater from most of the areas on which mining infrastructure will be located, will drain towards the Nyl River, except where hills or manmade feature such as the TSF and WRD will change the drainage pattern (EcoPartners, 2024).

4.5.3 Surface water flow patterns of the Nyl River Wetland

The Nyl River Wetland is flooded on an irregular, but mostly seasonal, basis. It receives surface run-off water flowing into the floodplain from its two main tributaries, the Great and Little Nyl Rivers, as well as from the other tributaries, arising in the Waterberg Mountains to the northwest of the floodplain. Upstream from the VPM, where the wetland begins to narrow, just before it crosses the Zebediela Fault, the river channel reforms once again. The wetland is not flooded every rainy season. The high rate of evapotranspiration, and ponding losses specifically, ensures that floodwaters do not leave the floodplain every year and the floodplain often becomes an inland delta. From historical records, it has been found that the inlet channel is flooded 7 out of 10 years, the low elevation floodplain grasslands is flooded 4 out of 10 years and the entire floodplain is flooded 6 out of 10 years (EcoPartners, 2024).

4.5.4 Surface Water Quality

Analyses results of the samples collected in 2011 were compared to the South African National Standard, SANS 241-1:2015 for drinking water quality. The iron, aluminium and arsenic concentrations of the baseline samples taken at the farm dam exceeded the values of the standard. Iron only exceeded the “aesthetic” range, but both arsenic and aluminium fell beyond the “human health” range of the standard. In addition to these three determinants, there were other determinants at this same site that were higher than would be expected when compared to the same determinants at the other sampling sites in the Nyl River. These were Copper, Nickel and Zinc. All these elements are associated with agricultural chemicals and it could be that the proximity of the dam from which the sample was collected to the centre pivot irrigation systems near the dam, is potentially the reason for finding these elements in elevated concentrations. These elements were not present in these concentrations at the up- and downstream sampling points (AES, 2022 as cited in EcoPartners, 2024). Subsequent groundwater sampling also showed elevated arsenic in some of the boreholes on site (GPT, 2026)

In general, the water quality of the samples associated with the Nyl River were of an exceptionally good quality. The water complied with the SANS 241:2015 drinking water standards in all chemical respects (EcoPartners, 2024).

4.6 GROUNDWATER

Geo Pollution Technologies - Gauteng (Pty) Ltd (GPT) compiled the ground water studies for the VPM site over a number of years and different iterations, starting in 2011 and the most recent update being in September of 2026. Below is a summary of their findings. The full report is available in

4.6.1 Aquifer characterization

4.6.1.1 Aquifer Vulnerability

Aquifer vulnerability assessment indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. It was determined that the aquifer is reasonably sensitive to contamination and although the natural factors provide some protection to shield groundwater from contaminating activities at the land surface, care should be taken with any activities that could generate contaminants (GPT, 2026).

4.6.1.2 Aquifer Classification

The aquifer(s) underlying the study area were classified in accordance with “A South African Aquifer System Management Classification, December 1995.” The aquifer system in the study area can be classified as a “Major Aquifer System”, due to the reliance of the surrounding water users on groundwater. Major Aquifer Systems have highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (GPT, 2026).

4.6.1.3 Aquifer Protection Classification

A Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required. GPT (2026) determined that a high level of groundwater protection is required for the aquifer. Reasonable and sound groundwater protection measures based on modelling are recommended to ensure that no cumulative pollution affects the aquifer, even in the long term (GPT, 2026).

4.6.1.4 Hydrogeology

The hydrogeology of the site is dominated by secondary porosity and hydraulic conductivity produced by faulting and fracturing. It is reported that the depth of weathering (and/or fracturing) is dominant in the first 50-60mbgl. Fractures or conduits are found deeper in the rock profile at around 90-100mbgl as well, which is also the depth at which irrigation boreholes in the area abstracts from (GPT, 2026).

4.6.1.5 Strategic groundwater source area

Strategic Water Source Areas (SWSAs) within South Africa were identified by Le Maitre, Seyler, Holland, Smith-Adao, Nel, Maherry, and Witthüser, as part of a Water Research Commission Project (Report No. TT 743/1/18) and are defined by the authors “as areas of land that either: (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b).” Le Maitre, et.al. reported that the newly defined Strategic Water Source Areas for groundwater (SWSA-gw) cover around 9% of the land surface of South Africa. The VPM area falls within the Nyl & Dorps River Valley Groundwater SWSA (EcoPartners, 2024).

4.6.2 Groundwater use and yield

GPT conducted hydrocensus in 2011 on and around the site, which included 72 boreholes and the Nyl River around the project area. The background values were obtained for the groundwater at the Zebediela fault to aid in the characterisation of the influence of the proposed opencast mining activity on the hydrogeological properties of the fault in terms of possible dewatering of the fault. The water levels ranged from 1.5 to 38mbgl. Groundwater is intensively used for irrigation, potable water and livestock watering. Large amounts of water are abstracted from the aquifer for irrigation purposes especially on the farms Volspruit and Bokpoort. The large-scale groundwater abstraction may stress the aquifer, especially if more groundwater is being abstracted than what is recharged to the aquifer. The boreholes identified during the hydrocensus around the mine have an average yield of 6.25l/s. The yields experienced in the VPM area are significantly higher than expected for the northern limb of the Bushveld Complex. These higher yields may be attributed to deep weathering and fracturing, as well as fault structures forming preferential flow paths. The drilled boreholes at the mine provided yields of up to 10l/s during pump testing (GPT, 2023).

A follow-up hydrocensus was conducted between 1 and 5 June 2026 within the area surrounding the proposed Volspruit site. The survey area was initially delineated using the local quaternary catchment boundaries. To focus the investigation on hydrogeological receptors most likely to be influenced by the proposed development, the upstream extent of the survey was limited to approximately 10 km from the site, while the natural quaternary catchment boundaries were retained in all other directions. This defined the maximum extent of the hydrocensus (GPT, 2026).

A total of 107 borehole localities and one surface water weir were visited during the survey. Numerous additional borehole locations, representing drilled boreholes that were never equipped or developed with groundwater abstraction infrastructure, were identified within the study area. Water level measurements were successfully obtained from 78 boreholes. Measured water levels ranged from 0.51 m to 76.63 m below ground level (mbgl), with an overall average water level of 22.06 mbgl.

An initial water level/topography relationship analysis showed a moderate positive correlation ($R = 0.64$) between groundwater elevation and surface elevation, but this was largely influenced by boreholes located at higher elevations on one property. After excluding these boreholes, the correlation dropped to $R = 0.008$, indicating no meaningful relationship between surface topography and groundwater elevation. This suggests that groundwater flow gradients cannot be inferred from surface topography in the study area (GPT, 2026).

4.6.3 Groundwater levels

In addition to the hydrocensus, piezometer boreholes were drilled along the Nyl River and fitted with electronic data loggers to provide real time monitoring data of the water levels in the floodplain of the river in the VPM area. Monitoring of these boreholes would give an indication of the gradient existing in the groundwater contour for the area, showing if base flow is reaching the Nyl River (GPT, 2026). These boreholes have now been monitored for longer than a year and will continue to be monitored.

4.6.3.1 Nyl River Piezometer Data

The groundwater reaction to rainfall and flooding events is central in understanding the surface water-groundwater interrelationship in the Volspruit area. A flood in the Nyl River was studied in February 2014. The years between 2011 and 2014 were not extreme wet or dry and can be considered a normal period. As it was found that the groundwater reaction during normal seasons differed considerably to those during a flood, these periods are addressed separately below.

Data in time series illustrates that during the normal seasons the groundwater levels decrease constantly, despite reasonable rain in the summers of 2012 and 2013. The groundwater level never intersected the Nyl riverbed and remains at approximately 5 to 12 mbgl. Although surface water has been observed in the river during the rainy periods, there seems to be little recharge and no interaction with the groundwater. Cross sections also indicated a general decrease in water level. The very flat groundwater table is indicative of the high hydraulic conductivity of the area and there are no lateral indications that the groundwater has ever been recharged from or to the river.

However, during the flooding period in the summer of 2014, the trends changed. It is apparent that there is now a sudden rise in the groundwater levels, synchronised with the flood. The groundwater in the upstream piezometers (MW2 – PO7) is significantly faster than those downstream (PO6 - PO3), though the last measurements show some stabilization 2-3 metres below surface. This is most likely due to this area having less of a clay layer underneath. At the North Pit area (PO6-PO3) the rise is significantly slower with groundwater levels still at least 4 meters below surface underneath the Nyl three months into the flood arrival.

Considerable recharge did thus occur with the flood, and the outstanding question is how and where. As the piezometer boreholes PO1 to PO9 were equipped with three separate PVC pipes targeted at different depths and sealed in-between, gradient could be calculated from these data. The results are graphed in Figure 8 and Figure 9. It is evident that there are no significant vertical gradients during the normal period (except for erratic data such as PO1, maybe due to measurement induced error), indicating very little vertical flow. But after the flood this changed dramatically. At PO6-PO3 there is now a pronounced and sustained upwards vertical gradient, especially in the vicinity of the river. While the gradient has been insignificant before the flood, it changed to vertical in the days following the flood and became even more pronounced upwards at a month after the flood established. In contrast, at PO7-PO9 vertical gradients developed a temporary upward gradient in some boreholes, which disappeared in April. This is further proof that the flood recharged the groundwater relatively quickly in the vicinity of South Pit. But at North Pit there is clear indication that the flow of water is upwards from the water table. Thus, the unsaturated zone underneath the river is filled from below, and not from the river. The deduction is that the clay layer in this area is indeed impermeable and that the flood needed to overtop the clay before infiltrating (GPT, 2026).

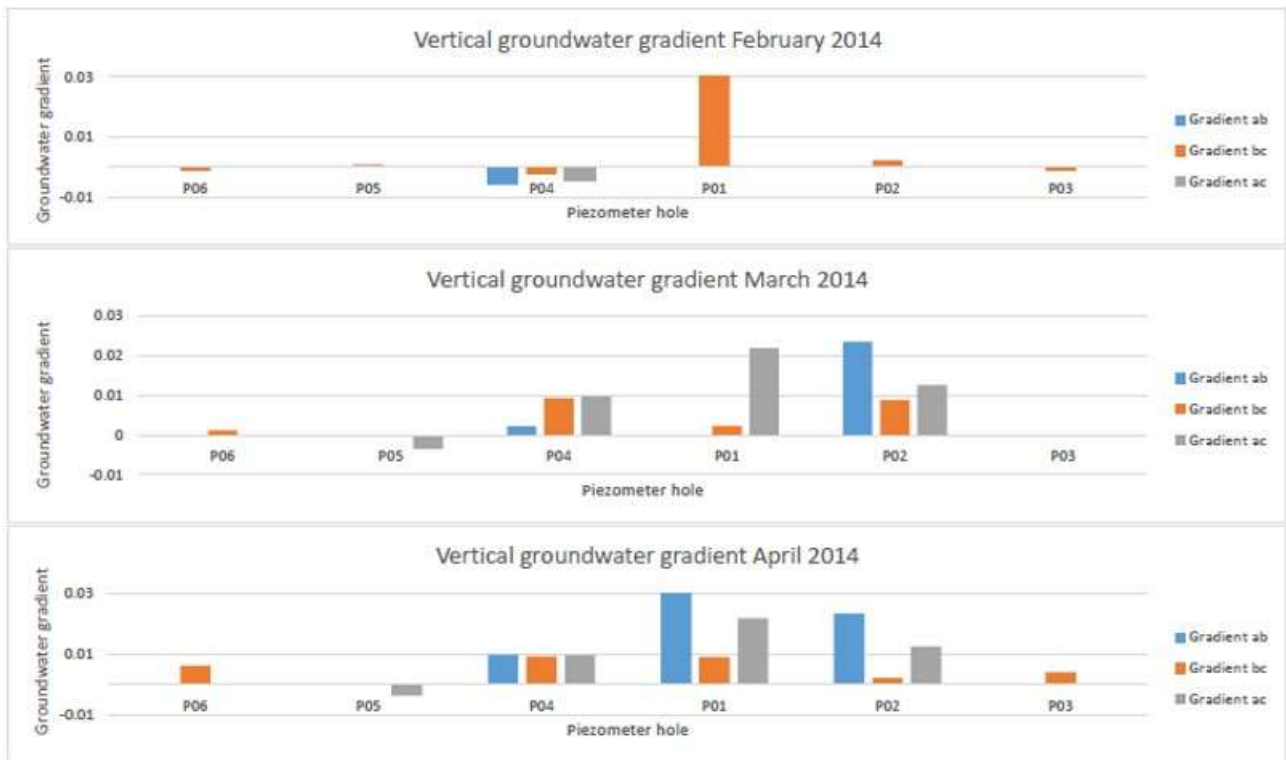


FIGURE 8: VERTICAL GROUNDWATER GRADIENT DURING A FLOODFOR P03 – P06 (GPT, 2026)

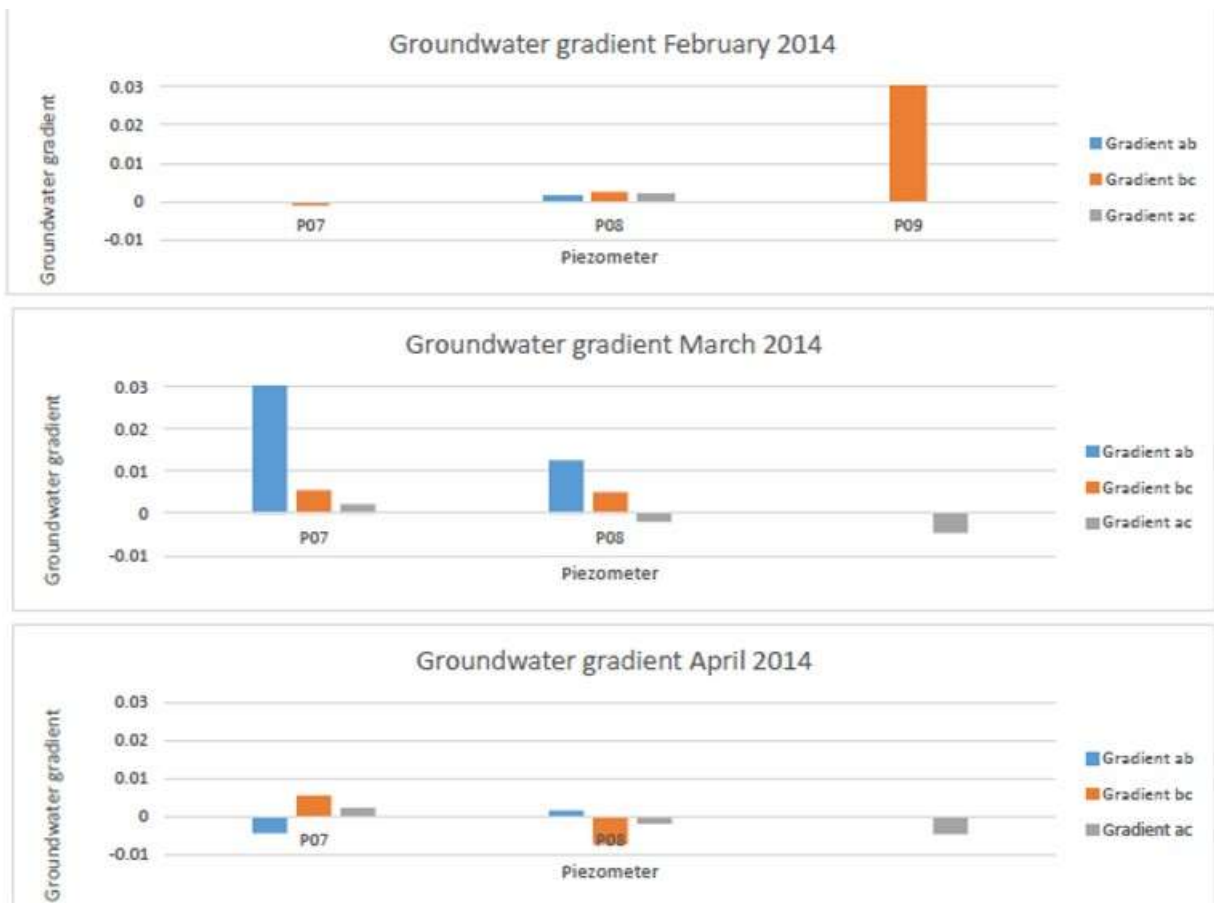


FIGURE 9: VERTICAL GROUNDWATER GRADIENT DURING A FLOODFOR P07 – P09 (GPT, 2026)

4.6.3.2 Ground water recharge

Recharge to the shallow, unconfined aquifer was estimated using the RECHARGE program developed by the Institute for Groundwater Studies at the University of the Free State, South Africa. The program applies the chloride mass balance (CMB) recharge estimation method described by Breckenkamp et al. (1995).

Due to the high variability in groundwater chloride concentrations across the study area, recharge was calculated using both (i) the average chloride concentration of all groundwater samples and (ii) a clipped average including only groundwater chloride concentrations below 100 mg/L. The latter approach was adopted to reduce the influence of anomalously high chloride concentrations, which may reflect localized evaporation, anthropogenic impacts, or other processes unrelated to regional recharge.

The calculated recharge estimates range from 2.6% to 4.8% of the Mean Annual Precipitation (MAP), based on the clipped average groundwater chloride concentration and interpretation of the schematic hydrogeological maps (average of 3 highest certainty level maps). This gives a range of 14 to 25.5 mm/a. Considering the extensive irrigation practices within the study area, groundwater chloride concentrations are likely elevated by irrigation return flows and other anthropogenic chloride inputs. As a result, even the clipped average groundwater chloride concentration may overestimate the true background chloride concentration, leading to an underestimation of recharge. For this reason, the upper end of the calculated recharge range, approximately 4.8% of MAP, is considered the more representative estimate for the study area.

4.6.4 Groundwater quality

During the April 2026 monitoring event a total 19 groundwater samples were taken at the Volspruit site and adjacent properties. To assess the groundwater quality present at the site, the analytical results were compared against the SANS 241:2015 drinking water quality guidelines (Table 4).

The following exceedances were recorded:

SANS 241:2015 drinking water quality guidelines:

- Electrical conductivity and Total dissolved solids exceeds aesthetic limits for Vols 2, Vols 3 and Vols 5.
- Nitrate as N exceed acute limits in VOL-Dam1, Vol 12, Vol 13, Vol 21, Vol 25, Vol 5, Vol 6 and Vols 2.
- Arsenic exceeds chronic limits in Abdul Dam, BH Quarry, Vol 12, Vol 20, Vol 6, Vol Hek 01, Vols 1, Vols 10, Vols 14 and Vols 2
- Total chromium exceeds chronic limits for Vol 12, Vol 13, Vol 25, Vol 5, Vol 6, Vols 1, Vols 2, Vols 3, Vols 5
- Iron exceeds aesthetic limits for Vol 17, Vol Hek 01 and Vols.10
- Manganese exceeds aesthetic limits for Vol 17. (GPT, 2026).

The detection of hexavalent chromium and arsenic in a number of boreholes triggered further geochemistry investigation into the site, discussed under Section 4.6.7.

TABLE 4: APRIL 2026 CHEMICAL MONITORING RESULTS (GPT, 2026)

Determinant	Risk	Unit	Standard limits	Apr-26																		
				Volspruit Results			De Klerk Results								De Beer Results							
				Abdul Dam	BH 104	BH Quarry	Vol 12	Vol 13	Vol 17	Vol 20	Vol 21	Vol 25	Vol 5	Vol 6	Vol Hek 01	Vols 1	Vols 10	Vols 13	Vols 14	Vols 2	Vols 3	Vols 5
Physical and aesthetic determinants																						
Conductivity at 25 °C	Aesthetic	mS/m	170	121.2	34	98.4	142.8	95.6	110.7	80.5	126.3	91	86.4	88.7	77.5	166.1	138.6	122.2	127.4	274.1	280.3	291.2
Total dissolved solids	Aesthetic	mg/L	1 200	848	238	689	1000	669	775	564	884	637	605	621	543	1163	970	855	892	1919	1962	2038
pH at 25 °C ^b	Operational	pH units	5 to 9.7	7.97	8.78	8.04	7.62	7.84	7.7	8.02	7.71	7.75	7.72	7.95	7.75	7.59	7.68	8.22	7.82	7.85	7.58	7.68
Chemical determinants – macro-determinants																						
Nitrate as N (NO ₃ - N)	Acute health	mg/L	11	9.71	BDL	BDL	40.7	19.62	2.97	4.05	34.9	14.77	14.27	12.99	1.37	10.78	1.43	1.1	BDL	29.31	27.15	28.5
Nitrite as N (NO ₂ - N)	Acute health	mg/L	0.9	BDL	BDL	BDL	BDL	BDL	0.34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sulfate as SO ₄ ²⁻	Acute health	mg/L	500	64.05	14.53	41.02	129.1	75.27	87.49	20.26	160	53.27	61.28	64.2	6.7	67.33	83.04	70.68	76.83	228.7	224.7	243.6
	Aesthetic	mg/L	250	64.05	14.53	41.02	129.1	75.27	87.49	20.26	160	53.27	61.28	64.2	6.7	67.33	83.04	70.68	76.83	228.7	224.7	243.6
Fluoride as F	Chronic health	mg/L	1.5	0.3	0.07	0.41	0.24	0.18	0.28	0.22	0.19	0.2	0.19	0.16	0.19	0.29	0.58	0.27	0.44	0.55	0.48	0.6
Ammonia as N	Aesthetic	mg/L	1.5	0.526368	BDL	0.4358985	0.485246	0.49347	0.633287	0.509919	0.065796	BDL	BDL	BDL	BDL	BDL	BDL	0.337205	BDL	BDL	BDL	BDL
Chloride as Cl	Aesthetic	mg/L	300	116.7	38.32	106	97.87	56.52	103.3	17.66	82.47	52.54	47.92	40.72	31.31	260.9	206	184.1	139.6	557	601.4	593.6
Sodium as Na	Aesthetic	mg/L	200	26.14	22.41	84.37	13.51	15.96	16.37	15.57	11.51	16.66	14.98	17.51	14.28	71.45	102.1	106.7	101.1	105.7	104	177.8
Zinc as Zn	Aesthetic	mg/L	5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.07	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05	BDL	BDL
Chemical determinants – micro-determinants																						
Arsenic as As	Chronic health	mg/L	0.01	0.014	BDL	0.011	0.013	BDL	BDL	0.011	BDL	BDL	BDL	0.017	0.021	0.021	0.024	BDL	0.028	0.013	BDL	BDL
Barium as Ba	Chronic health	mg/L	0.7	0.18	0.07	0.1	0.17	0.14	0.07	0.17	0.15	0.14	0.13	0.11	BDL	0.2	0.13	0.08	0.11	0.18	0.24	0.14
Boron as B	Chronic health	mg/L	2.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	Chronic health	mg/L	0.003	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total chromium as Cr	Chronic health	mg/L	0.05	BDL	BDL	BDL	0.22	0.28	BDL	BDL	BDL	0.21	0.28	0.26	BDL	0.14	BDL	BDL	BDL	0.71	0.78	0.37
Copper as Cu	Chronic health	mg/L	2	BDL	BDL	0.017	0.019	0.014	0.01	0.025	0.019	0.013	0.017	BDL	BDL	BDL	0.012	BDL	BDL	0.014	BDL	0.015
Iron as Fe	Aesthetic	mg/L	0.3	BDL	BDL	0.18	0.09	BDL	0.8	BDL	0.18	BDL	0.09	BDL	1.21	0.06	0.83	BDL	BDL	0.28	0.12	BDL
Lead as Pb	Chronic health	mg/L	0.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
	Chronic health	mg/L	0.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	Aesthetic	mg/L	0.1	BDL	BDL	BDL	BDL	BDL	0.51	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel as Ni	Chronic health	mg/L	0.07	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium as Se	Chronic health	mg/L	0.04	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.014	BDL	BDL
Aluminium as Al	Operational	mg/L	0.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.05	BDL	BDL	BDL	0.1	BDL	BDL	BDL	0.05	BDL
Hexavalent Chromium		mg/L		BDL	BDL	BDL	0.26	0.31	BDL	BDL	BDL	0.23	0.31	0.31	BDL	0.12	BDL	BDL	BDL	0.63	0.7	0.26
NR - Not Requested																						
Exceeded the SANS 241:2015 limits																						
BDL = Below Detection Limit																						

4.6.5 Groundwater model

4.6.5.1 Conceptual model

The conceptual understanding of the behaviour of groundwater levels in the vicinity of the Nyl was developed by the observation of groundwater levels during monitoring. It can be assumed that the groundwater and surface water was connected (as it is in most of wetter regions of South Africa) before human intervention in the area. This scenario is illustrated in Figure 10. In this scenario river water will recharge the aquifer during periods of floods, while groundwater should have provided base flow to the river in dryer periods.

This changed when groundwater abstraction was used for irrigation. A decline in groundwater level separated groundwater below the Nyl from the river flow, given the presence of the thick clay layer below the Nyl floodplain (Figure 11).

During periods of flood, when the Nyl River overflows its banks, surface water can seep through the more permeable gravelly soil to recharge the groundwater (Figure12), which was witnessed during the floods of 2014 and 2017.

While mining in the area will further decrease the groundwater levels it will not change the basic behaviour of groundwater water flow from and to the Nyl River, as is illustrated in Figure 13 and Figure 14 below. The clay layer below the Nyl floodplain will continue to prevent normal infiltration of surface water to the aquifer below, while separation of the waters will prevent groundwater flow to the surface water in the Nyl.

During periods of flood surface water that overflow the clay layer underneath the Nyl River will continue to seep to the aquifer at rates currently witnessed, as unsaturated flow is gravitationally driven and not dependent on total hydraulic head as is the case with saturated flow.

It is thus concluded from this conceptual understanding that further lowering of the groundwater levels in the area will not change the intrinsic dynamics of groundwater / surface water interaction in the Volspruit area, if direct flow from the river to the opencast pit is prevented by an impermeable berm as is currently planned (GPT, 2026).

UNDISTURBED SCENARIO

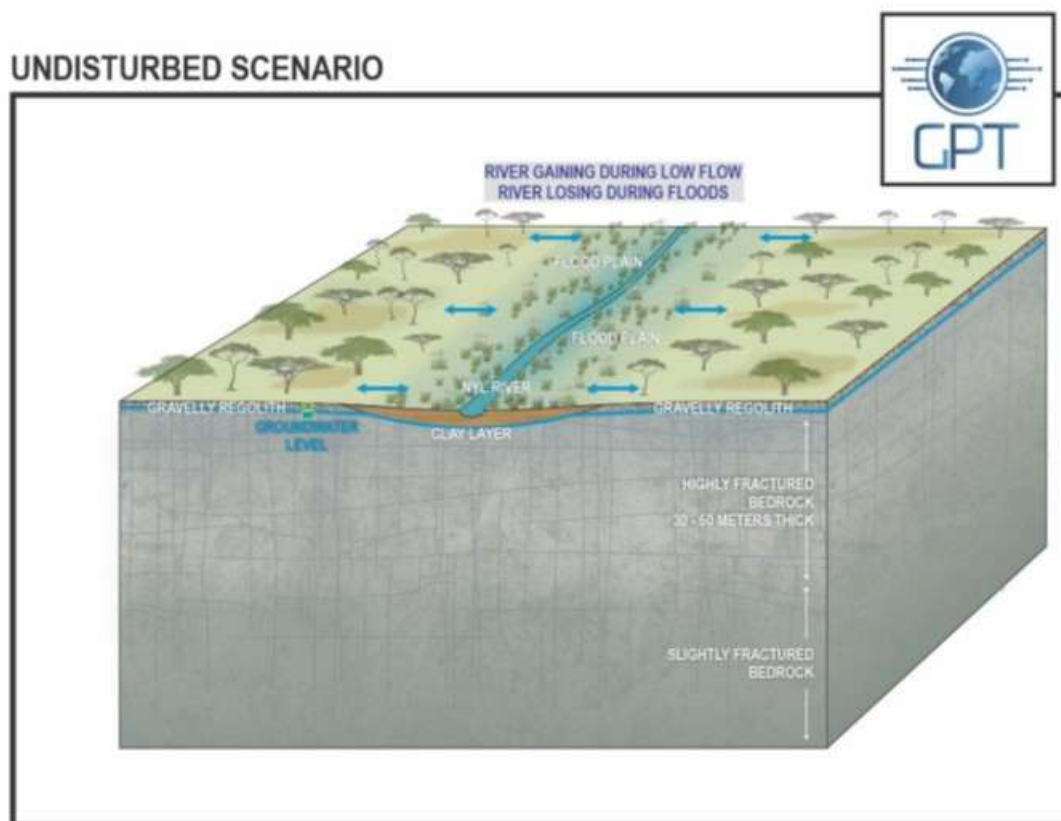


FIGURE 10: A SCHEMATIC DEPICTING THE GROUNDWATER LEVELS BEFORE IRRIGATION (GPT, 2026)

DISTURBED BY IRRIGATION NORMAL RIVER FLOW

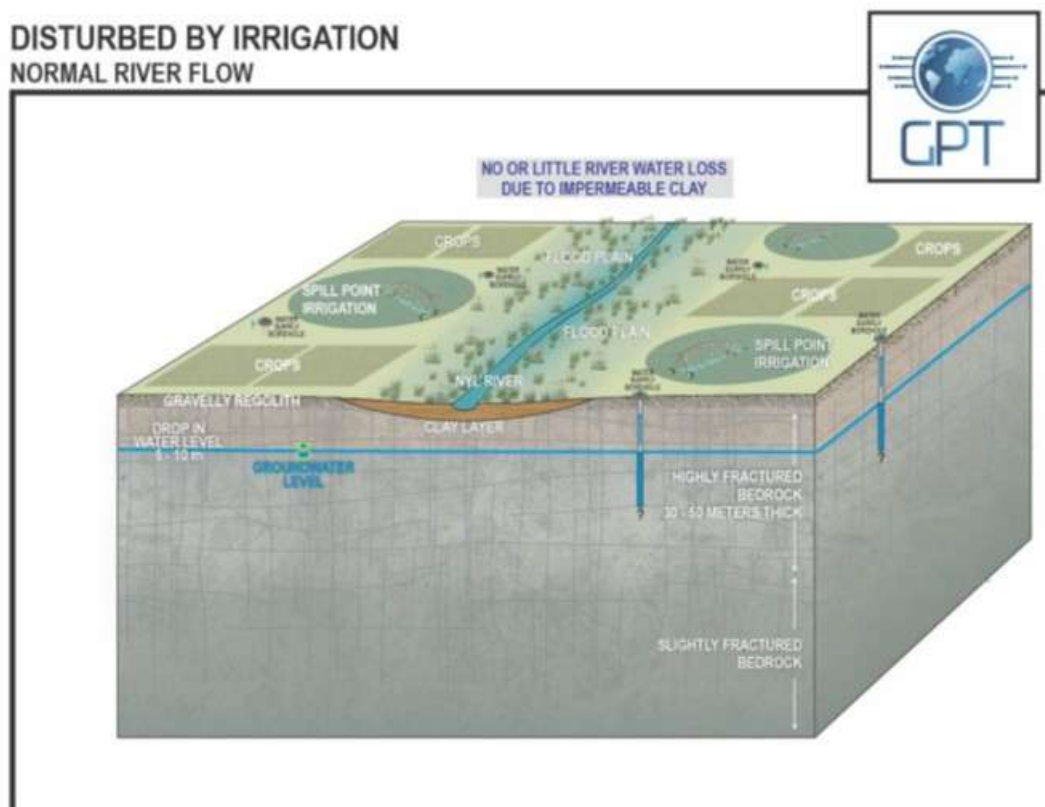


FIGURE 11: A SCHEMATIC DEPICTING THE GROUNDWATER LEVELS AFTER IRRIGATION (GPT, 2026)

DISTURBED BY IRRIGATION DURING FLOODS

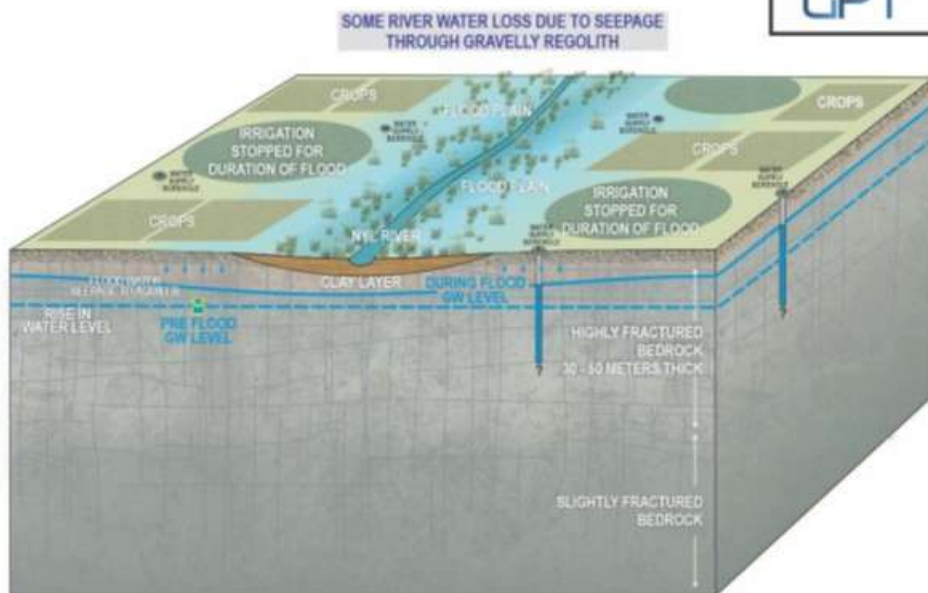


FIGURE 12: A SCHEMATIC DEPICTING THE GROUNDWATER LEVELS DURING FLOODING (GPT, 2026)

