INTEGRATED WATER AND WASTE MANAGEMENT PLAN

PREPARED FOR MOOIPLAATS COLLIERY

2020

1290: Integrated Water and Waste Management Plan for Mooiplaats Colliery

DOCUMENT CONTROL

	Name	Signature	Date
Compiled:	Brian Whitfield		24 February 2020
Reviewed:	Liam Whitlow	pp. 	27 February 2020
Authorized:	Adri Joubert		17 March 2020

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TABLE OF CONTENTS

LIST OF FIGURES:

LIST OF TABLES:

LIST OF APPENDICES:

List of Abbreviations

ABET	:	Adults Basic Education Training
BOD	:	Biological Oxygen Demand
CMA	:	Catchment Management Area
CMS	:	Catchment Management Strategy
COD	:	Chemical Oxygen Demand
DEA	:	Department of Environmental Affairs[1]
DMR	:	Department of Mineral Resources[2]
DWS	:	Department of Water and Sanitation[3]
EAP	:	Environmental Assessment Practitioner
ECO	:	Environmental Control Officer
EI	:	Ecological Importance
EIA	:	Environmental Impact Assessment
EIS	:	Ecological Importance and Sensitivity
EMP	:	Environmental Management Plan
EMPr	:	Environmental Management Program
EMS	:	Environmental Management System
EO	:	Environmental Officer
ES	:	Ecological Sensitivity
GSW	:	Geo Soil and Water cc
GDP	:	Gross Domestic Product
HRDP	:	Human Resources Development Programme
I&AP	:	Interested and Affected Party
IDP	:	Integrated Development Plan
ISO	:	International Organisation for Standardisation
IUA	:	Unit of Analysis

[1] This Ministry was recently renamed as Department of Environment Forestry and Fisheries (DEFF). All reference in this report to DEA should be read synonymously with DEFF.

[2] This Ministry was recently renamed as Department of Mineral Resources and Energy (DMRE). All reference in this report to DMR should be read synonymously with DMRE.

[3] This Ministry was recently renamed as Department of Human Settlements Water and Sanitation (DHSWS). All reference in this report to DWS should be read synonymously with DHSWS.

IWWMP:		Integrated Water and Waste Management Plan
LED	:	Local Economic Development
LoM	:	Life of Mine
MAE	:	Mean Annual Evaporation
mamsl	:	Metres Above Mean Sea Level
MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
MPRDA	:	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MSDS	:	Material Safety Data Sheet
NEMA	:	National Environmental Management Act, (Act 107 of 1998).
NEMBA	:	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA:		National Environmental Management: Waste Act (Act 59 of 2008)
NFEPA	:	National Freshwater Ecosystem Priority Areas
NWA	:	National Water Act (Act 36 of 1998)
NWRS	:	National Water Resource Strategy
PCD	:	Pollution Control Dam
PES	:	Present Ecological Status
PPP	:	Public Participation Process
PPR	:	Public Participation Report
Ptn	:	Portion
RE	:	Remaining Extent (in relation to farms and portions)
RQO	:	Resource Quality Objectives
SANS	:	South African National Standards
SASS	:	South African Scoring System
SAWQG:		South African Water Quality Guidelines
Sc	:	Specific Storage
SDS	:	Safety Data Sheet
SHE	:	Safety, Health and Environmental
SHEQ	:	Safety, Health, Environment and Quality
SLP	:	Social and Labour Plan
SWMP	:	Storm Water Management Plan

TDS	:	Total Dissolved Solids
WARMS	:	Water Authorisation Registration and Management System
WMA	:	Water Management Area
WML	:	Waste Management License
WMS	:	Waste Management Strategy
WCDSS	:	Water Conservation, Demand and Supply Strategy
WUL	:	Water Use Licence
WULA	:	Water Use Licence Application

1 INTRODUCTION

Environmental Impact Management Services (EIMS) (Pty) Ltd. was appointed by Geo Soil and Water CC. to assist Mooiplaats Colliery (hereafter referred to as the "Applicant"), with the compilation of an Integrated Water and Waste Management Plan (IWWMP) in-line with Department of Water & Sanitation (DWS) conditions to support an Integrated Water Use Licence Application (IWULA). Mooiplaats Colliery has an existing Water Use Licence (Ref.no.: 08/C11B/AGJ/2141) issued on 02/05/2013 (Appendix A). However, Mooiplaats Colliery has recently concluded a Section 102 application in terms of the MPRDA for the inclusion of two prospecting rights[4] into the existing mining right. Furthermore, Mooiplaats Colliery is also in the process of including two additional areas from the adjacent Vunene Mining Right into the Mooiplaats Colliery Mining Right though a Section 102 Application. Mooiplaats Colliery is therefore required to apply for all new Section 21 water uses that will be triggered by the inclusion of the additional areas into the Mining Right. The water use audit that was conducted in 2018 also identified certain water uses that have not been licenced within the Mooiplaats Colliery Mining Right as well as coordinates of licenced water uses that are incorrect. These new water uses and amendments to coordinates are included in this IWULA.

Relevant information from numerous existing sources were integrated and is presented in this document which follows the template provided by the IWWMP Guideline (DWA, 2010) and GNR 267 (2017) in support of the IWWMP Compilation. Table 1 below provides an overview of the existing documentation that was collated for the compilation of the IWWMP.

The Mooiplaats Colliery is located approximately 18km south of the town of Ermelo, between the N2 and N11, and lies to the south of the Eskom Camden Power Station which falls within the municipal boundaries of the Gert Sibande District Municipality, Mpumalanga Province. The mine has an existing WUL (Ref #; 08/C11B/AGJ/2141). Mooiplaats Colliery has a mining right (MP 30/5/1/2/68MR - Appendix B) in terms of the MPRDA for the Mooiplaats Colliery.

Table 1: Existing Reports Used to Compile the IWWMP

Author	Document Title
Envass	IWWMP-REP-13-079-16_17. Integrated Water and Waste Management Plan – 2017
EIMS	Annual External IWUL Audit Report, Mooiplaats Colliery. 2018.
GSW	Quarterly Water Quality Report 3-2018 01 October to 31 December 2018. Mooiplaats Colliery.

[4] 667PR over Portions 2, 3 and the remaining extent of the farm Klipbank 296IT and 677 PR over Portions 1, 2 and the remaining extent of the farm Adrionople 296IT.

Table 2: Details of the applicant

	Details
Company	Langcarel Rf (Pty) Ltd.
Name	Louis Loubser (CEO)
Telephone	+27 10 003 8075
E-mail Address	louis.loubser@mooiplaatscoal.co.za
Physical Address	4 Sederberg Road Alrode South Gauteng 1451

1.1 ACTIVITY BACKGROUND

Mooiplaats Colliery is an underground coal mine that utilises the board and pillar mining method and making use of continuous miners for optimal coal mining. Access to the underground workings is obtained through a single decline box cut, situated near the northern boundary of the Mooiplaats property.

1.2 REGIONAL SETTING AND LOCATION OF ACTIVITY

The Mooiplaats Colliery is located approximately 18 km south of the town of Ermelo, between the N2 and N11, and lies to the south of the Eskom Camden Power Station. The Colliery is located on portions 1, 2, 7, 8 and 9 of the farm Mooiplaats 290 IT, portions 0, 1 and 2 of the farm Adrianople 296 IT and portions 0, 2 and 3 of the farm Klipbank 295 IT and falls within the municipal boundaries of the Gert Sibande District Municipality, Mpumalanga Province (refer to Figure 1).

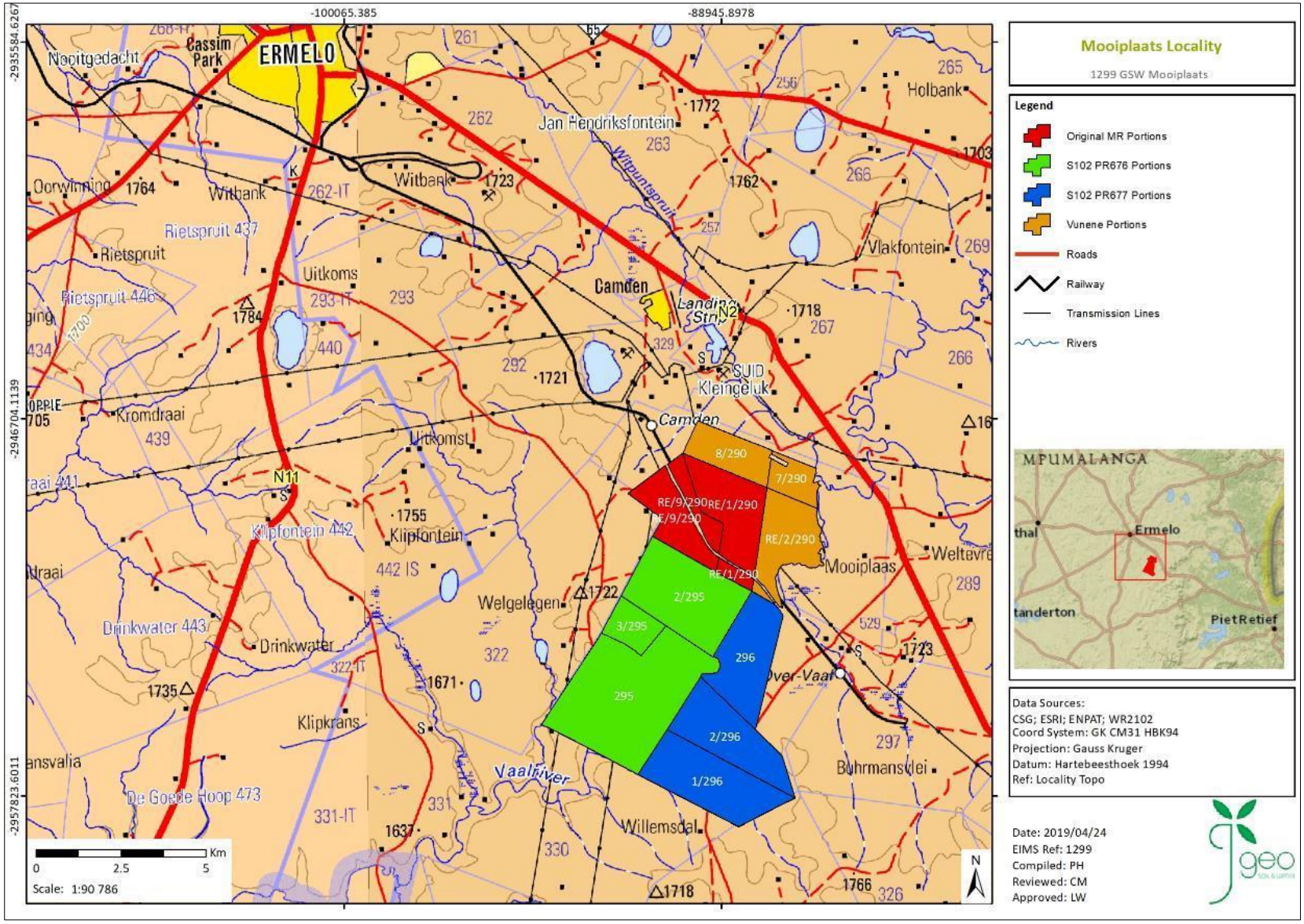


Figure 1: Locality of the Mooiplaats Colliery

1.3 PROPERTY DESCRIPTION

Table 3 below indicates which farms and farm portions form part of the Mooiplaats Colliery Mining Right (including the 3 proposed Mooiplaats Colliery Vunene project areas) and indicate the owner as well as the title deed of the property.

Table 3: Properties that form part of the Mooiplaats Colliery

Farm Description	Owner	Tittle Deed	Mineral Tenure Status
Portion 1 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T13234/79	Mooiplaats Original MR (MR68)
Portion 9 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T13234/79	Mooiplaats Original MR (MR68)
Remainder of Portion 2 of Mooiplaats 290 IT	Eglin Investments No. 44 (Pty) Ltd.	T84901/2002	Vunene Area subject to S102 (under application)
Portion 7 of Mooiplaats 290 IT	National Government of South Africa	T2301/2008	Vunene Area subject to S102 (under application)
Portion 8 of Mooiplaats 290 IT	National Government of South Africa	T2301/2008	Vunene Area subject to S102 (under application)
Portion 0 (Re) of Klipbank 295 IT	Madevu Farming Inv (Pty) Ltd.	Unknown	Mooiplaats South (PR 676 already incorporated into MR68 through S102)
Portion 2 of Klipbank 295 IT	Madevu Farming Inv (Pty) Ltd.	T16190/2018	Mooiplaats South (PR 676 already incorporated into MR68 through S102)
Portion 3 of Klipbank 295 IT	Mr. Hendrik Reyneke	T135860/1999	Mooiplaats South (PR 676 already incorporated into MR68 through S102)
Portion 0 (Re) of Adrianople 296 IT	Rassie Saaiman Trust	T14247/2018	Mooiplaats South (PR 677 already incorporated into MR68 through S102)

Farm Description	Owner	Tittle Deed	Mineral Tenure Status
Portion 1 of Adrianople 296 IT	Lood De Jager Trust	T138998/1997	Mooiplaats South (PR 677 already incorporated into MR68 through S102)
Portion 2 of Adrianople 296 IT	Willem Smuts	T5414/2008	Mooiplaats South (PR 677 already incorporated into MR68 through S102)

1.4 PURPOSE OF IWWMP

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

- Provide the regulatory authorities with focused and structured information not only to meet their general information needs, but also to articulate the required management measures and actions to achieve the water and waste related performance on an on-going basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.
- The IWWMP should be used in conjunction with other guidelines developed by DWS, such as the External Guideline on the Water Use Authorisation Process and the series of Best Practical Guidelines for water resource protection in the Industries and Mines. The Department and/or relevant Catchment Management Agencies (CMA) implement the integrated water resource management (IWRM) at source by means of an IWWMP.
- The Department requires an IWWMP as a simple feasible, implementable plan for water users based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), Catchment Management Strategy (CMS), Resource Quality Objectives (RQO's) and sensitivity of the receiving water resource, upstream and downstream cumulative impacts of water use activities, external water use authorisation guidelines, as well as water use specific supplementary information requirements. The most important component of the IWWMP development process is the formulation of various strategies, goals and objectives for the water use or waste management of an activity, in accordance with the set philosophies and policies. The policies must address the four key areas related to IWWMP development, namely process water, storm water, groundwater and waste.

The purpose of an IWWMP is as follows:

- Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects (e.g. process water balances, storm water management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimization and recycling) of the specific activity, in order to meet

set goals and objectives, in accordance with Integrated Water Resources Management principles;

- Provision of management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
- Documentation of all the relevant information, as specified in this guideline, to enable the Department to make the decision regarding the authorisation of a water use;
- Clarification of the content of the IWWMP for DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the content of an IWWMP;
- Standardisation of the format of the supporting documentation which the Department requires during submission of a WULA;
- Provision of guidance on the content of information required in an IWWMP as part of the water use authorisation process and level of detail that the Department requires to enable them to evaluate the supporting documentation to make a decision on authorisation water use; and
- Ensuring that a consistent approach is adopted by the Department and the various Regional Offices and CMA's with regards to IWWMPs.

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

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

- As the supporting technical documentation for any IWULA (the main purpose of this document);
- When converting Existing Lawful Use (ELU) to licensed water use;
- In order to comply with the conditions of an existing water use licence; and
- The implementation of the IWWMP is an interactive process whereas its performance is monitored on an annual basis. The assessment of the IWWMP document itself, as well as the submission of information relating to monitoring and auditing conducted in terms of it could lead to its shortcomings, which must be addressed in the annual update of the action plan of the IWWMP. This will ensure that the concept of continual improvement is applied throughout the life cycle of the activity (Operational Guideline: IWWMP dated February 2010 and GNR 267, the Water Use Licence Application and Appeals Regulations, dated March 2017).

In line with the guidelines of the DWS Operational Guideline: Integrated Waste and Water Management Plan (2010) and GNR 267, Water Use Licence Application and Appeals Regulations (2017), Figure 2 and Table 4

provides a guide to the structure of the IWWMP. Headings and sub-headings within this IWWMP are in line with required table of contents as specified within Annexure D of GNR 267.