DISTURBED BY IRRIGATION AND MINING NORMAL RIVER FLOW

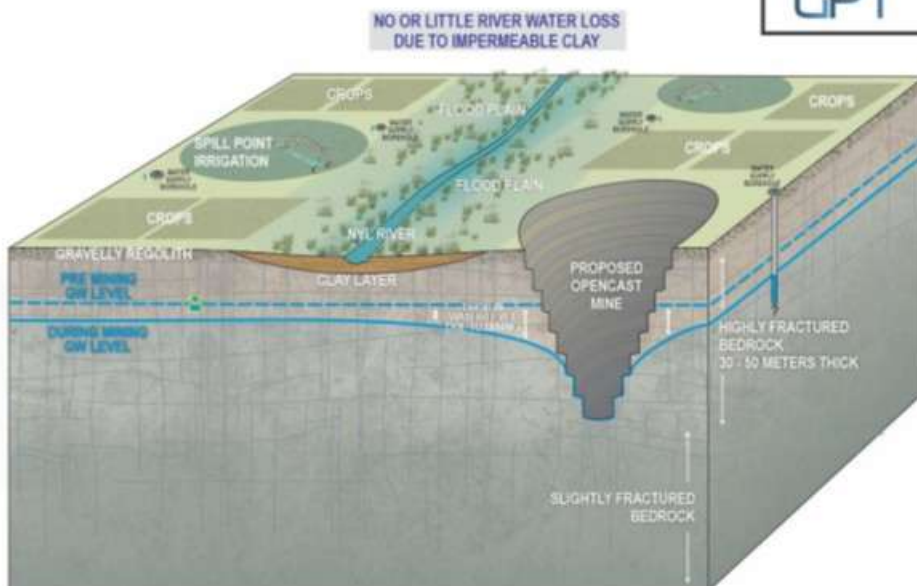


FIGURE 13: A SCHEMATIC DEPICTING THE GROUNDWATER LEVELS DURING MINING (GPT, 2026)

DISTURBED BY IRRIGATION AND MINING DURING MINING AND FLOODING

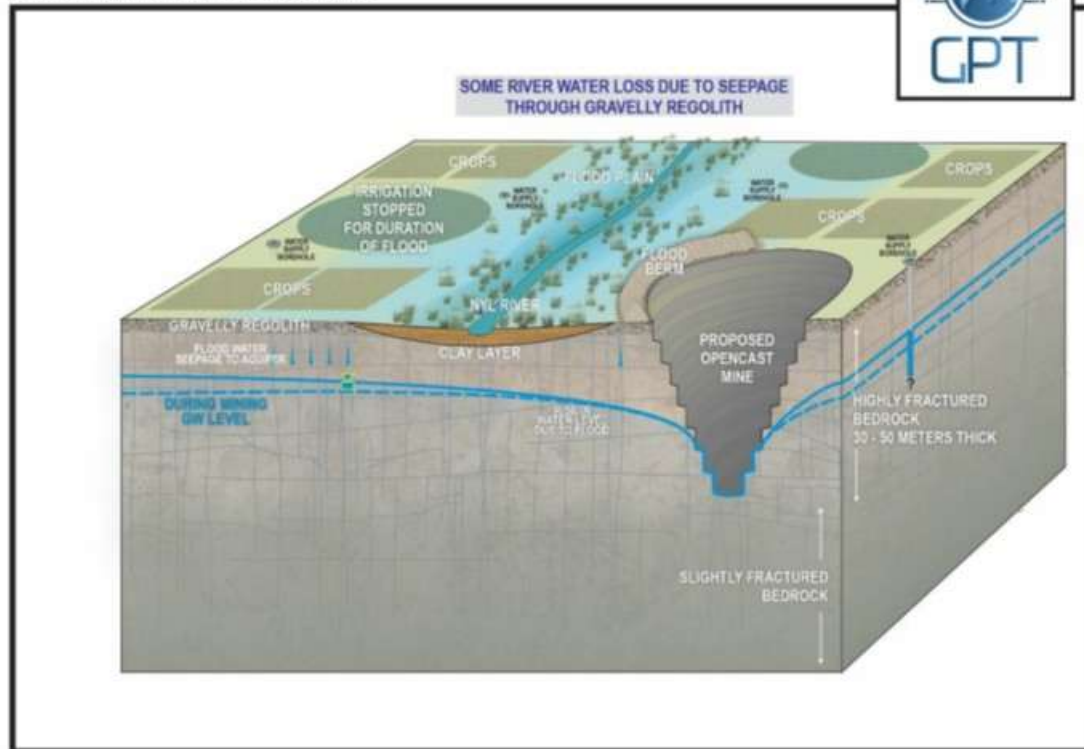


FIGURE 14: A SCHEMATIC DEPICTING THE GROUNDWATER LEVELS DURING MINING AND FLOODING (GPT, 2026)

4.6.6 Flow and transport modelling

Numeric modelling was done to understand the base case groundwater situation and then to predict the impacts of the planned mining.

4.6.6.1 Drawdown before mining due to registered water use

A list of registered groundwater users were received from DWS and approved volume allocations used for irrigation abstraction. This scenario was modelled as a steady state model with the boreholes at a depth of 100 metres below ground surface. The results are depicted as Figure 15 below. It can be deduced that:

- Drawdown of the groundwater is predicted to be in the order of 5 to 50 metres, with only the drawdown at Bokpoort that could be more than 50 metres. In many of the boreholes the theoretical drawdown is less than the 7 meters cutoff value.
- If all groundwater users extract only the registered groundwater volumes, the lowering of the groundwater is not excessive.
- However, a previous specialist report calculated that more ground water must be pumped to sustain irrigated crops. Thus, there is a possibility that the actual drawdown could be more in reality.

4.6.6.2 Drawdown of the groundwater due to mining

The mining scenario modelled was:

- Volspruit North Pit at full production and South Pit not yet mined. Grasvally first phase mining to the upper level (350mbg); including farmers irrigation abstraction.
- Volspruit North and South Pit at full production and abstraction, Grasvally at peak production (600mbgl) with abstraction; including farmers irrigation abstraction.
- Volspruit North Pit completely backfilled and South Pit at full production, Grasvally at peak production (600m); including farmers irrigation abstraction.

The results of the modelling are shown as Figure 16, Figure 17 and Figure 18. The following can be deduced from these figures:

For Volspruit:

- The groundwater drawdown at Volspruit during mining of the North Pit is about 130 metres, the depth of mining.
- The cone of depression could extend to about 1 kilometre in all directions due to the high hydraulic conductance of the faulted bedrock.
- At the Nyl, the drawdown could extend west to the river and is predicted to be in the order of 10 metres for a limited period while the deeper western section of North Pit is mined.
- The predicted drawdown at the river is illustrated in Figure 16 below. The drawdown at the river is expected to drop only for a limited time of about 2 years to more than 10 metres. For the rest of the time, it is mostly in the order of 2 - 4 metres, which is very similar to what is currently occurring due to irrigation.
- For South Pit, the drawdown is also about 130 meters, down to the level of mining. The extent of the cone of depression is also in the order of 1 km.
- As South Pit is further from the Nyl River, the drawdown is not expected to have a significant impact at the river.

For Grasvally:

- At Grasvally the calculated drawdown is about 30 metres directly above the underground stopes. However, this prediction is highly uncertain as the conductance of the mine roofs are unknown, and there are no data of the previous mining available to calculate it.
- The cone of depression due to Grasvally is similarly about 1 kilometre in all directions.
- The aquifer above the stopes is not completely dewatered due to the limited vertical hydraulic conductivity at this depth. The fracturing of bedrock becomes less frequent with depth and water bearing fractures becomes less permeable. However, the exact value of the vertical hydraulic conductivity is unknown, and the value used in this model was based on previous experience in deep Mpumalanga coal mines. Vertical fracturing at Grasvally could thus be different. A more precise estimate can only be obtained once dewatering has begun and enough groundwater volume and - level data has been collected.

Cumulative impact of Volspruit and Grasvally:

- In the extreme worst case with both opencast mines at Volspruit South at maximum and Grasvally Lower-Level stopes dewatered (Figure 18), the cone of drawdown extends to about

500 metres beyond the Nyl River, and the calculated drawdown increase to about 20 metres.

- There is also a merged groundwater depression between Grasvally and Volspruit of ≈ 30 metres and the drawdown at the Nyl is somewhat increased by 5 metres at most.

Lowering of the Groundwater Level below the Nyl River

It was mentioned above that the drawdown of the groundwater at the Nyl River is transient. This influence is illustrated in Figure 18. It can be concluded from this simulation that:

- Drawdown at the river is modelled to be about 5 metres below surface with irrigation only.
- The groundwater level recedes very slowly until about year 6 when mining progress to the west in the direction of the Nyl river.
- The groundwater the groundwater level then deepens to about 12 metres at the maximum depth of the pit at year 9.
- As mining is discontinued the groundwater level will start rebounding to reach normal levels of five metres below surface at year 12.
- Thereafter the reaction of the groundwater will depend on the use of the water, especially at Grasvally.
- Should the extracted groundwater water be used for irrigation and water supply to Mokopane, the groundwater levels could stabilise at levels of at least 5 to 10 metres below surface.

Impact of evaporation from South Pit

Evaporation from the planned pit lake in the South Pit was modelled and the additional impact is very low and will not change the drawdown or the movement of contamination after mining to any significant extent. The following was found:

- The additional drawdown at South Pit will be in the order of 5 - 10 metres in the long term.
- This is small compared to the drawdown to either mining or irrigation abstraction that is predicted to be several 10s of metres insert, even approaching 100 metres in places.

Decanting of the pits

After closure, the water table will rise in the rehabilitated pit to reinstate equilibrium with the surrounding groundwater systems. The mined areas will have a large hydraulic conductivity compared to the pre-mining situation. This will result in a relative flattening of the groundwater table over the extent of the rehabilitated opencast. The end result of this will be a permanent lowering of the groundwater level in the higher topographical area and a rise in lower lying areas.

The latest model input parameters indicate no decanting is predicted. But the groundwater is modelled to be very close to surface after mining and could lead to decant should layout or parameters change. A flood protection berm is planned down gradient between the pit and the river, increasing the freeboard to the point that decanting is not possible. It is thus concluded that direct surface decanting of the pits is unlikely.

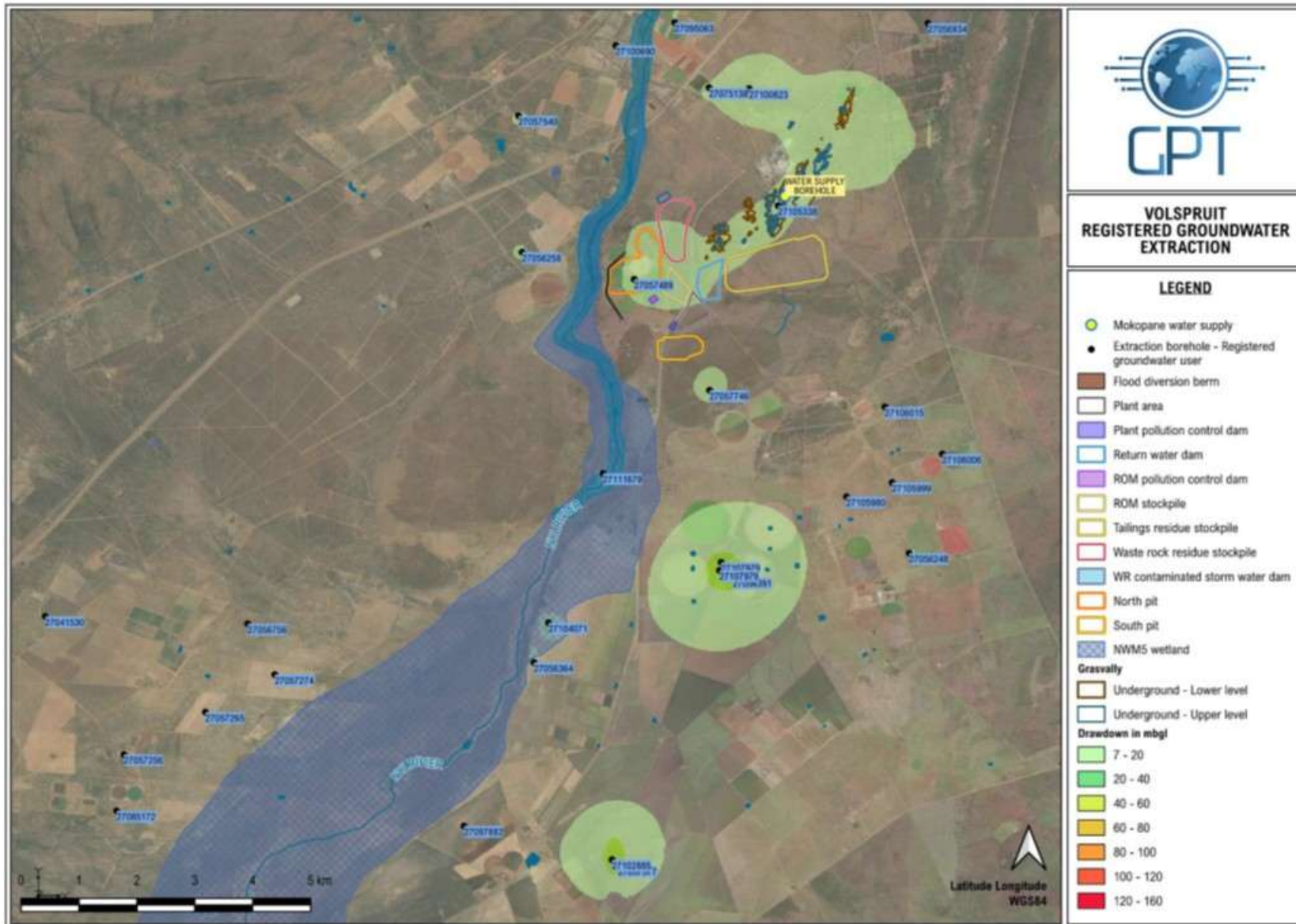


FIGURE 15: MODELLED CONES OF DRAW DOWN DUE TO CURRENT IRRIGATION (GPT, 2026)

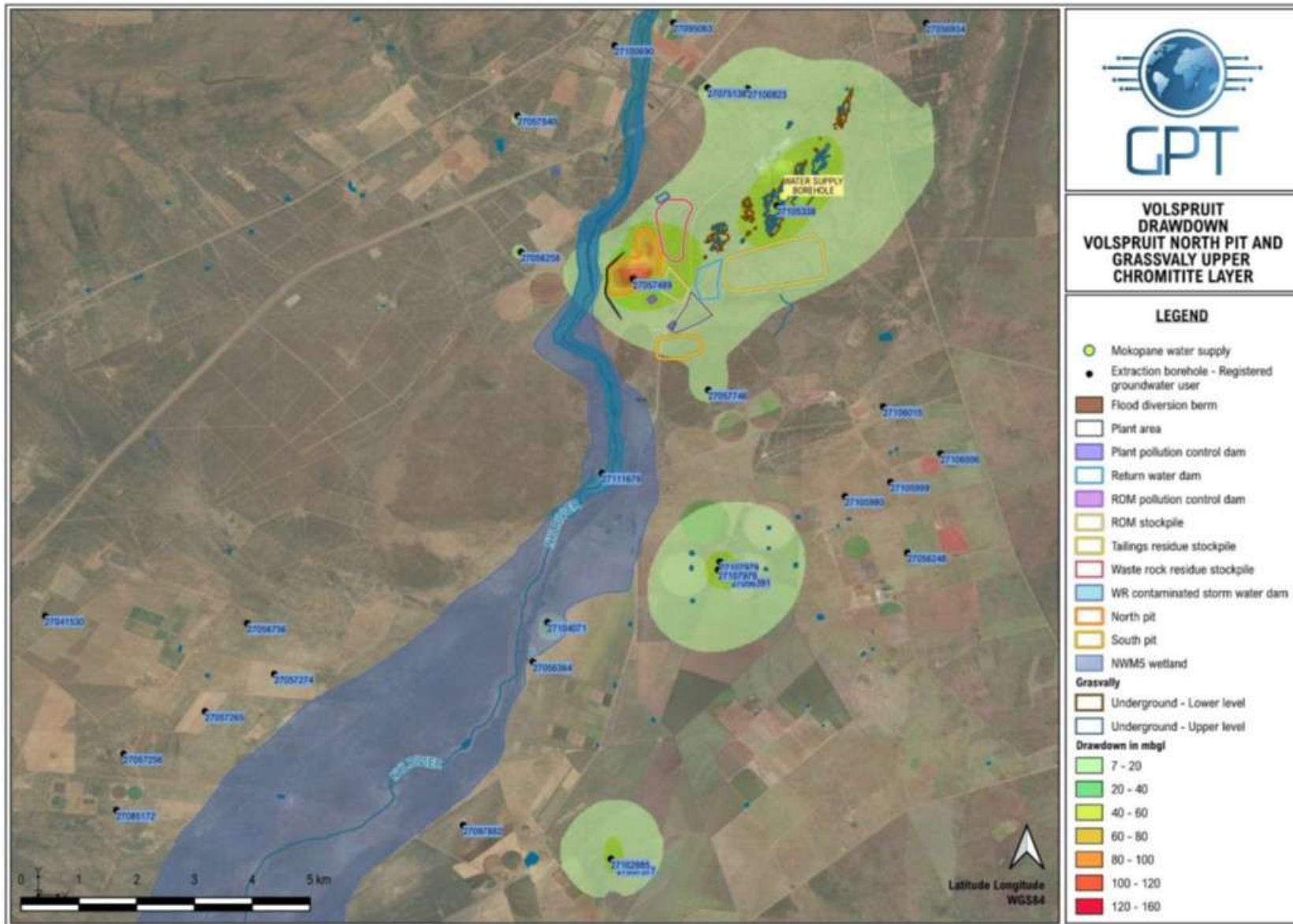


FIGURE 16: DRAWDOWN WITH NORTH PIT AND GRASVALLY UPPER LEVEL (GPT, 2026)

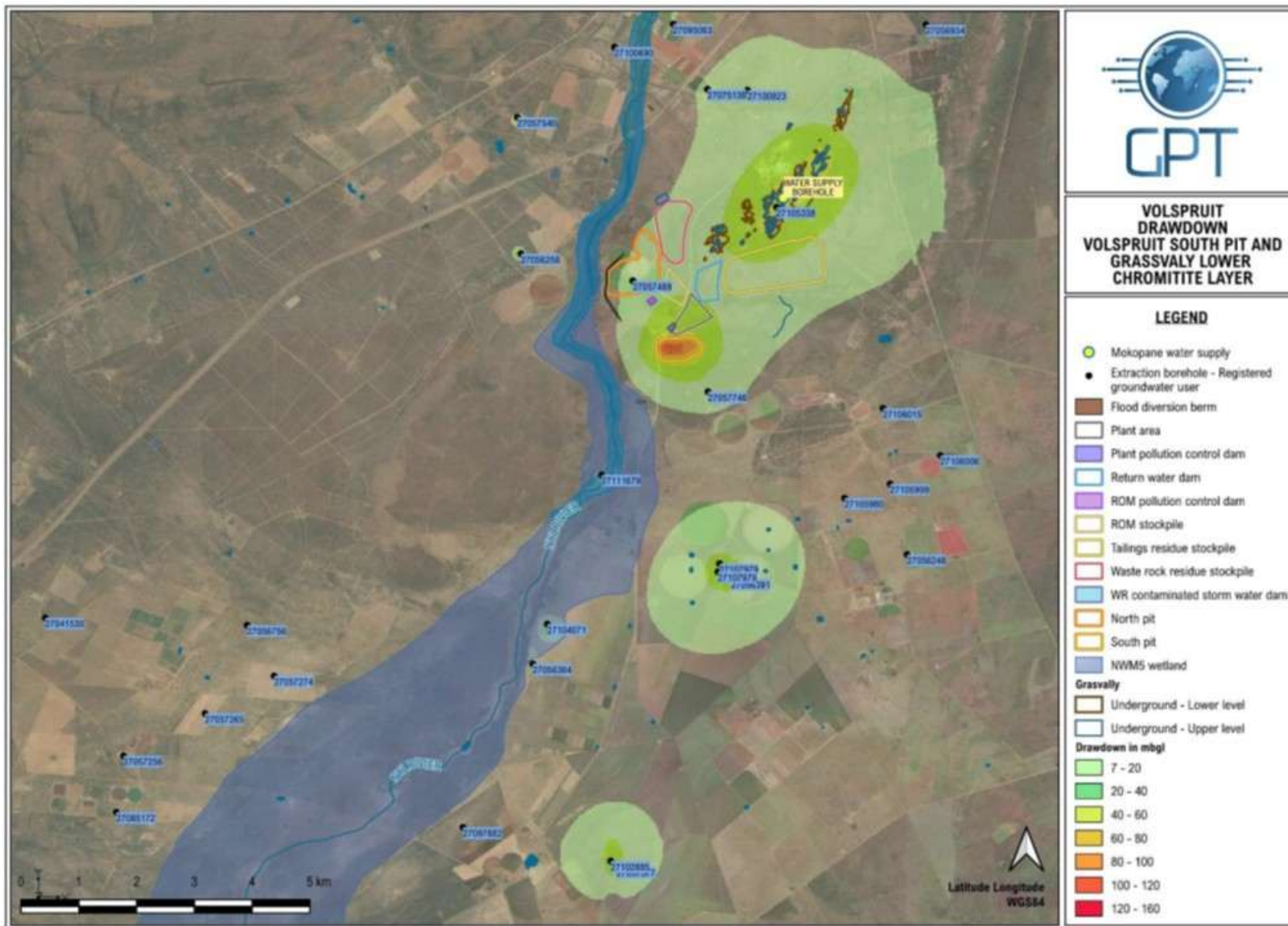


FIGURE 17: MODELLED CONES OF DRAW DOWN WITH SOUTH PIT AND GRASSVALLY LOWER LEVEL (GPT, 2026)

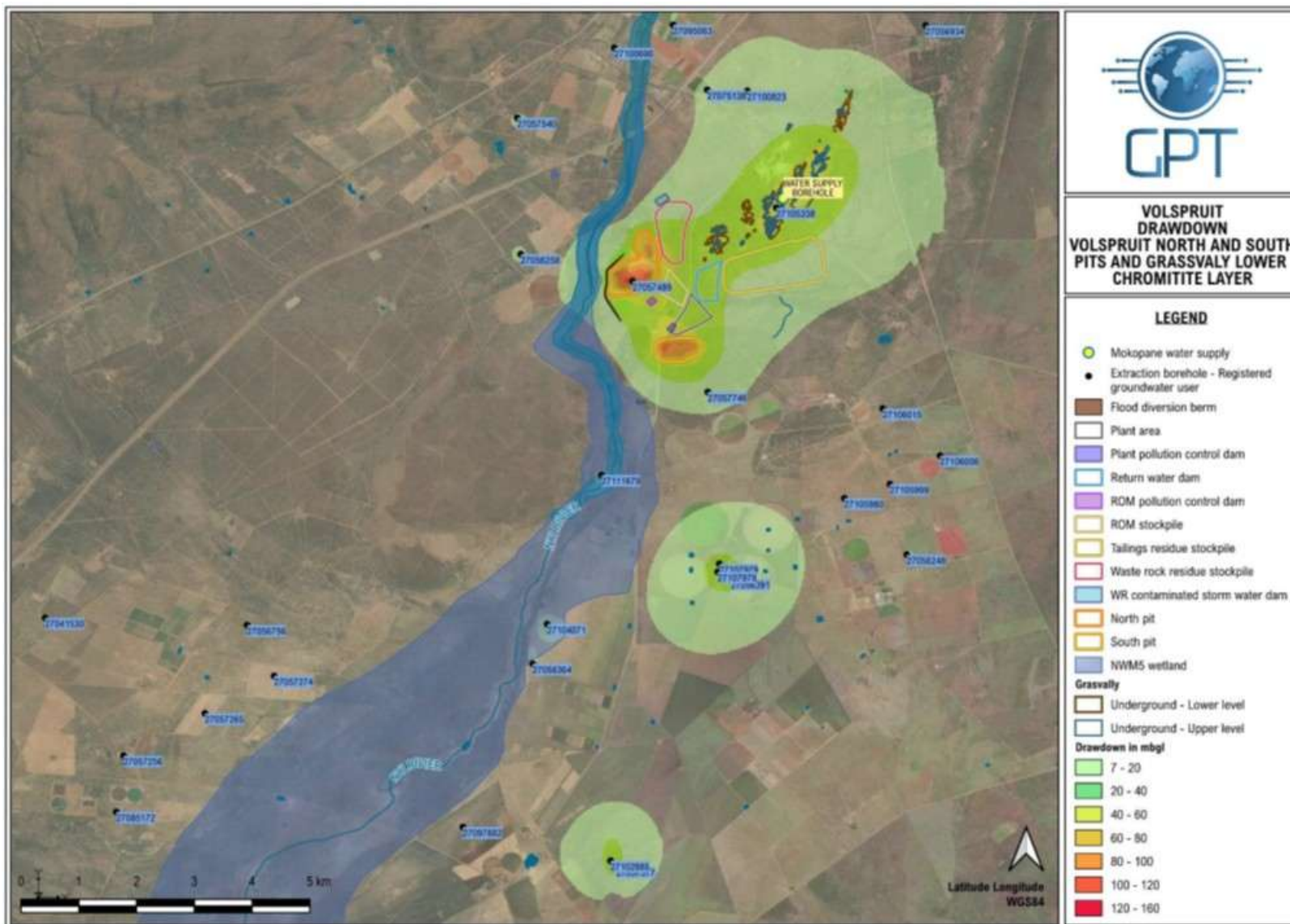


FIGURE 18: MODELLED CONES OF DRAW DOWN WITH NORTH PIT, SOUTH PIT AND GRASVALY LOWER LEVEL (GPT, 2026)

4.6.6.3 Transport modelling

Currently groundwater is extracted in the area for crop irrigation and could change groundwater flow directions. Thus, two scenarios have been modelled:

- With abstraction of groundwater based on registered groundwater users.
- The above with additional abstraction of water from Grasvally for Mokopane.

Migration of contaminated water from the mining area has been modelled with current irrigation included. The results are presented in Figure 19. It follows from this figure that:

- The plume is drawn towards the irrigation areas to the west of the Nyl River and underflow the river, but is deep below the floodplain bed and does not affect the surface water.
- There is also a substantial plume migration to the irrigation areas south of the mining area but is not predicted to reach those boreholes in the forecast period
- It thus follows that the direction of plume migration is dominated by groundwater abstraction, as result of the almost horizontal water table. The groundwater flow will thus always be to where the water table is lowered.

Migration of contaminated water from the mining area has been modelled with irrigation as well as abstraction from the Grasvally mine for Mokopane after closure. The flow patterns in the aquifer changed significantly in this scenario as illustrated in Figure 20:

- Plume movement is now significantly in the direction of Grasvally and is a more important factor of influence on groundwater flow than the abstraction for irrigation in the groundwater.
- This change in groundwater flow direction is due to the proximity of the underground mine to the Volspruit site as well as the depth of the defunct underground mine.

It is concluded that:

- Groundwater flow direction is dominated by groundwater abstraction rather than topographical features.
- Migration of potential pollution will thus be towards the most prominent groundwater abstraction areas rather than the topographical downstream regions as would be intuitively expected.
- The impact on the underlying aquifer and groundwater receptors will be insignificant due to the low acid generation capacity of the ore and bedrock.

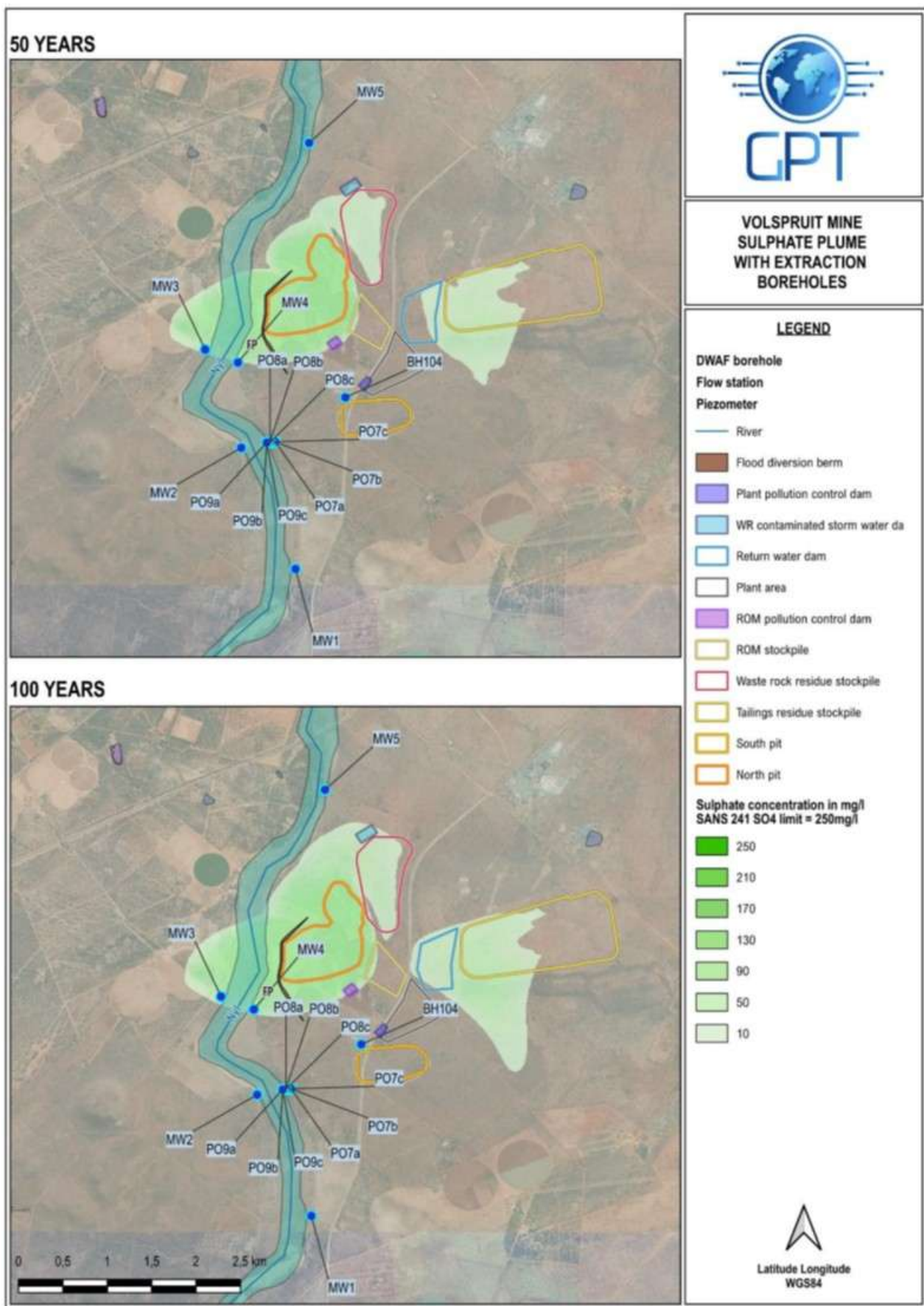


FIGURE 19: PLUME MIGRATION WITH GROUNDWATER ABSTRACTION FOR IRRIGATION ONLY (GPT, 2026)

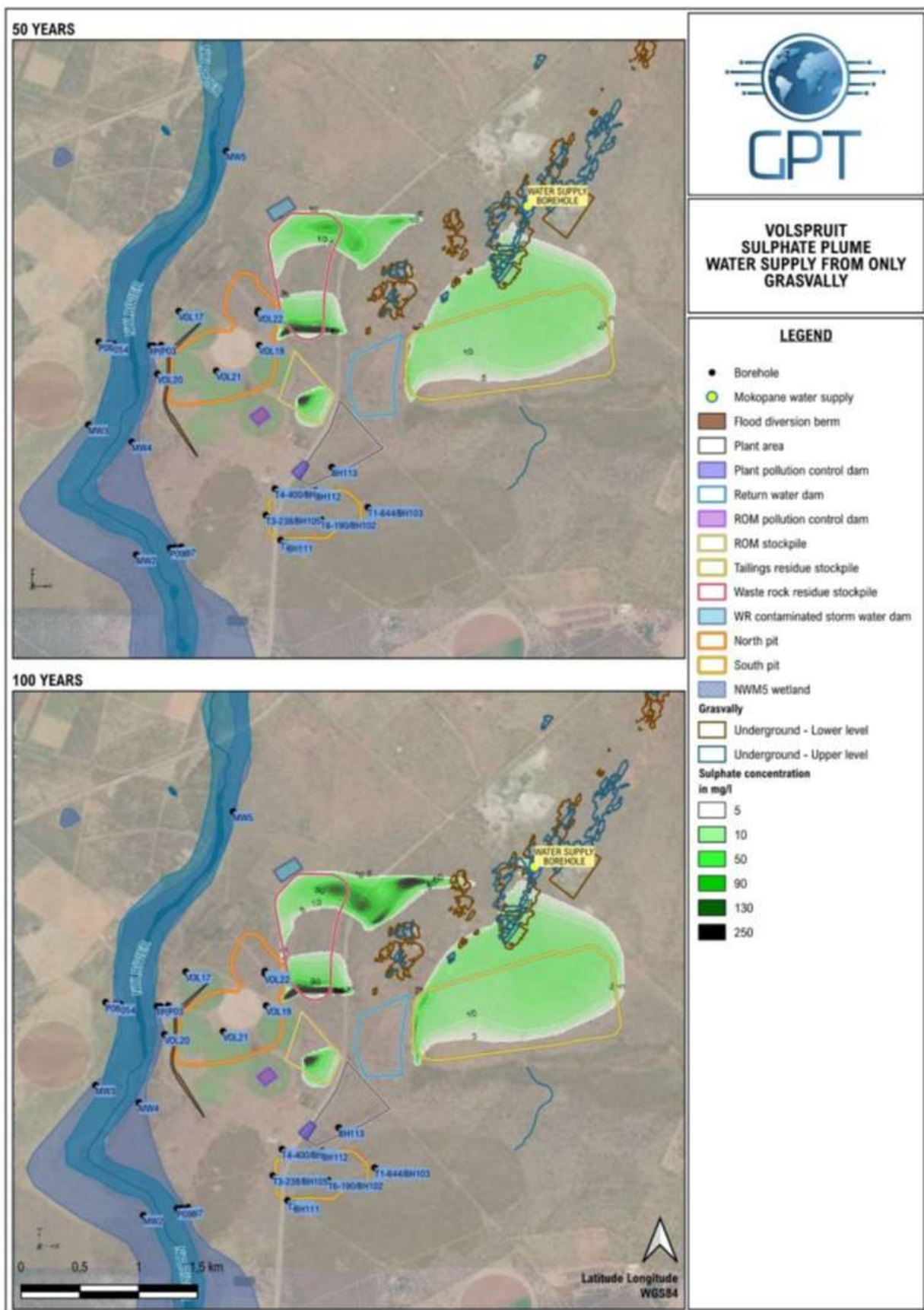


FIGURE 20: PLUME MIGRATION WITH ABSTRACTION FOR IRRIGATION + GRASVALLY (SHALLOW AQUIFER) (GPT, 2026)

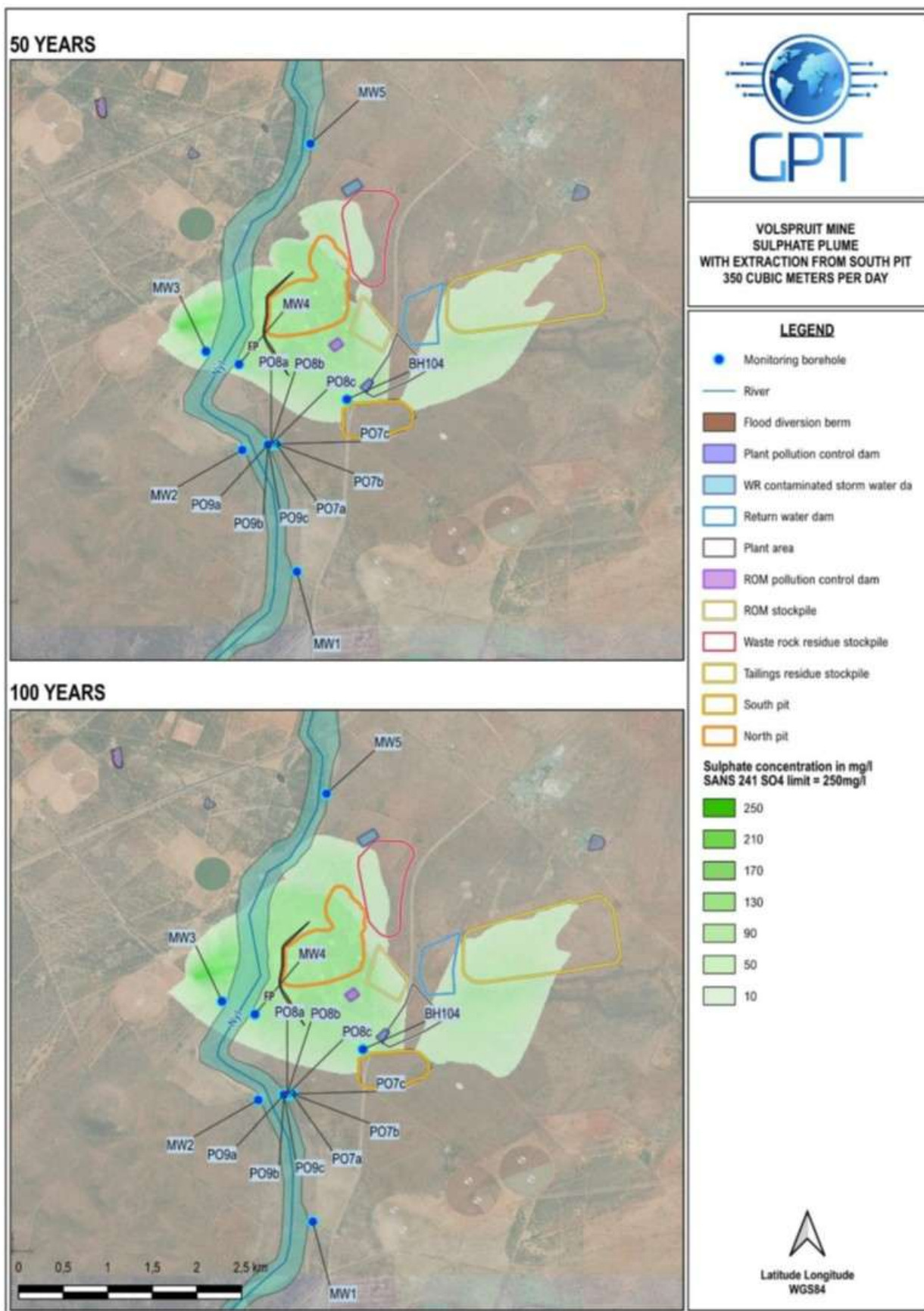


FIGURE 21: PLUME MIGRATION WITH GROUNDWATER ABSTRACTION FROM SOUTH PIT (GPT, 2026)

4.6.7 Geochemistry and salt balance

Geochemical modelling was done by Mills Water to determine the potential water qualities expected from the North Pit and its suitability for irrigation. Further investigation into the potential sources of arsenic and hexavalent chromium was also done. The full report can be viewed as Appendix D. Findings from the report are summarised below.

4.6.7.1 Water quality in terms of potable standards

Of note are the following:

- In samples associated with the basic volcanics (Lebombo Formation of the Karoo), EC, chloride and nitrate exceed the SANS limits in more than 50% of the samples.
- Nitrate exceeds the limits across the most different lithologies i.e. basic volcanics, gabbro-norite, harzburgite, mixed harzburgite/basic volcanics and pyroxenite.
- Sodium concentrations exceed the SANS limits in samples associated with basic volcanics only.
- Ammonium and fluoride exceed the limits in 10% or fewer samples from harzburgite lithologies.
- SANS limits for micro-parameters are exceeded for Cr(VI), arsenic, iron, aluminium and manganese.
- Samples associated with basic volcanic, pyroxenite/harzburgite and magnetite/gabbro lithologies exceed limits for iron and/or arsenic in <30% of the samples.
- Limits for more micro-parameters are exceeded in samples associated with harzburgite and pyroxenite compared to other lithologies.

Exceedance of SANS limits for EC, ammonium, chloride, sodium, aluminium, iron and manganese are related to aesthetic effects on water quality i.e. the water may look or taste sub-optimal, but these parameters are not associated with health effects.

However, nitrate, Cr(VI) and arsenic exceedances may indicate a potential health risk. Nitrate can pose an acute health risk, especially to bottle-fed infants, at concentrations exceeding 11 mg/L as N. Hexavalent chromium (CrVI) and arsenic are carcinogens which may pose a chronic health risk. Exposure to concentrations of these elements in drinking water at levels above the SANS guideline for an extended period of time should be avoided to limit the potential for development of certain cancers (World Health Organisation, 2022).

4.6.7.2 Water quality in terms of irrigation standards

The TWQR defines ideal water quality, but water outside of this range may still be acceptable depending on the soil type and/or crop. The DWAF has also defined maximum guideline limits above which most crops will not thrive (Department of Water Affairs and Forestry, 1996a). The maximum limit for chloride is exceeded in 77% of the samples from the Karoo volcanics. Nitrate concentrations exceeding the irrigation water maximum limit of 30 mg/L were measured in samples from Karoo volcanics (23% of samples), pyroxenites (21% of samples), harzburgite/volcanics (15% of samples) and harzburgites (10% of samples). pH above 8.4 was measured in 25% of samples from pyroxenites, 20% of samples from magnetite gabbro and 13% of samples from harzburgites. Iron and boron exceeded maximum limits in three, and one samples respectively. Chromium and arsenic did not exceed the maximum limits. High levels of nitrogen in groundwater are likely to affect most

crops and pose an increasingly serious risk of contaminating groundwater. Chloride concentrations exceeding 700 mg/L can result in accumulation of toxic levels of chloride through both root and foliar absorption, thus resulting in foliar injury and decreases in yield (Department of Water Affairs and Forestry, 1996a).

From an irrigation water quality perspective, nitrate concentrations above 30 mg/L and chloride concentrations above 700 mg/L are most likely to affect crop growth.

4.6.7.3 Nitrates

A plot of nitrate against TDS indicates the following:

- Positive correlations are observed between nitrate and TDS in some samples from Lower Zone aquifers (Harzburgites and pyroxenites) and in most samples from Karoo (Basic volcanics) affected aquifers, but the correlations are not the same. This may be due to the higher initial TDS of groundwater in the Karoo aquifers.
- Not all samples from the Lower Zone and other Rustenburg Layered Suite (RLS) aquifers indicate a correlation between nitrate and TDS, suggesting that the nitrate does not originate from the aquifer material.
- The observed correlations between nitrate and TDS suggest evaporative concentration which is likely to occur during irrigation.

The nitrate is therefore most likely to originate from fertilizers, with higher concentrations due to evaporative concentration through irrigation and in the soil zone. Nitrate can be difficult to remove from water with conventional water treatment methods (coagulation, sedimentation, filtration and chlorination), but ion exchange, reverse osmosis, biological denitrification and electrodialysis methods are effective (Department of Water Affairs & Forestry, 1996b; World Health Organisation, 2022). See Figure 22 for a map showing boreholes with elevated nitrates.

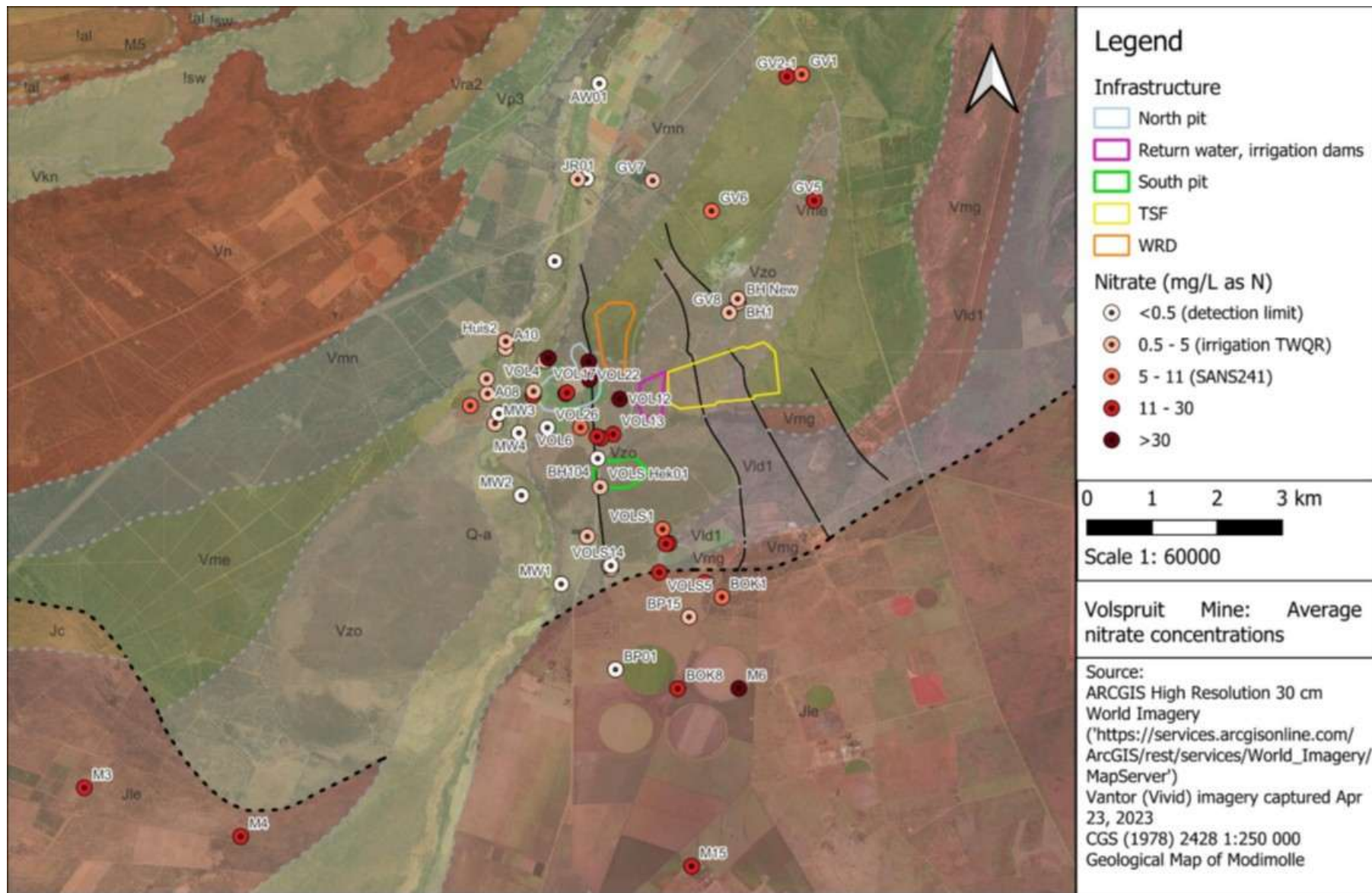


FIGURE 22: DISTRIBUTION OF BOREHOLES WITH ELEVATED NITRATE LEVELS (MILLS WATER, 2026)

4.6.7.4 Arsenic

Prolonged (>5 years) ingestion of water containing arsenic can lead to the development of arsenicism which is associated with dermal lesions, peripheral neuropathy, skin cancer, bladder and lung cancer and peripheral vascular disease.

However, there is uncertainty as to the risks at low concentrations, and the DWAF drinking water standard suggests that concentrations between 0.01 and 0.2 mg/L are tolerable with a low risk of skin cancer in highly sensitive individuals over the long term (Department of Water Affairs & Forestry, 1996b). The WHO has developed a provisional guideline of 0.010 mg/L based on limits on measuring low concentrations of arsenic and difficulties of removing arsenic from water to levels below 0.010 mg/L (World Health Organisation, 2022).

Arsenic was detected in 25 out of 88 samples with concentrations ranging from <0.01 to 0.028 mg/L, although it must be noted that 14 of the 53 non-detects have quantification limits of 0.05 mg/L or more, and arsenic may therefore be present but not reported due to the higher quantification limits in these analyses. The drinking water limit of 0.01 mg/L is exceeded at 27% of sampled locations. The arsenic concentrations are not correlated with any other parameter, but concentrations exceeding 0.01 mg/L appear to be associated with the RLS lithologies with the highest concentrations to the south of the proposed South Pit shell, mostly close to the Zebedelia Fault.

Arsenic is unlikely to originate through irrigation because it tends to be strongly adsorbed to soil, especially soils with high clay contents (Department of Water Affairs and Forestry, 1996a). Arsenic can become mobile under reducing conditions. Currently there are insufficient data to understand the origin and geochemical behaviour of arsenic, but it does appear to be associated with the RLS lithologies.

Arsenic concentrations exceeding the SANS241 drinking water limit of 0.010 mg/L have been identified at VOLS14 (0.028 mg/L), VOLS10 (0.024 mg/L), VOLS1 (0.021 mg/L), VOLS Hek01 (0.021 mg/L), VOLS5 (0.021 mg/L), JR01 (0.021 mg/L), MW3 (0.021 mg/L), VOL6 (0.017 mg/L), A06 (0.017 mg/L), Abdul Dam (0.014 mg/L), VOL12 (0.013 mg/L), VOLS2 (0.013 mg/L), VOL20 (0.011 mg/L) and BH-Quarry (0.011 mg/L).

Treatment of water to remove arsenic can be done by oxidizing dissolved arsenic to the pentavalent form using chloride or potassium permanganate, coagulation and flocculation of precipitated arsenic minerals using aluminium sulphate or lime, and then settlement and filtration (Department of Water Affairs & Forestry, 1996b; World Health Organisation, 2022). See Figure 23 for a map showing boreholes containing elevated arsenic.

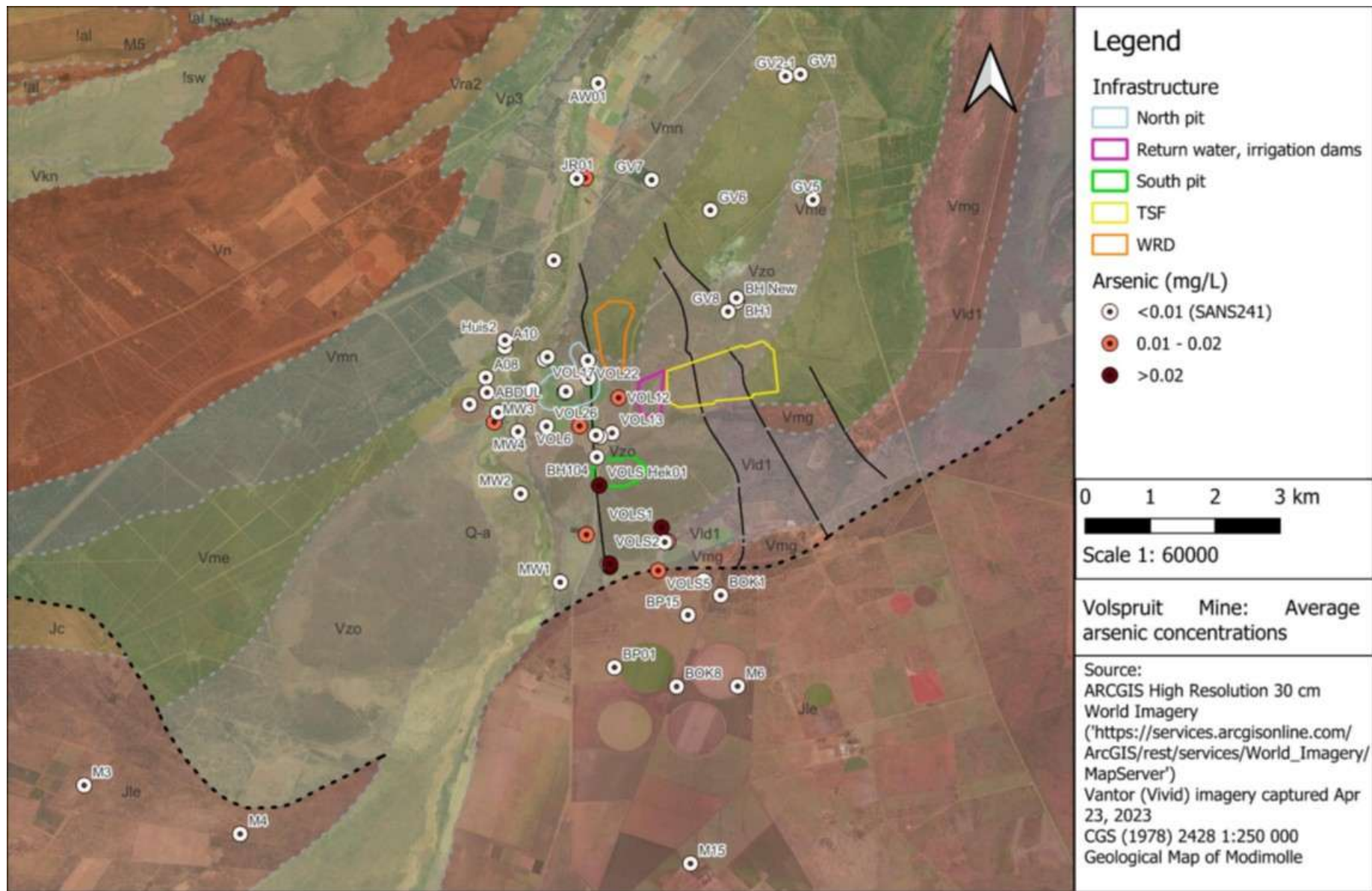


FIGURE 23: A MAP SHOWING THE DISTRIBUTION OF BOREHOLES WITH LEVATED ARSENIC (MILLS WATER, 2026)

4.6.7.5 Hexavalent chromium

Hexavalent chromium (Cr(VI)) is more toxic and mobile than trivalent chromium (Cr(III)). Inhalation of Cr(VI) can lead to the development of cancer, but there is limited available data to assess the potential for Cr(VI) to cause cancer via ingestion through drinking water. Environmental concentrations of Cr(VI) are generally orders of magnitude lower than concentrations which have been found to cause tumours in rats and mice and a Cr(VI) concentration of 0.05 mg/L is considered to be adequately protective of human health (World Health Organisation, 2022).

Chromium was reported in 24 of 77 samples. Speciation analysis confirmed that most of the chromium is present in the hexavalent form. The drinking water standard was exceeded in 21 of the 77 samples representing 32% of sampled locations with concentrations ranging from 0.01 to 0.70 mg/L. It should be noted that for most of the samples, the quantification limit was 0.05 mg/L, therefore it is possible that Cr(VI) is present at concentrations below the drinking water standard in these samples.

Detections of Cr(VI) are associated almost exclusively with the harzburgite and harzburgite/basic volcanics lithological groups, indicating a geological control. The harzburgites host the chromite layers that are mined at Grasvally and therefore represent an obvious potential source. However, not all samples from harzburgite lithologies have elevated Cr(VI). The Cr(VI) detections are spatially clustered into two areas, one in the vicinity of and to the south of the North pit shell, and the second to the north of the Zebedelia Fault (Figure 24). Both clusters are close to centre pivot irrigation systems. There does appear to be a correlation between most of the chromium detections and nitrate, with samples from VOLS2 and VOLS3 close to the Zebedelia Fault plotting above the correlation line and samples from VOL12 and VOL19 close to the North Pit shell plotting below the correlation line.

Cr(VI) in groundwater can originate from anthropogenic sources through industrial use and waste disposal, or through natural geochemical processes which can mobilise Cr(VI) from rocks into water. Anthropogenic sources include wastewater and sludges from the leather industry and slags and tailings from chromium processing (Zhigalenok, et al., 2025). Grasvally chrome mine represents an obvious potential source, however Cr(VI) was detected in only one of the boreholes close to the Grasvally operation, namely BH1 at 0.033 mg/L, and the highest Cr(VI) concentrations were detected more than 4 km to the south of the mining operations.

Concentrations of naturally occurring Cr(VI) are generally <0.01 mg/L, but concentrations of up to 0.3 mg/L have been observed in China and Cyprus associated with ultramafic aquifers (Rasool, et al., 2026). Chromium is mobilised from geological sources by initial slow weathering of primary chromium-containing minerals to release Cr(III) and then oxidation of Cr(III) to Cr(VI) (Zhigalenok, et al., 2025). This process occurs in well-aerated, alkaline conditions in ultramafic terrains in the presence of manganese oxide minerals (Rasool, et al., 2026). Intensive irrigation can leach natural Cr(VI) which has accumulated in the soil zone and transport it to groundwater. Nitrate-driven redox shift and anion competition also aid in mobilizing Cr(VI) in agricultural areas. Pumping of groundwater and lowering of water levels can also expose more material to oxygen or oxygenated groundwater, increasing the potential for oxidation of Cr(III) to Cr(VI) (Zhigalenok, et al., 2025; Rasool, et al., 2026). The enhancement of Cr(VI) leaching by pumping and irrigation may explain the observed correlation between Cr(VI) and nitrate, with nitrate being a tracer for high levels of irrigation. Based on available information, it seems most likely that Cr(VI) originates from the natural geology in the area, but mobilisation may be enhanced by extensive groundwater pumping and irrigation of centre pivot systems. Planned dewatering for open pit mining may lead to further mobilisation of Cr(VI) due to exposure of more chromium bearing minerals to an oxidizing environment and Cr(VI) concentrations will require routine monitoring and management in dewatering water.

Treatment options for removing Cr(VI) from water include (Department of Water Affairs & Forestry, 1996b; World Health Organisation, 2022):

- Reduction to Cr(III) by addition of ferrous sulphate with precipitation and flocculation of Cr(III) hydroxide with lime and alum followed by settlement and filtration;
- Adsorption by iron oxides; or
- Removal with reverse osmosis or ion exchange (Mills Water, 2026).

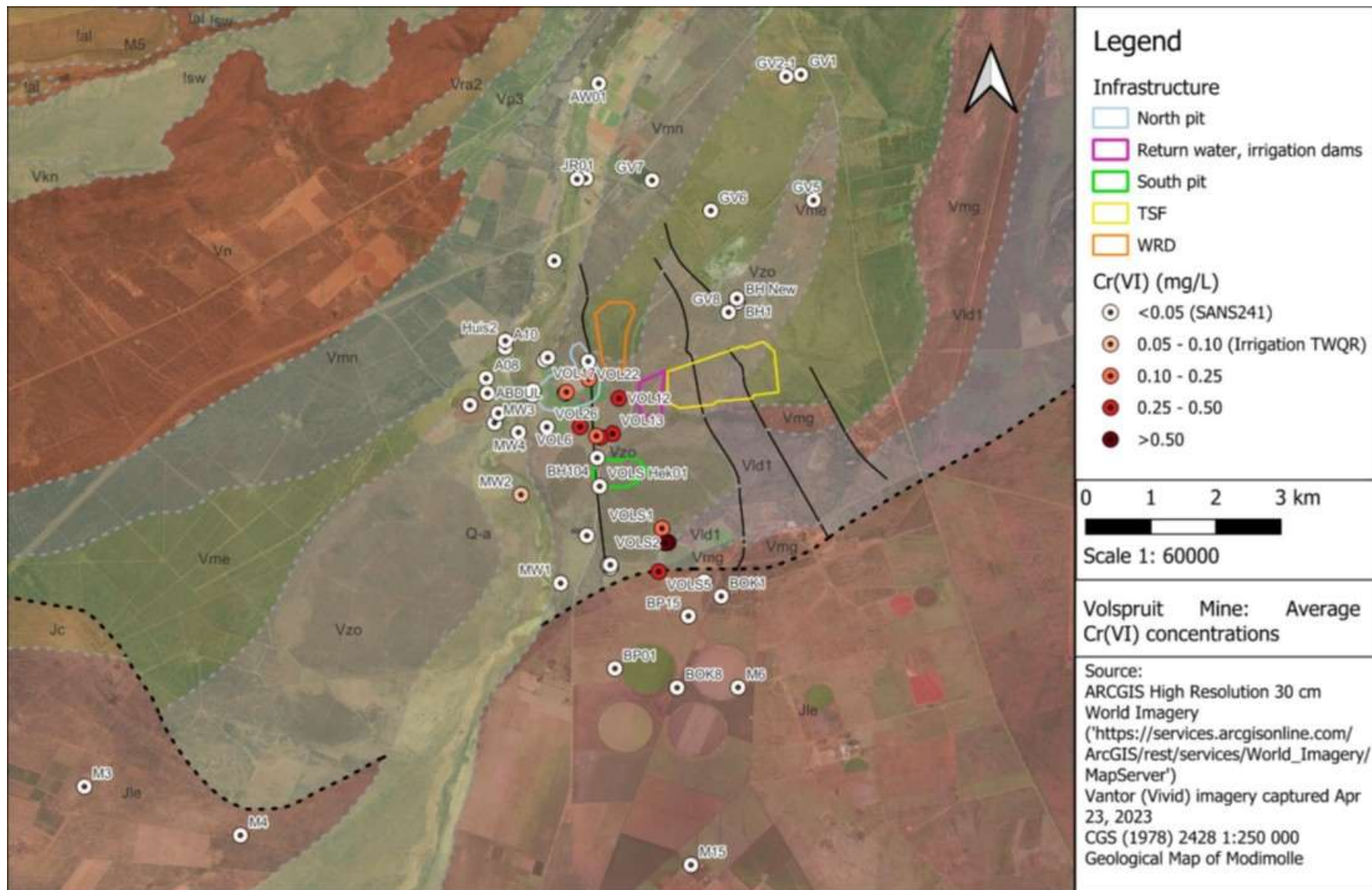


FIGURE 24: A MAP SHOWING THE DISTRIBUTION OF BOREHOLES WITH ELEVATED CR(VI) (MILLS WATER, 2026)

4.6.7.6 Geochemical modelling

The modelled irrigation water qualities shows that pH of the irrigation water in each of the models is near neutral to slightly alkaline, between 7.4 and 7.8. The TDS of the water in Scenarios 1 to 5 is more than five times higher than background groundwater, with the highest TDS (3157 mg/L) expected to occur if water inflow volumes are low (Scenario 2; GPT low) and in summer months when evaporation is greatest (Scenario 4). In the base case and the Scenario 3 (GPT high), the TDS in the sump may end up lower than the TDS of background groundwater. In the base case this is because groundwater is diluted by rainwater and there is no evaporation to cause further concentration of ions. In Scenario 3, it is because of the incongruent weathering of enstatite in the wall rocks, which releases magnesium which can react with alkalinity to precipitate magnesite, removing dissolved solids from the water. However, the rate and extent to which this reaction would occur is uncertain, and no reliance should be placed on the modelled lower TDS.

Most of the simulated element concentrations are within the irrigation TWQRs but the following elements exceed the TWQRs:

- EC in all the modelled scenarios. According to DWAF (1996), at the simulated EC levels (except for Scenario 2), a relative yield of more than 80% can still be achieved for moderately salt-tolerant crops. However, a leaching fraction of up to 0.2 would be required to prevent soil and groundwater salinization i.e. enough water would need to be irrigated to ensure that 20% of the applied water would drain through the soil below the level of evapotranspiration.
- Nitrate in all the modelled scenarios. Nitrate is believed to originate from fertilization of fields which currently occupy the surface footprint of the North Pit. With the commencement of mining, soils overlying the proposed pit shell will be removed. Nearby farming will stop, and nitrogen stored in the soils will gradually be leached out. The amount of nitrogen stored in the soils is not known and the amount of time taken for the nitrate in groundwater to return to background levels is not known. Nitrogen may also originate from areas upgradient of the mine footprint and be transported in groundwater, in which case the nitrogen concentrations may not decrease once mining has started. Irrigation with water with inorganic nitrogen concentrations exceeding 30 mg/L as N can affect yield and quality of crops. In addition, it can continue to contaminate groundwater, especially at the higher leaching fractions which may be required to prevent soil salinisation. The amount of nitrate used in crop fertilization can be reduced by an amount equivalent to that added in irrigation water to maintain the same amount of fertilisation while minimising the risks to groundwater (Department of Water Affairs and Forestry, 1996a).
- Chloride concentrations are above the TWQR for the GPT Low (Scenario 2) and the summer (Scenario 4) scenarios. Chloride concentrations of between 140 and 700 mg/L can cause foliar injury and yield decreases in sensitive crops when crop foliage is wetted, and may cause slight problems with chloride toxicity when water is applied to the soil surface.

The model indicates that nickel concentrations will be limited to <0.007 mg/L by sorption to montmorillonite. This is largely supported by measured baseline nickel concentrations which are below detection limits in groundwater in the vicinity of the North Pit shell, although nickel is detected at concentrations up to 0.064 mg/L at Grasvally. Measured and modelled nickel concentration are within the TWQR for irrigation (Department of Water Affairs and Forestry, 1996a). Modelled Cr(VI) concentrations range from 0.008 to 0.066 mg/L, with water quality in Scenario 2 predicted to exceed drinking water standards but remain within the irrigation TWQR. Measured groundwater Cr(VI)

concentrations do not exceed the drinking water standard or irrigation TWQR in the vicinity of the North Pit, although Cr(VI) was detected at low concentrations (<0.031 mg/L) nearby to the North Pit. The model does not account for generation of additional Cr(VI) due to oxidation of exposed rocks in the walls of the open pit or leaching from TSF and or WRDs. Cr(VI) concentrations will need to be closely monitored in the irrigation water.