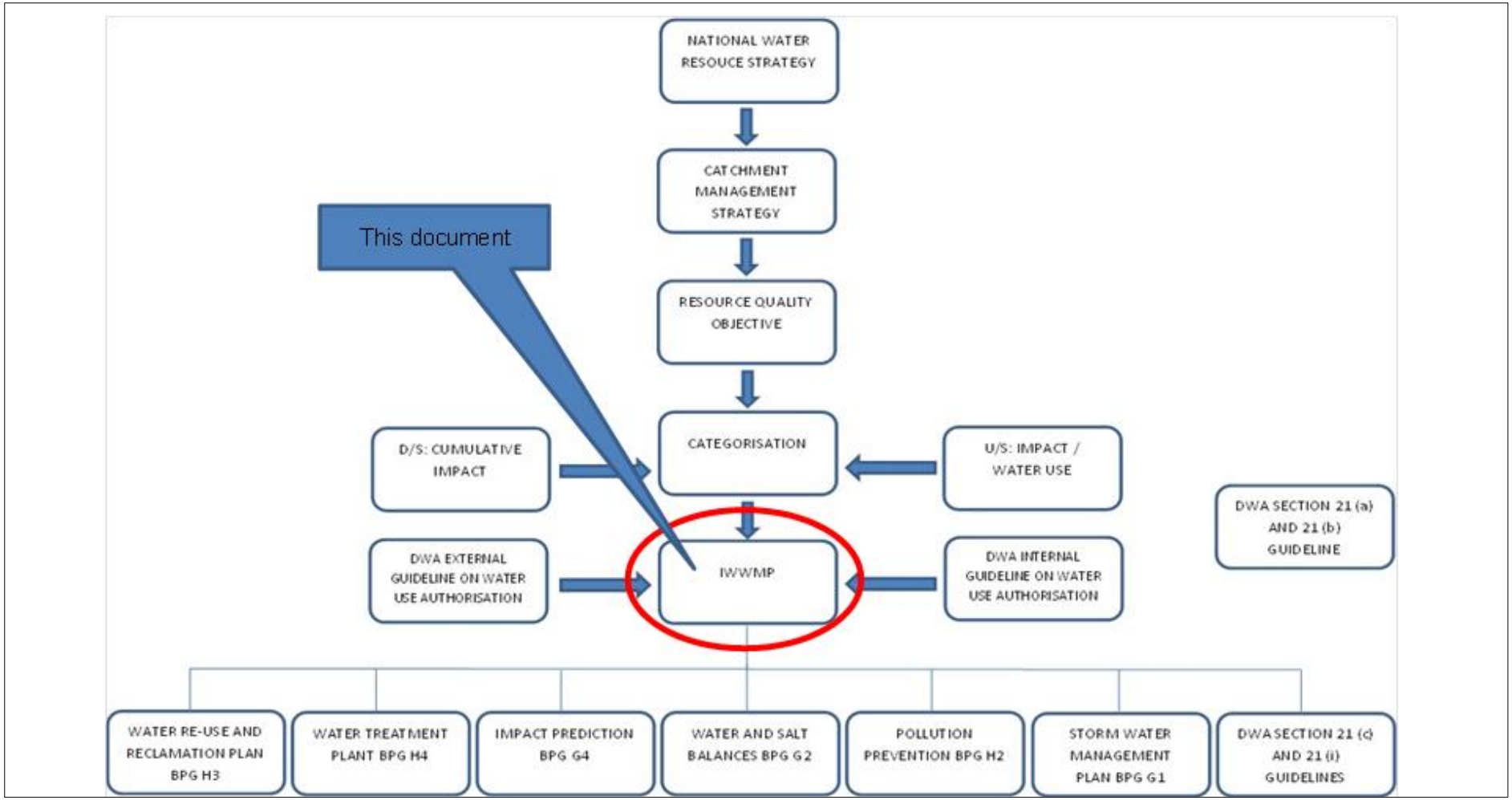


Figure 2: Schematic Layout of the IWWMP Approach

Table 4: Guide to the structure of the IWWMP

Guideline Item	Relevant IWWMP Section
Quantification of the Water Resource Problem	
Quantification of the Water Resource Problem	Section 4 and Section 5.14.
Are the existing water quality data adequate to identify contaminants of concern?	Yes, refer to Section 4 and Section 5.13.1, Section 5.13.2 and Section 5.13.3.
How well have the nature, extent and causes of the water management problems on site been identified?	Section 4.5.1, Section 4.5.2, Section 4.5.3 and Section 4.5.4.
To what extent has the analysis and characterization of the problems considered current thinking on water resource management?	Section 5.2, Section 5.2.5 and Section 5.18.
Are there any discernible trends?	Section 6.7.
Targets, Indicators and Monitoring	
Does the IWWMP define medium and long-term goals towards sustainable management of water resources?	Section 5.10 to 5.14.
Does the IWWMP make provision for the establishment of indicators of progress and set annual and medium-term targets?	Section 6.4.
Are these indicators and targets appropriate and consistent with the policies and strategies considered for implementation of the IWWMP?	Section 6.4 and Section 6.6
Are the proposed monitoring, review and evaluation as well as auditing systems adequate and sustainable?	Section 6.7, Section 5.13.1, Section 5.13.2 and Section 5.13.3
Priority Actions	
Does the IWWMP describe clear priorities for action, relevant to the goals and targets, feasibility in terms of achieving targets, their estimated costs, available resources, institutional capacities and effectiveness?	Section 6.1, Section 6.2, Section 6.3, Section 6.4 and Section 6.6.

Guideline Item	Relevant IWWMP Section
Does the water management strategy have an adequate and credible financial provisioning plan to support the implementation of the IWWMP?	Section 6.6

1.5 PROPOSED LICENCE AMENDMENT

As previously indicated, Mooiplaats Colliery has an existing WUL (Ref #; 08/C11B/AGJ/2141). Some of the water uses that have been licenced in this WUL require changes to be made due to incorrect farm portions and/or co-ordinates that were provided. Table 5 in Section 3 indicates all changes that need to be made to the existing licence.

2 CONTEXTUALISATION OF THE PROJECT

2.1 DESCRIPTION OF THE ACTIVITY

Mooiplaats Colliery is an underground coal mine that utilise the board and pillar mining method, using continuous miners. Access to the underground workings is obtained through a decline box cut which is situated near the northern boundary of the Mooiplaats property. The mining area lies within the Ermelo Coalfield.

2.2 EXTENT OF ACTIVITY

The Mooiplaats Colliery lies within the Ermelo Coalfield, three coal seams occur in the area of interest. The upper A, C and Lower B coal seams are poorly developed and not economically viable to mine. The B Upper seam is sufficiently developed and is the target seam for underground mining. Further borehole exploration is required to determine the feasibility of the “C” seam in this area. The “B” seam varies in thickness from less than 1.2 metres in the south-eastern corner of the reserve, increasing to 2.4 metres to the north. A depression in the seam to a width of approximately 1.5 metres runs through the reserve from north to south. This was probably caused by the close proximity of a Dolerite Sill above the coal. Access to the underground workings is obtained through an existing decline box cut. Mining is taking place approximately 100m below ground level. The Life of Mine (LoM) is indicated in Figure 3.

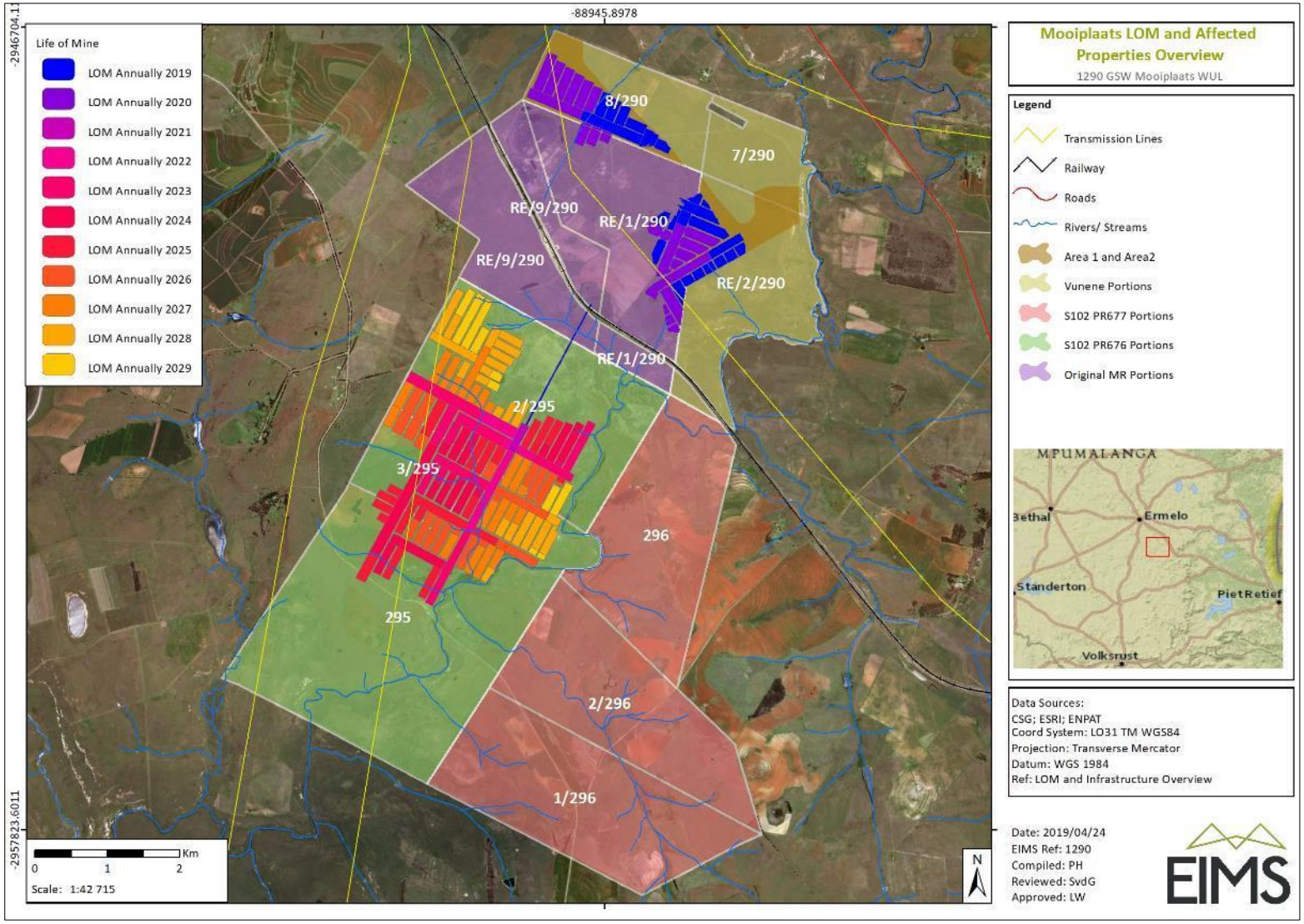


Figure 3: The Life Of Mine for the Mooiplaats Colliery including the Mooiplaats Colliery Vunene Project area

2.3 KEY ACTIVITY RELATED PROCESSES AND PRODUCTS

Mooiplaats Colliery is an underground coal mine that utilise the board and pillar mining method, using continuous miners. Access to the underground workings is obtained through a decline box cut which is situated near the northern boundary of the Mooiplaats property. The mining area lies within the Ermelo Coalfield.

The Mooiplaats Colliery lies within the Ermelo Coalfield, three coal seams occur in the area of interest. The upper A, C and Lower B coal seams are poorly developed and not economically viable to mine. The B Upper seam is sufficiently developed and is the target seam for underground mining. Further borehole exploration is required to determine the feasibility of the "C" seam in this area. The "B" seam varies in thickness from less than 1.2 metres in the south-eastern corner of the reserve, increasing to 2.4 metres to the north. A depression in the seam to a width of approximately 1.5 metres runs through the reserve from north to south. This was probably caused by the close proximity of a Dolerite Sill above the coal. Access to the underground workings is obtained through an existing decline box cut. Mining is taking place approximately 100m below ground level.

2.4 ACTIVITY LIFE DESCRIPTION

The mining method employed at the Mooiplaats Colliery comprises the mechanised board and pillar mining method, using continuous miners. Total Life of Mine will be approximately 16 years (2019 to 2034). The underground mining layout is designed to include the remaining resources in the Mooiplaats North and South (Klipbank). The life of mine production schedule is based on this mining layout which is shown in Figure 6 and Figure 7.

2.5 ACTIVITY INFRASTRUCTURE DESCRIPTION

Surface infrastructure associated with the existing Mooiplaats Colliery includes the following:

- Upslope diversion berms;
- Mining area:
    - Decline box-cut for the underground access for equipment and staff access;
    - Diversion berms and channels;
    - Overburden and soil stockpiles;
    - Conveyors for coal transports;
    - Three settling dams;
    - Erikson dams/tanks;
- Office and admin area:
    - Potable water tank;
    - Change house;
    - Sewage treatment plant;
    - Sump to collect run-off from office area fitted with a pump;

- Office and administrative buildings;
- Workshop;
- Washbay;
- Scrapyard;
- Substation;
- Generators;
- Diesel storage;
- Powerlines;
- Parkade;
- Stores;
- First aid room;
- Lamp room;

- Plant area:
  - Workshop;
  - Laboratory;
  - Processing plant and control room;
  - Coal stockpiling area;
  - Conveyors;
  - Substation;
  - Power lines; and
  - Erikson dams/tanks.
- Mine residue:
  - Co-disposal facility;
  - Return water dams;
- General:
  - Clean water storage tanks;
  - Pollution control dam;
  - Access road and secured access control;
  - Weighbridge and haul roads; and

- Boreholes.

The Mooiplaats South and Vunene areas will require two ventilation shafts and access roads, as well as additional rescue boreholes. Figure 4 below indicates the infrastructure on the original Mooiplaats Colliery section, and Figure 5 provides the infrastructure layout for the original Mooiplaats Colliery section, the Mooiplaats Colliery South section and the proposed Vunene project area to be included into the Mooiplaats Colliery mining right.

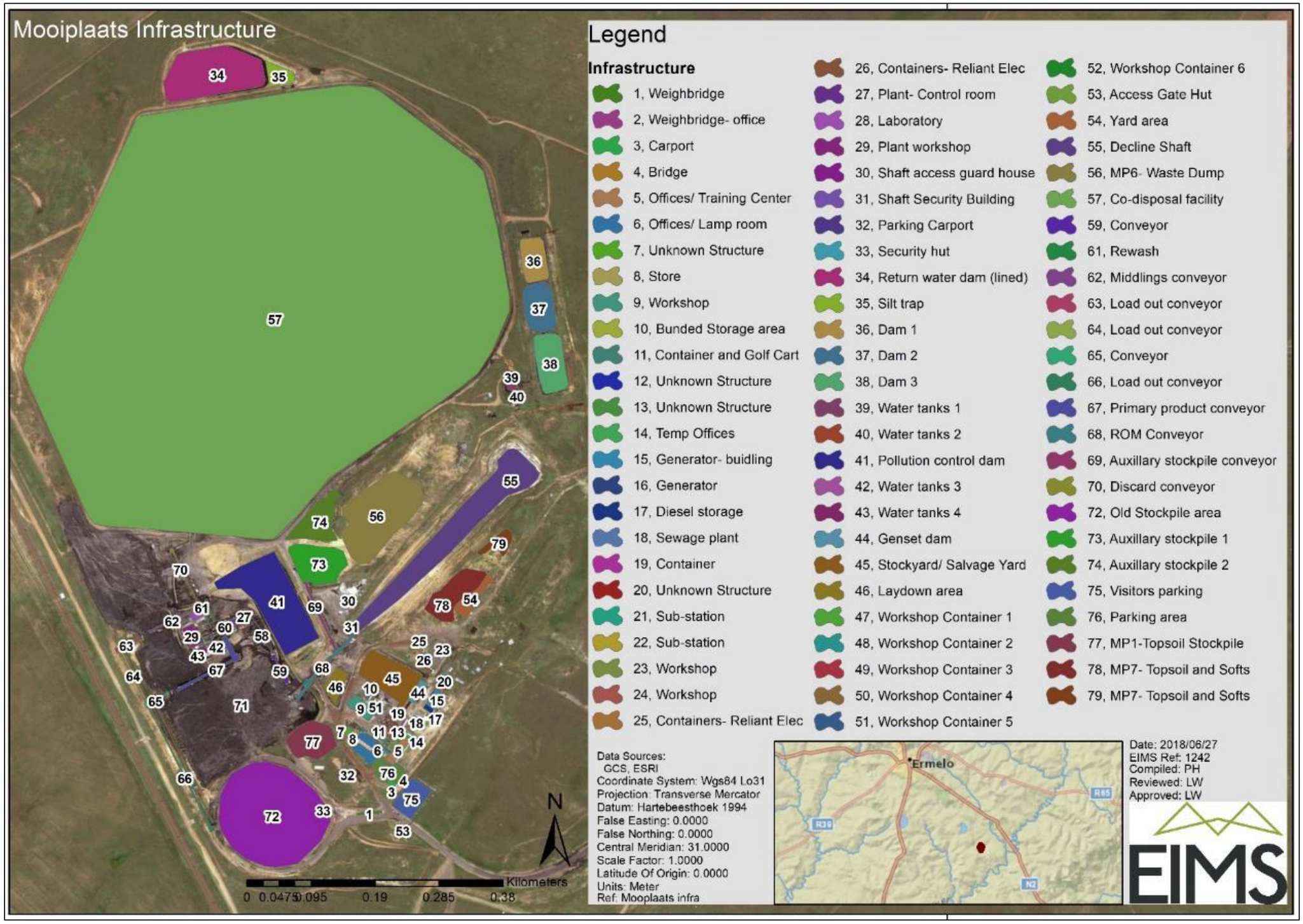


Figure 4: Existing infrastructure layout at the Mooiplaats Colliery

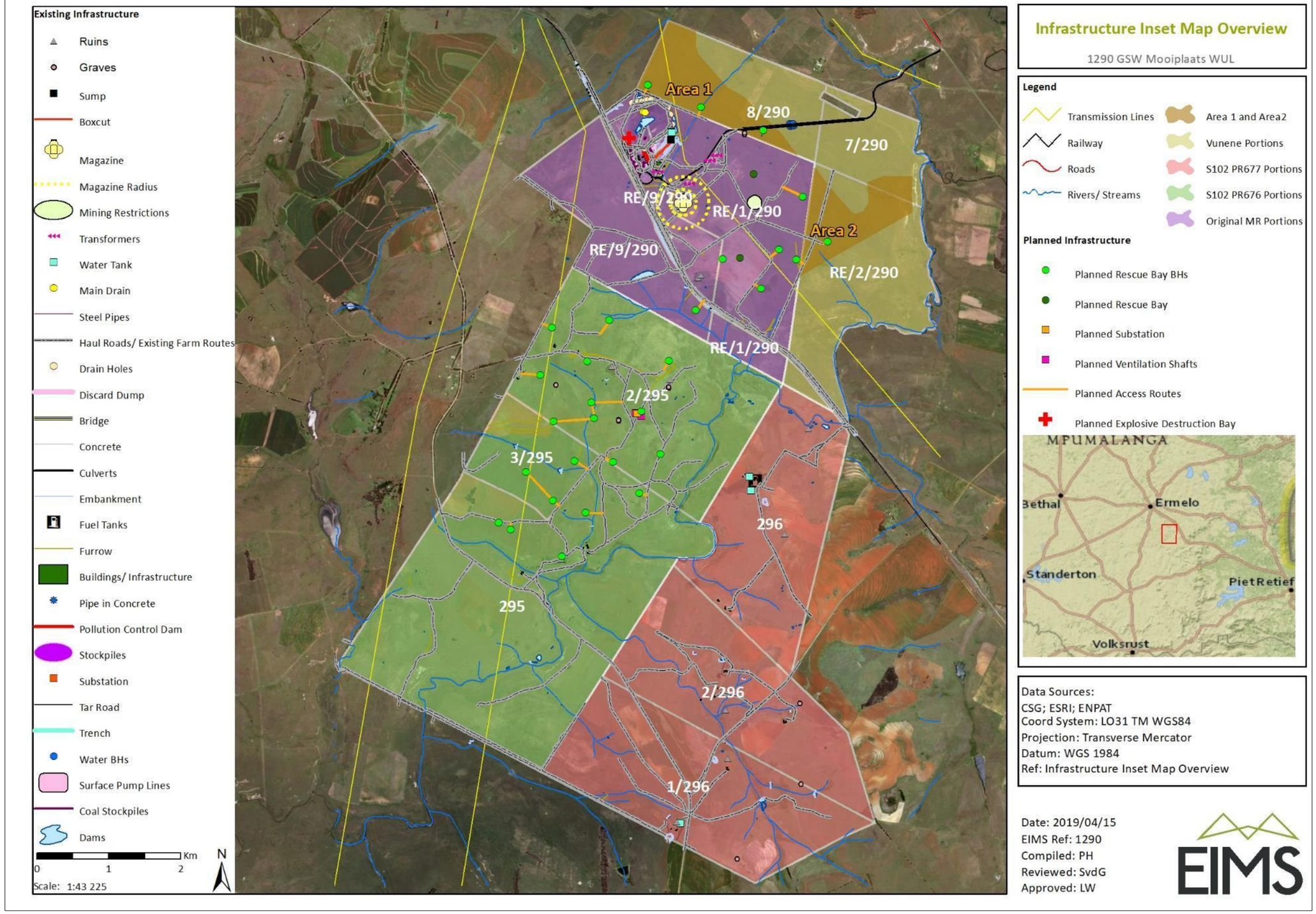


Figure 5: Mine and infrastructure layout of the Mooiplaats Colliery including the Vunene project area

2.5.1 MINERAL DEPOSIT

The mining area lies within the Ermelo Coalfield Three coal seams occur on the target properties and can be identified from top to bottom as A, B and C respectively. The A and C seams are poorly developed with an average width of less than 40cm and have been excluded as viable entities for the purposes of this project. Only the B Upper seam is sufficiently developed to form a viable economic entity and because of the depth of this reserve (>100m below surface).

2.5.2 MINE PRODUCTS

The design allows for the processing of 220 000 tons per month nominal feed through the DMS plant and with a yield of 65% will result in 14 300 tons per month of washed product. The bituminous or lean coal crusher is capable of crushing 220 000 tons per month which provides flexibility to Mooiplaats Colliery to ensure there is sufficient stockpile capacity of the bituminous / lean coal. The Run of Mine (RoM) production will be approximately 190 000 tons per month, with infrastructure design allowing for extraction at any given time of either anthracite or bituminous coal.

2.5.3 ACCESS TO THE WORKINGS

Access to the underground workings is via a decline box cut. The box cut has one roadway from the surface into the coal at a depth of approximately 44m. The first level is a separate haul way of 167 m each and 6.8 m wide at a slope of 15° and carries a single conveyor system. The second level is the central paved access roadway, approximately 220 m long and 6.8 m wide at a slope angle of 12°, used for the transport of staff and mining material in and out of the mine.

2.5.4 THE MINERAL PROCESSING PLANT

RoM coal from the underground bituminous mining operation is conveyed to a 2 800 ton capacity RoM coal stockpile by a 1200mm wide decline conveyor belt. The mining operation is carried out by three continuous miners with one blasting section and all RoM coal from the mine will be reduced in size to 250mm by feeder breakers.

RoM coal from the stockpile is reclaimed at a controlled rate by a combination of two vibrating feeders onto a 1200 mm reclaim conveyor belt feeding a 48" x 36" Shumar double roll primary crusher. This conveyor is fitted with a two weigh-idler electro-mechanical belt scale and an electro-magnet for tramp removal. The crusher discharge is then fed onto a 1050 mm conveyor feeding a 2.4 x 4.8 m inclined vibrating scalping screen fitted with a 50 mm aperture polyurethane screen panel deck. The +50 mm oversize discharges onto a 750 mm conveyor feeding the 36" x 30" Shumar double roll secondary crusher while the –50 mm discharge from the screen joins the secondary crusher sized coal on a 900 mm conveyor belt feeding the plant surge bin. The surge bin has a live capacity of 200 tons with a tilt switch probe on the surge bin feed conveyor to prevent over-filling of the bin. The capacity of the RoM section from feeders to surge bin is 400 tons per hour.

2.5.4.1 PRIMARY WASHING

Raw coal is reclaimed from the Surge bin at a controlled rate of up to 250 tons per hour per module by a single vibrating feeder feeding a 750mm wide conveyor belt duplicated for Module A and B. The nominal combined capacity between the two feeders is 250 tons per hour with both modules operational as the rewash feed capacity is limited. The two modular feed conveyors discharges onto a Vibramech 2.44 x 5.6 m desliming screen fitted with

a 0.8 mm Wedge wire Sieve bend on the incline to the screen and 0.8 mm polyurethane de-sliming panels installed on the screen deck. Each modular feed conveyor belt is equipped with a Process Automation EMB220/750/ACC.4 four weigh-idler electro-mechanical belt scales for accounting purposes and an automatic sampler on Module A feed conveyor only. The 50 x 0.8 mm deslimed raw coal is discharged into a mixing tube, where magnetite medium of a pre-determined density is added from where it is pumped by a Weir-Warman 10/8 pump to a 800 mm diameter Multotec dense medium washing cyclone, where the primary separation occurs.

Both the cyclone overflow (product) and underflow (rewash feed) are discharged onto a Vibramech 2.44 x 5.6 m drain and rinse split screen with a ratio of 1.5 m width for primary product and 0.9 m for the cyclone underflow refuse where with the use of sprays magnetite is washed and recovered. The screen utilizes 0.63 mm polyurethane screen panels throughout the deck except for the second and third last row on the primary product side where 20 mm square aperture polyurethane panels are installed to separate coarse and fine material. The fine primary product discharges onto a separate 750 mm wide Centrifuge feed conveyor feeding to a Malvern VM1300 vibrating centrifuge to remove excess moisture transferring to the 900 mm wide Primary product stack-out conveyor. The coarse primary product discharges onto a 750 mm wide Primary product conveyor which transfers the material also onto the primary product stack-out conveyor.

The desliming screen –0.8 mm fine material gravitates to the underpan of the desliming screen where it is pumped by a Weir-Warman 6/6 pump to a cluster of four Multotec 350 mm polyurethane classifying cyclones. The cyclones separate with water according to material size with the –0.2 mm material overflowing to the high capacity 13-meter diameter thickener. Flocculants is added from a mixing / curing / distribution system to aid the settling of the fine coal at the bottom of the thickener where it gravitates into a buffer tank. Dilution water is added from the adjacent clarified water (recovered from the thickener overflow to re-use as process water) and the slurry mixture pumped approximately 1 km to a co-disposal pond by a Weir-Warman 4/3 pump.

The 0.8 x 0.2 mm material discharging for the classifying cyclone underflow feeds two banks (one bank per module) of four Multotec MX7 triple start spiral concentrators where through centrifugal force less dense product gravitates towards the outside of the spiral and refuse towards the inner channel with product and discard discharging into a spiral product and discard tanks respectively. The spiral product and discard tanks each pumps to a cluster of two Multotec 350 mm polyurethane classifying cyclones to aid in dewatering by Weir-Warman 6/4 pumps ultimately gravitating to a 1.2 x 2.7 meter spiral product and spiral discard dewatering screens fitted with 0.3 mm slotted aperture polyurethane screen panels. The discharge from the spiral product dewatering screen falls onto the Primary product conveyor combining with the coarse primary product that discharged from the drain and rinse screen. The spiral discard dewatering screen discharges onto a 750 mm final discard conveyor with a capacity of 100 tons per hour.

Both the product conveyor belt and the common discard conveyor belts are equipped with Process Automation EMB220/750/ECO.2 two weigh-idler belt scales and Multotec hammer-type automatic samplers.

2.5.4.2 MIDDLINGS WASHING

Primary discard is discharged from the Primary drain and rinse screen onto a 750 mm Rewash Feed conveyor equipped with a EMB220/750/ECO.2 two weigh-idler belt scale. The material discharges into a mixing box where magnetite at a pre-determined density is added and the mixture pumped into by a Weir-Warman 8/6 pump into a Multotec 660 mm dense medium cyclone. Both the cyclone overflow (product) and underflow (discard) discharges firstly onto static sieve bends with an aperture of 0.8 mm to a 1.8 x 4.8 m Vibramech split deck drain and rinse

screen with apertures of 0.63 mm utilising polyurethane screen panels in order to recover magnetite. Secondary product discharges onto a 750 mm Eskom Product stack-out conveyor while the final discard is conveyed by the common discard conveyor to a 100 ton capacity discard bin. Tipper trucks are utilised to truck the final discard to the co-disposal dump where levelling and compacting is done.

Both the Eskom product conveyor belt and the common discard conveyor belts are equipped with Process Automation EMB220/750/ECO.2 two weigh-idler belt scales and Multotec hammer-type automatic samplers.

2.5.5 TRANSPORT

The coal is transported from the underground mining area to the surface near the wash plant via the conveyor system. The mine currently load and hauls product (washed coal) with road trucks to the Anthra siding located close to Piet Retief where a third party is responsible to material handling, shunting and loading of trains. Currently only Jumbo wagons with a capacity of 83 tons per truck and 100 wagons per train are loaded at the siding. The Inland market can also be catered for in the form of small nuts or peas where a mobile screen is utilized to separate the various size fractions. A portion of the coal product is delivered to Camden Power Station. All products leaving the mine is trucked and weighed at a static weigh bridge on site

2.5.6 ESTIMATED COAL RESERVES

It is anticipated that the total coal reserve will be 12 853 796 tons based on LoM schedule 2019 to 2034.

2.5.7 PLANNED LIFE OF MINE

Total Life of Mine will be approximately 16 years (2019 to 2034). The underground mining layout is designed to include the remaining resources in the Mooiplaats North and South (Klipbank). The life of mine production schedule is based on this mining layout which is shown in Figure 6 and Figure 7. Underground mining layout will continue in Mooiplaats North for the next five years before the mining operation will be moved to the Mooiplaats South Block. During the five year production from Mooiplaats North the development through the geologically disturbed area between the Mooiplaats North and South blocks must be completed. This will enable the mining operation to be moved to Mooiplaats South once Mooiplaats North has been depleted.

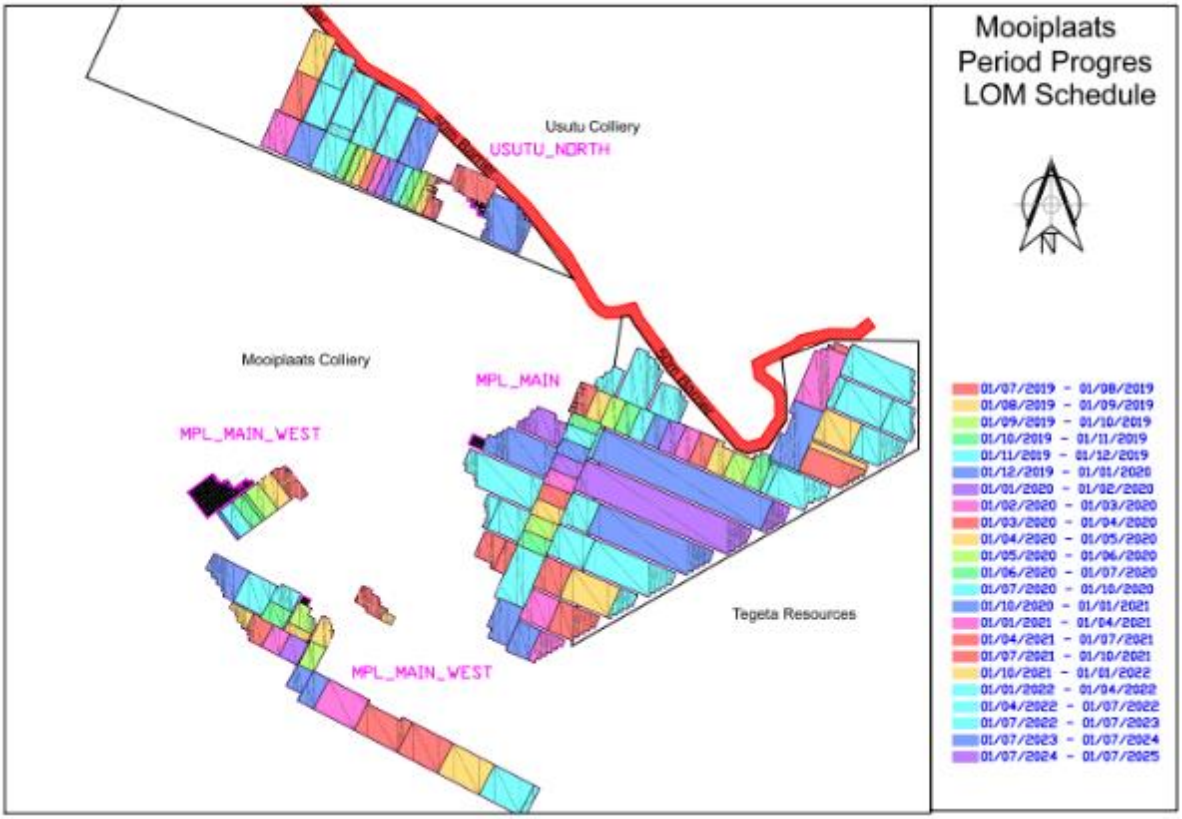


Figure 6: Mooiplaats North Block – B Upper Seam mining layout per annum.

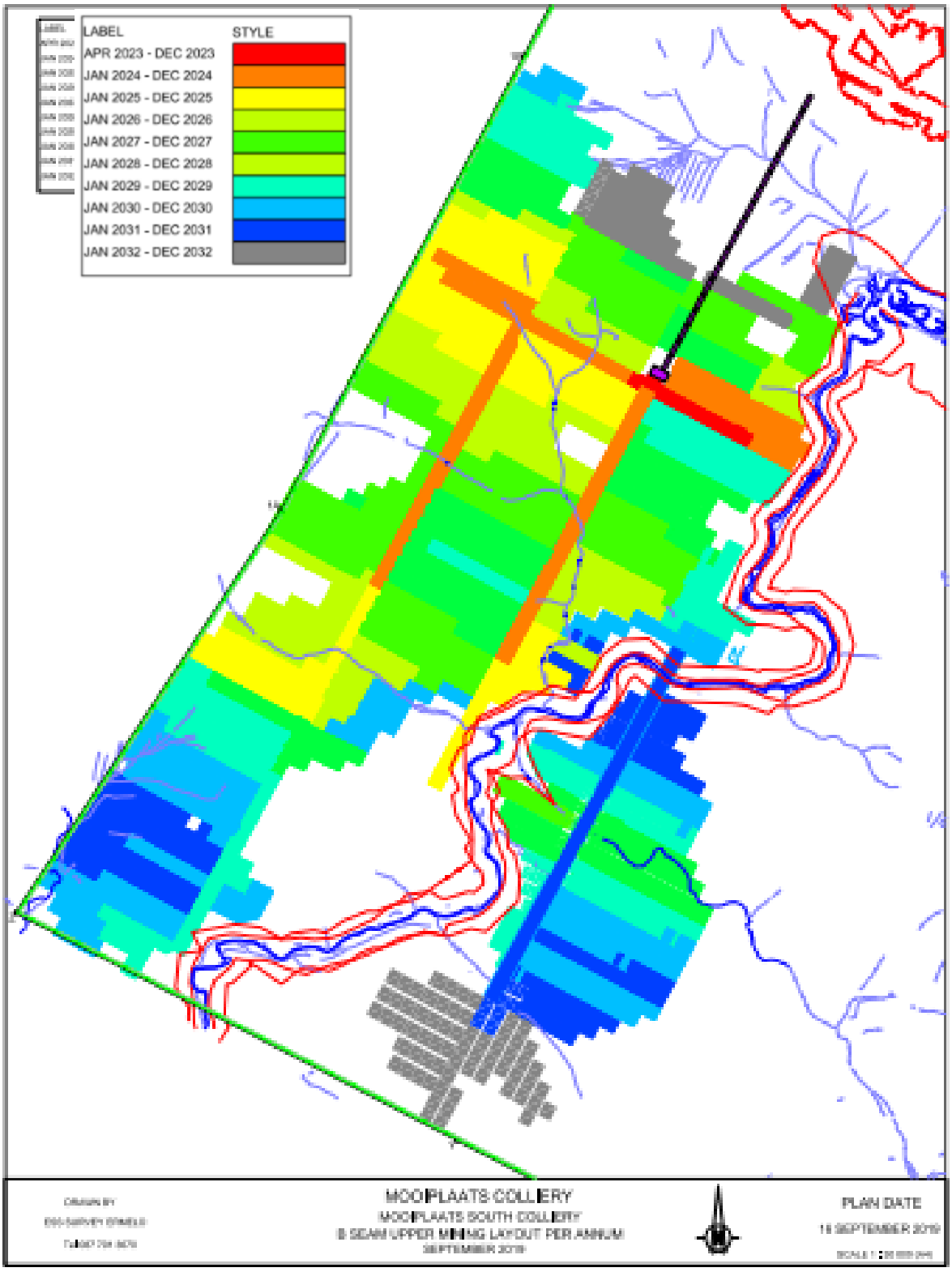


Figure 7: Mooiplaats South Block – B Upper Seam mining layout per annum.

2.6 KEY WATER USES AND WASTE STREAMS

Mooiplaats Colliery has an existing WUL (Licence No: 08/C11B/AGJ/2141) issued on 5 May 2013 for the following water uses.

- Section 21(a) Taking water from a water resource;
- Section 21(g) Disposing of waste or water containing waste in a manner that may detrimentally impact on a water resource;
- Section 21(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The Mooiplaats South and Vunene projects trigger additional water uses, while the existing WUL (Licence No: 08/C11B/AGJ/2141) issued on 5 May 2013 also requires certain amendments to correct aspects such as property details and coordinates. As such, this IWWMP addresses the existing water uses as well as the new water uses.

Water Uses for the Mooiplaats Colliery, including the existing water uses licenced in terms of IWUL Licence no.: 08/C11B/AGJ/2141 and changes required to be made to the existing IWUL are presented in Table 5.

Table 5: New water uses that form part of the Mooiplaats Colliery application and changes that need to be made to the existing approved water uses.

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21(a) (Existing)	Usutu Borehole 1	Process water	16 425 m^3/a	S 26°38'28.5" E 30°07'00.1"	Portion 8 of Mooiplaats 290IT	T2301/2008	Farm portion needs to be amended from Portion 2 of Mooiplaats 290IT to Portion 8 of Mooiplaats 290IT
S 21(a) (Existing)	Usutu Borehole 2	Process water	16 425 m^3/a	S 26°38'28.5" E 30°07'01.0"	Portion 8 of Mooiplaats 290IT	T2301/2008	Farm portion needs to be amended from Portion 2 of Mooiplaats 290IT to Portion 8 of Mooiplaats 290IT
S 21(a) (Existing)	Usutu Borehole 3	Process water	16 425 m^3/a	S 26°38'29.4" E 30°06'59.1"	Portion 8 of Mooiplaats 290IT	T2301/2008	Farm portion needs to be amended from Portion 2 of Mooiplaats 290IT to Portion 8 of Mooiplaats 290IT
S 21(a) (Existing)	Usutu Borehole 4	Process water	16 425 m^3/a	S 26°38'29.4" E 30°07'00.1"	Portion 8 of Mooiplaats 290IT	T2301/2008	Farm portion needs to be amended from Portion 2 of Mooiplaats 290IT to Portion 8 of Mooiplaats 290IT

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21(a) (Existing)	Potable Water Borehole 1 (North shaft)	Potable water	6 083 m^3/a	S 26°39'04.4" E 30°05'54.0"	Portion 9 of Mooiplaats 290IT	T13234/79	-
S 21(a) (Existing)	Potable Water Borehole 2 (North shaft)	Potable water	6 083 m^3/a	S 26°38'56.6" E 30°05'54.7"	Portion 9 of Mooiplaats 290IT	T13234/79	Change volume to 25 000m3/a
S 21(a) (Existing)	Potable Water Borehole 3 (North shaft)	Potable water	6 083 m^3/a	S 26°38'53.0" E 30°07'02.5"	Portion 1 of Mooiplaats 290IT	T13234/79	Farm portion needs to be amended from Portion 9 of Mooiplaats 290IT to Portion 1 of Mooiplaats 290IT
S 21(a) (New)	Potable Water Borehole 4	Potable water	18 000 m^3 /a	S26°38'50.852" E30°6'40.111"	Portion 1 of Mooiplaats 290IT	T33424/2004	-
S 21(b) (New)	JoJo Tanks	Storage of water	80 m^3	S 26°38'48.196" E 30°5'52.537"	Portion 9 of Mooiplaats 290IT	T33424/2004	Addition of this new 21(b) water use for storage of water in the JoJo tanks.