The modelled results for irrigation water indicate that the sump water quality is not ideal for irrigation and use may require management in terms of finding appropriate crops, ensuring a sufficient leaching fraction, adjusting fertilization amounts, and monitoring of groundwater quality to ensure the baseline quality does not deteriorate. The water quality is also likely to vary seasonally due to varying amounts of rainfall and evaporation, with worst qualities expected in the summer months. The aspects of the water quality that make it less suitable for irrigation are salinity and nitrate, which already exceed the DWAF irrigation TWQR concentrations in the background groundwater. These concentrations are increased by evaporation within the pit. Sulphate concentrations may increase due to oxidation of sulphide minerals, contributing to the salinity of the irrigation water (Mills Water, 2026). Annandale (2025) investigated the potential using the water as modelled and indicated the potential to use the water for irrigation of certain crops is realistic (see Appendix C).

The simulated water quality for the post closure scenario initially has lower concentrations for most parameters compared to background groundwater due to dilution by increased rainfall recharge into the backfilled material. Concentrations of conservative parameters which do not originate from reaction with backfilled material (e.g. chloride) remain stable for the duration of the model because of the slightly increased recharge expected over the backfill and the lack of evaporation. Nitrate concentrations decrease slightly with time as the system becomes less oxidizing due to rainwater inflow being smaller, and oxygen being consumed by sulphide oxidation. Sulphate concentrations increase slightly with time due to ongoing contribution by oxidation of nickel sulphide minerals. Nickel is also generated by these reactions but is immobilised by adsorption to smectite minerals.

EC and nitrate exceed the TWQR for irrigation water. The following should be noted:

- The results are dependent on the relative amounts of water entering and leaving the pit. These parameters are currently estimated at a high level.
- The model assumes oxygen is contributed by rainwater, and additional nickel sulphide is available each year. The presence of organic carbon in the backfilled material may induce more reducing conditions, under which further nickel sulphide oxidation would be limited, and denitrification could occur, limiting sulphate concentrations and potentially reducing nitrate concentrations (Mills Water, 2026).

4.7 LAND CAPABILITY AND LAND USE

The VPM site is not very near any urban developments or residential settlements. Cultivated commercial fields are located very close to and on the site earmarked for VPM and one neighbouring mining site exists. The planned mine site aligns with the land use based on what the area was earmarked for. The overall environmental sensitivity of the site is presented in the Figure 8 below. The sensitivity is based on the specialist assessments done over the period 2012 – 2023 (EcoPartners, 2024). Figure 25 shows the current land use for the area.

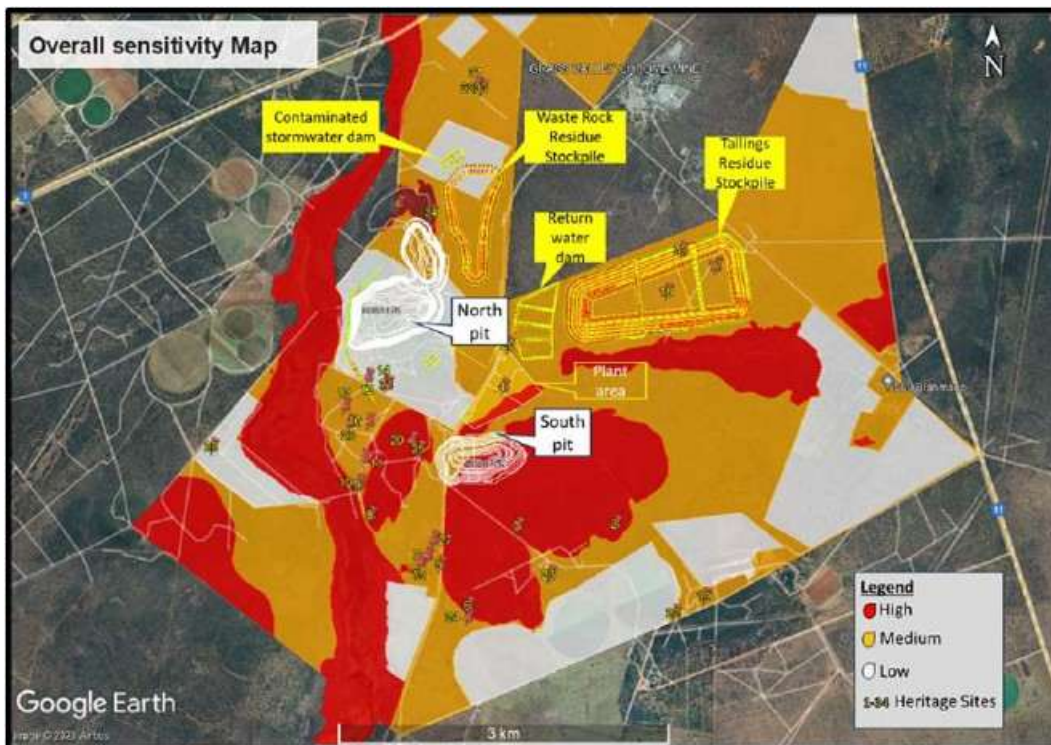


FIGURE 25: SHOWS THE LANDSCAPE SENSITIVITY MAPPED FOR THE VPM SITE (ECOPARTNERS, 2024)

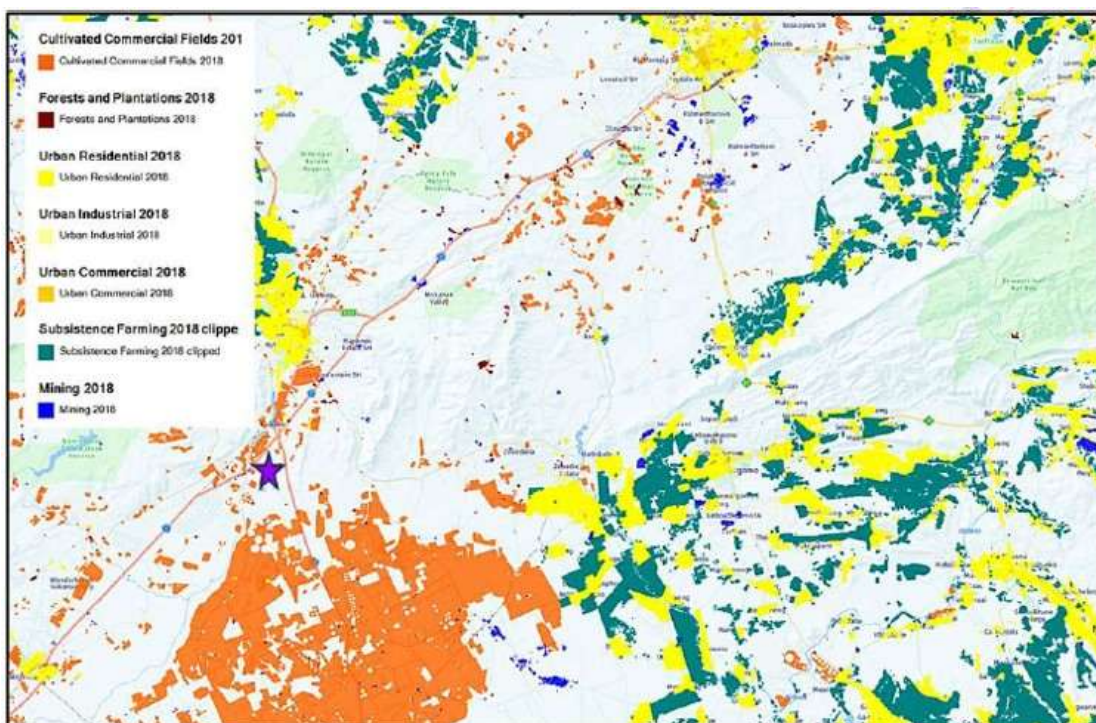


FIGURE 26: A MAP INDICATING THE LAND USE IN THE VPM AREA (ECOPARTNERS, 2024)

4.8 BIODIVERSITY

A biodiversity study was conducted by Wetland Consulting Services for the VPM project. Findings from the study, as published in their 2022 report (Appendix I), are summarised below.

4.8.1 Regional Vegetation and National Threatened Ecosystems

VPM is located within the Savannah Biome and the Central Bushveld Bioregion of South Africa. The specific vegetation types expected to occur on site have been classified as Central Sandy Bushveld (SVcb12) across most of the site, and a small section of Springbokvlakte Thornveld (SVcb15) occurring in the extreme south of the project area. Springbokvlakte Thornveld is considered Vulnerable in terms of the revised National List of Ecosystems that are Threatened and in Need of Protection (GN 2747 of 2022) and according to the Terrestrial Ecosystem Threat Status and Protection Level (WCS, 2022).

4.8.2 Habitat Classification

The Volspruit mine area was found to support several differing vegetation or habitat types, including wetlands, savanna, dense woodland, koppies and transformed or degraded areas in which human activity has negatively affected the integrity of the vegetation. Each of these habitats is expected to support a range of different species, as well as a number of species adapted specifically to the ecotones between habitats (WCS, 2022).

4.8.2.1 Savanna

The Central Sandy Bushveld vegetation unit is typically featuring Savanna, and covers large areas of the site. The terrain is flat to gently sloping and the soils are predominantly red sands of varying depth. The vegetation is open bushveld/savanna with a relatively well developed, graminoid-dominated basal layer, interspersed with woody shrubs and small to medium sized trees. Woody species commonly found include species of *Acacia* (*Vachellia/Senegalia*) and bushwillows (*Combretum*), buffalo thorn (*Ziziphus mucronata*), common wild currant (*Searsia pyroides*), velvet raisin (*Grewia flava*), and karee (*Searsia lancea*) (WCS, 2022).

A small area of Springbokvlakte Thornveld (Vulnerable) were founds in the extreme south of the site, to the east of the Nyl River by WCS. It lies completely outside of the proposed mining infrastructure footprint and is not expected to be affected by the proposed mining activity in any significant way. The Springbokvlakte Thornveld is characterised by flat terrain and dark vertic soils and the tree species *Vachellia tortilis* dominates the woody vegetation. The basal layer is grass dominated with good cover. In areas of disturbance, the grass oxtail buffalo grass (*Cenchrus ciliaris*) dominates the ground cover (WCS, 2022).

4.8.2.2 Dense Woodland

Dense woodland habitat units occur as discrete patches within the broader savanna vegetation, which occurs extensively across the site. The dense woodland habitat observed on site conforms with the low, broad-leaved *Combretum* woodland described as occurring within the Central Sandy Bushveld vegetation type. The woodland is dominated by moderately dense red bush willow (*Combretum apiculatum*) occurring on shallow, gravelly to rocky low hills with occasional small rocky rests (though instances of this habitat occurring on flatter terrain were observed). Species of *Searsia* and *Vachellia/Senegalia* trees are also present at low densities within the Combretum dominated woodland. The basal layer is grass dominated with low to moderate grass cover. Disturbance within this habitat includes clearing of vegetation along access tracks and fence lines and within the footprint of homesteads (WCS, 2022).

4.8.2.3 Koppies

The koppies present within the study area are distinguished from dense woodland on low hills based primarily on slope. Hills with a slope greater than 5° were classified as koppies. Due to this, the koppie habitat is characterised by dense woodland on steeper sloping, rocky terrain with shallow, red soils. According to WCS (2022), the vegetation consists of a well-developed woody canopy and low to moderate basal cover, including grasses, forbs and succulents. The woodland on the koppie to the east of the Nyl River, is characterised by species such *Combretum apiculatum*, velvet bushwillow (*Combretum molle*), species of *Vachellia/Senegalia* and *Grewia*, lavender croton (*Croton gratissimus*) and Velvet Corkwood (*Commiphora mollis*).

The koppies on site introduce spatial heterogeneity into the landscape, due to the differing aspects, slopes and altitudes present, all contributing to differing soil, light, temperature and hydrological conditions. Increased habitat diversity supports greater faunal and floral diversity across the landscape. Current disturbance is limited to small areas of vegetation clearing along tracks, fence lines, and in the case of the north-eastern koppie, at the summit and in a small rock borrow pit on the side slope (WCS, 2022).

4.8.2.4 Wetlands

The Nyl River and associated Floodplain wetland that flows along the western boundary of the mining right area from south to north, contains all of the wetland areas on site. This wetland is an important hydrological feature in the general area with importance for agriculture and domestic water supply, as well as being of high biodiversity importance well beyond the current study area, as it provides an important forage and water resource which attracts a large variety of species, particularly aquatic and avifaunal species, and acts as an important natural corridor and linear migratory route (WCS, 2022). WCS reported that the vegetation of the floodplain shows clear zonation related to the depth and duration of inundation. This zonation is evident in the southern reach of the floodplain on site, where the central, most frequently inundated section of the wetland is dominated by a variety of sedges (*Eleocharis* and *Schoenoplectus* spp.) and other mostly obligate wetland species such as bluegrass (e.g. *Panicum schinzii*), while the sides and perimeter of the floodplain are grass dominated and characterised by various facultative wetland species such as vlei finger grass (*Dichanthium annulatum*), finger grass (*Digitaria eriantha*), catstail vlei grass (*Dinebra retroflexa*), saw-tooth love grass (*Eragrostis superba*), thimble grass (*Fingerhuthia africana*), border grass (*Ischaemum fasciculatum*), *Panicum maximum*, common bristle grass (*Setaria sphacelata*), vlei bristle grass (*Setaria incrassata*), Johnson grass (*Sorghum halepense*) and buffalo grass (*Cenchrus ciliaris*). Wild rice (*Oryza longistaminata*) was observed only in small, isolated stands on site, in contrast with the Nylsvley Nature Reserve, where roughly 600 plant species have been recorded. The presence of the dams within the floodplain has extended the periods of water retention within this section of the wetland and the vegetation has responded accordingly, with areas affected by dam inundation being characterised by species more commonly associated with extended/permanent saturation. WCS (2022) found large stands of Johnson grass (*Sorghum halepense*), an alien plant to South Africa, during a field survey within the floodplain wetland. Johnson grass is listed by SANBI as a naturalised exotic and is categorised by NEMBA as a Category 2 invader. The presence of this species at high densities across large areas of the floodplain wetland on site is a concern, appears to be spreading within the wetland habitat on site.

4.8.2.5 Transformed/Degraded Land

Parts of site and surrounding area have been utilised for various forms of agriculture, including

irrigated and dryland cultivated crops, livestock grazing and game farming. In some areas, the natural vegetation has become significantly and extensively degraded or completely transformed compared to the surrounding natural vegetation typical of the area. There are two areas of significant irrigated lands on site, as well as other minor cultivated areas. There are also large areas that were previously cultivated but are now lying fallow. These have mostly reverted to secondary vegetation and in areas visited adjacent to the wetland habitat are characterised by very low density of *Vachellia/Senegalia* shrubs or small trees and extensive grasses, often dominated by the grass *Cenchrus ciliaris*. In some areas it appears that the naturally occurring woody vegetation has been partially cleared, possibly to increase the extent of grazing for livestock (WCS, 2022).

4.8.3 AQUATIC BIODIVERSITY

Clean Stream Biological Services (CSBS) updated the aquatic biodiversity assessment for the VPM site in a report published in 2023 (Appendix J).

4.8.3.1 Aquatic Habitat Integrity

The overall habitat integrity of the Nyl River on site is Moderately Modified (Present Ecological State - Category C). The greatest impacts on habitat integrity were related to farm dams and road crossings (along the dam walls). Water backed up during high flow events at the N1 crossing, which is directly downstream of the study area, and likely contributes to an increase in flood levels within the study area. During times of high flow, the bridge essentially serves as a dam wall, causing flow restrictions and increased inundation upstream. The fact that this only happens occasionally during the rainy season should be noted (and probably not every year). Additionally, the upstream inundation of the bridge creates a depositional environment for the sediments, potentially leading to the accumulation of sediments on the upstream side of the bridge. Reeds usually inhabit these sediments. Additionally, during times of high flow, the bridge obstructs flows, which makes flows downstream of the N1 bridge and, consequently, downstream of the study area, more concentrated and erosive. As a result, the flow pattern is changed downstream of the bridge to form a channel and become more erosive (CSBS, 2023). Aquatic weeds were present in the pools and dams, most notably the invasive *Lemna* (duckweed). It has been reported that farm dams contain alien carp fish and these cause turbidity in the water, disrupt bottom substrates, and create competition for food and habitat. Only minor impacts were associated with agriculture. Irrigation has impacted water quality because it typically results in an increase in salinity and nutrients from agricultural return flows from cultivated fields. Cattle trampling has changed the suitability of substrates and has resulted in turbidity and increased nutrients in the water. Impacts from abstraction (from surrounding boreholes and the river itself) are likely although the significance of this impact is uncertain. It is unclear how much of the catchment's irrigation has resulted in reduced flows and longer low flow spells. The effects of groundwater abstraction are less evident than those of surface water abstraction from farm dams, which has undoubtedly impacted Nyl River flows (CSBS, 2023).

4.8.3.2 Aquatic Macroinvertebrates

The diversity scores were relatively low, but stable throughout the site, which is not unexpected considering the wetland nature of the aquatic ecosystems. Four taxa with a moderate or high requirement for good water quality were recorded during March 2022. Three taxa with a moderate requirement for good water quality were recorded. There was an improvement in South African Scoring System (SASS) score and diversity in a downstream direction during the March 2022 survey.

The highest score (104) and number of taxa (21) were recorded from the most downstream site in the study area (site 6B). This low diversity of aquatic macroinvertebrates with a moderate or high requirement for good water quality indicates that the aquatic macroinvertebrate assemblage are responding primarily to habitat availability, with a secondary response to water quality. Habitat was also considered the primary driver of assemblage patterns (CSBS, 2023).

4.8.3.3 Fish

Thirteen indigenous fish species have a known distribution range in the Nyl River system in the vicinity of the study area. Due to the absence of fast habitats, and especially rocky bottom substrates, at least two species can be excluded from the study area, namely *Labeobarbus marequensis* (Largescale yellowfish) and *Labeo molybdinus* (Leaden labeo). *Marcusenius macrolepidotus* (Bulldog) can be excluded based on its preference for deep pools and undercut banks and root wads, being absent from the sites surveyed and the river reach in general. During the surveys conducted in January 2011, November 2021, and March 2022, the presence of seven of these species was verified. Under the current circumstances, all ten fish species are predicted to persist in this reach, albeit with changed frequency and quantity of occurrence. Because of the risk of hybridization with the alien Nile tilapia, one of the observed species—the Mozambique tilapia—is categorized as Vulnerable (IUCN) and is a species of conservation concern. During the investigation, specimens of two alien fish species—Common carp and Mosquito fish—were collected as part of surveys conducted in January 2011 and November 2021/22. These species could significantly affect the native fish in the area. The indigenous fish species of this reach of the Nyl River are classified as tolerant to moderately tolerant to changes in the environment. The most intolerant of all species is the Johnston's topminnow, which are intolerant to habitat alterations and water quality deterioration. This species, if still present, will be the most important indicator fish species to use in future to detect changes as a result of activities such as mining operations. Survey results indicate that the present ecological state may have deteriorated from a category B in 2011 to a category C in 2021/22. The temporal decrease in biotic integrity, as reflected by the fish assemblage was related to the following results and observations:

- Decreased occurrence, and potential absence of the Johnston's topminnow (*M. johnstoni*): This species was absent during November 2021 and March 2022 although adequate habitat was available. This species is intolerant to habitat and water quality changes and most probably highly susceptible to be impacted by the predatory alien *G. affinis*.
- *Enteromius bifrenatus* was also not sampled during 2021/22 surveys and was very scarce during January 2011. There is a probability that this species may have become even scarcer or may now be absent from this reach. This species will also be influenced by alterations in habitat (sedimentation, flow), water quality deterioration and the presence of alien fish species.
- Increase in alien fish species, with *G. affinis* not being sampled in 2011 and now (2021/22) being very abundant and widespread throughout the study area. The impact of alien fish species on indigenous species have increased notably over this period resulting in an overall deterioration in the indigenous fish species assemblage (CSBS, 2023).

4.9 WETLANDS

WCS updated the specialist wetland assessment for the proposed VPM in 2022 (Appendix K).

4.9.1 National Wetland Databases

According to the most recent national wetland dataset, the National Wetland Inventory 560, a large floodplain wetland associated with the Nyl River extends into the project study area. Freshwater Ecosystem Priority Areas (FEPAs) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. The Nyl River and associated wetland habitat are classified as wetland FEPA (WCS, 2022). See Figure 27.

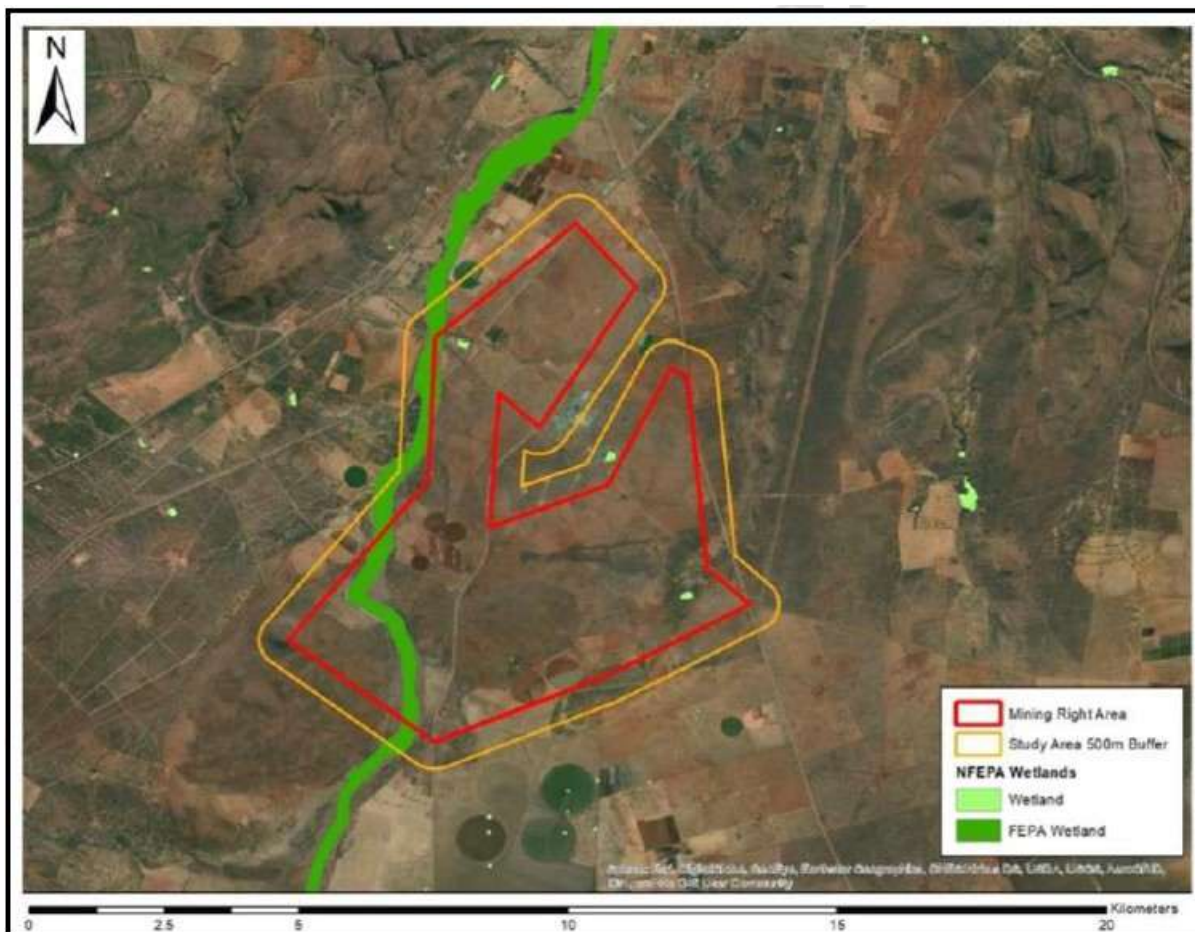


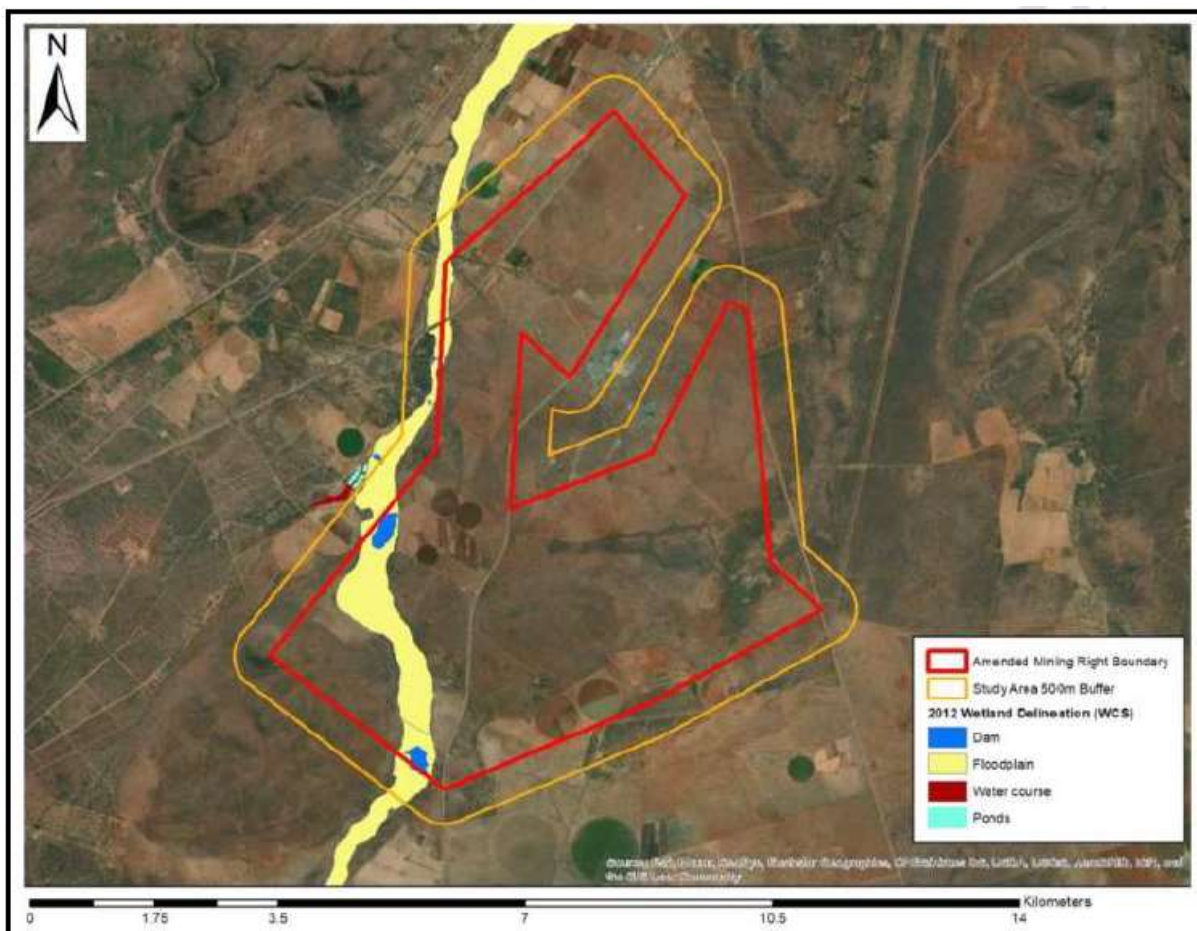
FIGURE 27: A MAP SHOWING THE FEPA WETLAND IN RELATION TO THE VPM SITE (WCS, 2022)

4.9.2 Wetland Delineation and Classification

The floodplain covers approximately 317 ha of the study area. A small seep wetland along the western edge of the floodplain and two small depression wetlands makes up an additional 5.1 hectares of wetland habitat. Two small farm dams and a water-filled quarry add a further 1.2 ha of artificial wetland habitat. Natural wetland habitat makes up 6.2 % of the study area (WCS, 2022) (Figure 28).

The southern reaches of the floodplain are characterised by a broad, flat, grassed wetland with no defined channel, approximately 380m across, which is similar to the wetland south of the site. Zonation of the vegetation on site indicates that the central region of the floodplain is inundated more frequently and that most surface flows will be confined to this section. This central section of the

floodplain is dominated by a variety of short to tall sedges and grass species. As one moves outward from the centre of the floodplain the sedges make way for a grass dominated community. The outer edges are expected to be inundated only during larger flood events, though the soils would still become saturated for short periods during most years, as indicated by the presence of many facultative wetland grass species. The middle reach of the floodplain on site has been markedly influenced by the construction of the large dam across the floodplain. The dam maintains an open water body (with scattered stands of reeds) of approximately 10 ha and significantly increases the depth and duration of inundation of the floodplain for several hundred meters upstream of the dam. Along this section of the floodplain a shallow berm has also been constructed along the western bank of the floodplain to prevent large floods spilling into the fallow cultivated fields adjacent to the floodplain. The presence of the dam has altered the vegetation within the floodplain wetland and resulted in the presence of a vegetation community adapted to near permanent water and characterised by reeds such as the common reed (*Phragmites australis*) and bulrush (*Typha capensis*), as well as tall emergent sedges. Adjacent to this permanent wet area the seasonal sedge dominated community occurs in a reduced extent, followed by the extensive grass dominated temporary wet edge of the floodplain. The terrestrial edge of the floodplain coincides roughly with the tree line, where a narrow riparian fringe occurs. At its widest point, the floodplain in this reach is more than 800m across (WCS, 2022).



4.9.3 Functional Assessments

4.9.3.1 Ecosystem Services

WCS (2022) utilised the updated WET-EcoServices Version 2 assessment methodology to assess Nylsvley floodplain within the project study area in terms of ecosystem services. The results of the WET-EcoServices assessment indicated the following:

- The floodplain wetland is well placed to provide ecosystem services related to water quality maintenance such as: Nitrate Assimilation, Phosphate Assimilation, and Toxicant Assimilation. The diffuse nature and extended residence of flows within the wetland provide ample opportunity for biogeochemical cycling. These characteristics also provide ideal opportunities for sediment trapping.
- The highest scores were obtained for Biodiversity Maintenance, with both the Demand and Supply scores being Very High.
- A High demand was identified for “Water for Human Use” – although little direct abstraction takes place from the wetland.
- Livestock grazing was highlighted as an important provisioning service.
- Supply scores for Cultural Services were High to Very High, though Demand was only High for Tourism and Recreation.

4.9.3.2 Present Ecological State

The Present Ecological State (PES) is used to define the health of a wetland and is determined for the hydrology, geomorphology and vegetation of the wetland. A combined score for the wetland can be obtained, but this is not recommended. The present ecological state assessment undertaken as part of this study was specifically applicable to the section of the floodplain located within the study area boundaries and found the floodplain wetland to be in a Moderately Modified condition (PES category C) (WCS, 2022).

4.9.3.3 Ecological Importance and Sensitivity

The biodiversity supported by the Nyl floodplain, especially in terms of avifauna, causes the floodplain on the VPM site to be considered as of Very High ecological importance and sensitivity (WCS, 2022). WCS noted that the hydrological functions supported by the floodplain have been found to be somewhat more limited than would generally be expected from a floodplain of the size of the Nyl floodplain. Some sediment trapping and water quality enhancement is likely to occur. In addition, should significant infrastructure be constructed downstream of the Nyl floodplain in close proximity to the Mogalakwena River, the flood attenuation value of the floodplain could increase.

4.9.3.4 Buffer recommendations

A buffer zone is intended as an area to mitigate the impact of the development on sensitive features on site. A vegetated wetland buffer of 50m is proposed by WCS (2022) (Figure 29). To ensure maximum effectiveness of the buffer zone, it should remain vegetated. In those sections of the buffer

currently devoid of vegetation (e.g., within the cultivated fields) indigenous vegetation should be re-established and should include grass cover as well as locally occurring tree species.