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Underground mining	Undermining of wetlands	-	Start: S 26°38'2.87" E 30° 5'50.14" End: S 26°38'37.11" E 30° 6'55.61"	Portion 8 of Mooiplaats 290IT	T2301/2008	-
S 21 (c) and 21 (i) **(New)**	Middling's Stockpile	Middling's stockpile located within 500m of wetlands.	-	S 26°38'37.10" E 30°5'35.8"	Portion 9 of Mooiplaats 290IT	T33424/2004	-
S 21 (c) and 21 (i) **(New)**	Underground mining	Undermining of wetlands	-	Start: S 26°39'28.00" E 30° 6'47.14" End: S 26°39'7.54" E30° 7'20.57"	Portion 1 of Mooiplaats 290IT and Re of Portion 2 of Mooiplaats 290IT	T13234/79 T84901/2002	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Underground mining	Undermining of wetlands	-	Start: S 26°42'0.25" E 30° 4'52.10" End: S 26°39'43.61" E 30° 5'26.87"	Portion 2, 3 and Re of Klipbank 290IT	T16190/2018 T135860/1999	-
S 21 (c) and 21 (i) **(New)**	General Mining Infrastructure (GMI)	Mining infrastructure located within 500m of wetlands.	-	S 26°38'45.719" E 30° 5'53.819"	Portion 1 and 9 of Mooiplaats 290IT	T33424/2004	-
S 21 (c) and 21 (i) **(New)**	Waste Water Treatment Plant	WWTP located within 500m of wetlands.	-	S 26°38'47.609" E 30°5'55.849"	Portion 1 of Mooiplaats 290IT	T33424/200	
S 21 (c) and 21 (i) **(New)**	Pollution Control Dam	PCD located within 500m of wetlands	-	S26°38'41.838" E 30°5'48.217"	Portion 9 of Mooiplaats 290 IT	T33424/2004	

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 1 (RB1)	Rescue borehole	-	S 26°38'20.778" E 30°6'15.595"	Portion 8 of Mooiplaats 290IT	T2301/2008	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 1 (RB1)	Access road	-	Start: S 26°38'24.54" E 30° 6'14.09" End: S 26°38'20.778" E 30°6'15.595"	Portion 8 of Mooiplaats 290IT	T2301/2008	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 2 (RB2)	Rescue borehole	-	S 26°39'21.758" E 30°7'18.674"	Re of Portion 2 of Mooiplaats 290IT	T84901/2002	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 2 (RB2)	Access road	-	Start: S 26°39'22.47" E 30° 7'16.46" End:	Re of Portion 2 of Mooiplaats 290IT	T84901/2002	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
				S 26°39'21.758" E 30°7'18.674"			
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 3 (RB3)	Rescue borehole	-	S 26°39'29.819" E 30°7'2.989"	Re of Portion 2 of Mooiplaats 290IT	T84901/2002	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 3 (RB3)	Access road	-	Start: S 26°39'31.57" E 30° 7'6.70" End: S 26°39'29.819" E 30°7'2.989"	Re of Portion 2 of Mooiplaats 290IT	T84901/2002	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 4 (RB4)	Rescue borehole	-	S 26°41'4.686" E 30°4'46.438"	Portion 3 of Klipbank 295IT	T135860/1999	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 4 (RB4)	Access road	-	Start: S 26°41'19.95" E 30° 5'2.84" End: S 26°41'4.686" E 30°4'46.438"	Portion 3 of Klipbank 295IT	T135860/1999	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 5 (RB5)	Rescue borehole	-	S 26°41'27.474 E 30°4'32.52"	Re of Klipbank 295IT	-	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 5 (RB5)	Access road	-	Start: S 26°41'26.78" E 30° 4'32.90" End: S 26°41'27.474 E 30°4'32.52"	Re of Klipbank 295IT	-	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 6 (RB6)	Rescue borehole	-	S 26°41'30.559" E 30°4'38.647"	Re of Klipbank 295IT	-	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 6 (RB6)	Access road	-	Start: S 26°41'27.60" E 30° 4'38.33" End: S 26°41'30.559" E 30°4'38.647"	Re of Klipbank 295IT	-	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 7 (RB7)	Rescue borehole	-	S 26°39'59.695" E 30°4'59.84"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road Rescue Borehole 7 (RB7)	Access road	-	Start: S 26°39'57.74" E 30° 4'55.26"	Portion 2 of Klipbank 295IT	T16190/2018	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
				End: S 26°39'59.695" E 30°4'59.84"			
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 8 (RB8)	Rescue borehole	-	S 26°39'56.592" E 30°5'28.842"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 8 (RB8)	Access road	-	Start: S 26°40'2.59" E 30° 5'24.10" End: S 26°39'56.592" E 30°5'28.842"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 9 (RB9)	Rescue borehole	-	S 26°40'21.04" E 30°4'53.983"	Portion 2 of Klipbank 295IT	T16190/2018	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 9 (RB9)	Access road	-	Start: S 26°40'20.17" E 30° 4'44.12" End: S 26°40'21.04" E 30°4'53.983"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 10 (RB10)	Rescue borehole	-	S 26°40'14.966" E 30°5'17.621"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access Road to Rescue Borehole 10 (RB10)	Access road	-	Start: S 26°40'13.42" E 30° 5'17.88" End: S 26°40'14.966" E 30°5'17.621"	Portion 2 of Klipbank 295IT	T16190/2018	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 11 (RB11)	Rescue borehole	-	S 26°40'33.539" E 30°5'19.349"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 11 (RB11)	Access road	-	Start: S 26°40'33.23" E 30° 5'34.96" End: S 26°40'33.539" E 30°5'19.349"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 12 (RB12)	Rescue borehole	-	S 26°40'40.692" E 30°5'20.706"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 12 (RB12)	Access road	-	Start: S 26°40'33.66" E 30° 5'19.58" End:	Portion 2 of Klipbank 295IT	T16190/2018	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
				S 26°40'40.692" E 30°5'20.706"			
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 13 (RB13)	Rescue borehole	-	S 26°40'41.898" E 30°5'0.352"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 13 (RB13)	Access road	-	Start: S 26°40'40.73" E 30° 5'20.94" End: S 26°40'41.898" E 30°5'0.352"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 14 (RB14)	Rescue borehole	-	S 26°40'59.768" E 30°5'10.838"	Portion 3 of Klipbank 295IT	T135860/1999	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 14 (RB14)	Access road	-	Start: S 26°41'3.76" E 30° 5'17.67" End: S 26°40'59.768" E 30°5'10.838"	Portion 3 of Klipbank 295IT	T135860/1999	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 15 (RB15)	Rescue borehole	-	S 26°41'0.373" E 30°5'30.073"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 15 (RB15)	Access road	-	Start: S 26°40'58.53" E 30° 5'26.47" End: S 26°41'0.373" E 30°5'30.073"	Portion 2 of Klipbank 295IT	T16190/2018	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 16 (R16)	Rescue borehole	-	S 26°40'57.05" E 30°5'53.902"	Portion 2 of Klipbank 295IT	T16190/2018	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 17 (RB17)	Rescue borehole	-	S 26°41'17.714" E 30°4'59.88"	Portion 3 of Klipbank 295IT	T135860/1999	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 17 (RB17)	Access road	-	Start: S 26°41'19.92" E 30° 5'2.89" End: S 26°41'17.714" E 30°4'59.88"	Portion 3 of Klipbank 295IT	T135860/1999	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 18 (RB18)	Rescue borehole	-	S 26°41'23.161" E 30°5'16.156"	Re of Klipbank 295IT	-	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 18 (RB18)	Access road	-	Start: S 26°41'23.47" E 30° 5'24.84" End: S 26°41'23.161" E 30°5'16.156"	Re of Klipbank 295IT	-	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 19 (RB19)	Rescue borehole	-	S 26°41'42.774" E 30°5'4.178"	Re of Klipbank 295IT	-	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 19 (RB19)	Access road	-	Start: S 26°41'43.28" E 30° 5'4.74" End: S 26°41'42.774" E 30°5'4.178"	Re of Klipbank 295IT	-	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 20 (RB20)	Rescue borehole	-	S 26°39'42.75" E 30°6'45.158"	Re of Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 20 (RB20)	Access road	-	Start: S 26°39'40.65" E 30° 6'41.75" End: S 26°39'42.75" E 30°6'45.158"	Re of Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (c) and 21 (i) **(New)**	Rescue Borehole 21 (RB21)	Rescue borehole	-	S 26°39'52.276" E 30°6'12.323"	Portion 9 of Mooiplaats 290IT	T13234/71	-
S 21 (c) and 21 (i) **(New)**	Access road to Rescue Borehole 21 (RB21)	Access road	-	Start: S 26°39'47.83" E 30° 6'16.34"E End:	Portion 9 of Mooiplaats 290IT	T13234/71	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
				S 26°39'52.276" E 30°6'12.323"			
S 21 (c) and 21 (i) **(New)**	Co-disposal facility	Disposal of discard		S 26°38'35.123" E 30°5'47.397"	Re of Portion 9 and Re of Portion 1 of Mooiplaats 290IT	T13234/71	-
S 21 (c) and 21 (i) **(New)**	Settling Dam 1	Collects water from PCD and shaft water, sewage effluent and water from boreholes (dry periods only)	459 030 m^3/a	S 26°38'28.669" E 30°6'2.226"	Portion 1 of Mooiplaats 290IT	T13234/79	Amend co-ordinates: S 26°38'24.94" And E 30° 6'1.35"
S 21 (c) and 21 (i) **(New)**	Settling Dam 2	Stores water from Settling Dam 1	452 145 m^3/a	S 26°38'29.992" E 30°6'3.589"	Portion 1 of Mooiplaats 290IT	T13234/79	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (c) and 21 (i) **(New)**	Settling Dam 3	Water collected from Settling Dam 2	402 112 m^3/a	S 26°38'30.0" E 30°06'02.1"	Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (c) and 21 (i) **(New)**	RoM Stockpile 1	Coal from mining before processing	299 500 tons	S 26°38'40.287" E 30°5'48.859"	Portion 9 of Mooiplaats 290IT	T13234/79	-
S 21 (c) and 21 (i) **(New)**	RoM Stockpile 2	Coal from mining before processing	793 761 tons	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended: S 26°38'40.10" E 30° 5'46.70"
S 21 (c) and 21 (i) **(New)**	Plant Erickson Dam	Receives water from Settling Dam 3	423 400 m^3 (Note: current annual maximum use is 40 000m3/a based on maximums of 1	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	Proposed volume of 60 000m3/a

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
			year - 2 Ericksons of 1000m^3 each)				
S 21 (c) and 21 (i) **(New)**	Underground Erickson Dam	Water used for underground supply, collected from plant Erickson Dam	120 000 m^3	S 26°38'39.396" E 30°5'58.217"	Portion 1 of Mooiplaats 290IT	T13234/79	The Mooiplaats coal target is 85 000 tons per month (+- 1 000 000 tons per a. for 1 mil tons they will probably use 120 000m3 underground per year
S 21 (c) and 21 (i) **(New)**	Office Complex	Administrative offices	-	S 26°38'45.73" E 30° 5'53.82"	Portion 9 of Mooiplaats 290IT	T13234/79	-
S 21 (c) and 21 (i) **(New)**	Conveyor belt	Conveying of coal	-	Start: S 26°38'36.32" E 30° 6'0.53" End: S 26°38'46.56" E 30° 5'48.68"	Portion 1 and Portion 9 of Mooiplaats 290IT	T13234/79	-

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
~~**Section 21(f):**~~	~~Discharge of water from WWTP~~	~~Discharging water treated at the Final effluent is discharged into Genset PCD dam. Genset PCD Water go to Settling Dam 1 or Co disposal Waste Water Treatment Works~~	~~Volumes to be provided~~	~~S 26°38'46.48"~~ ~~E 30° 5'55.55"~~	~~Portion 1 of Mooiplaats 290IT~~	~~T13234/79~~	DWS clarified that the discharge of treated wastewater from the WWTW into the Genset PCD is not a 21 (f) water use
Section 21 (g) **(New)**	Dust suppression	Dust Suppression water piped from Underground Erickson dams to gooseneck	21 900 m^3/a	Gooseneck coords S 26°38'43.962" E 30°5'53.38"			-
S 21 (g) **(Existing)**	North Shaft Settling Dam 1	Collects water from PCD and shaft water, sewage effluent and water from boreholes (dry periods only)	459 030 m^3/a Capacity 13 320 m^3	S 26°38'53.0" E 30°07'02.5"	Portion 1 of Mooiplaats 290IT	T13234/79	Co-ordinates need to be amended to the following: S 26°38'28.669" E 30°6'2.226"

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (g) (Existing)	North Shaft Settling Dam 2	Stores water from Settling Dam 1	452 145 m^3/a Capacity 13 500m^2	S 26°38'53.0" E 30°07'02.5"	Portion 1 of Mooiplaats 290IT	T13234/79	Co-ordinates need to be amended to the following: S 26°38'29.992 " E 30°6'3.589
S 21 (g) (Existing)	North Shaft Settling Dam 3	Water collected from Settling Dam 2	402 112 m^3/a Capacity 20 160 m^3	S 26°38'30.0" E 30°06'02.1"	Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (g) (Existing)	North Shaft Return Water Dam	Collects water from co-disposal facility	320 645 m^3/a Capacity 17 438 m^3	S 26°38'15.6" E 30°05'42.9"	Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (g) (Existing)	Plant Erickson Dam	Receives water from Settling Dam 3	423 400 $m^{3/a}$ Volume 2000 m^3	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	-
S 21 (g) (Existing)	U/G Erickson Dam	Water used for underground supply, collected	120 000 m^3/a Capacity 2 000 m^3	S 26°38'44.3" E 30°05'44.3"	Portion 1 of Mooiplaats 290IT	T13234/79	The Mooiplaats coal target is 85 000 tons per month (+- 1 000 000 tons per a. for 1 mil tons they will probably use

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
		from plant Erickson Dam					120 000m3 underground per year
S 21 (g) (Existing)	Pollution Control Dam	Collects dirty water run-off	111 870 m^3/a Capacity 23 000 m^3	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended to the following: S 26°38'41.856" E 30°5'48.214" and the farm portion needs to be amended
S 21 (g) (New)	Genset Dam	Collects dirty water run-off from the contractor yard and office area	Volume required.	S 26°38'46.48" E 30° 5'55.55"	Portion 1 of Mooiplaats 290IT	T13234/79	-
S 21 (g) (Existing)	Co-disposal facility (North Shaft)	Slurry and discards	325 133 m^3	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	Co-ordinates need to be amended to the following: S 26°38'35.123" E 30°5'47.397"

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (g) (Existing)	Middling's Stockpile	Coal Stockpile	282 000 tons	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended to the following: S 26°38'37.10"S E 30° 5'35.80"E and the farm portion needs to be amended to Portion 9.
S 21 (g) (Existing)	Primary Stockpile	Coal product from coal washing plant	760 000 tons	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended to the following: S 26°38'46.16" E 30° 5'42.61" and the farm portion needs to be amended.
S 21 (g) (Existing)	RoM 01 Stockpile	Coal from mining before processing	299 500 tons	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended to the following: S 26°38'46.86"S And E 30° 5'48.64"

Water Use	Name	Purpose	Quantity/capacity / volume	Co-ordinates	Property	Title Deed	Changes required to IWUL Licence no.: 08/C11B/AGJ/2141
S 21 (g) (Existing)	RoM 02 Stockpile	Coal from mining before processing	793 761 tons	S 26°38'44.3" E 30°05'44.3"	Portion 9 of Mooiplaats 290IT	T13234/79	The co-ordinates need to be amended:
S 21 (j) (Existing)	Dewatering	Dewatering of underground workings for the safety of people	100 000 m^3/a	S 26°38'24.79" E 30° 6'2.27"	Portion 1 of Mooiplaats 290IT	T13234/79	Existing (j) water use named "Settling Dam 1". Remove the word "Settling Dam 1" and replace with "Dewatering". Amend coordinates: S 26°38'24.79" . E 30° 6'2.27". Amend volume to 59 800m3/a. Volume should be changed to 100 000 m^3/a to cater for future workings.

2.6.1 KEY WASTE STREAMS

The key waste streams that are generated on the site are as follows:

- Solid waste:
- Waste rock dump;
- Industrial waste;
- Domestic waste;
- Liquid effluent;
- Shaft area / underground water;
- Dirty water and stormwater in Pollution Control Dams, settlement dams and Genset Dam;
- Sewage; and
- Hazardous waste including hydrocarbons.

2.6.1.1 WASTE ROCK DUMP

Overburden rock from the development of the box cut and decline shaft, are stockpiled on the waste rock dump located upslope of the box cut. A sacrificial layer is compacted beneath the waste rock dump to prevent the ingress of water into the groundwater regime.

2.6.1.2 GENERAL, INDUSTRIAL AND DOMESTIC WASTE

A central waste collection area is established and demarcated at the plant area. The waste collection area is situated on an impermeable layer, within the dirty water area. Waste skip bins of different colours are provided for the different waste types generated. The small quantities of general industrial (approximately 5 tons per month) and domestic waste (approximately 1 ton per month) generated at Mooiplaats Colliery, are disposed of at an approved industrial waste site. A registered contractor is used to transport and dispose of the waste. A waste contractor is utilised for the collection of general waste and is disposed of at a nearby general, licensed landfill site. A recycling station is set up at the Mooiplaats Colliery for the recycling of scrap metal, glass, paper, cans and used lubricants. Contractors specialising in the recycling of these materials are utilised for the recycling of the materials. Waste training is provided to employees in order to ensure that correct waste separation and recycling is conducted at source. An inventory is kept of all waste types and volumes generated and disposed of or recycled.

2.7 ORGANISATIONAL STRUCTURE OF ACTIVITY

The organisational structure of for the Mooiplaats Colliery is indicated in Figure 8.