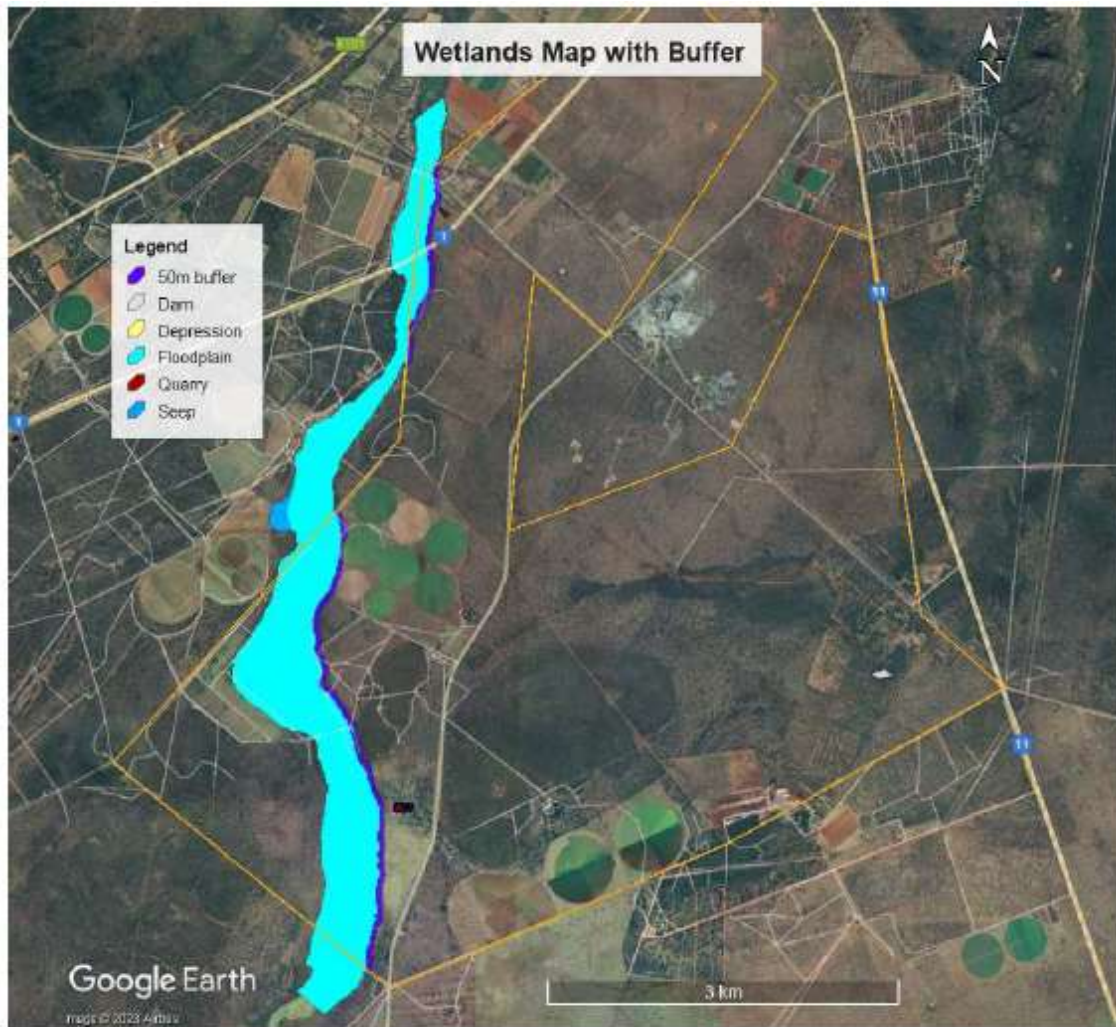


FIGURE 29: A WETLAND DELINEATION MAP INDICATING THE PROPOSED 50M BUFFER ZONE (WCS, 2022)

4.9.4 Hydropedology

Wetland Consulting Services (Pty.) Ltd. (WCS) was appointed to undertake a hydropedological assessment of the area affected by the planned opencast mining and associated infrastructure with the proposed VPM, with an emphasis on a section of the Nylsvlei floodplain (See appendix L for the report). As part of this assessment the soil forms were determined at each sampling/observation site and have been interpolated throughout the study area. According to WCS the hydropedological response units provide an insight into the hydrology conceptually and are shown in Figure 30. The study area mainly consists of recharge (soils where surface water can infiltrate and percolate and recharge the groundwater) and recharge/responsive soils (responsive soils are soils where no infiltration or groundwater recharge will occur). The only exception are some steep rocky outcrops at the upper end of the catchment as well as the floodplain consisting of responsive soils. There was a notable lack of interflow soils indicating that water does not flow laterally within the soil profile, but instead either infiltrates into the parent material and percolates to the below-lying aquifer as groundwater recharge, or for shallow soils resulting in surface runoff (responsive soils). Soils found within the study area that had the responsive component also showed relatively high infiltration rates indicating that they had both responsive as well as recharge properties. Only certain areas show

predominantly responsive characteristics such as the floodplain as well as some rocky areas mostly at the very top of hillslopes (WCS, 2023).

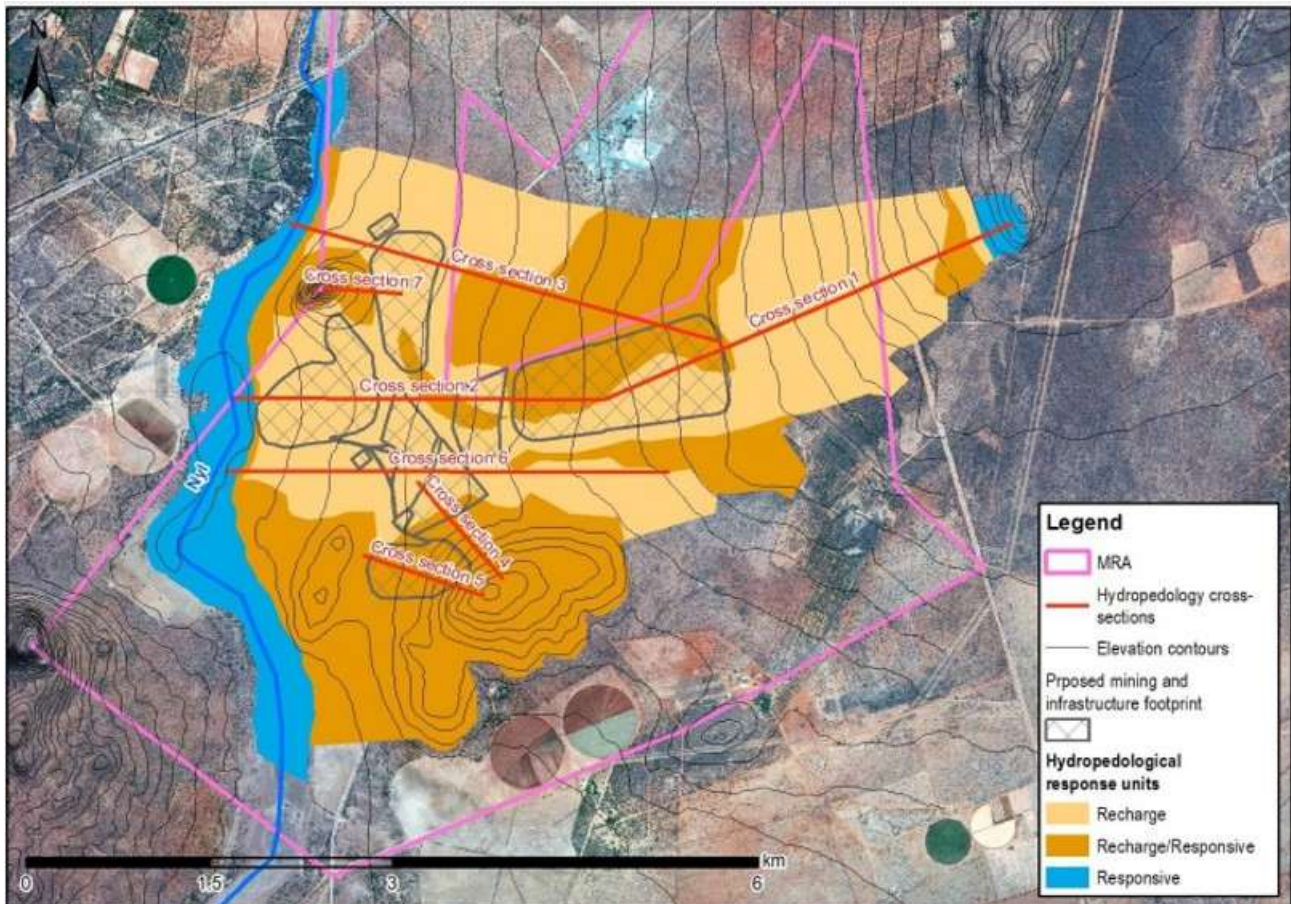


FIGURE 30: MAP SHOWING THE APPROXIMATE LAYOUT OF THE HYDROGEOLOGICAL RESPONSE UNITS WITHIN THE STUDY AREA (WCS, 2023)

4.10 ANIMAL LIFE

Information extracted from the National Web-based Environmental Screening Tool, indicated that the following sensitive animal species may occur within the proposed Volspruit study area (EcoPartners, 2024).

4.10.1 Mammal Species of Conservation Concern (SCC)

Enviro-Insight conducted a baseline mammal study (see Appendix M) with emphasis on three mammal species predicted to occur on site with a medium sensitivity (*Crocidura maquassiensis*, *Dasymys robertsii* and *Lycaon pictus*; and completed an environmental impact assessment (EIA) for the VPM site. Wild dogs (*Lycaon pictus*) are absent from the study area and surroundings.

4.10.1.1 Maquassie Musk Shrew (*Crocidura maquassiensis*; IUCN Vulnerable B2ab(ii,iii,iv))

This species has an extensive global distribution with an estimated extent of occurrence of 721,746 km² spanning South Africa, Swaziland and Zimbabwe. Although tolerant of a range of different habitats, this species is dependent on moist habitats such as montane grasslands, coastal forests

and riparian or wetland areas. Since this study area falls within the global range of the species, the precautionary principle is applied, and it is assumed that the species is present in the wetland habitats within the study area (Enviro-Insight, 2023).

4.10.1.2 African Marsh Rat (*Dasymys robertsii*; IUCN Vulnerable B2ab(ii,iii,iv))

All three members of the *Dasymys* genus, known as African Marsh Rats, are dependent on riparian and wetland ecosystems and do not tolerate habitat degradation. They are not common and are thought to occur at relatively low densities in fragmented subpopulations. *Dasymys robertsii* is known from South Africa, Swaziland and Zimbabwe and has a relatively large global geographic distribution. The species is listed as being vulnerable to extinction due to the ongoing degradation, fragmentation and loss of suitable wetland habitat. Consequently, recommended mitigation and conservation actions are coupled with the prevention of any degradation of suitable wetland habitat, as well as applying active restoration of degraded riparian vegetation while promoting connectivity between subpopulations. Since this study area falls within the global range of the species, the precautionary principle is applied, and it is assumed that the species is present in the wetland habitats within the study area (Enviro-Insight, 2023).

4.10.1.3 Buffer requirements

The species protocol guidelines do not provide prescribed buffers around habitats utilised by mammal SCC, but rather require that such buffers are assessed on a project-by-project basis. No additional mammal-specific buffers were applied, and the 50m buffer was included in the Site Ecological Importance (SEI) evaluation as part of the riparian/wetland habitat, which is the most suited habitat for the two species studied (EcoPartners, 2024).

4.10.1.4 Mammal Site Ecological Importance (SEI)

SEI allows for rapid spatial inspection and evaluation of impacts of a proposed development within the context of on-site habitats and SCC, and also facilitates the integration of inputs from different specialist studies. The spatial representation of this SEI evaluation, with the application of buffers, is presented in Figure 31 and, it is evident from the figure that the proposed project infrastructure has minimal interaction with the High SEI and mostly interacts with the Medium SEI.

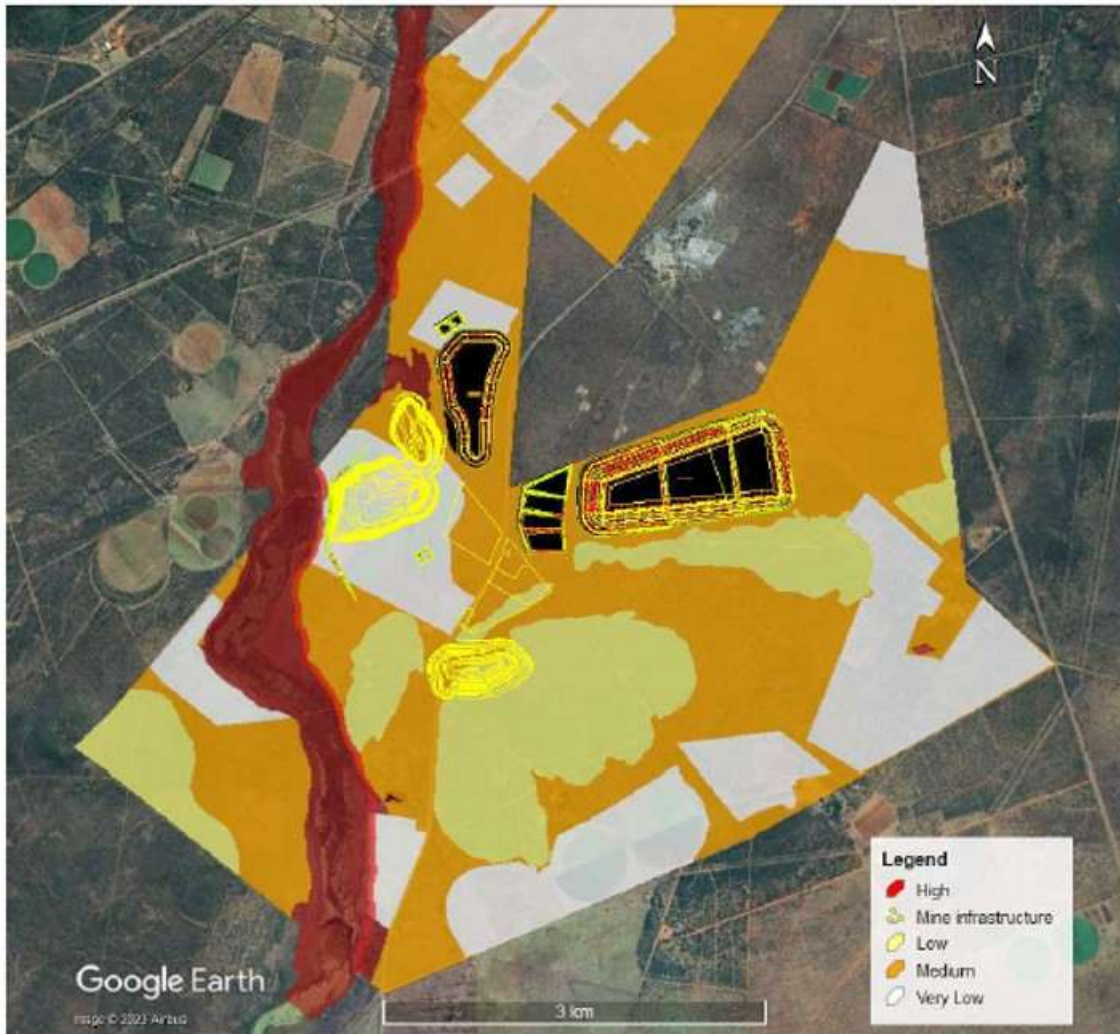


FIGURE 31: A MAP SHOWING THE SITE SEI FOR MAMMALS (ENVIRO-INSIGHT, 2023)

4.10.1.5 Current Impacts on mammal species

The current impacts observed on MSCC and their habitats were in relation to the riparian (wetland) habitat. In general, the observed current negative impacts on the riparian/wetland habitats were not extensive or intensive enough to warrant major concern (low significance) (EcoPartners, 2024).

4.10.2 Avifauna

A thorough analysis revealed that ASCC can be present, additional to those highlighted by the screening tool, especially sporadic appearances of raptors. Enviro-Insight completed a baseline avifauna study with emphasis on a single expected avifauna species of conservation concern (ASCC) namely the Secretarybird (*Sagittarius serpentarius*), and to perform an environmental impact assessment (EIA) for the VPM site.

4.10.2.1 Important Bird Areas (IBA)

The Nyl River Floodplain is a Global IBA and meets the following IBA Criteria:

- A1: Globally Threatened Species - The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

- A3: Biome Restricted Assemblages - The site is known or thought to hold a significant component of a group of species whose distributions are largely or wholly confined to one biome.
- A4: Congregations – The Nylsvley River Floodplain qualifies on the following criteria:
 - The site is known or thought to hold, on a regular basis, >1% of the Afro-tropical population of a congregatory waterbird species.
 - The site is known or thought to hold, on a regular basis, >20 000 waterbirds. According to the Waterberg District Bioregional Plan, “The Nyl River Floodplain Important Bird Area was identified due to the large number of waterbirds that occur in the floodplain. During flood periods more than 80 000 bird individuals can be found. The floodplain is one of the most important waterbird breeding areas in South Africa.” It supports several threatened species, such as the Vulnerable African grass owl (*Tyto capensis*) and Secretary bird (*Sagittarius serpentarius*), and the Near Threatened Black-winged pratincole (*Glareola nordmanni*). Barred wren-warbler (*Calamonastes fasciolatus*), Burchell's starling (*Lamprotornis australis*), Kurrichane thrush (*Turdus libonyanus*) and White-bellied sunbird (*Cinnyris talatala*) are also Least Concern biome-restricted birds that are present.

4.10.2.2 Avifauna Observations

A total of 133 avifauna species were observed during the rapid field survey, representing 52% of the 256 avifauna species expected to occur within the study area with a Medium or High probability of occurrence. Only a single ASCC was observed namely the Secretarybird (*Sagittarius serpentarius*) (EcoPartners, 2024).

4.10.2.3 Avifauna Species of Conservation Concern (ASCC)

Seventeen ASCC were evaluated and only four have a high- and five species a medium probability of occurrence in the study area, respectively. Only a single ASCC was confirmed within the study area namely the Secretarybird (*Sagittarius serpentarius*); which was predicted by the screening tool. Eight of the initial 17 species included in the analysis are considered unlikely to occur within the study area and consequently labelled as having a low probability of occurrence (EcoPartners, 2024).

4.10.2.4 Current Impacts on Avifauna

Two negative and two positive current impacts on avifauna and their habitats were observed within and adjacent to the mining right area during the avifauna survey:

Negative:

- Habitat loss & degradation – large areas of natural habitat have been transformed and/or degraded, predominantly due to crop agriculture, representing a loss of foraging and breeding habitat for certain species. The mining activities previously undertaken by the

adjacent Grass Valley Chrome Mine have also caused some habitat loss in the area. The remaining habitat is generally managed as game farms or used for low density cattle grazing.

- Roads – the mining right area is surrounded by two major national roads namely the N1 and N11. These busy roads almost certainly result in the roadkill of many fauna species. Raptors that scavenge on road kills are themselves highly susceptible to collisions with vehicles. Nocturnal species such as owls and nightjars often sit on the roads at night or are confused by the headlights of oncoming traffic while in flight and succumb to subsequent collision with vehicles. The carcasses of such species are often observed along busy roads in the region.

Positive:

- Damming of river, a positive impact for certain species – artificial damming of the river, typically a negative impact on riverine ecology, promotes the persistence of medium to long-term aquatic habitats and provides important foraging and breeding habitats for aquatic avifauna species, which would otherwise not have been able to forage/breed in this area due to the episodic nature and subsurface flows of the river. A good example of this is the observation of the Dwarf Bittern (*Ixobrychus sturmii*), which under natural river flow conditions would have a low probability of occurrence in the study area. Other highly rare species such as Eurasian Bittern (*Botaurus stellaris*) and Rufous-billed Heron (*Ardeola rufiventris*) will also be attracted to the region with both species having been located in the area and neighbouring Dinokeng Nature Reserve.
- Habitat transformation, a positive impact for certain species – agricultural fields provide important foraging areas for several ASCC. In particular, multiple stork species, forage on newly ploughed or mowed fields as this enhances their foraging success. Such foraging opportunities are usually temporary and short-lived and are tolerated by the farmers. Woodland areas cleared for agriculture and subsequently allowed to return to fallow in-between planting periods, or simply cleared of trees to enhance grazing opportunities for cattle, provide ideal foraging habitat for Secretarybird (*Sagittarius serpentarius*) which prefer foraging in open habitats. Indeed, this species was observed within the study area utilising such disturbed habitat adjacent to active agricultural fields (EcoPartners, 2024).

4.10.3 Herpetofauna

Enviro-Insight completed a herpetofauna study with emphasis on two reptile species (*Crocodylus niloticus* and Sensitive species 12) and perform an environmental impact assessment (EIA) for the proposed VPM. Two reptile species of conservation concern, the Nile Crocodile (*Crocodylus niloticus*) and Sensitive species 12 were identified, investigated and reported on in 2022.

4.10.3.1 Herpetofauna Observations

A total of 20 herpetofauna sample sites were searched during the fieldwork survey, four of which were re-sampled at night for crocodiles. Neither of the target HSCC were observed during the field survey. Habitat suitability surveys for Sensitive Species 12 revealed seemingly ideal habitat located within the study area. No other HSCC were observed or are expected to occur in the Potential Area Of Influence (PAOI). Other herpetofauna observed during the survey include four common reptile species: Turner's Gecko (*Chondrodactylus turneri*), Common Tropical House Gecko (*Hemidactylus mabouia*), Common Variable Skink (*Trachylepis varia*) and South African Marsh Terrapin (*Pelomedusa galeata*). Nine amphibian species including the Banded Rubber Frog (*Phrynomantis bifasciatus*) were identified on-site. Regarding Sensitive Species 12, this near-endemic species is associated with rocky hillsides in mixed woodlands of the Bushveld, where it often brumates in rock crevices or abandoned animal burrows. It is currently listed, regionally and globally, as Vulnerable, with major threats including habitat destruction and degradation, use of fire as a management tool and collection for food or the pet trade. This species was not observed directly within the study area and none of the farmers or farm workers encountered had ever observed this species. This species is almost certain to occur within the study area and potentially good habitat for this species was also encountered and described within the study area (EcoPartners, 2024).

4.10.3.2 Herpetofauna Site Ecological Importance (SEI)

The spatial representation of this SEI evaluation, with the application of buffers, is presented in Figure 32, from which can be seen that the proposed project infrastructure has minimal interaction with the High SEI and mostly interacts with the Medium SEI.

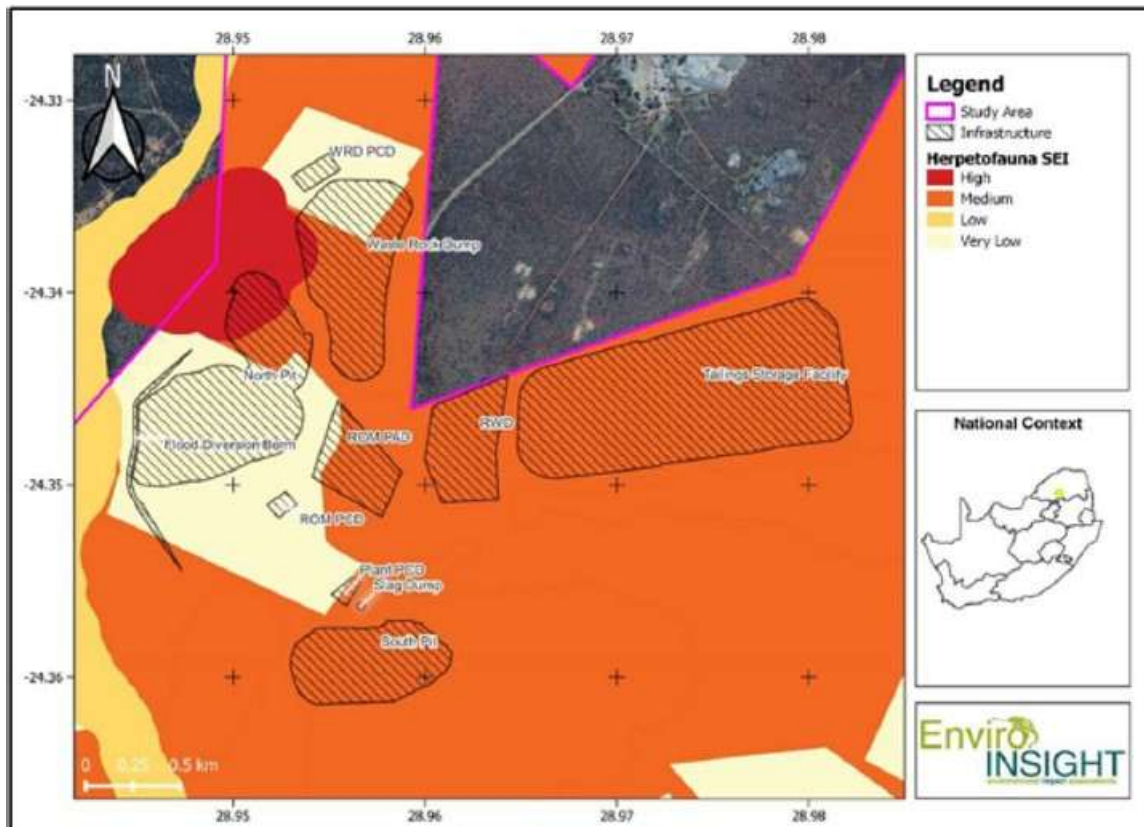


FIGURE 32: THE SEI MAP FOR HERPETOFAUNA ON THE VPM SITE (ENVIRO-INSIGHT, 2023)

4.10.3.3 Herpetofauna Buffers

The species protocol guidelines prescribe recommended buffers around habitats utilised by species of conservation concern. For Sensitive Species 12 the prescribed buffers around sensitive habitats is 100m. Due to the delineated sensitive habitats being buffered with 200m as per recommendation from GDARD, no additional buffers were applied (EcoPartners, 2024).

4.10.3.4 Current Impacts on Herpetofauna

Only two major current impacts on herpetofauna and their habitats were observed within and adjacent to the mining right area during the herpetofauna survey:

- Habitat loss & degradation – large areas of natural habitat have been transformed or degraded, predominantly due to crop agriculture. The adjacent mining operations (Grass Valley Chrome Mine) have also caused some habitat loss in the area. The remaining habitat is generally managed as game farms or used for low density cattle grazing.
- Roads – the mining right area is surrounded by two major national roads namely the N1 and N11. These busy roads almost certainly result in the roadkill of many species. The group to which Sensitive Species 12 belongs are particularly vulnerable to collision with fast moving vehicles as they are slow-moving and cannot react quickly to oncoming traffic.

4.11 SOCIAL AND COMMUNITY

Urban-Econ Development Economists completed an economic impact assessment study (see Appendix N) for the proposed Volspruit mine operations and is summarised as cited in EcoPartners (2024).

The proposed VPM is located in Mogalakwena Local Municipality (LM), which is one of five local municipalities together with Bela-Bela, Lephalale, Modimolle-Mookgopong, Mogalakwena and Thabazimbi of the larger Waterberg District Municipality (DM) in the Limpopo Province. The Waterberg DM is a Category C municipality, which denotes that the municipality has a municipal executive and legislative authority in an area that includes more than one municipality. The Mogalakwena LM is a Category B municipality, which means it shares a municipal executive and legislative authority with a Category C municipality within whose area it falls. The Mogalakwena LM is a municipality that was established on the 5th of December 2000 through the merger of various municipalities and councils that had previously served Potgietersrus and surrounding areas. The town nearest to VPM is Mokopane and was founded as the result of mining activities found in the area (EcoPartners, 2024).

4.11.1 Sense of Place, History and Cultural Aspects

The Mogalakwena LM is largely situated in a bushveld environment and has a multi-cultural community. The area also boasts various tourism sites. These include Makapan Valley, a United Nations Educational, Scientific and Cultural Organization (UNESCO) Heritage Site, located 15 km east of Mokopane. In the caves of Makapan Valley, notable sediments, fossils, bones, and artefacts were found and are preserved as a unique record of hominid habitation and

evolution, which dates to 3.3 million years ago. Additionally, a museum and various game and nature reserves are present in the area, offering outdoor activities ranging from hiking, fishing, water sports, game viewing, camping, and birdwatching. The area around the proposed VPM is predominantly rural. No settlements are in its immediate vicinity. Within a 60 km radius, there are several settlements including Mokopane, Sterkrivier, Polokwane and Moletlane (EcoPartners, 2024).

4.11.2 Demographics, Health, and Crime Profiles

The Mogalakwena LM has a population of approximately 334 682 people, with a total of 85 221 households. The population in the local municipality constitutes about 45.09% of the Waterberg DM population, thus having the highest population in the district. Furthermore, 43.20% of the total households in the Waterberg DM are in Mogalakwena LM. The Mogalakwena LM recorded an annual population growth rate of 1.1% per annum between 2015 and 2020. It is also noted that the Mogalakwena LM has a significantly high population density (54.3) compared to its DM (16.5) and a relatively higher population density than South Africa (48.8). The population consist of mostly women (54.16%). It is noted that the working-age group contributes the most to the population in the municipality. Most of the population (47.18%) are aged between 20 and 64 years, followed by those above 64 years with just over 31%, and the minority (9.46%) of the population is aged between 15 and 19 years, followed by those below the age of 15 (12.14%). Between 2017 and 2018, the Mahwelereng Cluster, (which comprises police stations within the Mokopane area) was the worst in terms of contact crimes, burglaries at residential premises and livestock theft. Crime prevention, safety and security are among the municipality's priorities and, as outlined in the local strategic documents, planned improvements to the provision of basic services and infrastructure such as street lighting are envisaged to assist with crime reduction in the area. Crime has been constantly increasing between 2017 to 2019 and then a major decrease in 2020. Covid 19's lockdown regulations are likely responsible for the large decrease in crime during 2020 (EcoPartners, 2024).

4.11.3 Income and Education Levels

According to Statistics SA (Stats SA), the 2011 census found that out of the 78 647 economically active population (employed or unemployed but looking for work) in the district, 40.2% were unemployed. They further mention that Mogalakwena's unemployment rate is almost double that of the other municipalities in the district. The 2022 Census portal does not report on employment or income levels of the municipality. The largest portion (about 23%) of the Mogalakwena LM earned an average monthly household income ranging between "R9 601 – R19 600". Considering more recent data presented by Quantec in 2019, the Mogalakwena Municipality has an average monthly household income of about R6 707. A large proportion of the population completed all the years of formal schooling (matric qualification) or less, noting that a relatively small share of the population is highly educated, hence it is very likely that most of the available workforce will be low-skilled and potentially semi-skilled given the level of education (EcoPartners, 2024).

4.11.4 Economic Profile

4.11.4.1 Gross-Value Added (GVA)

The value of goods and services generated in a certain location, industry, or sector of the economy is measured by Gross Value Added (GVA). It differs from GDP in that it excludes consumption and is considered a more practical measure to determine the actual economic welfare of a country's economy. The Mogalakwena LM has only contributed 4.39% to the total GVA of the Limpopo

province and 16.67% to that of the Waterberg DM. This is concerning, as the Mogalakwena LM accounts for almost half of the Waterberg DM's population and houses Polokwane, which is the provincial capital. The Mogalakwena LM GVA growth also fluctuated at a rate of less than 1% each year whereafter, the GVA growth of the local municipality declined more aggressively between 2019 and 2020. The decline may likely be due to the Covid 19 pandemic as it affected several industries. The Mogalakwena LM economy was largely driven by its tertiary sector, as it contributed 73.66% of the LM GVA. The sector was largely driven by the finance, insurance, real estate and business services industry, as well as general government, contributing about 41.73% of the total LM GVA. The Mogalakwena LM primary sector contributed 12.4% of the LM total GVA and contributed 3.64% to the total GVA of the Waterberg DM. The mining sector was responsible for 8.61% of the above mentioned 12.4% and only contributed 2.84% of the DM's total GVA. Even though the mining sector was the largest contributor within the primary sector, it is underdeveloped compared to the rest of the DM (EcoPartners, 2024).

4.11.5 Labour Force and Employment Structure

As of 2019, the working-age population (WAP) constituted 56.9% of the Mogalakwena LM population, which translates to about 194 043 people. About 54% of the working-age population is not economically active (NEA) and about 27% being employed, mostly formally. It should be noted that Mogalakwena LM employs approximately 7% of the Waterberg DM's employed population, with an estimated unemployment rate of about 36.78%. Over the past ten years, the number of unemployed people has been increasing relative to the WAP, while the employment trends have varied over the years. According to the Mogalakwena IDP, women, especially rural women, constitute the greatest number affected by the lack of job opportunities as well as other social problems. The tertiary sector absorbed the largest proportion of the labour force in Mogalakwena LM, constituting 78.7% of the employed population. This illustrates that the economy is service orientated. Mining is the smallest employer in the area, accounting for 1% of the total employment.

4.11.6 Access to Services and State of Local Built Environment

4.11.6.1 Settlement Profile

The household density in Mogalakwena LM is 14 households/km² and the population density is 55.3 persons/km². Village settlements in Mogalakwena LM are relatively small, with an average of 506 stands per village, while the urban core has settlements that are large and clustered. Mokopane is one of the three proclaimed townships within the municipality together with Mahwelereng, which is situated in direct proximity to the proposed project site, and Rebone (EcoPartners, 2024).