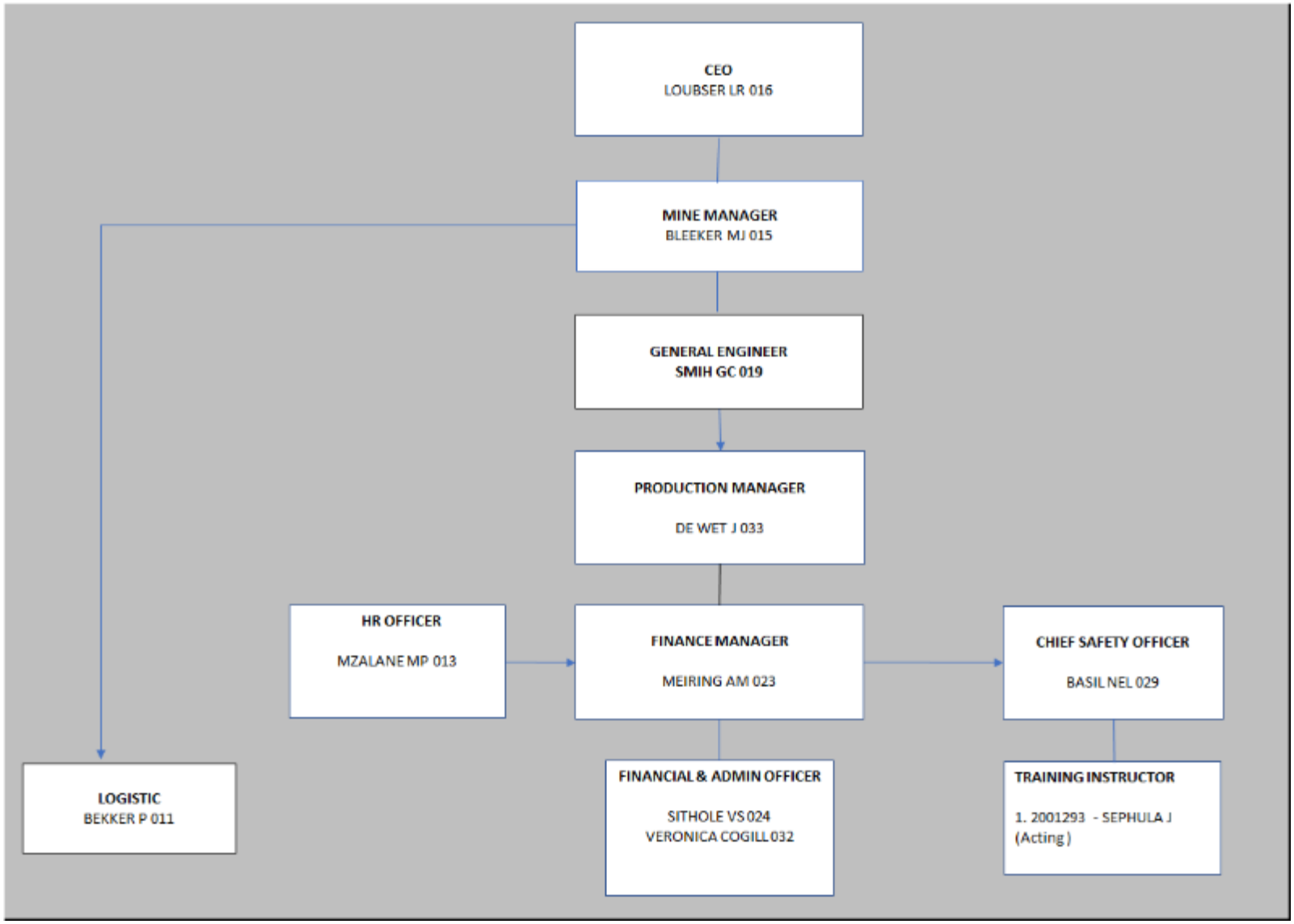


Figure 8: Organogram for the Mooiplaats Colliery

2.8 BUSINESS AND CORPORATE POLICIES

Mooiplaats Colliery is committed to the health and safety of its employees and the environment in which it operates. Mine Management will ensure that all health and safety regulations as contained in the Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) are complied with to ensure a safe working environment for all employees. All on site legal appointments of Mooiplaats Colliery personnel will be according to the MHSA, as well as safety representatives as required by the MHSA. All safety equipment, including personal protective equipment is provided by the mine to all employees. Mine management are also responsible to ensure that emergency procedures are in place, updated on a regular basis and complied with.

The target areas for health, safety and the environment include:

- Health and safety:
  - Zero fatalities;
  - Zero lost time injuries; and
  - Management of the health and safety management system.
- Environment:
  - Zero significant impacts;
  - Minimising water consumption;
  - Minimising pollutants in effluents;
  - Minimising waste; and
  - Recycling/re-using waste where possible.

The safety and health objectives of the management system are to:

- Have an injury free working environment combined with zero tolerance for non-compliance or unsafe behaviour; Minimise major occupational risk in the work environment in order to eliminate occupational illness and disability; and
- Maintaining high safety standards in respect of the entire mine.

The Environmental objectives involve ensuring the sustainable exploitation of natural resources through dedicated programmes that focus on water resource, air quality and biodiversity management. Different environmental aspects were identified in the EMPR and objectives were set for each of the following environmental components:

- Geology;
- Climate;
- Topography;
- Soils;
- Flora and Fauna;
- Surface water;

- Groundwater;
- Wetlands;
- River crossings;
- Air quality;
- Noise;
- Vibration and blasting; and
- Archaeological and cultural sites.

There are a number of key performance areas identified for Mooiplaats Colliery in the different disciplines, which are depicted below:

- Marketing:
  - Product portfolio management;
  - Pricing strategy;
  - Production strategy;
  - Sales and distribution strategy;
  - Distribution;
  - Strategic outsourcing;
  - Information technology; and
  - Marketing forecast.
- Environmental Management:
  - Key issues management;
  - Regulatory authorisations;
  - Community involvement; and
  - Other interested and affected parties.
- Human Resources:
  - Talent management and development;
  - Organisational architecture;
  - Employment equity; and
  - Training and competency.
- Technical Support:
  - Safety and health regulatory requirements;

- Mining operational effectiveness;
- Planned maintenance programmes;
- Machinery and equipment optimisation;
- Equipment utilisation;
- Effective cost control; and
- Asset management.

- Information Systems:
  - Support of core and support strategies;
  - Outsourcing and project delivery; and
  - Integrated information systems.
- Finance Support:
  - Commercial competence;
  - Core business strategy support;
  - Corporate governance; and
  - Finance efficiency.
- Planning:
  - Production and mine planning;
  - Production scheduling, geological reserves control;
  - Production forecasting; and
  - Capacity planning and leverage

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

The Mooiplaats Colliery has been in existence for several years and as such a number of licenses and authorisations are held by the mine. The following rights, licenses, authorisations and approvals are currently in place and have been considered in the compilation of this report:

Table 6: Existing rights, licenses and authorisations for Mooiplaats Coal Mine.

Document	Applicable Properties	Reference Number
Mining Right- EMPR Approval	Ptn 1 and 9 Mooiplaats 290IT *The 2007 EMPR approval letter refers to only Ptn1 of the farm Mooiplaats 290IT.	30/5/1/2/2/68 MR
Water Use Licence	Ptn 2 (S21a-water abstraction), Ptn 1 (S21 g) and Ptn 9 (S21 g and j) Mooiplaats 290IT.	08/C11B/AGJ/2141
Environmental Authorisation *a copy of this EA was not available- reference was made in one of the audits	Ptn 1 of farm Mooiplaats 290 IT	17/2/1/18 MP 29
Environmental Authorisation	Ptn 1 and 9 Mooiplaats 290IT	17/2/5GS-58
Environmental Authorisation- NEMA Section 24G	Ptn 1 and 9 Mooiplaats 290IT	17/2/4/G(GS)-36

In addition to the approved authorisations and licenses listed in Table 6, Mooiplaats also wishes to extend the mining operations outside of the current approved Mining Right areas by adding two portions of the Vunene MR into the Mooiplaats MR. In addition to the expansion of the mining operations, amendments to certain existing conditions of the IWUL are being applied for.

3.1 SUMMARY OF WATER USES

A detailed list of the current and proposed water uses is included in Section 2.6 Table 5. A summary of the water uses covered by this IWWMP is as follows:

- Section 21(a) – abstraction of water from boreholes;
- Section 21(b) – storage of water;
- Section 21(c&i) – impeding or diverting or altering the beds, banks, course or characteristics of a watercourse;
- Section 21(g) – disposal of waste or water containing waste (stockpiles / PCD's); and
- Section 21(j) – dewatering underground for safe operations.

3.2 EXISTING LAWFUL WATER USES

In terms of Section 32 of the NWA, an existing lawful water use is defined as a: "Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of the NWA, or which has been declared an existing lawful water use in terms

of Section 33 of the Act". Mooiplaats Colliery began mining in 2001-2002 and as such, no existing lawful water uses apply to the mine in terms of Section 32 of the NWA.

Mooiplaats Colliery does have an existing water use licence dated 02 May 2013 (Licence number 08/C11B/AGJ/2141). An Integrated Water Resource Management Plan (IWRMP) for Mooiplaats Colliery was compiled by Groundwater Consulting Solutions (GCS) in May 2010.

3.3 EXEMPTION OF THE REQUIREMENTS OF GN704

General Notice (GN) 704 (dated 4 June 1999) place certain restrictions on mining and related activities for the protection of water resources. In terms of Regulation 3, the Minister may in writing authorise an exemption from the requirements of regulations 4, 5, 6, 7, 8, 10 or 11 on his or her own initiative or on application, subject to such conditions as the Minister may determine. Certain of the existing and proposed mining activities on Mooiplaats Colliery trigger in terms of GN704 and these activities are presented in Table 7 below.

Table 7: GN 704 applicability to Mooiplaats current and future operations.

Ref:	Regulation Description	Mining Aspect
4(a)	**No person in control of a mine or activity may -** locate or place any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;	The main underground boxcut is located within 100m of a delineated watercourse. SWMP infrastructure within 100m of a watercourse.
4(b)	**No person in control of a mine or activity may -** 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;	Underground mining is occurring approximately 100m below watercourses.
4(c)	**No person in control of a mine or activity may -** 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	Backfilling of the underground access boxcut will be undertaken with overburden.
5	**Restrictions on use of material** No person in control of a mine or activity may use any residue or substance which causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road or railway, or for any other purpose which is likely to cause pollution of a water resource.	The co-disposal dam is constructed from carbonaceous materials and is not currently lined.
11(b)	**Additional regulations for rehabilitation of coal residue deposits** Any person mining or establishing coal residue deposits must rehabilitate such residue deposits so that the rehabilitation of the residue deposits is implemented concurrently with the mining operation.	Rehabilitation of the co-disposal dump has not commenced concurrently with mining activities due to operational constraints.

Mooiplaats Colliery will require exemption from the Department of Water and Sanitation (DWS) in terms Regulation 4(a), (b), (c), 5 and 11(b) of GN 704 as presented in Table 7 above and expanded upon in Section 3.6 and Section 4.4 to 4.6.

3.4 GENERAL AUTHORISATION WATER USES

In terms of Section 22 (1) of the NWA, a person may use water without a licence if that water use is permissible in terms of the General Authorisations (GAs) issued under Section 39 of the NWA. All the water uses at the study area and proposed operations were assessed to determine whether they requires authorisation in terms of a GA and it was found that the water uses do not fall in the specifications of the GAs and can't be generally authorised.

3.5 NEW WATER USES TO BE LICENCED

A summary of all water uses that are applicable to Mooiplaats are indicated in Table 8 while a comprehensive list of all water uses is presented in Section 2.6 Table 5. The completed Water Use Licence Forms and this IWWMP will be submitted to the DWS via the EWULAAS online system.

Table 8: New water uses.

Section 21 Water Use	Water Use Name	Description / purpose
Section 21(a)	Boreholes for abstraction of potable water	Removal of water for use at mine
Section 21(a)	Abstraction of water through Usutu Boreholes	Water is to be abstracted underground for the safety of the people
Section 21 (c) and (i)	Mining within 500m of a wetland;	underground mining.
Section 21 (c) and (i)	Mining infrastructure situated within 500m of a wetland	All mining infrastructure falling within the 500m buffer (e.g.: plant, PCD's, settling ponds, rescue boreholes and various roads).
Section 21(j)	Removal of underground water	Removal of underground water from underground mining areas for safety of people and operations.

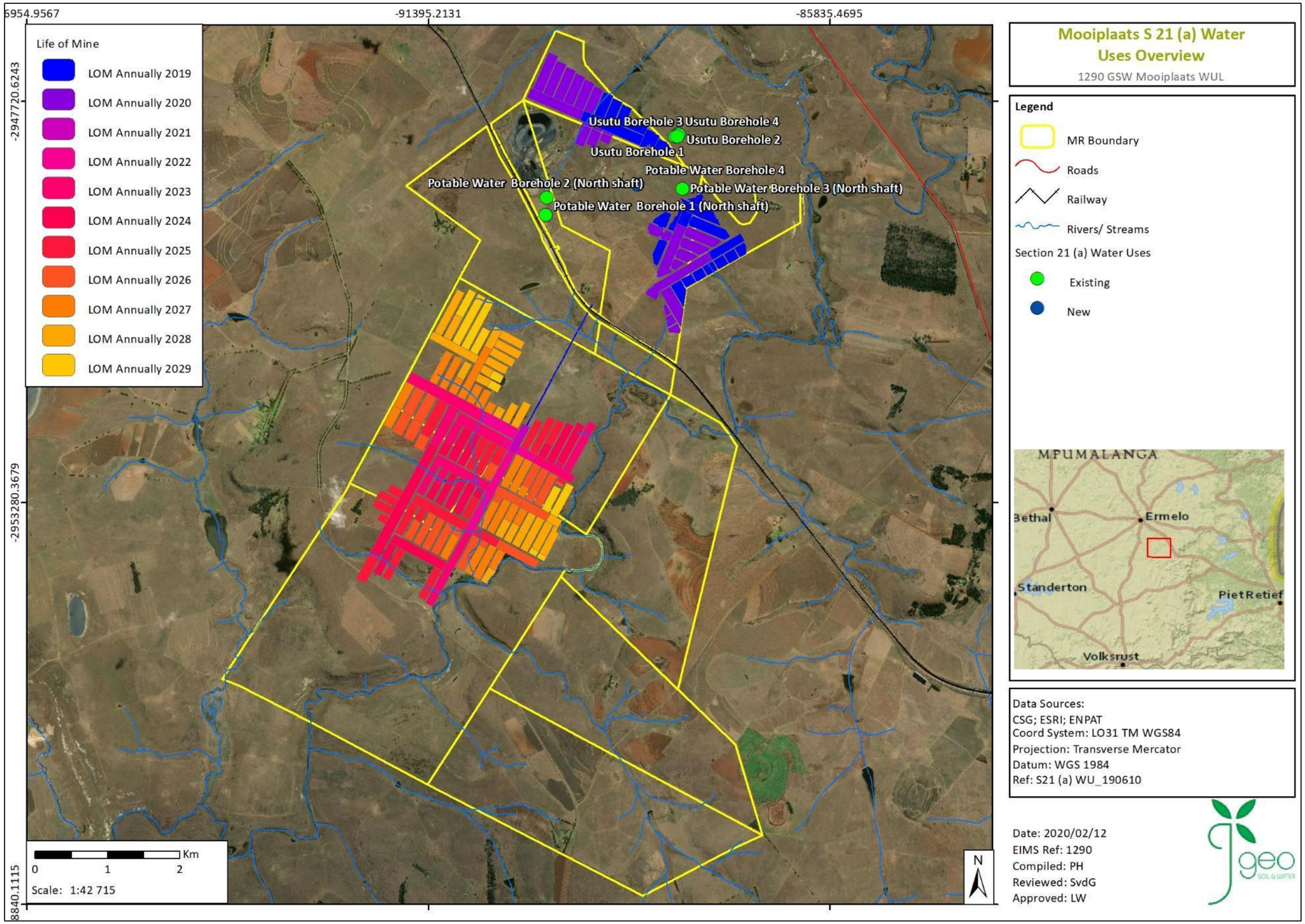


Figure 9: NWA Section 21(a) water uses overview.

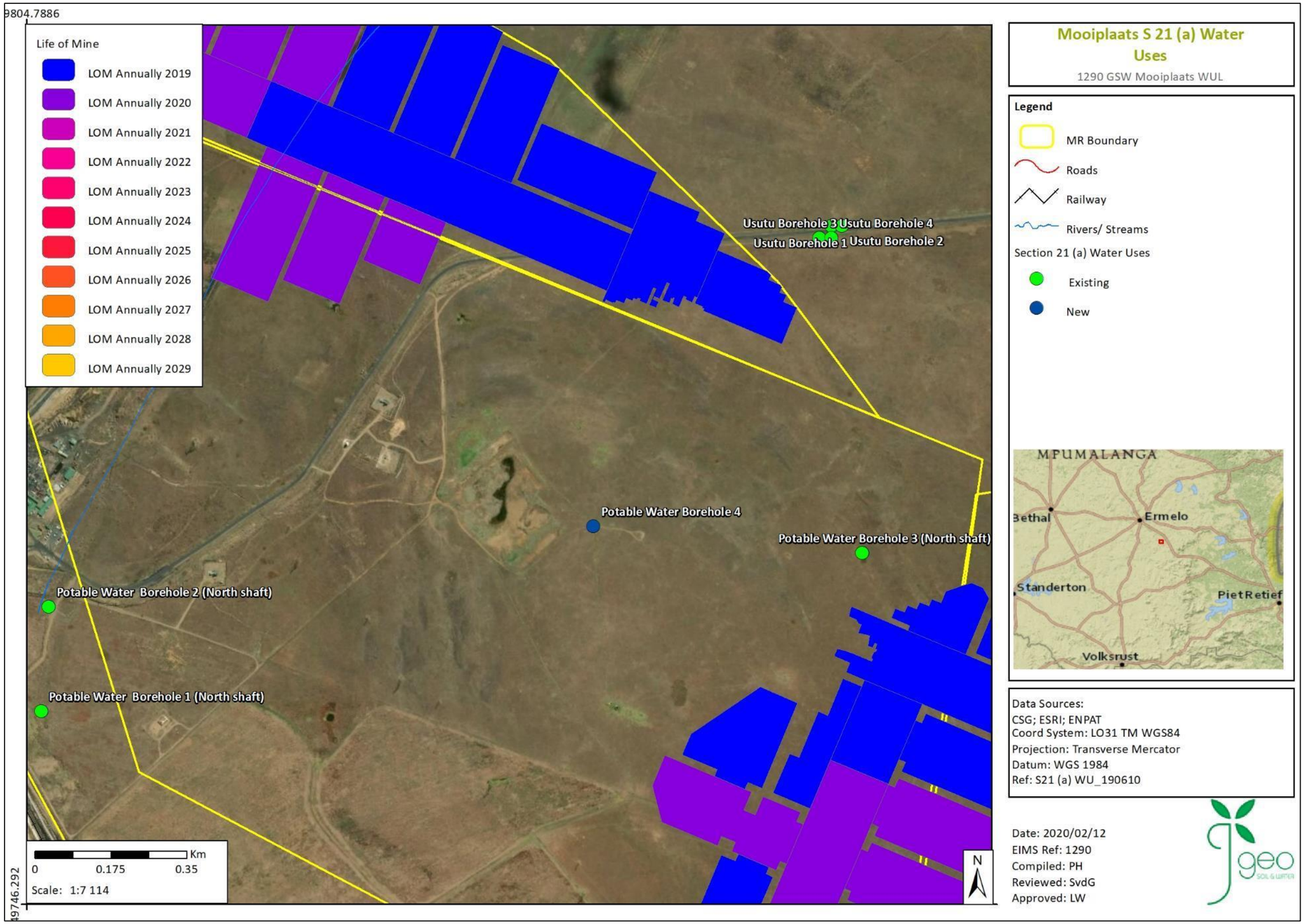


Figure 10: NWA Section 21(a) water uses inset.