4.11.6.2 Access to Housing and Basic Services

As of 2019, 91.5% of the Mogalakwena LM houses are brick structured dwellings on separate yards; 4.9% are informal dwellings; 1,1% are traditional dwellings; almost 2% are flats, complexes, and backyard dwellings. This shows that over 90% of the households live in formal dwellings. Nonetheless, the LM experiences challenges in the provision of adequate housing. Among these challenges is insufficient land for development; the LM not being authorised to perform housing delivery; and lack of an Integrated Human Settlement Plan or Housing Plan for future planning. The Mogalakwena LM is facing infrastructure challenges. This is prominently resembled in water, sanitation and refuse removal services. Only 19.94% of the population has access to water inside their dwelling. 67.02% of the population must make use of pit toilets and 6.54% of the population

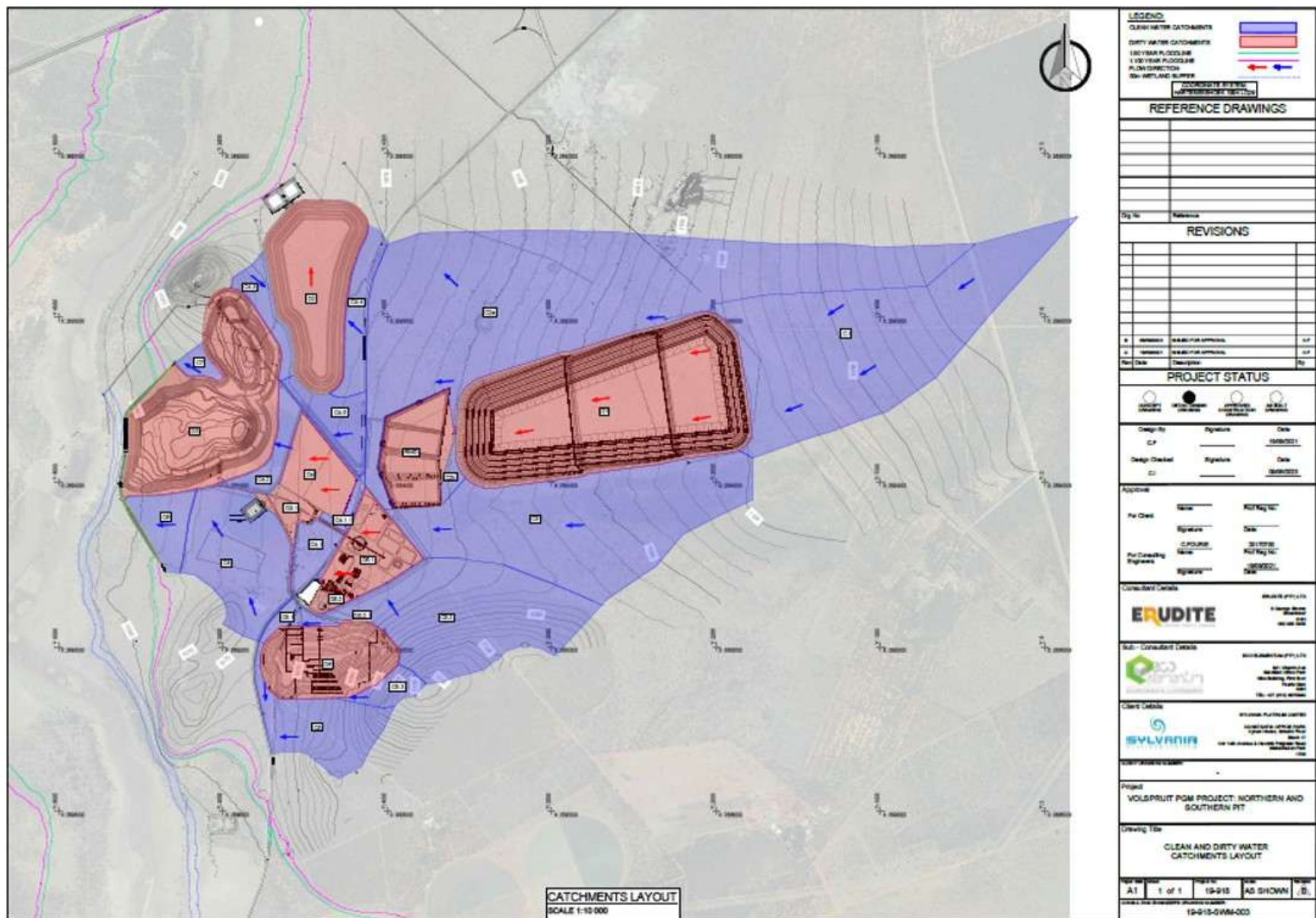
must remove their own refuse. These factors all indicate that the Mogalakwena LM has poor infrastructure which can be a hindrance for future development (Ecopartners, 2024).

5 ANALYSIS AND CHARACTERISATION OF ACTIVITY

5.1 SITE DELINEATION FOR CHARACTERISATION

EcoElementum did a characterisation of the activities in 2023, which was updated in 2026, and this section shows an adapted summary of that characterisation.

The whole mining area is classified as a dirty area. Clean water (non-contact water) is diverted around the site and dirty run-off (contact water) is collected in the proposed pollution control dams. See Figure 33 for a delineation of clean and dirty water catchments. Also see Appendix A for more detailed storm water management drawings.



5.2 WATER AND WASTE MANAGEMENT

5.2.1 WASTE

See Section 2.4.2 for a list of identified waste streams.

5.2.1.1 Waste Rock classification

Topsoil and waste rock will be removed and placed on dumps, or preferably directly returned to the mined-out parts of the pit. An average of 18 406 tons of waste rock will be excavated each month for the first 48 months. Topsoil will be stockpiled in sperate stockpiles for use in rehabilitation.

The waste rock will be licensed under a Section 21(g) as it is used for backfilling and stored in the WRD. Waste rock from the South Pit will make up the bulk of the backfill into the North Pit.

Low grade ore will be treated as waste rock and will be disposed of as above in a separate stockpile area for later processing.

Geochemical investigations have been conducted on the quality of the waste rock. This will also assist management on the deposition of the waste rock to manage drainage quality from the dumps. The waste classified as a Type 3 waste, but EcoElementum (2026) is motivating for a Class D barrier system due to very marginal exceedances of threshold values.

Clean run-off water would also be diverted around the waste rock dumps by means of water diversion berms.

5.2.2 PROCESS WATER

5.2.2.1 Water supply

Process water will initially be received from the Grasvally borehole and later on from pollution control dams: RWD, WRD PCD, Plant PCD and ROM PCD.

5.2.2.2 Water balance

A dynamic water balance simulation was done by Water Hunters and Simx Consulting in 2024 for the VPM operations as part of the current planning and application phase. The results from this simulation is reflected in this section. See Figure 34 for a water balance flow diagram and Table 5 for a summary of water flows simulated for life of mine. It should be noted that this is simulated predictions and only metered data collected once the mine is operational, will be able to improve the accuracy.

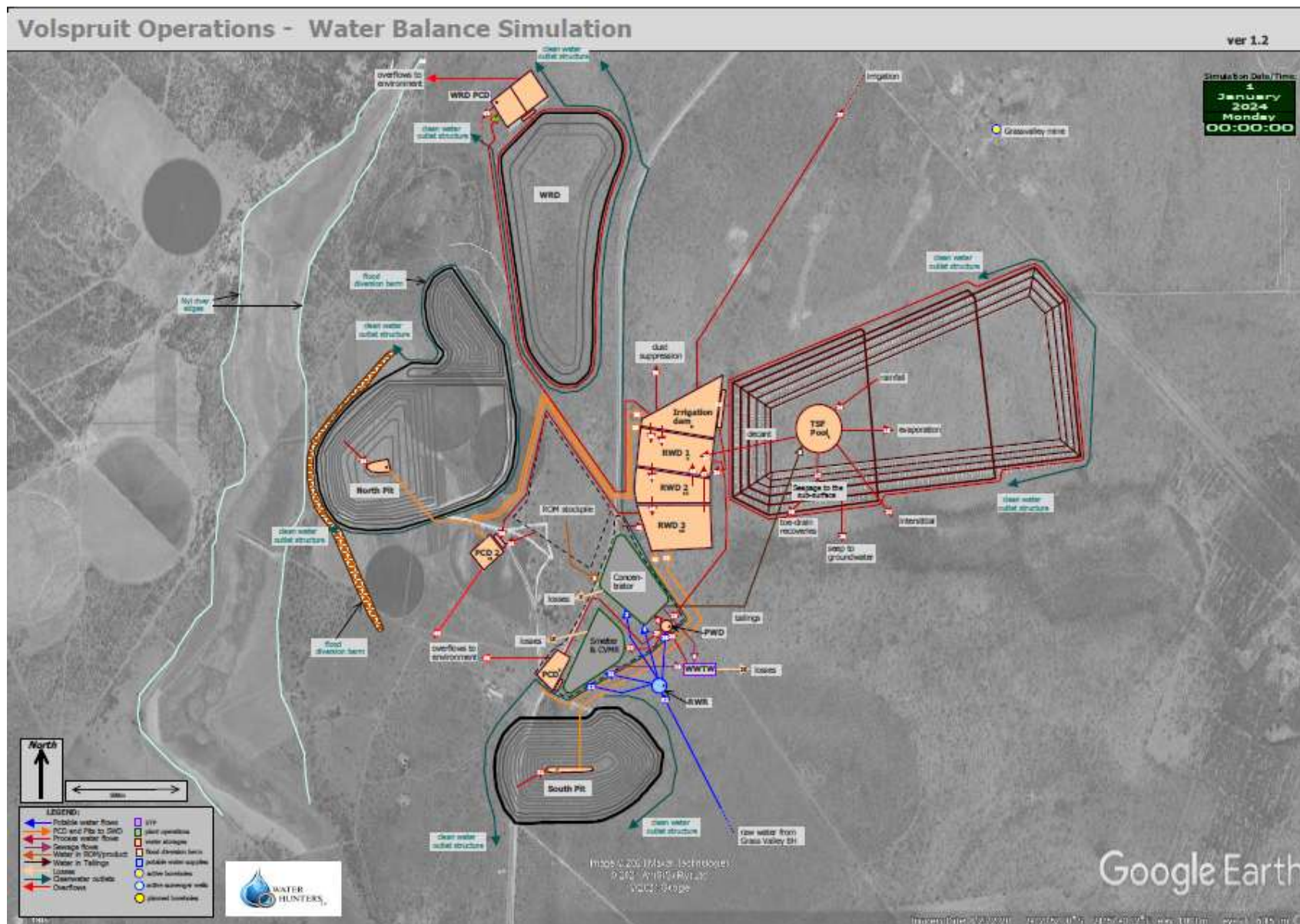


FIGURE 34: THE MINE WATER BALANCE FLOW DIAGRAM FOR VPM (WATER HUNTERS, 2024)

TABLE 5: A SUMMARY OF WATER FLOWS SIMULATED FOR THE VPM OPERATIONS (WATER HUNTERS, 2024)

No	Flow From	Flow To	20 yr m ³	avg m ³ /a
1	Raw Water Reservoir (RWR)	Concentrator (drinking/change houses...)	1,029,871	51,494
2	Raw Water Reservoir (RWR)	Concentrator (gland services, flocculants...)	821,119	41,056
3	Moist in Concentrator Feed tonnes	Concentrator	894,960	44,748
4	Process Water Dam (PWD)	Concentrator	80,469,638	4,023,482
5	Concentrator	Losses	8,218,572	410,929
8	Concentrator	Tailings Storage Facility (TSF)	73,967,145	3,698,357
9	Concentrator	WWTW	1,029,871	51,494
11	Raw Water Reservoir (RWR)	Smelter & CVMR (drinking/ablution...)	51,494	2,575
12	Raw Water Reservoir (RWR)	Smelter & CVMR (services)	34,665	1,733
13	Process Water Dam (PWD)	Smelter & CVMR	3,397,199	169,860
14	Rainfall	Tailings Storage Facility (TSF)	5,464,589	273,229
15	Smelter & CVMR	Losses (incl. evaporation, final product losses)	3,431,864	171,593
16	Tailings Storage Facility (TSF)	Evaporation	8,348,025	417,401
17	Tailings Storage Facility (TSF)	Seepage to the sub-surface	17,164,869	858,243
18	Sub-surface	Toe-drain recoveries	17,164,867	858,243
19	Smelter & CVMR	WWTW	51,494	2,575
20	Sub-surface	Seep to groundwater	2	0
21	Tailings Storage Facility (TSF)	Interstitial Losses	5,718,909	285,945
22	Tailings Storage Facility (TSF)	Return Water Dam (RWD)	48,177,511	2,408,876
23	Return Water Dam (RWD)	Process Water Dam (PWD)	82,445,761	4,122,288
24	ROM stockpile	Recovered runoff	100,610	5,030
25	WWTW	Losses	107,055	5,353
26	WWTW	Process Water Dam (PWD)	974,310	48,715
27	Pollution Control Dam (PCD)	Process Water Dam (PWD)	523,714	26,186
28	Raw Water Reservoir (RWR)	Process Water Dam (PWD) make-up	12,857	643
29	Irrigation dam silt trap	Irrigation dam	-	-
30	Irrigation dam silt trap	Return Water Dam 1 (RWD 1)	17,164,867	858,243
31	Fissure	South Pit	19,162,408	958,120
32	South Pit	Return Water Dam 3 (RWD 3)	19,650,242	982,512
34	Fissure	North Pit	30,234,509	1,511,725
35	North Pit	Irrigation Dam (ID) via a settler	29,941,447	1,497,072
36	Pollution Control Dam 2 (PCD 2)	Irrigation Dam (ID) via a settler	30,924,742	1,546,237
37	Irrigation Dam (ID) via a settler	Irrigation water to farmers	30,015,255	1,500,763
38	Irrigation Dam (ID) via a settler	Return Water Dam (RWD) return and overflow	23,018,100	1,150,905
39	Return Water Dam 3 (RWD 3)	Pollution Control Dam 2 (PCD 2)	31,043,925	1,552,196
41	Pollution Control Dam (PCD)	Return Water Dam 3 (RWD 3)	353,577	17,679

No	Flow From	Flow To	20 yr m ³	avg m ³ /a
42	Pollution Control Dam (PCD)	overflow to environment	-	-
43	Waste Rock Dump PCD	Return Water Dam 3 (RWD 3)	1,790,509	89,525
44	Irrigation Dam (ID)	Return Water Dam 3 (RWD 3)	6,675,318	333,766
45	Return Water Dam 1 (RWD 1)	Return Water Dam 2 (RWD 2)	124,224,651	6,211,233
46	Return Water Dam 2 (RWD 2)	Return Water Dam 3 (RWD 3)	97,620,282	4,881,014
47	Return Water Dam 3 (RWD 3)	Return Water Dam 1 (RWD 1)	87,309,032	4,365,452
48	Return Water Dam 2 (RWD 2)	Return Water Dam 1 (RWD 1)	25,434,529	1,271,726
49	Pollution Control Dam 2 (PCD 2)	overflow to environment	-	-
50	Irrigation Dam	Dust Suppression	124,331	6,217
51	Reserved	Reserved	-	-
52	Grass Valley borehole	Raw Water Reservoir (RWR)	1,948,929	97,446
53	Reserved	Reserved	-	-
54	Reserved	Reserved	-	-
55	Reserved	Reserved	-	-
56	Waste Rock Dump PCD	overflow to environment	-	-
57	Reserved	Reserved	-	-

5.2.2.3 Re-use and recycling

Process water is re-used and recycled as indicated in the water balance. Process water from the Return Water dam / Pollution control dams / Treated sewage effluent will be used for other processes within the mine facility, while the irrigation dam water will be used for some dust suppression and crop irrigation (Figure 34 and Table 5).

5.2.2.4 Water conservation and demand management

VPM will practise water conservation and demand management (WC/WDM) by recycling water from all the pollution control dams to the plant, mining area and workshop. Water will be lost within the process through evaporation and/or seepage. However, it is advised that water from the pollution control dams will be used first before being supplemented from borehole water.

Water conservation will be promoted throughout all operational areas with the assistance of educational publications and programs. Annual updates of the water balance and implementation of new technology for water saving will further contribute to the WC/WDM.

5.2.2.5 Sewage management

VPM will contain all sewage generated on site in specially constructed wastewater treatment works (WWTW), currently planned to be a package plant of adequate sizing to safely treat flows indicated by the water balance. The treated effluent from the sewage will be disposed to a pollution control dam for re-use.

5.2.2.6 Point source discharges

No-point source discharges will be applicable.

5.2.3 STORM WATER

Figure 4 and plans in Appendix A show the storm water design for the VPM site. The following storm water will be generated on site:

- Dirty storm water pumped from opencast sections, plants and workshop areas
- Dirty storm water from ore stockpiles, overburden and discard stockpiles
- Dirty storm water from the TSF, entering return water flows
- Clean storm water from areas not disturbed by mining

The mine will follow a zero discharge policy and water management infrastructure will be designed in accordance with the requirements as contained in Regulation 704.

The surface water management structures which are to be implemented will entail the following:

- Water cut-off structures (clean water cut-off berms and drains)
- Water conveying structures (lined channels and berms), i.e. storm water channels
- Pollution control dams

Water conveying channels will be provided along the higher side of the mining areas in order to divert clean surface water draining from higher lying areas to natural drainage courses traversing the project area. Strategically aligned berms and channels will be located within the mining area in order to contain the polluted surface water runoff from the mining area and from contaminated sources originating from the mining operations. Diversion channels will be constructed in order to divert polluted (dirty) surface water to pollution control dams (PCDs) where the polluted water will evaporate, leaving the pollution elements behind, or be re-used in the process. The capacity of the diversion channels is determined by the area which is to be drained. The critical areas would be the areas utilized for the access roads, overburden dump areas, ROM stockpile and the mine workshop and admin areas. The capacity of the channels must cater for a 1:50 x 24 h storm event.

The storm water infrastructure is so located to divert the clean storm water away from the opencast and operational areas and allow dispersal into the natural environment.

A total run-off has been calculated as 723 027 m³ during the 1:50 year storm event. The berms are all placed up-gradient from potentially contaminated areas, deflecting run-off from the areas it protects. The ingress of 'clean' storm water into the processing areas will be minimised through the appropriate establishment of either cut-off trenches / diversion berms on the up-slope of the yard. Rainwater falling on the yard surface itself will be diverted to a dirty storm water dam for reuse in site processes.

The flood protection berm at the North Pit will be constructed to prevent flood water from the Nyl River from entering the North Pit mine workings.

5.2.3.1 Flood protection berm

Part of the North Pit will be situated inside the 1:50 year and 1:100 year flood lines. In order

[illegible]



The flood berm area will first be excavated, grout anchors drilled and grouted, and then backfilled with a clay core, then competent rock, before the berm is constructed as compacted layer works around the core. The berm will have a “semi-porous clay core,” extending approximately 7m above ground and keyed in approximately 2.5m below ground level, surrounded by compacted rockfill slopes with a gradient of 1v:1.5h. The base of the berm will be approximately 10m wide. The slopes will be vegetated with rock pitching for scour protection. There will be a 5m-wide service road with a 2m-wide verge for vehicles and construction along the river-side of the berm. A 50m vegetated buffer between the eastern delineated wetland edge and the service road will be in place.

Flood modelling done on peak flood show that the flood line on the opposite side of the Nyl River will not be changed by the presence of the berm.

Three pollution control dams (PCDs) will be constructed (Table 6 for capacities). These are:

- WRD PCD
- Plant PCD

- ROM PCD

TABLE 6: A TABLE LISTING THE DIFFERENT WATER STORAGE PLANNED FOR VPM (WATER HUNTERS, 2024)

Description	Capacity (m³)
Tailings Storage Facility (TSF)	500,000
Return Water Dam (RWD 1) Cell 1	119,091
Pollution Control Dam (PCD) at Plant	35,095
Process Water Dam (PWD)	8,000
Raw Water Reservoir (RWR)	2,000
North Pit	10,000
South Pit	10,000
Waste Rock Dump PCD	63,340
Irrigation Dam (ID)	100,842
Return Water Dam (RWD 3) Cell 3	118,840
Pollution Control Dam 2 (PCD 2) at ROM stockpile	20,900
Return Water Dam (RWD 2) Cell 2	116,613

The water containing structures will be lined with 1.5mm thick HDPE liner, in order to limit any seepage/leakage from the dams. All PCDs and RWDs will have silt traps constructed upstream of the inflow structures.

The plant/tailings/return water dam is a closed circuit operating within the plant reticulation circuit. A separate draining system has not been designed for the tailings dam and it was assumed that all water falling on the surface of the tailings dam will drain via the penstock or toe drains to the return water dam. The return water dam (RWD) will consist of three cells, connected via spillways to cater for collection of storm water during high rainfall events. The Irrigation dam will be a last emergency collection dam in case of excessive storm events with rainfall higher than that of a 1:50 year return event.

A PCD at the rock dump will have a stormwater overflow compartment and water from this facility will be pumped back into the process water flow.

No pollution control dams will be placed within the 1:100 year flood line of any natural water course.

The PCD and the plant will collect contact water from the plant surface area for re-use as process water in the plant. Similarly, the water collected from the ROM stockpile area will be re-used as process water. The process water dam will act as a buffer for collecting water and distributing it to areas in the plant.

Pit water pumped from the pits to the irrigation dam will be used for dust suppression on road and the TSF. If found to be feasible, this water will also be used for crop irrigation.

The raw water reservoir will contain water from boreholes and regarded as clean water. This water will be used for potable supply and gland service water.

5.2.4.1 Tailings Storage Facility Specifics

The tailings storage facility (TSF) will be lined to a Class C equivalent barrier system and will be developed in a series of three cells to prevent long exposure of the HDPE liner to UV

sunlight (see design report in Appendix B). Penstocks will be used as a decant system and each cell will have a dedicated penstock. The penstock intakes will be accessed by catwalk structures. The penstock outfall will deliver water to a silt trap that also collects water from the toe drain collection trench, from where water will flow into the RWD cells.

The tailings facility will have an underdrainage system with a coarse tailings outer wall constructed by on-wall hydro cyclone deposition. It will consist of a toe drain and with curtain drain parallel to the starter walls. These drains will be constructed from adequately graded filter sand to ensure water flow and should prevent the phreatic surface from daylighting on the side walls.

A trapezoidal concrete lined solution trench will be constructed around the tailings storage facility to intercept water from the underdrainage system and transport it to the silt trap (EcoElementum, 2026).

5.2.4.2 Waste water treatment works

VPM will treat all sewage on site by using an appropriately sized package plant for treatment. Any treatment sludge from the plant will be used as compost on the TSF, while treated effluent will be re-used in the processing plant.

5.3 MONITORING AND CONTROL

5.3.1 GROUNDWATER MONITORING

A groundwater monitoring system must adhere to the criteria mentioned below.

5.3.1.1 Source, plume, impact and background monitoring

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped classification according to the following purposes:

Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry.

Plume monitoring: Monitoring boreholes are placed in the primary groundwater plume's migration path to evaluate the migration rates and chemical changes along the pathway.

Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern.

Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry.

5.3.1.2 System response monitoring network

Groundwater levels: The response of water levels to abstraction is monitored. Static water levels are also used to determine the flow direction and hydraulic gradient within an aquifer. Where possible all the above-mentioned borehole's water levels need to be recorded during each monitoring event.

5.3.1.3 Monitoring frequency

In the operational phase and closure phase, monitoring of groundwater quality and groundwater levels is recommended. Monitoring frequency must be in line with the the conditions set in the Water Use Licence and should not be less frequent than quarterly.

5.3.1.4 Monitoring Parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sampling positions. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH drops.

5.3.1.5 Abbreviated analysis (pollution indicators) (monthly)

Physical Parameters: Groundwater levels

Chemical Parameters:

- Field measurements: pH, EC
- Laboratory analyses: Major anions and cations (Ca, Na, Cl, SO₄); Other parameters (EC); certain metals, in this case Arsenic and CrVI

5.3.1.6 Full analysis (every 2 years)

Chemical Parameters:

- Field measurements: pH, EC
- Laboratory analyses: Anions and cations (Ca, Mg, Na, K, NO₃, Cl, SO₄, F, Fe, Mn, Al, & Alkalinity); and full metals

5.3.1.7 Monitoring Boreholes

Currently a monitoring network does exist for the proposed mine, and are frequently monitored, based on the requirements of the contracted groundwater specialists. The location of these monitoring boreholes is shown in Figure 37. It is recommended that these continue to be monitored for water levels and where appropriate for water chemistry.

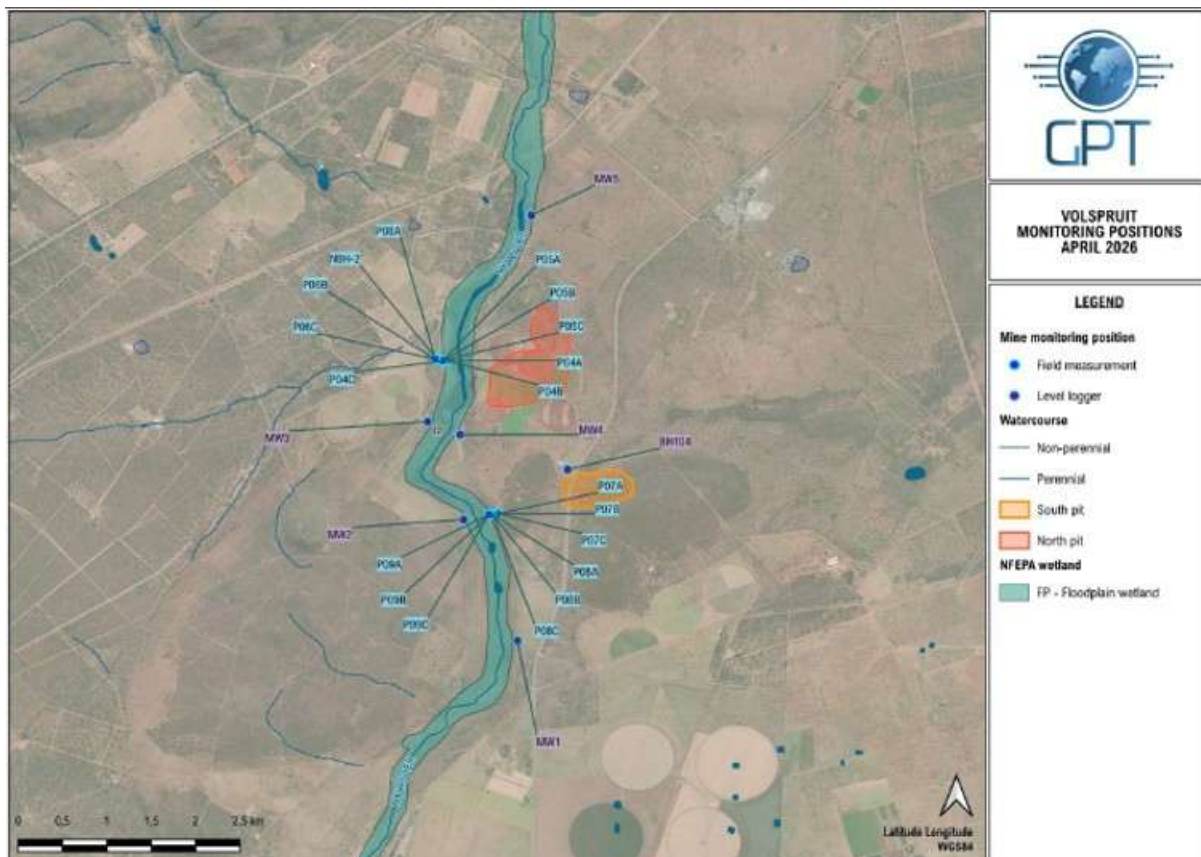


FIGURE 37: PIEZOMETER & LEVEL LOGGER POSITIONS (GPT, 2026)

Table 7 shows the coordinates for the monitoring boreholes used by GPT.

TABLE 7: A LIST OF MONITORING BOREHOLES USED AT VPM (GPT, 2026)

BH ID	Y	X	Z
BH4	-24.33140804	28.97484996	1086.828247
BH1	-24.33289499	28.97500603	1091.125732
BH2	-24.33241798	28.97475801	1086.939453
BH3	-24.33296104	28.97325103	1083.921875
BH New	-24.333492°	28.975032°	
A01	-24.34905102	28.93442396	1062.082642
A02	-24.34879504	28.93407301	1063.512939
A03	-24.34823597	28.93337304	1064.345337
A06	-24.34724799	28.93705303	1060.815186
A07	-24.346213	28.93692696	1061.131226
A08	-24.34498999	28.93690903	1061.552246
A09	-24.33990897	28.93910701	1062.191772
A10	-24.34031499	28.93979098	1055.187378
HUIS01	-24.33974703	28.93922604	1059.314331
HUIS02	-24.339297	28.93982098	1055.342163
VOL13	-24.35377398	28.95607702	1071.501953
VOL13	-24.35341	28.9561	1076.9777
VOL12	-24.34805701	28.95711503	1067.079834
VOL10	-24.34799	28.95538	1076.126
VOL11	-24.34753	28.95579	1076.3622

VOL14	-24.35528	28.95332	1074.7766
VOL15	-24.35458	28.95381	1074.2164
VOL16	-24.35048	28.94722	1066.2753
VOL17	-24.342247	28.945761	1068.1526
VOL19	-24.345089	28.952506	1073.9661
VOL20	-24.347501	28.943976	1063.111
VOL21	-24.347248	28.948895	1069.052
Vol 23	-24.34647778	28.9438	1062.1395
vol 24	-24.35085	28.94707778	1066.0684
Vol 25	-24.34708895	28.94909467	1069.7358
Vol 26	-24.352396	28.946116	
VOL4	-24.34185	28.94626	1068.8785
VOL5	-24.35399	28.95426	1075.0441
VOL6	-24.35235	28.95117	1072.6782
VOL7	-24.34757	28.95148	1071.436
VOL8	-24.34806	28.95231	1071.8611
VOL9	-24.34882	28.95325	1074.5887
VOLS11	-24.37355	28.9603	1068.2144
Vols12	-24.37379722	28.96224167	1068.5421
Vols13	-24.37333056	28.95548333	1063.5867
Vols14	-24.37332627	28.95575856	1064.13
VOLS2	-24.36994	28.96455	1074.7864
VOLS3	-24.37002	28.96411	1074.8528
VOLS4	-24.3699	28.96495	1074.5986
VOLS5	-24.37435	28.9631	1067.538
VOLS6	-24.3749	28.96355	1066.9882
VOLS7	-24.37607	28.95455	1063.4867
VOLS8	-24.37545	28.95464	1063.9545
VOLS9	-24.3747	28.95501	1064.9398
VOLS hek 01	-24.361372	28.95413199	1068.651489
VOLS1	-24.36780704	28.96365199	1070.365967
VOLS1	-24.3678	28.96363	1082.4506
VOLS10	-24.37377	28.95575	
VOLS10	-24.37377	28.95575	1064.4572
BH104	-24.357076	28.953765	1075.9779
MW1	-24.376117	28.948217	1059.2722
MW2	-24.362667	28.942194	1062.5955
MW3	-24.351767	28.938183	1062.8729
MW4	-24.3532	28.941817	1064.4083
BH Quarry	-24.36889254	28.95219208	1064.4064

5.3.2 BIOMONITORING

Clean Stream Biological Services recommended that a biomonitoring programme be implemented as soon as possible in the mining area, which should be part of the water use licence conditions. This programme should be implemented to improve the baseline information (a low flow/dry season survey is of special importance to ensure adequate seasonal coverage for baseline information). The baseline information is critical in enabling

detection of future changes associated with the development. Recommendations on a proposed biomonitoring programme for the mining area are made in below.

Nyl 1 to Nyl 7

Habitat assessment, SASS5 and fish surveys, PES assessment using MIRAI and FRAI - Bi-annually (wet and dry season surveys)

DWS's DEEEP protocol: Whole effluent toxicity testing using four different biota (fish, daphnia, algae and bacteria) - Quarterly (4 times per annum)

Boreholes within and adjacent to the floodplains and irrigated fields

DWS's DEEEP protocol: Whole effluent toxicity testing using at least three different biota (fish, daphnia, algae and bacteria) – Quarterly (4 times per annum)

Pollution control dams, Sewage Treatment Plant effluent, any other potential pollution source

DWS's DEEEP protocol: Whole effluent toxicity testing using at least three different biota (fish, daphnia, algae and bacteria) – Quarterly (4 times per annum) (CSBCS, 2023)

Below are listed suggested biomonitoring sites with each sites coordinates:

Nyl 1

-24.362672° S; 28.944097° E

Site in Nyl River inside mining area, but upstream of most potential impacts related to proposed mine (including South pit).

Nyl 2

-24.350034° S; 28.941436° E

Site in Nyl River in upper reaches of area to be directly impacted by proposed mining.

Nyl 3

-24.347120° S; 28.942333° E

Site in inundated section (dammed area) of Nyl River. Close proximity of proposed mining area (North pit).

Nyl 4

-24.346606° S; 28.942183° E

Site downstream of dam in Nyl River. Close proximity of proposed mining area.

Nyl 5

-24.341364° S; 28.941872° E

Site in Nyl River, downstream of most potential mining impacts (North pit).

Nyl 6

-24.339664° S; 28.940469° E

Site in another small, dammed section of Nyl River, downstream of most potential mining impacts.

Nyl 6B

-24.332443° S; 28.948171° E

Site downstream of most mining impacts. (including Waste Rock Dump PCD and residual stockpiles)

Nyl 7

-24.287153° S; 28.959269° E

Site in Nyl River, further downstream of potential mining impacts in vicinity of previous National River Health monitoring site A6NYL-JAAGB (CSBS, 2023).

CSBS based the proposed biomonitoring on the observations and results gained from the current and previous studies. The sites recommended for inclusion in the biomonitoring programme are those that should provide a good measure of potential impacts associated with the proposed activity, and that allow the application of generally recommended biomonitoring protocols.

5.3.3 SURFACE WATER MONITORING

Water quality monitoring parameters proposed to be monitored on a monthly frequency during the various phases of the mine is contained in Table 8. Figure 38 shows the location of the proposed natural surface water monitoring points.

TABLE 8: A LIST OF VARIABLES SUGGESTED TO BE ANALYSED FOR AS PART OF SURFACE WATER MONITORING AT VPM

Variable	Unit
Aluminium as Al	mg/l
Calcium as Ca	mg/l
Chloride as Cl	mg/l
Chromium ³⁺	mg/l
Chromium ⁶⁺	mg/l
Electrical Conductivity as EC	mS/m
Fluoride as F	mg/l
Iron as Fe	mg/l
Magnesium as Mg	mg/l
Manganese as Mn	mg/l
Nitrate as NO ₃	mg/l
pH	unit
Potassium as K	mg/l
Phosphate as P	mg/l
Sodium as Na	mg/l
Sulphate as SO ₄	mg/l

Variable	Unit
Suspended solids as SS	mg/l
Total alkalinity	mg/l
Total Dissolved Solids as TDS	mg/l
Total hardness as CaCO ₃	mg/l

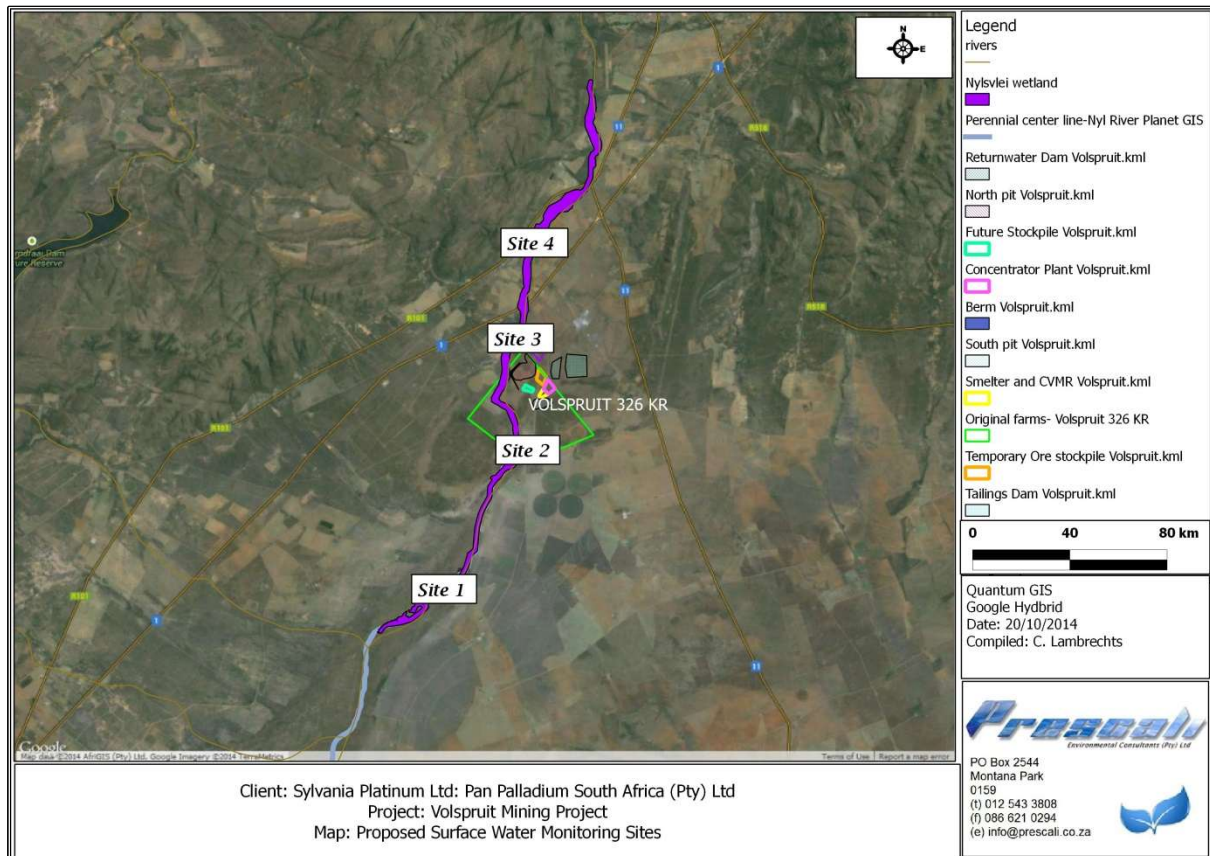


FIGURE 38: A MAP INDICATING THE SUGGESTED SURFACE MONITORING POINTS FOR VPM (PRESCALI, 2015)

The flow gauge in the Nyl River near the N1 highway will be monitored during flood events and the mine will have its own level pegs to monitor flood levels at the flood protection berm.

All surface water containing structures on the mine site will be sampled quarterly and analysed for the constituents listed in Table 6. Monitoring data will be kept in a data base and used to guide management decisions. Quarterly and annual monitoring reports will be sent to the relevant government departments. The following monitoring regime will be followed:

- Quarterly natural surface environmental water quality and quantity
- Quarterly bio-monitoring at the surface water points
- Quarterly process water quality
- Bi-annual toxicity testing of return / storm water dams' water
- Daily recording of all water abstracted boreholes and pits
- Daily recording of dam water levels
- Daily recording of waste generated
- Daily recording of water pumped to the plant and mining areas

5.3.4 Operational Management

5.3.4.1 Organizational Structure

See Section 2.5.

5.3.4.2 Resources and Competencies

VPM will appoint appropriately qualified personnel based on the most feasible personnel structure and ensure that all activities are managed according to regulatory requirements.

5.3.4.3 Education and Training

VPM has an approved social and labour plan in place which guides education and training policies of the mine and ensures that imbalances in employment from the past are rectified according to legal requirements

5.3.4.4 Communication

VPM will have internal and external communication procedures in place. Public complaints will be allowed for through a complaints procedure that provides for any public complaints to be raised with the senior management of the mine and adequate feedback being given timeously to complainants.

On-site incidents will be handled through an internal complaints procedure forming part of the mine's SHE management system.

5.4 RISK ASSESSMENT / PUBLIC PARTICIPATION

5.4.1 Risk assessment

Tables 9 – 12 shows the assessment results of impacts related to water as assessed by various specialists and reported by EcoPartners (2024). Currently all impacts can be mitigated to an adequate level.

TABLE 9: ASSESSMENT OF IMPACTS ON GROUNDWATER (ECOPARTNERS, 2024)

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
Operation	Water pumped from pits to be mined	Drawdown of North Pit	D	1.00	2	3	3	4	2	4	Low
Operation	Water pumped from pits to be mined	Drawdown of South Pit	D	1.00	2	3	3	4	2	4	Low
Post Closure	Remaining mined out pits to contaminate groundwater after closure of the mine	Decanting of North Pit	D	1.00	3	5	2	2	3	2	Low
Post Closure	Remaining mined out pits to contaminate	Decanting of South Pit	D	1.00	3	5	2	2	3	2	Low

	groundwater after closure of the mine										
Operation	Mining of pits to contaminate groundwater	Groundwater Quality of Pits	D	1.00	3	4	2	2	3	2	Low
Operation	Remaining mine infrastructure to contaminate groundwater after closure of the mine	Groundwater Quality of TSF / TRS & RWD / WRRS	D	1.00	3	5	2	3	3	2	Low
Post Closure	Remaining mine infrastructure to contaminate groundwater after closure of the mine	TSF / TRS & RWD / WRRS with fully compliant liner	D	1.00	3	5	2	1	4	2	Negligible

TABLE 10: ASSESSMENT OF IMPACTS ON SURFACE WATER (ECOPARTNERS, 2024)

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
Construction	Surfaces will be cleared to make way for mine surface infrastructure as well as the areas that would be mined as opencast areas. Vegetation will be removed from the original land surfaces and the berms and canals intended to both contain contaminated water and to divert clean water around these surfaces will not have been constructed yet, or will only be partially constructed	Increased run-off coefficient (n), potentially giving rise to a greater measure of erosion while construction is underway if this aspect is done during the rainy season • Greater erosion will lead to greater siltation to the surrounding Nyl River and its wetland; however, it is actual normal for the Nyl River wetland to receive silt from its catchment. Subsequently this impact will not have significant negative effects on the wetland	D	1.00	3	2	2	2	3	1	Negligible
Operation	Surface run-off entering potentially contaminated areas from outside mining areas	Clean surface water could potentially acquire contaminated substances (AMD, oils, fuel, greases, other) from mining infrastructure areas	D	1.00	2	4	2	4	4	1	Low
Operation	Rainwater falling on potentially contaminated surfaces will flow away from these surfaces into the nearby Nyl River and its associated wetland	Contaminated water will reach the aquatic environment and cause environmental degradation of aquatic ecosystems	D	1.00	2	4	3	4	4	1	Moderate
Operation	Interception of surface run-off to the Nyl River	Limited impact in relation to the catchment of the Nyl River	D	1.00	1	4	2	4	1	4	Low
Operation	Mining or infrastructure within the riparian zone	By mining within or in close proximity to the riparian or	D	1.00	2	4	2	4	4	2	Low

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
	or flood zones of a stream/river	flood zones of a stream impacts could be immediately transferred from the place where the incident occurred to the watercourse. Note that allowance is made for a 50 m vegetated buffer zone between the mine and the edge of the delineated wetland. The north pit falls within the flood line.									
Operation	Releasing pollution into the surface water environment	AMD and other pollutants could be released into the aquatic environment by discharging water into the Nyl River or its wetland from discharges such as water pumped from the mine workings	D	1.00	3	4	2	3	4	1	Low
Post Closure	Remaining mine infrastructure to contaminate surface streams after closure of the mine	Continued seepage through the tailings residue deposit or surface run-off from the waste rock residue deposit could contaminate the aquatic environment	D	1.00	2	5	2	3	4	1	Low
Post Closure	Remaining mine infrastructure to contaminate surface streams after closure of the mine	Continued decanting of water from the flooded underground mine voids could contaminate surface streams	D	1.00	2	5	3	2	4	1	Low

TABLE 11: ASSESSMENT OF IMPACTS ON AQUATIC BIODIVERSITY (ECOPARTNERS, 2024)

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
Construction	Clearing of vegetation and soil disturbance	Erosion and sedimentation: Increased erosion of sediments (especially during wet season) and increased dust that may enter the receiving water bodies. This would lead to increased turbidity (decreased water quality) which may have a negative impact on aquatic fauna, especially visual predators and filter feeders. The impact would vary in intensity between different species and different life stages and processes (spawning, feeding, etc.). When the suspended solids (soil/dust particles)	D	1.00	2	5	4	3	2	2	Moderate

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		settle out on the substrates in the aquatic ecosystems, it leads to shallower pool depths and colonisation of the sediments by monospecific stands of reeds which, in turn, decrease the availability of open pools and water column biotopes. Benthic substrates are transformed which may lead to deterioration in biotic integrity and loss of species.									
Construction	Construction of pits, dams, trenches, berms and infrastructure	Altered flows: Interception of surface runoff, preventing it from reaching the Nyl River. Surface flows in the Nyl River can be impacted where surface runoff has been intercepted. This can change both the timing and duration of surface flows, as well as overall volumes of water within the channel. Alien vegetation encroachment due to disturbances can also have a significant impact on water levels in streams and rivers.	D	1.00	3	4	4	4	3	2	Moderate
Construction	Introduction of people to an area	Spread of alien fish species: The introduction of alien species is most often for angling/recreational purposes but can also be driven by subsistence needs for protein. Alien fish species compete with indigenous fish species for habitat and food and can have a devastating impact on natural aquatic biota through predation and habitat destruction.	D	1.00	3	5	4	3	3	1	Moderate
Construction	Increased number of people in an area	Increased pressure on fish stock, increased fishing pressure on the aquatic ecosystems because it is often a free and readily available source of food. Except for the Sharptooth catfish, indigenous fish species observed in the study area have low importance as angling species. Smaller species are however sometimes netted for subsistence. The abundance of catfish is furthermore as a result of existing alteration (creation of dams) related to agriculture in the area.	D	1.00	2	4	3	3	4	4	Low
Construction	Spills/leaks during general construction activities (oil, diesel, cement, etc)	Water quality deterioration. Storm water flushing construction areas, as well as dust, can carry additional pollutants into water bodies. Water quality deterioration will especially affect fish species intolerant to water quality alteration (especially Johnston's topminnow) but can have an impact on all aquatic fauna (e.g. fuel spills).	D	1.00	1	3	3	3	4	2	Low

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
Operation	The northern pit is located within the 10-, 50- and 100-year flood lines.	Loss of water to the northern pit: An impermeable barrier will be constructed around the pit to prevent water from entering during flood events. As flows in the Nyl River are slow, the risk of large-scale structural failure or scouring is unlikely. Should this occur, however, flood levels will be reduced, with negative consequences for fish spawning and migration. Considering that the Nyl River is relatively unimpacted with a high biodiversity and good water quality, even small disturbances can translate into significant impacts for sensitive species. The impermeability and structural integrity of the flood protection berm has not yet been demonstrated. The berm will be in place permanently. The berm has been designed for the 1:100 year flood event and the effects of climate change are uncertain in the long term. Culverts beneath the N1 to be inspected to maintain the status quo.	D	1.00	2	5	5	4	4	2	Moderate
Operation	Seepage from the waste rock dump, tailings facility and stockpiles	Seepage from the waste rock dump, tailings facility and stockpiles could alter groundwater quality. Water quality deterioration will cause increased salts (particularly sulphates), metals and changes in pH in the groundwater. The separation of the surface water from the groundwater by the clay layer that underlies the Nyl floodplain will confine the seepage to the groundwater and will have limited impact on water quality of the Nyl River. If groundwater is used for crop irrigation contaminated groundwater will ultimately reach the Nyl River as runoff or agricultural return flows. It is likely that there will be some impact to water quality in the Nyl River, albeit indirectly, at relatively low concentrations and over an extended period of time (increasing cumulatively with ongoing evapotranspiration from irrigated fields). The pH in the Nyl River is likely to increase if this high-calcium high-pH runoff were to reach the river. Under alkaline conditions, nitrates become reduced to form ammonia. Ammonia can be highly toxic to aquatic biota,	I	1.00	2	5	4	2	2	2	Moderate

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		including fish. Nitrates can also cause a proliferation of algae and changes to oxygen fluctuations which can be limiting to fish (low concentrations at night when photosynthesis stops or supersaturated during the day when the algae photosynthesise). The concentrations of nitrates may be exacerbated by fertilisers used on cultivated fields. The effects of algae on oxygen concentrations and ammonia on toxicity are likely to have the greatest impact on aquatic biota, mainly fish species intolerant to water quality alteration (especially Johnston's topminnow) but will have an impact on all aquatic fauna.									
Operation	Dewatering of the Northern pit to allow for mining during the operational phase	Dewatering is likely to cause a drawdown cone of depression - a lowering of the groundwater table in the vicinity of the dewatering. This drawdown cone of depression will extend below the Nyl River. The Nyl River has a clay layer beneath the alluvial soils which limits linkages between the surface water and groundwater. Therefore, impacts to aquatic ecosystems is unlikely. The only loss of water is likely to occur if the flood levels extend beyond the edge of the clay layer in the floodplain which will only occur during big flood events and will not result in the loss of large volumes of water. This assumes that the clay layer will remain intact and that the existing flood lines are not significantly altered.	D	1.00	2	3	3	1	1	4	Negligible
Operation	Spills, leaks, subsurface seepage or failure of contaminated water containment, sewerage and distribution pipelines	Spills, leaks, subsurface seepage or failure of contaminated water containment, sewerage and distribution pipelines could lead to the deterioration in water quality. The worst case scenario will be structural failure, which would result in a large-scale pollution event in the Nyl River. The waste rock residue stockpile contaminated stormwater dam is located on the edge of the 1:100 year flood line and poses the greatest risk. Contaminants are likely to include sulphates, calcium and nitrates. This could lead to the reduction of nitrates to ammonia and the impacts of	I	1.00	1	5	3	3	4	3	Low

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		increased nitrate and ammonia concentrations on aquatic system as previously discussed.									
Operation	Blasting	Blasting in close proximity to aquatic ecosystems may also have a direct impact on fish assemblages through disturbance. In addition, nitrates from explosives can cause increased nitrate concentrations in groundwater and surface water (through runoff from storage and transport areas. This could lead to the reduction of nitrates to ammonia and the impacts of increased nitrate and ammonia concentration on aquatic system as previously discussed.	D	1.00	2	2	2	2	1	1	Low
Operation	Blasting and ore transportation, topsoil and product stockpiles, residue stockpiles and unpaved roads	Soil erosion and dust may lead to the input of sediment into the wetland system. In addition, dust and eroded sediments from mining activities contain metals and salts that can contaminate surface water and also cause increases in turbidity. Sedimentation within the wetland may lead to changes in wetland vegetation as sediments are colonised by reed species such as <i>Typha capensis</i> or <i>Phragmites australis</i>, often in monospecific stands. Disturbed areas are also more susceptible to colonisation by alien vegetation within the wetlands. In addition, pool habitats may become shallower and warmer, with lower oxygen concentrations, due to deposition of sediments on pool substrates, thus affecting certain fish species. Sedimentation may cause pool habitats to be silted up, with a consequent displacement of water into a more pronounced channel. Water may also 'back up' behind the deposited sediments, which may obstruct surface flows. These changes are likely to impact on habitat availability for aquatic biota.	D	1.00	2	2	3	2	4	2	Negligible
Operation	Stormwater runoff from areas cleared of vegetation and from mine infrastructure	Storm water runoff will increase in velocity and volume following rainfall events due to a decrease in infiltration causing erosion at storm water outlets. Where these occur in wetland areas, vertical incision of the floodplain may alter the flow characteristics, from diffuse, mainly subsurface flows to a	D	1.00	2	2	3	4	4	3	Low

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		more channelised overland flow with decreased lateral connectivity.									
Operation	Dams, road crossings and abstraction of water from dams	Dams, road crossings and abstraction of water from dams are likely to exacerbate existing impacts to water quality, quantity and flow regimes (e.g. prolonged no-flow periods). Dams and road crossings also impact fish migration patterns.	D	1.00	2	4	3	4	4	2	Moderate
Operation	Increased numbers of people in an area	Increased numbers of people in an area often results in increased fishing pressure on the aquatic ecosystems, as it is often a free and readily available source of food. Except for the Sharptooth catfish, indigenous fish species observed in the study area have low importance as angling species. Smaller species are however sometimes netted for subsistence. The abundance of catfish is furthermore as a result of existing alteration (creation of dams) related to agriculture in the area. Ideally these river-crossing and dams should be removed.	D	1.00	3	4	2	3	4	1	Low
Operation	Mining activities, including seepage, drainage, spills or leaks containing fuels, oils, greases, sewage, chemicals, hazardous waste, tailings or mine water.	Water quality deterioration related to operational activities Water quality deterioration related to hazardous waste, accidental spills and leaks during general operational activities (fuels, cement, PVC, tyres etc). Storm water flushing areas that contain contaminated sediments as well as dust can also carry pollutants into water bodies. Water quality deterioration will especially affect aquatic fauna intolerant to water quality alteration but can have an impact on all aquatic fauna (e.g. fuel and sewage spills).	D	1.00	2	3	3	2	3		Low
Operation	Interception of surface water runoff from upslope areas by the pits and mining infrastructure	Some surface water runoff from upslope areas will be intercepted by the pits and mining infrastructure, resulting in less water reaching the floodplain. This may result in a drop in water levels in the Nyl River (especially during drier months) and longer no-flow periods, ultimately having a negative effect on aquatic biota, particularly sensitive species. A drop in water levels will affect the availability of habitats for aquatic species and will also exacerbate water quality impacts due to conditions being more concentrated (i.e. less dilution). This	D	1.00	2	4	1	1	4	1	Negligible

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		amount of surface water intercepted is likely to be minimal (based on the surface water report by AEG 2022).									
Operation	Erosion, sedimentation and altered hydrology	Loss of Biodiversity and decline in ecological integrity: It is likely that there will be a loss of sensitive species from the system due to altered water quality, altered flows and a decline in habitat availability (due to erosion, sedimentation and altered hydrology) as well as colonisation of sediments by monospecific stands of reeds, typically <i>Typha</i> or <i>Phragmites</i> , which then outcompete other species. Pool habitats are also likely to support fewer fish due to sedimentation, while water quality deterioration will affect fish species intolerant to water quality alteration (especially Johnston's topminnow) but will also have an impact on all aquatic fauna. These impacts are likely to be carried downstream and may impact on other animals higher up in the food chain (e.g. frogs, birds, otter).	I	1.00	2	5	4	4	4	1	Moderate
Decommissioning & Closure	The Northern pit is located within the 10-, 50- and 100-year flood lines	A flood protection berm will be constructed around the pit to prevent water from entering during flood events. There is a risk during this phase – and beyond closure – is that the berm will be damaged, overtopped, or that flood levels will rise due to climate change. There is therefore a risk that water will be lost from the Nyl River post-closure. This could have a severe impact upon flood volumes in the river as well as pool depth during low flow periods. Fish migration and spawning may be affected, while colonisation by alien species will be favoured. There may also be impacts to water quality.	D	1.00	3	5	4	3	3	1	Moderate
Decommissioning & Closure	Residue deposits	Water quality deterioration related to seepage from the residue deposit will cause increased salts, metals and changes in pH (increased alkalinity) in the groundwater. Should this water emerge at the surface, it may cause a decline in aquatic ecosystem integrity. Groundwater assessment found that mine drainage is likely to be alkaline and saline and the increase in sulphates is expected to fall within guideline limitless. Calcium is also expected to become elevated and the	D	1.00	3	5	4	2	4	2	Moderate

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		pH of the leachate is predicted to be slightly alkaline at a value of approximately 8. The separation of the surface water from the groundwater by a thick clay layer means that impacts to the Nyl River will primarily be via surface water runoff If ground water is used for irrigation of crops, thus indirectly reaching surface water in the Nyl River as agricultural return flows, there may be a gradual increase in nitrate and salt concentrations in the receiving Nyl River over time. This could lead to the reduction of nitrates to ammonia and the impacts of increased nitrate and ammonia concentration on aquatic system as previously discussed. Water quality deterioration will especially affect fish species intolerant to water quality alteration but will have an impact on all aquatic fauna, causing a decline in diversity									
Decommissioning & Closure	Seepage from mined pits	Water quality Deterioration (Ingress). After closure, the open pits are likely to fill with water (from groundwater recharge, surface runoff or direct inflows from the Nyl River under flood conditions). Groundwater assessment found that water within the pits will become contaminated, notably by salts (especially sulphates, nitrates and chlorides) and metals (especially iron and aluminium). Contaminated water could potentially migrate from the pit into surrounding groundwater causing a contamination plume. The clay layer below the Nyl River will prevent groundwater from emerging at the surface and is therefore not likely to affect water quality in the river. In addition, sulphate levels will remain relatively low and the water will be slightly alkaline. Calcium concentrations will become elevated and groundwater pH is predicted to remain slightly elevated to an approximate value of 8 If groundwater will be used for crop irrigation adjacent to the river, it could eventually reach the Nyl River as agricultural return flows. It is likely that	1	1.00	2	5	5	3	4	1	Moderate

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		there will be some impact to water quality in the Nyl River, albeit indirectly and/or at lower concentrations. With ongoing irrigation over many years, there is likely to be a gradual accumulation of salts and metals at the soil surface, with ongoing evapotranspiration from irrigated fields. These may be washed into the Nyl River in surface runoff. This is likely to be accompanied by a proliferation in algae due to increased salts and nutrients (already evident in sections of the river). Toxic ammonia could potentially become problematic should the pH become too alkaline. Therefore, while there is likely to be some decline in water quality in the Nyl River, this will mainly result in the proliferation in algae, which may affect oxygen concentrations and be harmful to sensitive fish. The formation of toxic ammonia under alkaline conditions cannot be ruled out during dry periods. This is less likely to be problematic during wet periods due to dilution.									
Decommissioning & Closure	Decant from mined pits	After closure, the pits are likely to fill with water (from groundwater recharge, surface runoff or direct inflows from the Nyl River under flood conditions). The groundwater assessment found that water within the pits will become contaminated, notably by salts (especially sulphates, nitrates and chlorides) and metals (especially iron and aluminium). But that direct surface decanting of the pits is unlikely. Should it occur, decant could potentially have a significant negative effect on water quality in the receiving Nyl River, with negative consequences for sensitive species, such as Jonston's Topminnow.	D	1.00	2	5	3	2	4	1	Low
Decommissioning & Closure	Deconstruction of infrastructure and rehabilitation	Deconstruction of infrastructure and rehabilitation will cause mobilisation of sediments and erosion. This will result in increased sediment loads being carried downstream. The consequences of this include: > Increased turbidity; > Increased settling out of sediments in downstream reaches, causing changes in benthic habitat suitability and	D	1.00	2	3	2	4	4	1	Low

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
		colonisation by monospecific reed beds; > Change in instream and marginal habitats from slow-moving dispersive flows to an increasingly incised channel with higher flow velocities and fewer pool habitats									
Decommissioning & Closure	Seepage of pollutants from contaminated soils; Dust sediments; Stormwater flushing of old stockpile areas; Spills or leaks from vehicles and storage areas	Water quality deterioration due to spills/leaks. It is likely that residual seepage of pollutants will take place from contaminated soils left on site. Dust and sediments may contain contaminants that can pollute surface water. Storm water flushing old stockpile areas, as well as dust, can also carry pollutants into receiving water bodies. Spills or leaks from vehicles and storage areas during decommissioning also pose a risk to water quality.	D	1.00	1	3	2	3	2	2	Low
Decommissioning & Closure	Flow of contaminated water into river	Decline in ecological integrity and biodiversity: Where contaminated water reaches the Nyl River, there is likely to be a loss of sensitive species (such as Johnston's Topminnow) and an increase in abundance of more hardy species and exotic fish species (such as predatory mosquito fish). Predators higher up in the food chain (e.g. frogs, birds) may also be affected. Furthermore, the decline in habitats due to ongoing deposition of sediments, may result in continued declines in abundance and species composition. These impacts may be carried downstream, affecting ecosystems downstream of the study site.	D	1.00	3	5	4	2	4	1	Moderate

TABLE 12: ASSESSMENT OF IMPACTS ON WETLANDS (ECOPARTNERS, 2024)

Phase	Description of Aspect	Description of Impact	Impact Category	Nature	Extent	Duration	Intensity	Probability	Mitigation Potential	Reversibility	Significance Negative
Construction	Poorly supervised construction activities, incorrect placement of temporary stockpiles and construction camps, increased human and vehicle traffic in the area seeking access to the wetland area	Destruction and disturbance of wetland habitat	D	1.00	1	4	5	4	4	2	Moderate
Construction	Vegetation clearance, erosion risk associated with extensive areas of bare soils, topsoil and overburden stockpiles during rainfall events, earthworks, run-off from these areas	Increased sedimentation in the wetland	D	1.00	1	3	3	3	4	2	Low
Construction	Flood diversion berm could limit the extent of the flooded area on the floodplain during large flood events	Altered flow and flooding characteristics	D	1.00	2	2	3	3	2	4	Low
Construction	Increased turbidity and suspended solids derived from soil erosion on the bare soil surfaces, spillages and leakages of hazardous substances such as oil, diesel explosives etc., stockpiling and use of cement and other polluting products.	Water Quality Deterioration	D	1.00	2	2	3	3	2	4	Low
Operation	Expected increased groundwater drawdown and possible slight reduction in MAR	Decreased extent and duration of flooding	D	1.00	3	4	4	2	2	2	Moderate
Operation	Disturbances to the edge of the floodplain, increase in alien vegetation, influx of labour, increased poaching, altered flooding regime	Changes in habitat and loss of biodiversity	D	1.00	3	4	4	4	2	2	High
Operation	Infrastructural disturbances	Increase in alien invasive vegetation	D	1.00	2	4	2	4	3	4	Low
Operation	Irrigation with contaminated groundwater with surface runoff transporting contaminants into the wetland	Water quality deterioration	D	1.00	2	4	2	3	2	3	Low
Decommissioning & Closure	Deterioration of mine water over time, with elevated concentrations of sulphate and major ions likely, leading to contamination of the floodplain. In the absence of decant contaminated groundwater water used for irrigation by neighbouring landowners	Water quality deterioration	D	1.00	2	5	3	3	2	2	Moderate

5.4.2 Issues and responses from public consultation process

The public participation process is still ongoing and official issues and responses will be reported with the updated submission documents.

5.5 AREAS OF CONCERN / INFORMATION NOT SUFFICIENT

All current studies are based on predictions with the best available data used for all models. Information will only improve once more data is collected during the operational phase of the mine, when models can then be updated and better calibrated. The current level of information is sufficient for the development stage of the mine and should enable authorities to make an informed decision.

6 WATER AND WASTE MANAGEMENT

This discusses a summary of points related to water and waste issues as listed in the EMPr.

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

VPM does not have formalised corporate water and waste management policies, but the following will be adhered to:

- Process water must be re-used
- Storm water leaving the premises must not be polluted by the on-site activities
- Groundwater monitoring to determine the potential impact of the activities need to be analysed as specified
- Where possible waste must be recycled to reduce the impact on the environment (Prescali, 2015)

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

In terms of the proposed mining activities the following management measures are essential in implementing mitigation measures to prevent and/or reduce environmental impacts:

- Development of an Integrated Water Resource Management Plan
- Separation of clean and dirty water systems as part of a Storm Water Management Plan
- Reducing the catchment of dirty areas
- Diversion of drainage lines and release of diverted water in a responsible manner
- Containment of all contaminated water in dedicated design facilities
- Re-use, recycle and minimise or reduce all wastewater generated on the site (Prescali, 2015)

6.2.1 WASTE CLASSIFICATION AND MANAGEMENT

Waste will be classified as per the approved procedure dictated by the waste license application. Waste will be sorted and disposed based on the waste license.

6.3 PERFORMANCE OBJECTIVES / GOALS

6.3.1 ENVIRONMENTAL OBJECTIVES AND MITIGATION MEASURES

The Environmental Management Programme (EMPr) covers the construction and operational activities of the proposed Volspruit mine development amendments. The EMPr considers the results of the updated and new specialist studies as described in the Environmental Impact Assessment Report by EcoPartners (2024).

The objectives of the impact management process are as follows:

Soils

To conserve and protect site soils, through practical and feasible means, such that any impact on such does not impede Sylvania from achieving the stated 'ecological' and 'end land-use' objectives for the site at closure or any other environmental objectives applicable to construction- and operational related phases of mining.

Biodiversity

To, through practical and feasible means, optimise the human use value of the site whilst still improving biodiversity levels of the specific systems present over the mine site; toward meeting the stated 'ecological' and 'end land-use' objectives for the site at closure.

Surface- and Ground Water

To ensure that, through the implementation of appropriate pollution and storm water control and prevention measures and the efficient re-use and recapture of 'affected' water on site, that the Volspruit Mine does not unnecessarily overburden ground- and surface water resources (quality and quantity) on which adjacent communities and agri-industry in the catchment are dependent on for their livelihood and / or well-being.

Noise

No phase of mining should generate noise to the extent that such becomes a continual disturbance beyond current, baseline, ambient noise levels at the site boundary.

Air

To manage emissions generated on-site (incl. fugitive dust) in such a manner that is legally compliant, and protective of human health and well-being. To promote best environmental practice as far as practical and to provide a practical management system that facilitates implementation.

Waste

To manage all waste generated on-site in a manner that is protective of human health and

environmental resources, and that efforts to optimise waste recycling, reuse or recovery ultimately achieve a better environmental outcome than if waste were to be disposed of to landfill.

6.3.2 SURFACE WATER

VPM will aim to achieve the following:

- Mine infrastructure layout adjusted to avoid sensitive areas
- Contaminated water will be contained within an isolated dirty water system
- Generation of contaminated water to be reduced as far as possible. All pit water to be pumped to the irrigation dam on a continuous basis to minimise exposure to waste material
- The integrity of all dirty water dams will be maintained to prevent spillages, leaks and seepage from the impoundment to the natural water resource
- The bulk of the contained dirty water will be re-used and a small volume will be allowed to evaporate
- The location and sizing of the storm water drain must ensure that contaminated water emanating from the disturbed area is contained
- Annual update of the water balance for the VPM
- The storm water diversion trenches will be kept free from obstructions to ensure that their efficiency is not rendered negatively
- The water pollution control management facilities will be operated in such a way as to ensure that the available capacity and freeboard requirements as depicted in GN704 are adhere to at all times
- Water management measures for potable water supply and wastewater disposal measures will be implemented and maintained
- Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining
- Monitoring of surface water
- Construct flood protection berm infrastructure before any mining of the North Pit starts (Prescali, 2015)

6.3.3 GROUNDWATER

To ensure that, through the implementation of appropriate pollution and storm water control and prevention measures, and the efficient re-use and recapture of 'affected' water on site, that the VPM does not unnecessarily overburden ground- and surface water resources (quality and quantity) on which adjacent communities and agri-industry in the catchment are dependent on for their livelihood and / or well-being.