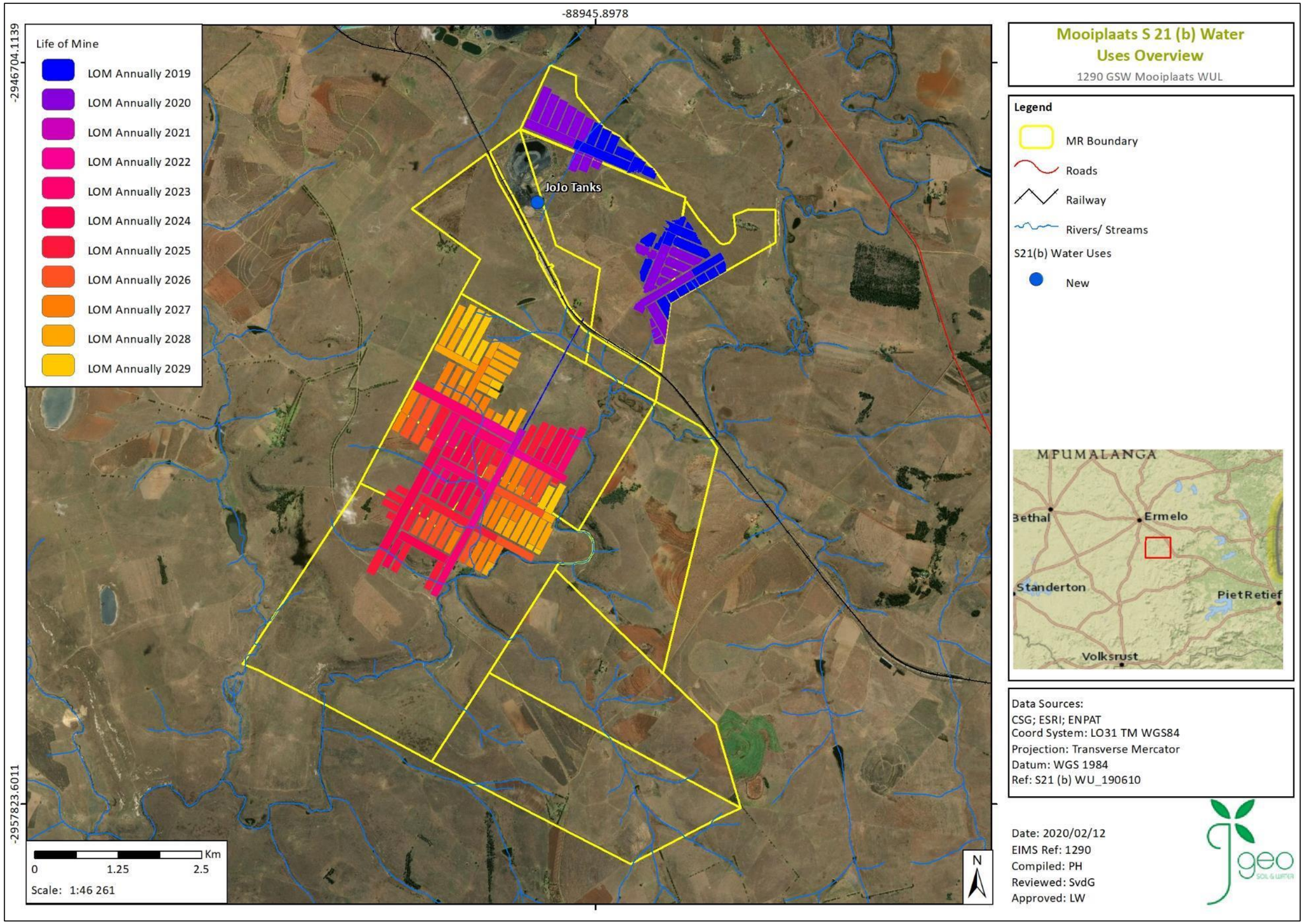


Figure 11: NWA Section 21(b) water uses overview.

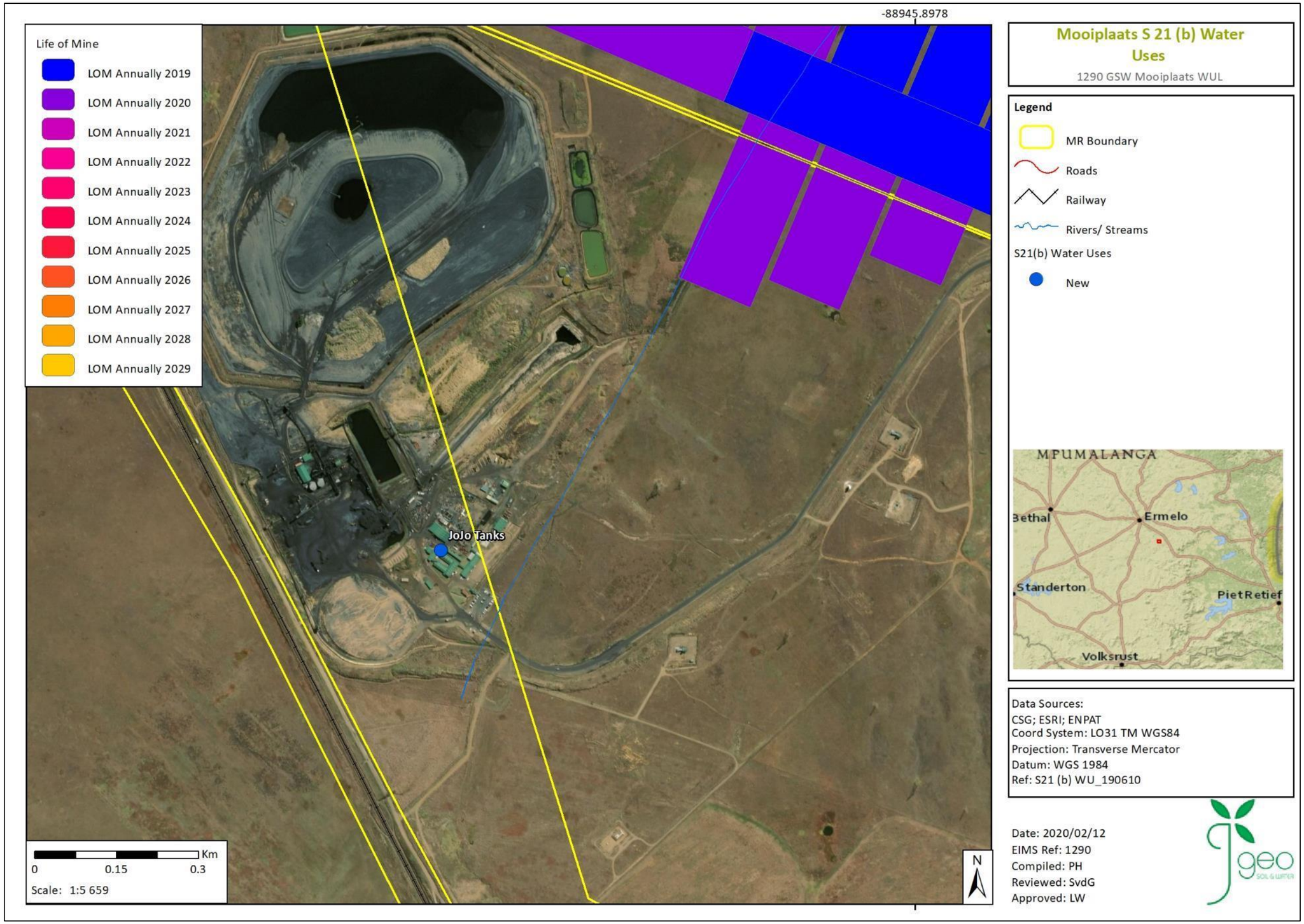


Figure 12: NWA Section 21(b) water uses inset.

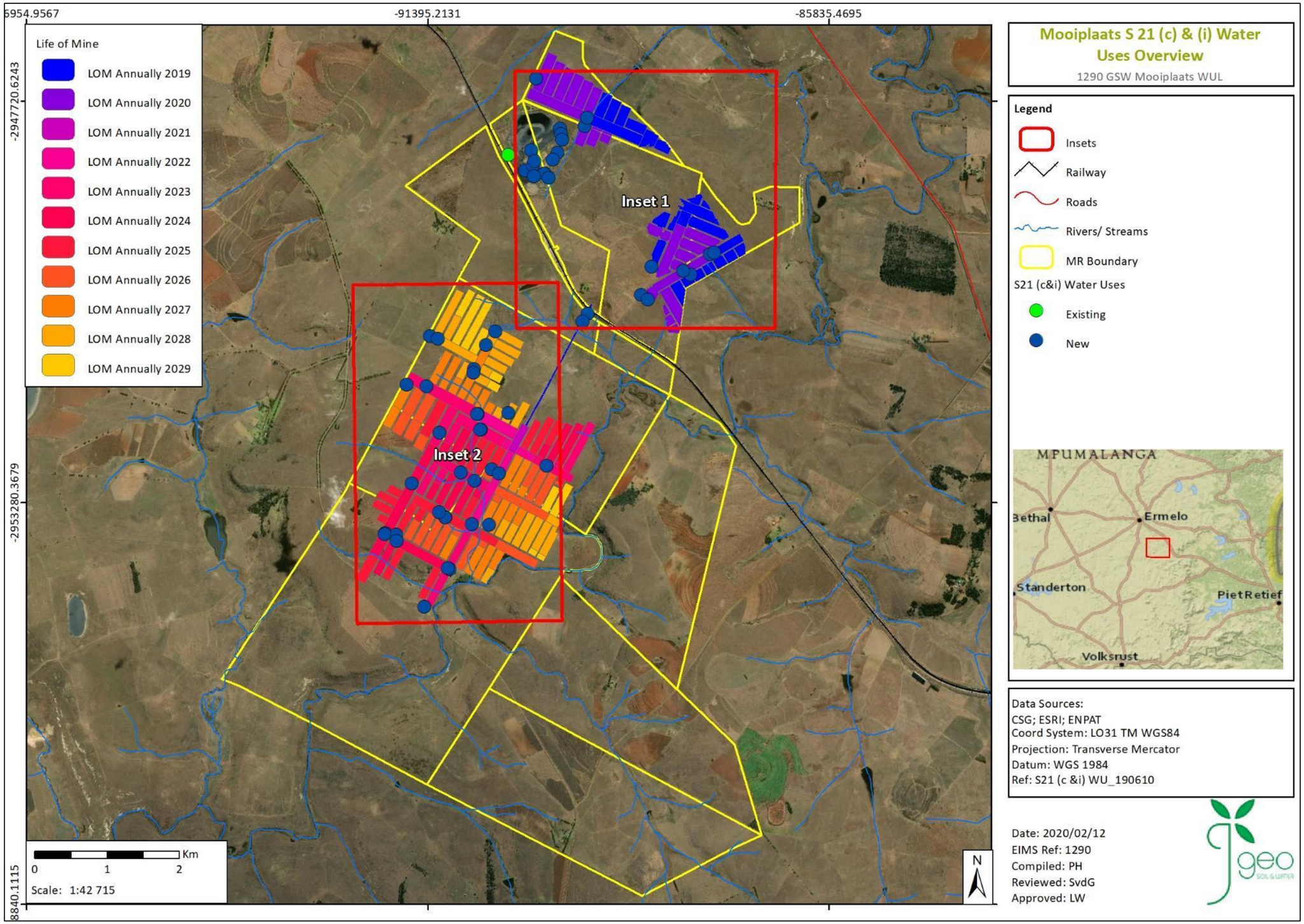


Figure 13: NWA Section 21(c&i) water uses overview.

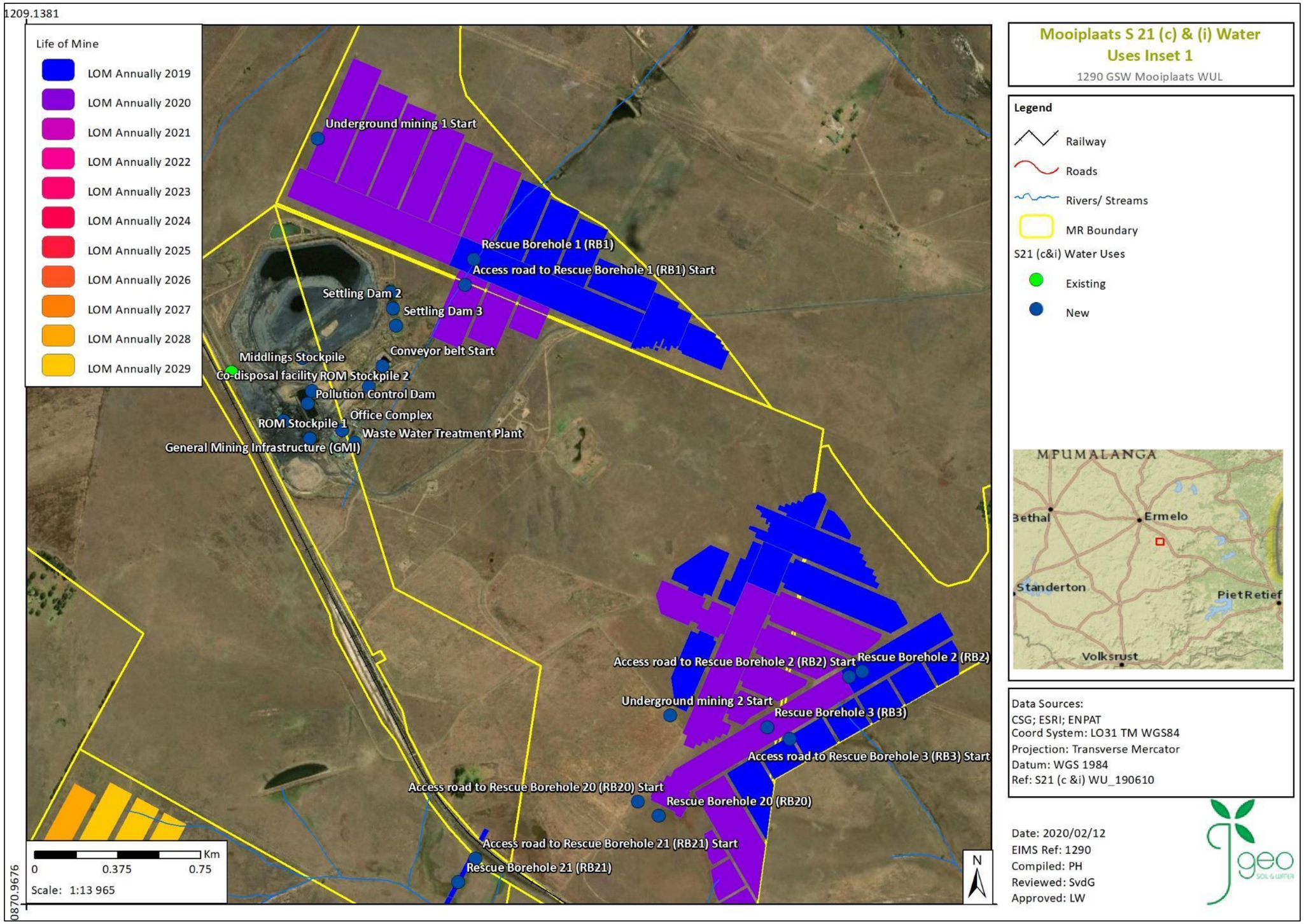


Figure 14: NWA Section 21(c&i) water uses inset 1.

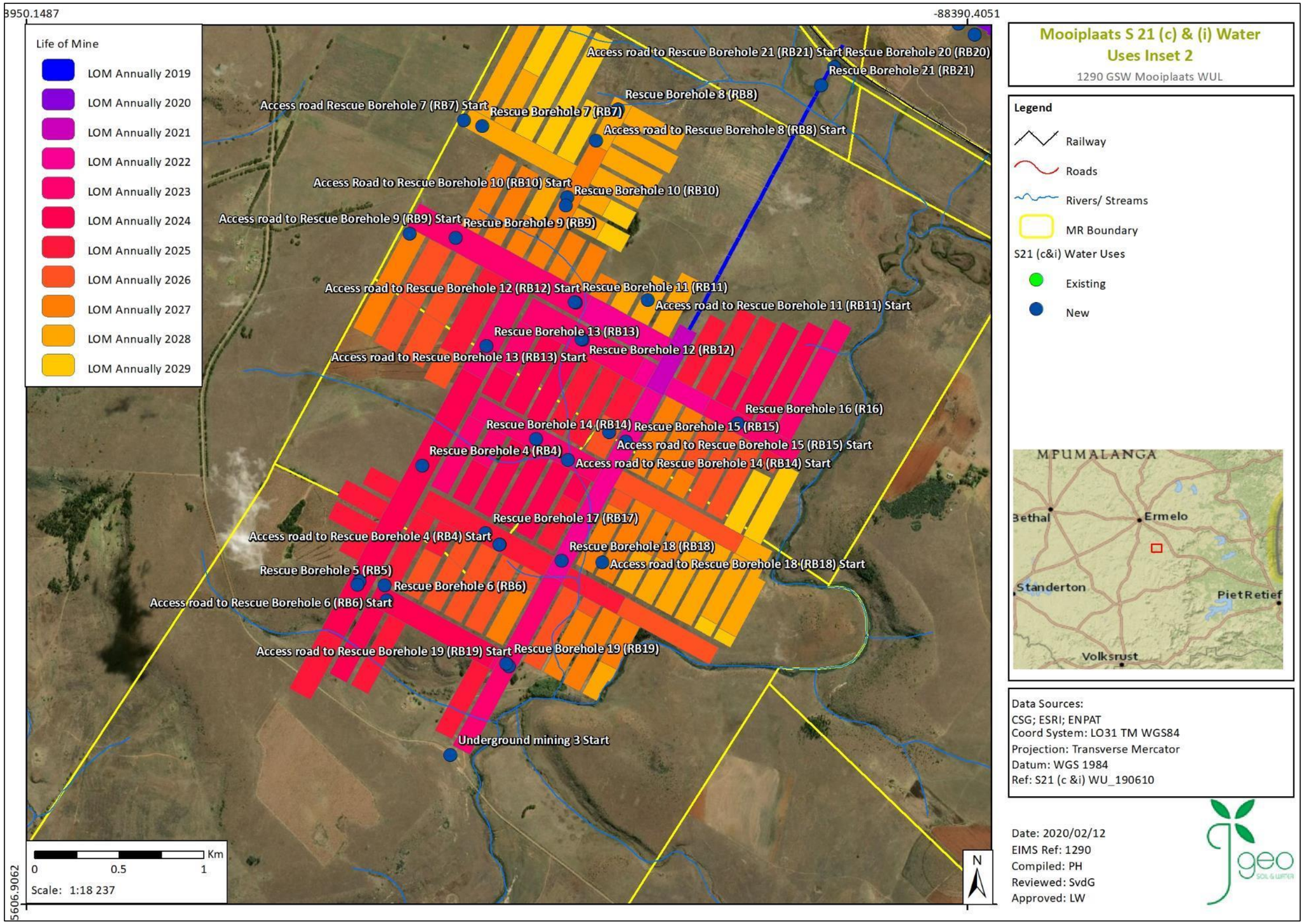


Figure 15: NWA Section 21(c&i) water uses inset 2.

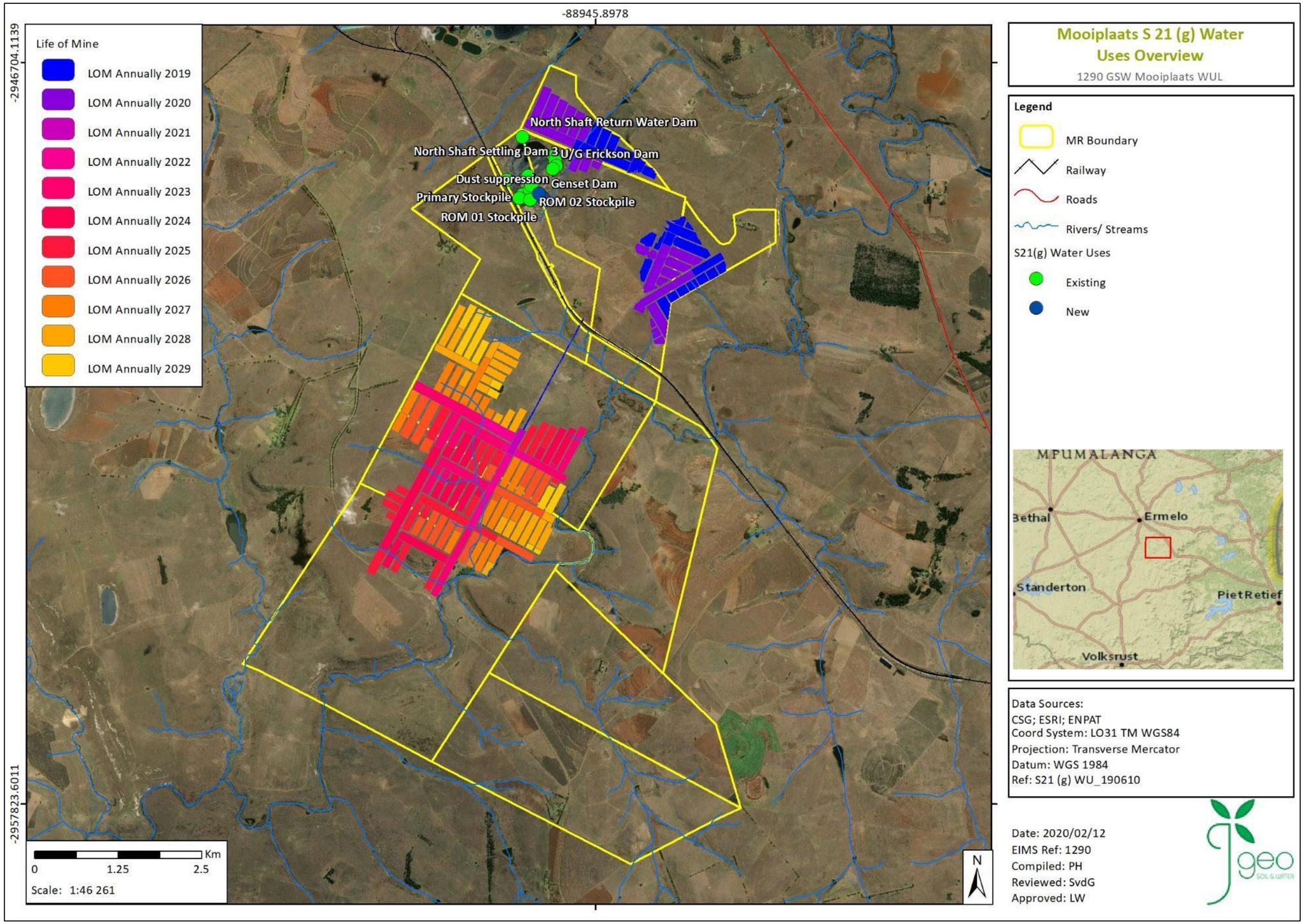


Figure 16: NWA Section 21(g) water uses overview.

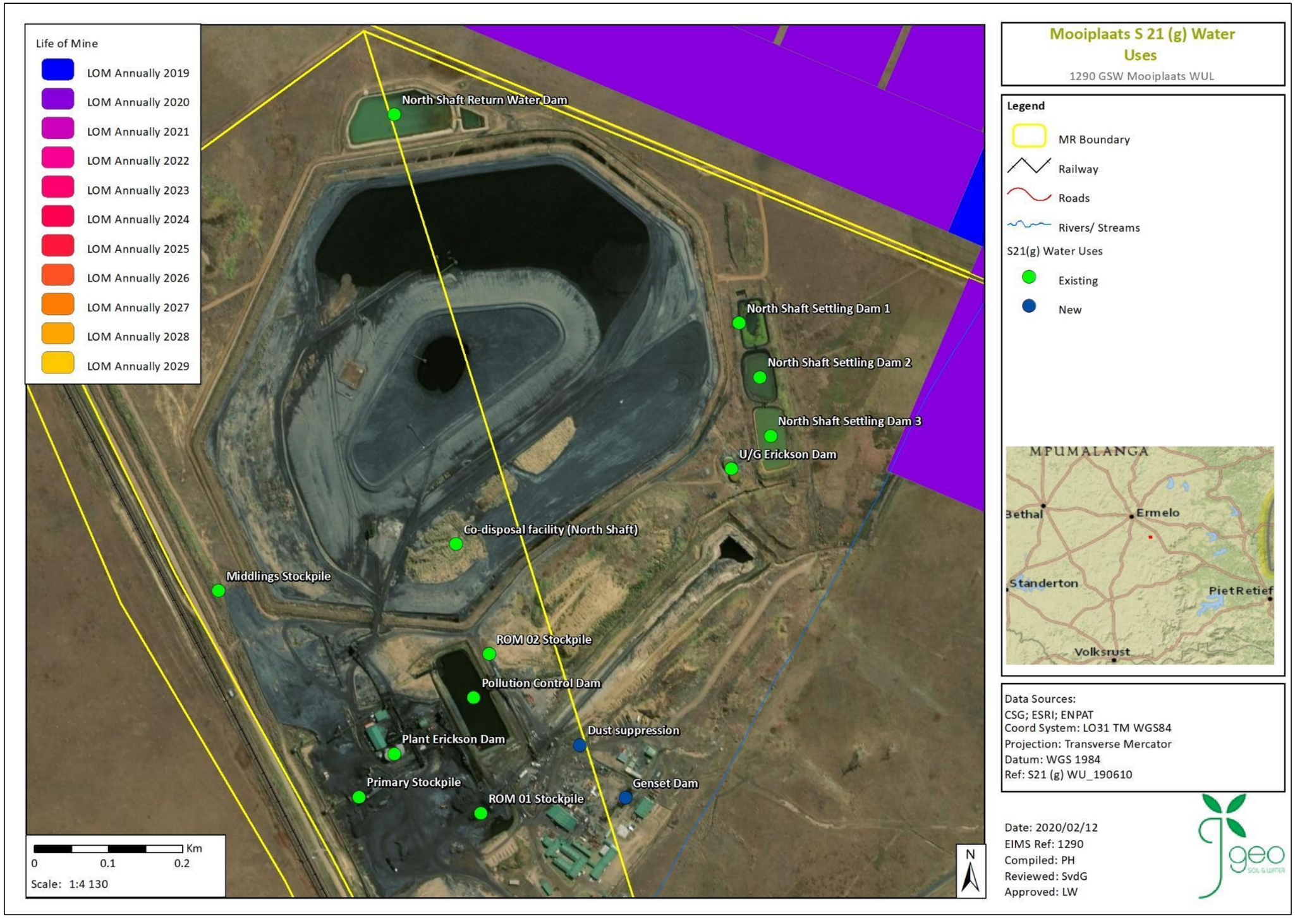


Figure 17: NWA Section 21(g) water uses inset.

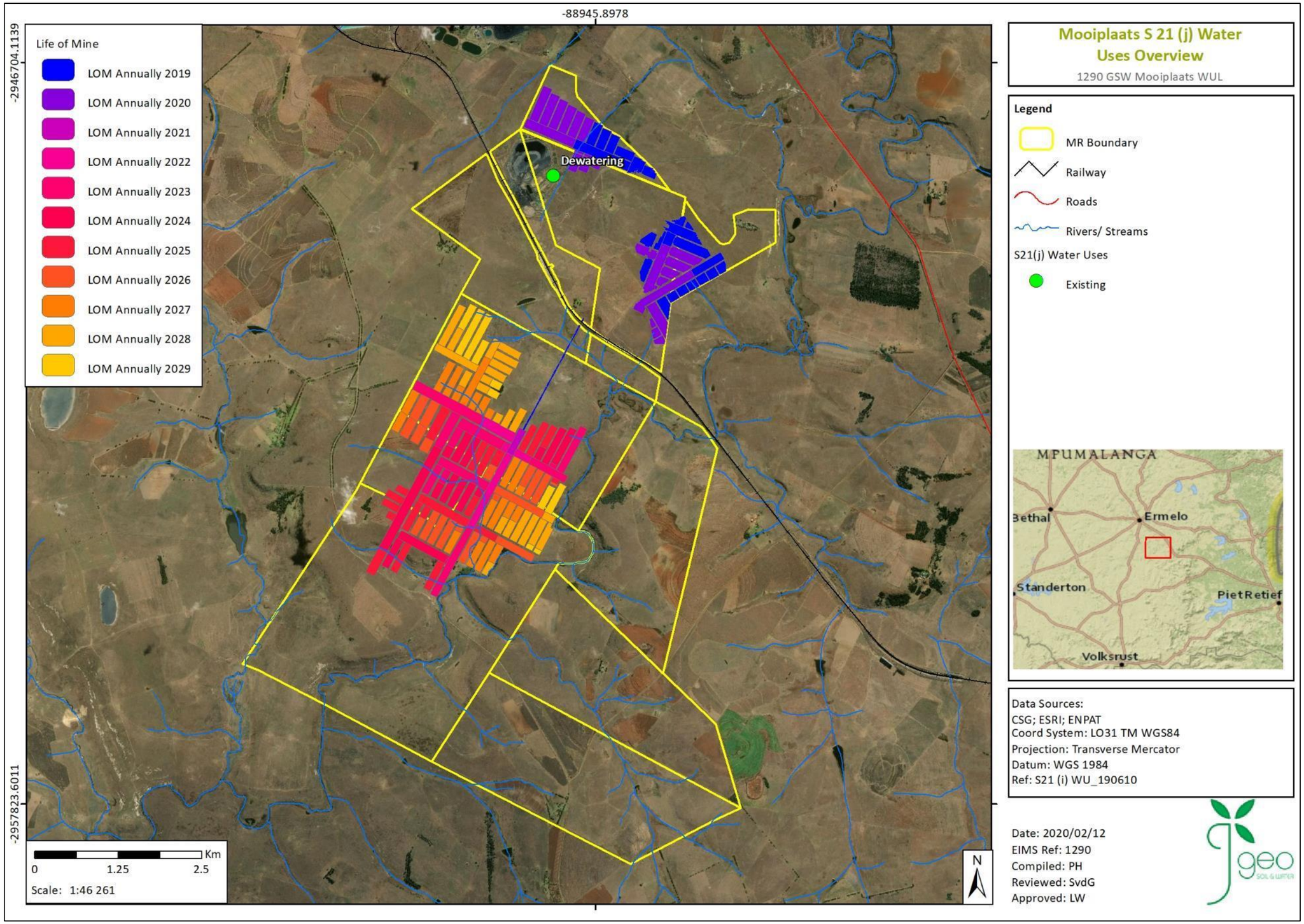


Figure 18: NWA Section 21(j) water uses overview.

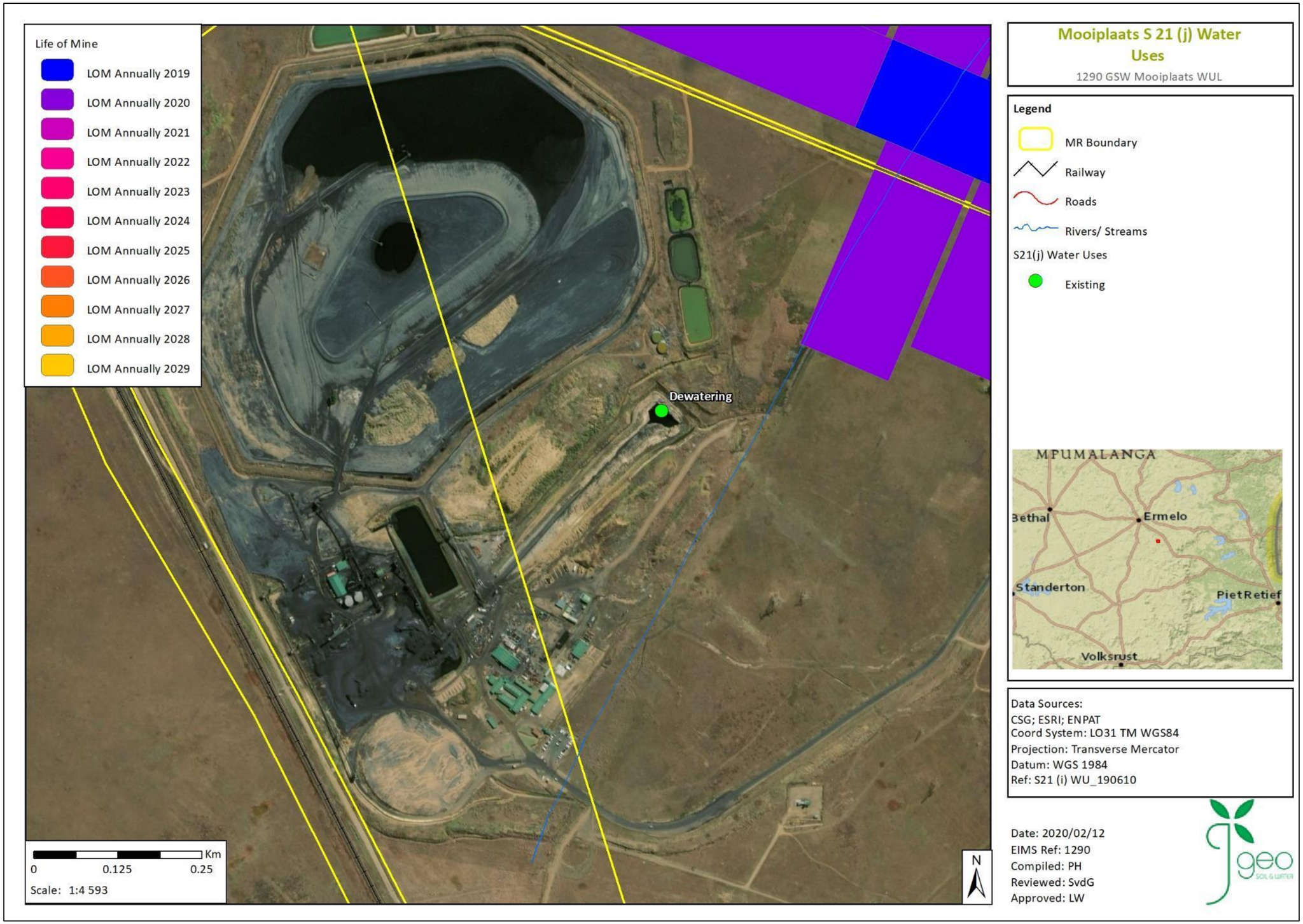


Figure 19: NWA Section 21(j) water uses inset.

3.6 WASTE MANAGEMENT ACTIVITY (NEMWA)

Although none of the listed activities detailed in National Environmental Management: Waste Act, 2008 (NEMWA) regulations are applicable to the Mooiplaats Colliery Vunene project, the requirements of this act must be taken into consideration for the remainder of the existing Mooiplaats operations. The National Environmental Management: Waste Amendment Act came into force on 2 June 2014. Waste is accordingly no longer governed by the MPRDA but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

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

1. A holder of waste must, within the holder's power, take all reasonable measures to-
    a) "Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;
    b) Reduce, re-use, recycle and recover waste;
    c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
    d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;
    e) Prevent any employee or any person under his or her supervision from contravening the Act; and
    f) Prevent the waste from being used for unauthorised purposes."

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

Waste can be defined as either hazardous or general in accordance to Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste. Under Category A (hazardous waste), the act makes allowance for, but not limited to, "wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal; oil wastes and wastes of liquid fuels; and construction wastes".

In order to attempt to understand the implications of these waste groups, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."
- Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."
- Residue stockpile: means "any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit

or, production right or an old order right, including historic mines and dumps created before the implementation of this Act."

- General waste: means "waste that does not pose an immediate hazard or threat to health or to the environment and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69."

NEMWA Planning and Management of Residue Stockpiles and Residue Deposits Regulations, 2015 (GN R 632):

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the NEMA. A risk analysis based on the characteristics and the classification set out in Regulation 4 and 5 must be used to determine the appropriate mitigation and management measures. The pollution control barrier system shall be defined by the-

- National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and
- National Norms and Standards for Disposal of Waste to Landfill, 2013.