VPM will aim to achieve the following:

- Limit the use of groundwater from the Grasvally borehole to a minimum
- Implement measures to reduce potential contamination of groundwater on and off-site, but installing adequate liners and interception infrastructure

- Monitoring groundwater
- Reinstatement of water supply where groundwater supply to neighbours has been reduced due to mining activities

6.3.4 WASTE MANAGEMENT

Detailed waste management actions are described in the EMP. VPM will aim to achieve:

- Reduction of waste leaving the site to landfill by reducing waste generated and increasing recycling where possible
- Improve deposition of mineralised waste through best practice to ensure the least impact on water resources

6.3.5 MINE CLOSURE

The following closure objectives are planned (see Appendix O):

- North Pit – grazing potential land and where possible arable land for irrigation
- South Pit – pit lake with safety berm for aquaculture production
- Waste Rock Dump – wilderness potential land with limited grazing
- Tailings Storage Facility – wilderness potential land with limited grazing
- Other Areas – grazing potential land

6.4 MEASURES TO SUSTAIN AND ACHIEVE PERFORMANCE OBJECTIVES

VPM will develop an environmental management system (EMS) to implement with the necessary management- and operational procedure and regular review loops, to ensure that the mine's environmental performance improves over time.

6.5 OPTIONS ANALYSES AND MOTIVATION FOR IMPLEMENTATION OF PREFERRED OPTION

The following was taken into account over the span of developing the project since 2011:

- Footprint Alternatives – avoiding sensitive areas as far as possible
- North Pit design – moved out of the wetland area
- Flood protection berm location – moved out of the wetland area
- Rehabilitation – Concurrent rehabilitation and reduce disturbance impacts after closure

6.6 ACTION PLAN

Improvement actions planned for operational phase		
Process Water	Maintain Water Balance	Re-evaluate the use of more water efficient tailings disposal options
		Investigate the potential of different treatment options for irrigation water

Groundwater	Protect groundwater resources	Update the groundwater model with latest monitoring data in three years' time
		Update geochemical modelling with latest monitoring data in one years' time
		Investigate the feasibility of using pit dewatering boreholes for pumping access pit water to the irrigation dam

6.7 CONTROL AND MONITORING

See Section 5.3 of this report.

7 CONCLUSION

7.1 REGULATORY STATUS OF ACTIVITY

There is currently no approved water use license in place for the planned VPM.

7.2 STATEMENT ON WATER USES REQUIRING AUTHORISATION, DISPENSING WITH THE REQUIREMENT FOR A LICENCE AND POSSIBLE EXEMPTION FROM REGULATIONS

No water uses requiring authorisation, but dispensing with the requirement for a licence are applied for. The only exemptions applied for are those from GN704.

7.3 SECTION 27 MOTIVATION

7.3.1 EXISTING LAWFUL WATER USES

See Table 2 in Section 3.1.1. for a list of the existing lawful water uses, which the applicant is aware of, registered for the applicable properties, as received from DWS.

7.3.2 THE NEED TO REDRESS THE RESULTS OF PAST RACIAL AND GENDER DISCRIMINATION

Sylvania (Pty) Ltd owns Volspruit Mining Company (Pty) Ltd (VMC) and is an international company, registered as a 30% Black Empowered Company (Reg. No. 2010/019087/07) in South Africa.

VMC is committed to the development of the South African workforce and to the availability of the mining operations' skills and competence required for the successful mining and production of platinum group metals. The company is further committed to compile a Workforce Skills Plan and pay the required skills levies. VMC will at all times adhere to the requirements of the skills Development Act, the Skills Development Levies Act and any other legislation that has an impact on the skills development of the employees, including the Broad-Based Socio-Economic Development Charter for the Mining Industry. It will ensure that its workforce is trained, developed and empowered to be skilled, functionally literate and numerate and possesses the relevant skills required for the mining and production operation through the following five plans/initiatives:

- Skills Development Plan
- Career Progression (Path) Plan
- Mentorship Plan
- Internship Plan
- Employment Equity Plan

The actions are regulated by their approved Social and Labour Plan (SLP).

7.3.3 EFFICIENT AND BENEFICIAL USE OF WATER IN THE PUBLIC INTEREST

7.3.3.1 Taking of water

Potable water will mainly be obtained from abstracted borehole water and will be contained in a raw water reservoir. This water will be purified for domestic use by means of filters and UV technology. Water for mining activities will be obtained from contained dirty water in the pollution control dams as well as recycling of water from pit dewatering and return water dams. The overall impact from the mine will be beneficial to the area.

Excess pit water will be stored in the irrigation dam and would be used for dust suppression and potential future crop irrigation, should this prove feasible. As part of the mine's SLP, municipal water supply will also be provided to Mokopane, which have been struggling with potable water supply (Table 15).

7.3.3.2 Altering the natural characteristics of the wetland areas

The current planned mine layout will have minimal impact on the wetland. All infrastructure will be outside the wetland buffer zone. The proposed mining and infrastructure activities are unlikely to have a significant negative impact on the flow drivers of the affected section of the floodplain, particularly in the context of the findings related to the conceptual hillslope hydrology (WCS, 2023).

7.3.3.3 Waste disposal

Several Section 21(g) applications for the disposal of waste in a manner that may be detrimental to the environment, are made:

- Wastewater treatment works for sewage treatment~54 000m³/a
- WRD
- TSF
- PCDs~120 000m³ storage capacity
- RWD~355 000m³ storage capacity
- Irrigation dam~101 000m³ storage capacity
- Waste rock backfill to North Pit
- Open Pit~20 000m³ storage capacity
- Ore stockpiles
- Road construction with waste rock
- Dust suppression with pit water~6 200m³/a

7.3.3.4 Removing of water from the open pits

Water will be removed from the open pit areas to prevent contaminated water from leaving the area/zone of influence. Pit water will be used for dust suppression and potential future crop irrigation, to replace the irrigated fields destroyed by mining. To improve the quality of available water for irrigation, the use of pit dewatering boreholes will be investigated. The pumping is also needed to ensure that the mining activities can continue and for the safety of the workers.

7.3.4 THE SOCIO-ECONOMIC IMPACT OF THE WATER USE OR USES IF AUTHORISED

From a local policy perspective, the mining sector remains a priority for the Mogalakwena LM alongside agriculture and tourism, as it creates jobs for low and unskilled workers. Mining activities create opportunities for economic growth such as job creation that can cause an increase in household income and improve socio-economic conditions. The job opportunities offered may also involve skills training that will benefit employees. The mine will most likely source its operational resources from surrounding businesses, thus becoming a node for further economic growth noting the interlinkage of the industry to the economy.

The operational phase of the proposed mine has the potential of creating sustainable jobs that require different skillsets, which will benefit the local communities. The creation of long-term jobs will improve the income levels in the area and the workers' standard of living. Beyond these direct employment prospects, the operation of the mine can also have indirect employment effects on other sectors of the local economy. The direct employment of 708 persons relating to the management of the mine will be sustained throughout the facility's operations. As the production impact filters through the economy, a further 1 355 Full-Time Equivalent (FTE) jobs could be generated (Urban Econ, 2024). See Table 13 for more information on indirect FTE jobs in different sectors.

TABLE 13: A LIST OF DIRECT AND INDIRECT FTE JOBS TO BE CREATED BY THE MINE GOING AHEAD (URBAN ECON, 2024)

	Direct	Indirect	Induced	Total	Percentage (Total)
Agriculture	-	29	141	170	8,3%
Mining	708	21	4	733	35,5%
Manufacturing	-	49	55	104	5,0%
Electricity	-	32	6	38	1,8%
Water	-	13	2	15	0,7%
Building and Construction	-	109	21	130	6,3%
Trade and accommodation	-	95	101	196	9,5%
Transport and storage	-	51	18	69	3,3%
Financing	-	22	94	116	5,6%
Real estate and business services	-	154	136	291	14,1%
Government services	-	157	22	179	8,7%
Other	-	4	19	23	1,1%
Total	708	735	620	2 063	100,0%

Some negative socio-economic impacts are expected. See Table 3 for a discussion on how to manage these impacts.

TABLE 14: A LIST OF NEGATIVE SOCIO-ECONOMIC IMPACTS AND HOW VPM PLANS TO MANAGE IT

Aspects	Negative impact	How Volspruit Mining Company will address
Relocation of people/Loss of agricultural jobs	yes	Farm workers will be provided with an opportunity to be employed by the mine or with the LED project and future irrigation planned with mine water.
Influx of people to the area	yes	The mine will not be situated directly adjacent to any settlements, which will deter the influx of people. The mine will discourage the development of unsustainable settlements surrounding the mine.
Housing Demand	yes	The housing demand will increase, which could create artificially high housing prices. The mine will not be in a position to control housing prices, should this happen.

VPM has committed to a local economic development (LED) plan in the SLP. Table 15 shows the details of this plan. Implementation of this plan will assist in re-employing local farm workers effected by the mining development as well as contribute to water supply of the town.

TABLE 15: THE LED PLAN AS PROPOSED IN THE SLP FOR VPM (VMC, 2021)

Project Name	Water Supply Project for Mogalakwena Municipality					FY of Project Sheet	2020			
Background to project	The Mogalakwena Municipality approached Sylvania with a request for assistance with a planned project to augment water supply to Mokokopane. Lepela Water Association was appointed to manage the project. Voelpuit Mine will assist by completing a groundwater study, establishment of infrastructure to extract water from the underground aquifer and pumping infrastructure required to transfer water to an existing surface pipeline.					Project start date	December 2019			
						Project End Date	June 2021			
Project Partners	Mogalakwena Municipality Lepela Water Department of Water and Sanitation					Information Valid as at:	February 2021			
Project Incorporated into which IDP						Beneficiaries (Community Specific)	Broader Mogalakwena Community			
IDP Reference Number of Project	Total Expected Number of Jobs to be created Spin off employment opportunities	Male	Female	Youth	Disabled	Geographic Location of Project	Approximately 24° 19.927'S and 28° 58.417' on the farm Grasvalley, 16.5 kilometres SSW of Mokokopane			
		38	17	35	2					
		Male	Female	Youth	Disabled					
		15	9	16	2					
		Total Employment Opportunities Created:								
		Short Term	Medium Term	Long Term						
		27	18	8						
Output	Responsible Entity	Activity		Timesframe					Budget Allocation	
		KPA (key performance area)	KPI (key performance indicator)	Year 1	Year 2	Year 3	Year 4	Year 5		
Establish Borehole – Drill & Equip	Sylvania	Borehole Infrastructure	2 x 8" Borehole, 120m deep, delivering 80 l/s max with 45 kW pumps	R 2 850 000						R 2 850 000
Storage Dam	Sylvania	Water Storage	2 x 100 000 litre Galvanised	R 250 000						R 250 000

			1/6 max with 45 kW pumps						
Storage Dam	Sylvania	Water Storage	2 x 100,000 bbls Covered Reservoir	R-	R-	R120,000	R-	R-	R120,000
Water Treatment Plant	Sylvania	Water Treatment	Clarine dosing system 2gpl 85 l/s max + oil valves	R-	R-	R230,000	R-	R-	R230,000
Booster Pump Station	Sylvania	Water Pressurisation	2 x 100 kW pumps – duty and standby plus civils, piping, instruments	R-	R-	R1,120,000	R-	R-	R1,120,000
Electrical Infrastructure	Sylvania	Electrical Supply	Transformer, switchgear and cabling	R-	R-	R2,270,000	R-	R-	R2,270,000
Groundwater Studies and Reporting	Qlywale	Geological Studies and Permitting	Establish sustainable borehole yield and prepare report for VRI	R-	R-	R-	R-	R-	R-
Distribution Piping	Sylvania	Water Transport	MPVC Pipeline from Storage Dam to LWA Connection	R-	R-	R5,970,000	R-	R-	R5,970,000
Design and Engineering	G4EPS	Design and Engineering	Design, Drawings, Details, Procurement	R-	R1,040,000	R-	R-	R-	R1,040,000
Total Budget									R10,810,000

7.3.5 THE SOCIO-ECONOMIC IMPACT OF THE FAILURE TO AUTHORISE THE WATER USE (SECTION 27 (D)(II))

If this project does not continue, the applicant will be prevented to invest large sums of money reaching a desperate community in the form of salaries, which will have a direct impact on the local community. The presence of the mining activity, the employment of local persons and the utilisation of local services will result in an increased income for local communities and business and an increased tax base for traditional authorities and municipalities. These opportunities will be lost should the project not proceed, and will have consequences on local, regional, national and international scale (Prescali, 2015).

The status quo should exist and could have some growth through agricultural production improvements, which seems to be limited at this stage. The benefits of the project as listed below will be lost.

The VPM is the holder of a mining licence for the mining of PGMs, copper and nickel. PGM minerals are considered green minerals for the contribution made to the generation of green energy. The water uses are required to support the mining operation. The construction & operation of the mine development is furthermore likely to have the following benefits:

- Stimulation of the Local and National Economy – The initial capital investment involved in the construction of the mine is likely to contribute positively to the construction sector. In most cases, the basic resources will be sourced from local businesses and will thus, temporarily stimulate the local economy during the construction phase. If the resources are more specialized and not available in the immediate vicinity, the mine will depend on businesses outside of its immediate vicinity and thus, cause a stimulation of a section of the national economy. Additional workers being employed during the operational phase of 20 years as well as products being sold to the relevant buyers will stimulate local and national economies.
- Creation of Employment Opportunities at a Local and National Level – Given the high unemployment rates in the municipal area, the construction and operation phases will likely create temporary employment for local communities close to the proposed development.
- Increase in Household Income – The construction phase will likely create an increase in household income levels due to the increase in demand for employment in the region. The proposed mining development is likely to create sustainable jobs within its local community and, therefore, benefit areas such as Mokopane and Moletlane.
- Skills Development due to the Creation of New Employment Opportunities – The area is likely to be able to provide unskilled and low skilled labourers for the mine's construction activities, as well as some of the more experienced mine workers that are required during construction. The sustainable impact of skills development will thus improve the skills profile for the local economy. Skills development is imperative for local communities and the initiatives planned by the mine developer during the operational phase may contribute to the current status of skills development in the area.
- Improved Living Standards of Positively Affected Households – A potential to improve the living standards of a local community through the direct benefits as well as the indirect job opportunities likely to be created through the economic linkages of the proposed development.

- Government Revenue Increase Due to Capital Expenditure – Goods and services will be required and purchased for the mining-related infrastructure required for the operations of the proposed mine. Companies are obliged to pay the government income taxes and payroll taxes. Various taxes received by the government improves the government's ability to deliver services and an increase in national fiscus will prevail.
- VPM will contribute about 1.8% of the national platinum production of South Africa (Ecopartners, 2024).

7.3.6 THE CATCHMENT MANAGEMENT STRATEGY APPLICABLE TO THE RESOURCE (SECTION 27 (E))

The former Department of Water Affairs and Forestry is responsible for the National Water Resource Strategy for South Africa. This strategy defined key elements for a broad strategic perspective for the Limpopo Water Management Area. According to the National Water Act, 1998 (Act 36 of 1998), a Catchment Management Agency should be established for each water management area. The Limpopo-Olifants CMA manages the Limpopo catchment. The established Catchment Management Agency will be responsible for the Catchment Management Strategy for each water management unit. According to the 2024 annual report of the Limpopo-Olifants CMA, the strategy is being compiled.

7.3.7 THE LIKELY EFFECT OF THE WATER USE ON WATER USERS (SECTION 27 (F))

It is not expected that other water uses will be directly affected by the authorization of the Water Use License, to the extent that impacts cannot be mitigated. A groundwater drawdown is predicted and is shown in the geohydrological reports compiled for Volspruit. As a result of this, the water levels in one or two boreholes may decrease within the normal level fluctuations for the region for a short time period. This will be mitigated by the supply of excess mine water for irrigation and potentially potable water if that becomes necessary.

No significant impacts on water quality are predicted and the acid base accounting shows no risk for acid mine drainage to occur. Should quality impacts prove significant, the water would be treated to acceptable quality levels (GPT, 2024). The SLP project will also add to the potable water supply of Mokopane.

No negative effects are expected on the surface water of the Nyl River due to the fact that it was proven that there is a clay layer separating the hydrological interaction between the surface and ground water systems. There are however significant benefits to the social and economic environment if the water use is authorized.

7.3.8 THE CLASS AND THE RESOURCE QUALITY OBJECTIVES OF THE WATER RESOURCE (SECTION 27 (G))

A comprehensive reserve determination was conducted by the DWA in 2010 and the results from this determination are discussed. The Limpopo Water Management Area, specifically A61E has a PES category of Class C: Moderately Modified and the recommended Ecological Class is Class B. The PES in the Nyl River was confirmed as Class C by information from SANBI (NFEPA_Rivers).

Management area

Drainage area: A61E

River name: Nyl River

Management Unit: Limpopo Water Management Area

7.3.8.1 Resource Objectives and Standards

There was a complete reserve conducted for the Limpopo Water Management Area in 2010. In such an instance, the Department of Water and Sanitation compile objectives based on the downstream users once a water use licence has been applied for (during the reserve determination phase). The Target Water Quality Ranges (TWQR) for the A61E can be seen in Table 16.

TABLE 16: TARGET WATER QUALITY OBJECTIVES (PRESCALI, 2015)

Chemical Parameter	Target Water Quality Ranges		
	Class 0	Class I	Class II
pH	6 - 9	5 – 6 & 9 – 9.5	4-5 & > 9.5 - 10
Electrical Conductivity	< 70	70 -150	150 – 370
Calcium as Ca	< 80	80 – 150	150 – 300
Magnesium as Mg	< 70	70 – 100	100 – 200
Sodium as Na	< 100	100 – 200	200 – 400
Chloride as Cl	< 100	100 – 200	200 - 600
Sulphate as SO ₄	< 200	200 – 400	400 – 600
Nitrate as NO _x – N	< 6	6 – 10	10 – 20
Fluoride as F	< 0.7	0.7 -1.0	1.0 – 1.5

There were no approved reserve quality guidelines available for the Nylsvlei Catchment, therefor the quaternary catchment next to the Nylsvlei was used as an indication and data is provided below. The Mogalakwena River is located in the A61F Quaternary Catchment and has a PES of Class C and an Ecological Importance and Sensitivity of High. The area is fairly similar to the Nylsvlei due to a high EIS, which is due to the occurrence of important conservation and natural areas, such as the upstream RAMSAR site, rare and endangered species, as well as species richness and unique endemic species.

TABLE 17: PRELIMINARY DETERMINATION OF THE RESERVE FOR WATER QUALITY (DWAF, 2010)

Chemical Parameter	Preliminary reserve		
	Ecological Reserve	Basic Human Needs Reserve	Water Quality Reserve
pH	>6.5 < 9.0	5 –9.5	>6.5 < 9.0
DO	>6.5	N/A	> 6.5
MgSO ₄	< 37	N/A	< 37
Na ₂ SO ₄	< 20	N/A	< 20

MgCl ₂	< 51	N/A	< 51
CaCl ₂	< 63	N/A	< 63
NaCl	< 45	N/A	< 45
CaSO ₄	< 351	N/A	< 351
Calcium as Ca	< 23	<150	< 23
Magnesium as Mg	< 14	< 100	< 14
Sodium as Na	< 85	<200	< 85
Chloride as Cl	< 234	< 200	< 200
Sulphate as SO ₄	< 21	< 400	< 21
Nitrate as NO _x – N	< 4.0	N/A	< 4.0
Phosphate (PO ₄)	< 0.07	N/A	< 0.07
Ammonia	< 0.007	N/A	< 0.007

7.3.8.2 Management area

The area to be developed (A61E) by the VPM project are under the jurisdiction of the Limpopo Water Management Area (WMA).

7.3.8.3 Preliminary Management Class

The Preliminary present and future River Management Class of the drainage area is presented in Table 18.

TABLE 18: PRELIMINARY RIVER MANAGEMENT CLASS (DWAF, 2010)

River Class	Perspective	Preliminary Management Class	
		Present	Future
Natural	No or negligible modification of the resource.		√
Good	Moderately used or impacted resource.	√	
Fair	Heavily used or impacted resource.		
Poor	Unacceptable degraded resource (This is not a management class but a description of an unacceptable state)		

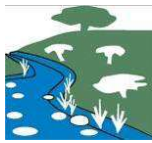
7.3.8.4 Preliminary Resource Quality Objectives

The water resources in the area are largely intact and the following biological parameters (Table 19) and habitat (Table 20) is anticipated.

TABLE 19: BIOLOGICAL PARAMETERS (DWAF, 2010)

Indicators	Present Status	Management class / target / objective
 Macro-invertebrate Integrity	 Good	 Good
 Fish Assemblage Integrity	 Natural	 Natural
 Water Quality	 Good	 Good

TABLE 20: HABITAT INDICES (DWAF, 2010)

Indicators	Present Status	Management class / target / objective
 1) In-stream Habitat (Dark green) 2) Riparian Zone Habitat (Light blue) 3) Riparian Vegetation Integrity (Light green)	 1) Natural 2) Natural 3) Good	 1) Natural 2) Natural 3) Good

7.3.9 INVESTMENTS ALREADY MADE BY THE WATER USER (SECTION 27 (H))

The applicant made various investments in terms of exploration for minerals, appointment of specialists to conduct investigations in support of the applications for various authorisations. The amounts listed in Table 21 have already been spent on the project. In total 84.2 million rand have been spent.

TABLE 21: AMOUNTS OF MONEY ALREADY SPEND BY THE APPLICANT ON THE VOLSPRUIT PROJECT (VMC, 2025)

Item	Amount
Exploration	R 55.1m
EIA, WULA etc.	R 17.3m
SLP	R 4.5m
Other	R 7.3m
Total	R 84.2m

7.3.10 THE STRATEGIC IMPORTANCE OF THE WATER USE TO BE AUTHORIZED (SECTION 27 (l))

The South African PGM mining industry, which produces the full suite of PGMs (platinum, palladium, rhodium, ruthenium, iridium, and osmium), is a leading producer globally. It is the largest producer of platinum and rhodium and the second largest producer of palladium in the world (EcoPartners, 2024).

For the Volspruit PGM mining project and associated water uses, the mining activity would have positive social and economic benefits that would be experienced on local, regional, provincial and national scales. The benefits of the proposed mining activities include:

- Security of employment and subsequent contribution to stabilizing the economic activity in the area
- An increase in foreign exchange earnings for the country
- The provisioning of PGM metals to national and international production
- Has an approved Social and Labour Plan (SLP) ensuring skills development to much needed workers and communities
- Internal and External learnerships offered to workers being able to work at VPM
- School support and Post Matric programmes
- Registration with SETA from year one of mining (Prescali, 2015)

If the project does not proceed, there will be a decrease in foreign exchange earnings for the country, which would alternatively remain at status quo. Further to this, South Africa currently does not have the ability to transform coal into cheap energy, and coal is not as competitive as an energy source as it used to be, in fact the use of coal as an energy source is frowned upon. It is critical for the South African economy to identify new sources of comparative advantage, considering the global changes that the energy transition is creating. The international climate change goals offer the South African economy an alternative to grow into decarbonization. The responsible mining of PGMs, forms the foundation of “green growth” opportunities that will enable a more sustainable resilient world. South Africa holds about 80% of the world’s platinum reserves. The use of PGMs produced as part of the platinum mining operations spreads over a vast array of products such as:

- PGMs are used in auto catalysts to transform noxious vehicle emission gases – hydrocarbons, nitrogen oxide and carbon monoxide – into the more benign components of water, carbon dioxide and nitrogen gas.
- Iridium is a key mineral to the hydrogen economy and is used in proton exchange membrane (PEM) electrolyzers with platinum to produce hydrogen
- Platinum is an effective catalyst for proton exchange membrane (PEM) fuel cells. Ruthenium in PEM fuel cells with platinum is scalable from small devices to heavy duty transport (EcoPartners, 2024)

The above will become critical energy elements and it would be of national importance to supply the international market with these.

In 2021, the 277 t of PGMs produced by 172 159 direct employees for R347-billion, represented nearly 40% of the total minerals sold by South Africa. In 2023, South Africa exported platinum valued at 10,726,818 (USD thousand). Roughly 500 000 people have jobs within the PGMs sector via direct and indirect jobs, which is important to the economy of South Africa. The new South African National Platinum Strategy aims to create over one million jobs and contribute R8.2 trillion to the economy by 2050, showing that the industry is expected to grow (EcoPartners, 2024). There is a very clear economic contribution to be made by further platinum mining.

7.3.11 THE QUANTITY OF WATER REQUIRED FOR THE RESERVE (SECTION 27 (J))

Table 22 shows the availability of water as calculated for the A61E quaternary catchment. An average annual groundwater recharge of 101.2 million m³ (Mm³) of which 0.62 Mm³ per annum (6.1%) is required for the Reserve is received by A61E quaternary catchment (Buchner, 2007).

TABLE 22: WATER AVAILABILITY OF THE A61E CATCHMENT (DWAF, 2010)

Natural resources		Usable return flow			Total local yield (Mm ³) (1)	Transfers in (Mm ³)	Grand total (Mm ³)
Surface water (Mm ³)	Groundwater (Mm ³) (2)	Irrigation (Mm ³)	Urban (Mm ³)	Mining & Bulk (Mm ³)			
100	70	34	5	1	210	91	301
1. After allowance for the impacts on yield of ecological component of Reserve, river losses, alien vegetation, dry land agriculture and urban runoff. 2. The groundwater availability is underestimated.							

The in-stream flow requirements (percentage of the virgin MAR) required from base flow is based on the Maintenance Low Flow (MLF) for Class C (Prescali, 2015).

7.3.12 THE DURATION OF WATER USE (SECTION 21 (K))

The water uses associated for the mine will be required for the maximum of 20 years (Life of Mine is estimated as 19 years). Closure and Rehabilitation will be additional two/three years. This means that a water use license is needed for a period of 25 years.

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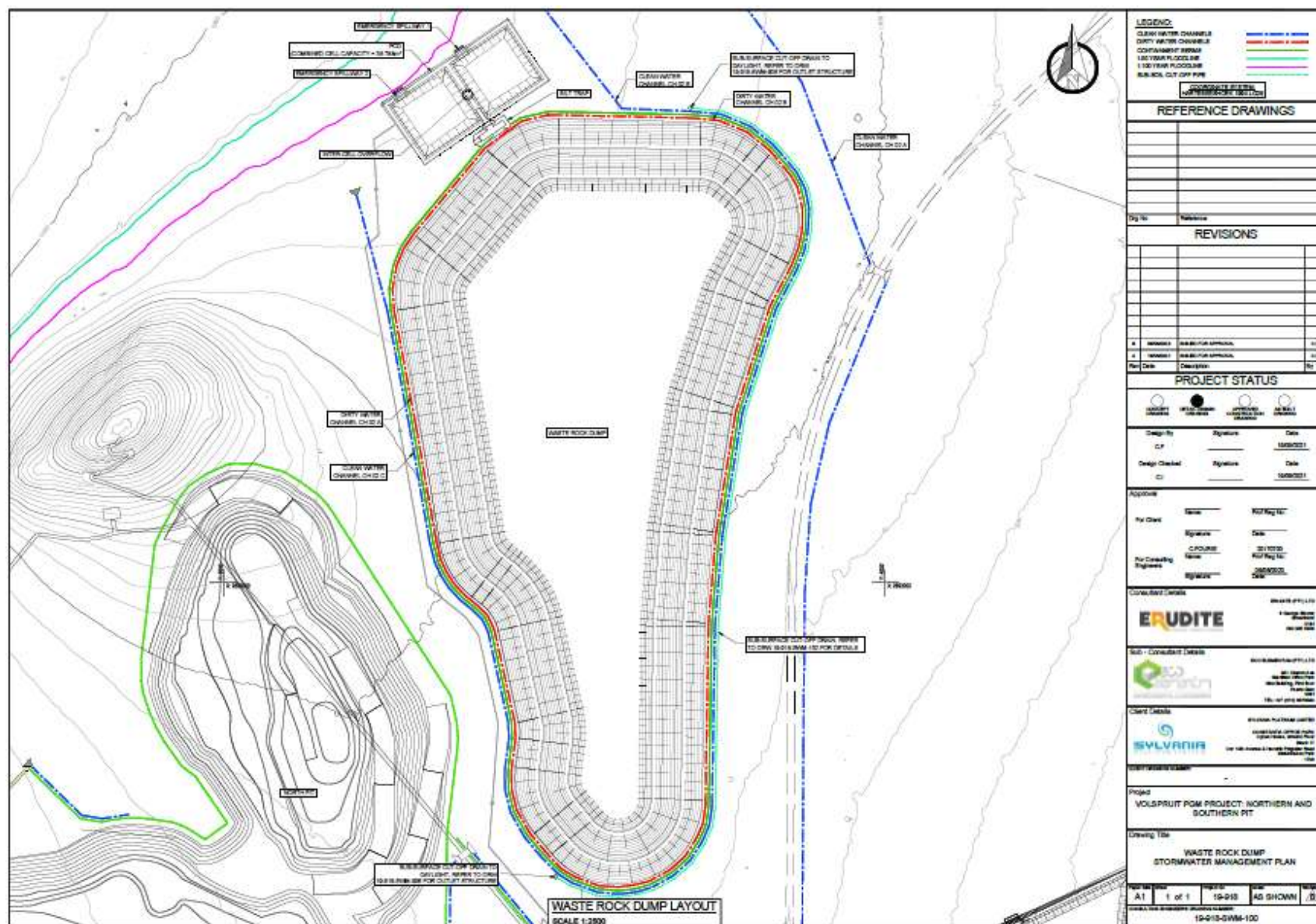
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9 APPENDICES

9.1 APPENDIX A: STORM WATER MANAGEMENT PLANS





REFERENCE DRAWINGS			
Cp. No.		Reference	
REVISIONS			
PROJECT STATUS			
☐ PROJECT INITIATED ☐ PROJECT ON HOLD ☐ PROJECT ON PAUSE ☐ PROJECT COMPLETED		☐ PROJECT ON HOLD ☐ PROJECT ON PAUSE ☐ PROJECT COMPLETED	
Design By C.P.		Signature Date (MM/DD/YYYY)	
Design Checked C.I.		Signature Date (MM/DD/YYYY)	
Approval			
For (Date)		For (Signature)	
Signature		Date	
For Consulting Engineer		For (Signature)	
Signature		Date	
Consultant Details			
		4000 West 10th Avenue Suite 100 Denver, CO 80202 Tel: 303.733.1111 Fax: 303.733.1112 Email: info@erudite.com	
Sub-Consultant Details			
		4000 West 10th Avenue Suite 100 Denver, CO 80202 Tel: 303.733.1111 Fax: 303.733.1112 Email: info@erudite.com	
Client Details			
		4000 West 10th Avenue Suite 100 Denver, CO 80202 Tel: 303.733.1111 Fax: 303.733.1112 Email: info@erudite.com	
Project			
VOLSPRUIT PGM PROJECT: NORTHERN AND SOUTHERN PIT			
Drawing Title			
FLOOD DIVERSION BERM CROSS SECTIONS			
Date: 11/11/11 Sheet: 1 of 1 Project: 15-015 As Shown: 15-015-SWM-701			

1. IF BOTH MATERIAL IS DISCLOSED ACCEPTABLE, TP AND COMPLY IN DETAIL WITH THE FOLLOWING STANDARDS TO THE BENEFIT OF THE AGENT COMPANY.
2. IF BOTH MATERIAL IS NOT DISCLOSED ACCEPTABLE, IF FREQUENT, IMPROVE TO THE PLACE OF THE AGENT AND COMPLY TO THE BENEFIT OF THE AGENT COMPANY. FINAL COMPLETED LAMIN TO BE AT LEAST 0.001 INCH THICK.
3. COMPLY TO BE EVALUATED IN A FINAL INSPECTION WITH THE AGENT COMPANY.



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REVISIONS

[illegible]

A.	UNIT 10001	SUBJECT FOR APPROVAL	C
Rev	Date	Description	By

 CONCEPT
DRAWING
 APPROVAL
DRAWING
 APPROVED
CONSTRUCTION
 AS BUILT
DRAWING

Design By	Signature	Date
R.H.		26/10/2021
Design Checked	Signature	Date
C.P.		26/10/2021

For Class	_____	_____	_____
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For Consulting Engineers	Signature	C. POLPES P.E. 2010270	20/02/2019 Date
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ERUDITE

SYLVANIA

VOLSPRINT PGM PROJECT:
NORTHERN AND SOUTHERN PITSCLEANWATER CHANNELS - FAITH SPARKS INC.
SECTION AND DETAIL 80

A1	Training for 12-215-SWM 001	Ver No A	Date AS SHON
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9.2 APPENDIX B: ECOELEMENTUM DESIGN REPORT

9.3 APPENDIX C: JOHN ANNANDALE IRRIGATION REPORT

9.4 APPENDIX D: MILLS WATER GEOCHEMISTRY REPORT

9.5 APPENDIX E: WATER BALANCE REPORT

9.6 APPENDIX F: PROF CLAASEN SOIL REPORT

9.7 APPENDIX G: SURFACE WATER REPORT

9.8 APPENDIX H: GROUNDWATER REPORT

9.9 APPENDIX I: BIODIVERSITY REPORT

9.10 APPENDIX J: AQUATIC BIODIVERSITY REPORT

9.11 APPENDIX K: WETLANDS STUDY

9.12 APPENDIX L: HYDROPEDOLOGY REPORT

9.13 APPENDIX M: ENVIRO-INSIGHT ANIMAL STUDY

9.14 APPENDIX N: URBAN ECON SOCIO-ECONOMIC STUDY

9.15 APPENDIX O: CLOSURE PLAN