The planning, management and reporting of residue stockpiles and residue deposits is shown schematically in **Figure 20** below.

Figure 20: Overview of the planning and management of residue stockpiles and residue deposits regulations

It is anticipated that existing stockpiling areas will be used for the Mooiplaats South and Vunene project areas and therefore there will be no requirement to identify new stockpile areas or licence new stockpiles under the NEMWA.

3.7 WASTE RELATED AUTHORISATIONS

Mooiplaats North Colliery is an operating underground operation and has a MR in terms of the Mineral and Petroleum Resources Development Act (2002) for the Mooiplaats Colliery with an original EMPR dated 2005. This MR (MP 30/5/1/2/2/68 MR) was granted to Langcarel (Pty) Ltd in 2007. This mining right allowed for the underground mining of coal and on-site processing and associated infrastructure as discussed in the original EMPR. A subsequent revision to the original EMPR was undertaken in 2012 under the instruction of the DMRE.

The transitional provisions of GNR 921 as amended on 24 July 2015 states that "an environmental management programme or plan approved in terms of the Mineral and Petroleum Resources Development Act, 2002 shall be deemed to have been approved and issued in terms of this Act". As such, the waste related activities (e.g.: residue stockpiles or residue deposits) that currently occur on Mooiplaats Colliery do not require further waste related authorisations in terms of the NEMWA.

3.8 OTHER AUTHORISATIONS

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA further governs the sustainable utilisation of South Africa's mineral resources. In the event that the proposed activities require material (e.g. sand, gravel, aggregate) for the purposes of construction then the provisions of the MPRDA may apply.

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment to Section 102 which concerns the amendment of rights, permits, programmes and plans, to requiring the written permission from the Minister for any amendment or alteration; and the Section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014 as was amended in April 2017. A new EA Application has been initiated under the NEMA for the proposed inclusion of the Mooiplaats Colliery Vunene Project area into the Mooiplaats Colliery mining right area. Therefore, a Section 102 application, for the amendment of the Mooiplaats Colliery MWP and approved EMPR to include the activities pertaining to the proposed Mooiplaats Colliery Vunene Project area, will be completed in due course.

In support of the EA application submitted for the Mooiplaats Colliery Vunene Project area, the applicant is required to conduct an EIA process comprising of the preparation of environmental Scoping and EIA Reports, an EMPR, as well as Interested and Affected Party (I&AP) consultations, all of which must be submitted to the DMR for adjudication.

3.8.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998 – NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA. In South Africa, EIA's became a legal

requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now DEA) promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010 and again in December 2014 as well as April 2017. The 2014 NEMA EIA Regulations (as amended) are applicable to this project. Mining activities, including activities such as the proposed Mooiplaats Colliery Vunene Project area, officially became governable under the NEMA EIA Regulations (as amended) in December 2014.

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

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's in order to apply for, and be considered for, the issuing of an EA. These EIA Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and GN R. 985) and a more complete EIA process (activities listed in GN R. 984). In the case of the Mooiplaats Colliery Vunene Project area, there are activities triggered under GN R. 984 and as such a full EIA process is necessary. The listed activities under the NEMA EIA Regulations (2014) that are applicable to this project are as follows:

- Activity 9 of GN 983;
- Activity 10 of GN 983;
- Activity 12 of GN 983;
- Activity 13 of GN 983;
- Activity 19 of GN983;
- Activity 24 of GN 983;
- Activity 27 of GN 983;
- Activity 34 of GN 983;
- Activity 45 of GN 983;
- Activity 46 of GN 983;
- Activity 56 of GN 983;
- Activity 63 of GN 983;
- Activity 6 of GN 984;
- Activity 7 of GN 984;

- Activity 11 of GN 984;
- Activity 15 of GN 984;
- Activity 16 of GN 984;
- Activity 17 of GN 984;
- Activity 4 of GN 985;
- Activity 12 of GN 985;
- Activity 14 of GN 985; and
- Activity 18 of GN 985.

3.8.2 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT

The purpose of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008 - NEMWA) is to prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development. In addition, sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is reduced, re-used, recycled or recovered and only as a last resort treated and safely disposed of.

Section 19 of the Act allows that the Minister may, by notice in the Gazette, publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. Such activities require a waste management licence. The Act aims to address the likely environmental impacts associated with wastes on the cradle to grave basis.

The activities listed include the following categories:

- Storage of waste;
- Reuse, recycling and recovery;
- Treatment of waste;
- Disposal of waste;
- Storage, treatment and processing of animal waste; and
- Construction, expansion or decommissioning of facilities and associated structures and infrastructure.

Each of the listed activities has a threshold which would trigger the need for a waste management licence (WML) (thresholds relate to, inter alia, volumes, time, and throughputs). As from the 2nd of September 2014, WML's are required for all new residue stockpiles and deposits relating to prospecting, mining, exploration or production activities. As detailed in Section 3.7, the waste related activities that occurred prior to 2015 are considered authorised under the transitional provisions of the NEMWA GNR 921.

The Act also addresses contaminated land and requires that on identification of such land the DEA must be notified and relevant site assessment / contamination assessments undertaken. If contaminated then such land is recorded as contaminated on a national contaminated land register.

It is further important to consider the provision of Section 16 of the Act which requires that:

"A holder of waste must, within the holders' power, take all reasonable measures to-

- *avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*
- *reduce, re-use, recycle and recover waste;*
- *where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;*
- *manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;*
- *prevent any employee or any person under his or her supervision from contravening the Act; and*
- *prevent the waste from being used for unauthorised purposes."*

4 PRESENT ENVIRONMENTAL ATTRIBUTES

4.1 CLIMATE

The Mooiplaats Colliery site falls within the Highveld region, which is typically characterised by warm wet summers and cold dry winters. The mean annual temperature ranges between 16°C in the west to 12° in the east, with an average of about 15°C for the catchment as a whole. Maximum summer temperatures occur in January and minimum winter temperatures are experienced in July. Rainfall is seasonal and most rain occurs in the summer months (October to April). Precipitation occurs as showers and thunderstorms and is sometimes accompanied by hail. Frost occurs in winter, with occasional light snow on high lying areas. The mean annual rainfall decreases from the east (1000mm) to the west (500mm), with the mean annual precipitation (MAP) of approximately 700mm.

4.2 REGIONAL CLIMATE RAINFALL

The study area receives approximately 705mm of rain per year with most of the rainfall during summer periods. The minimum temperatures in the winter months can be very low, especially over June and July, however the average maximum temperatures remain mild.

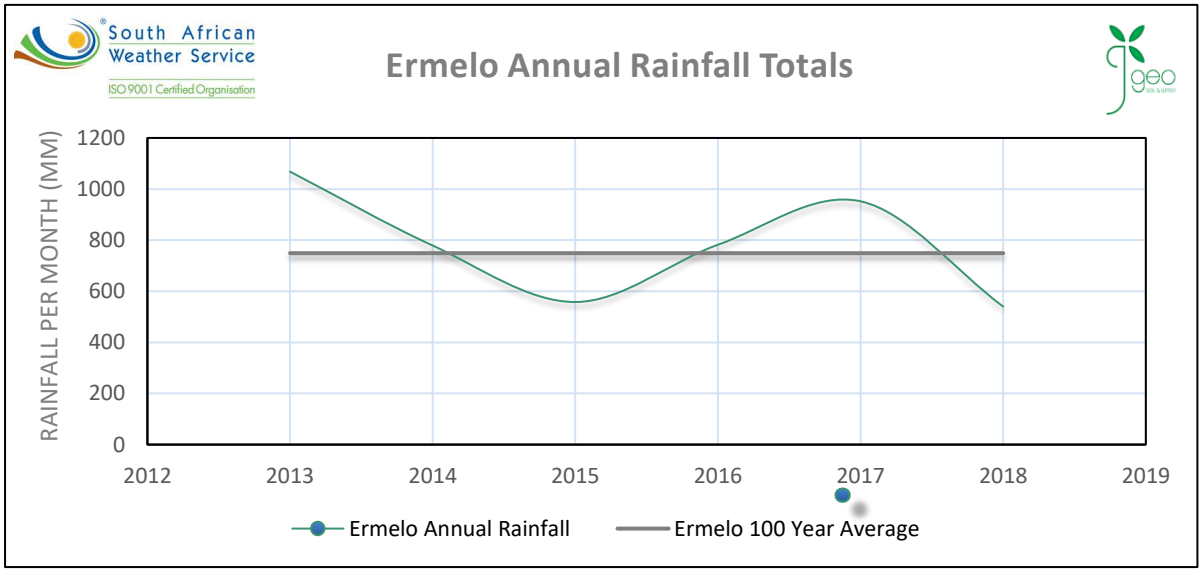
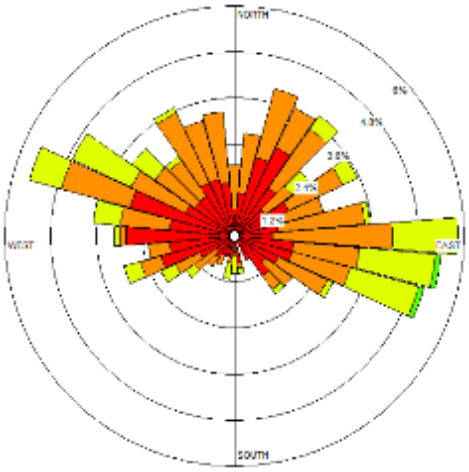
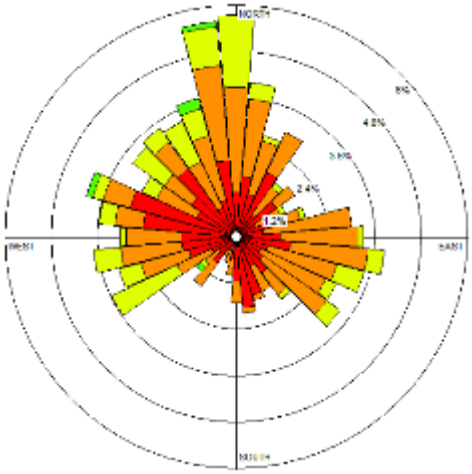
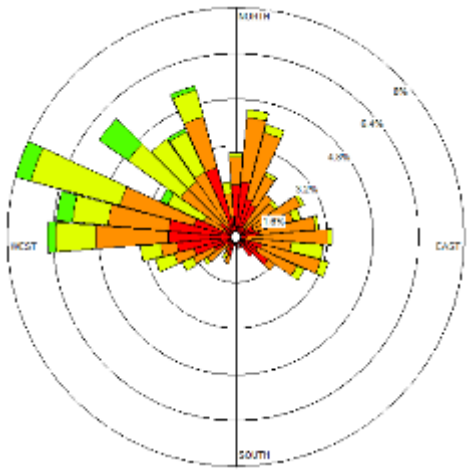
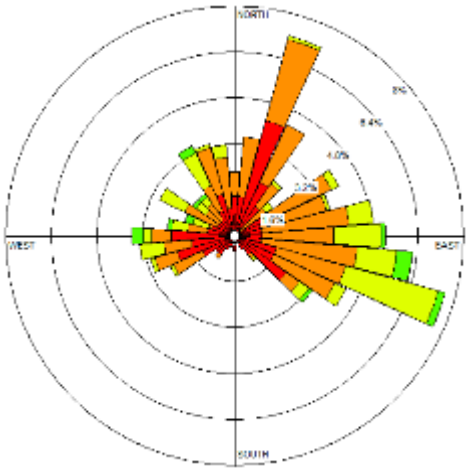
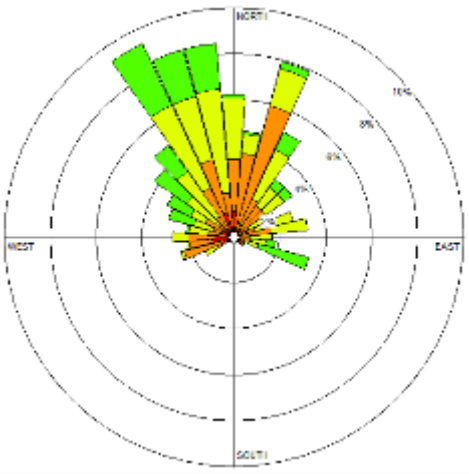
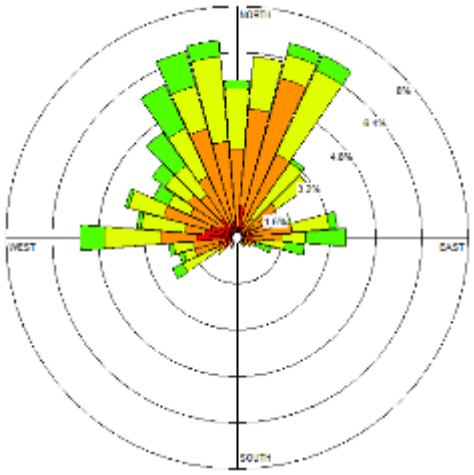


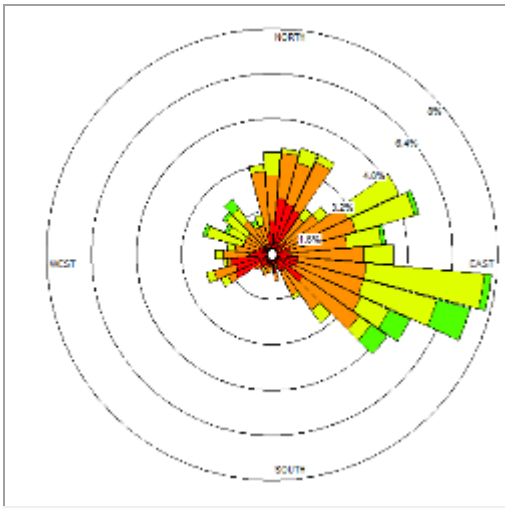
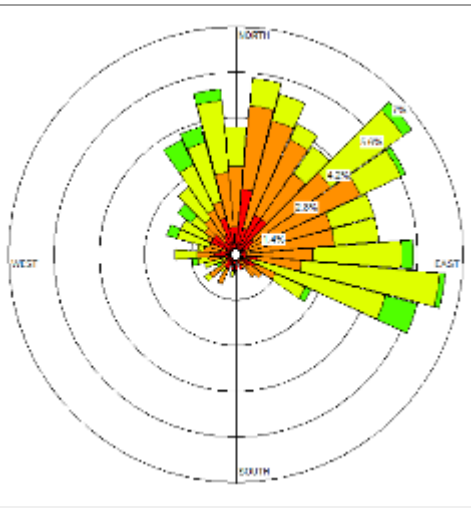
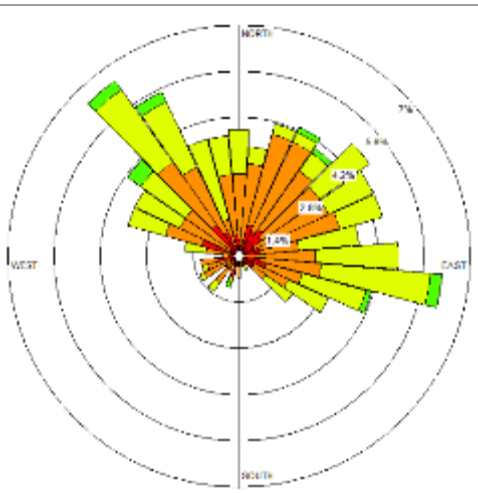
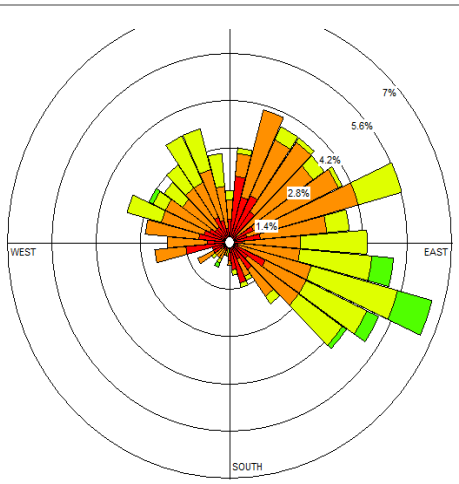
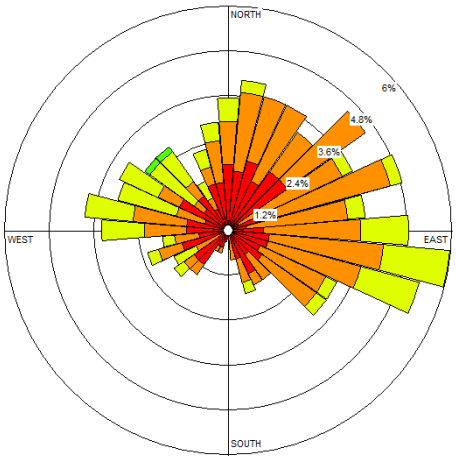
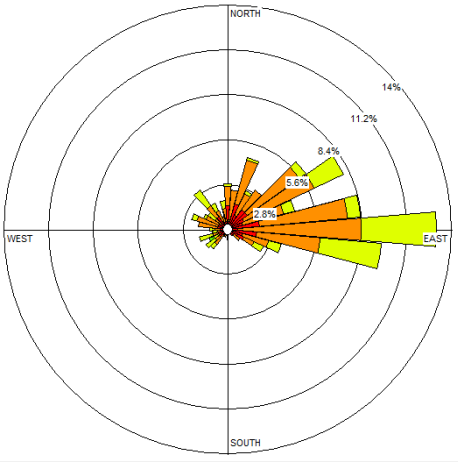
Figure 21: Ermelo Annual Rainfall Totals

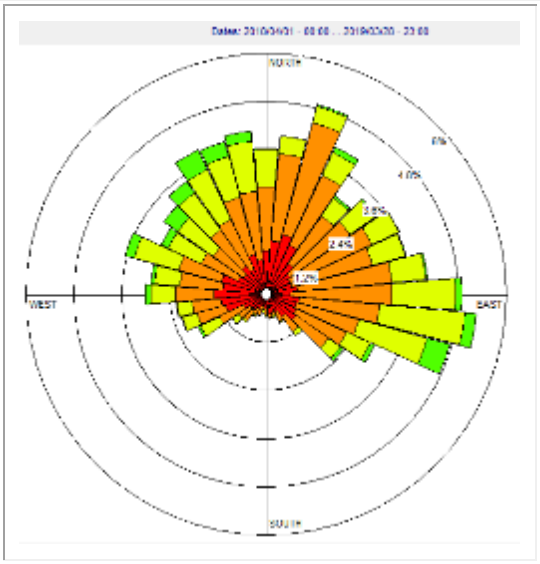
4.3 EVAPORATION

Prevailing spring daytime wind direction in the proximity of the site are north and east (refer to Table 9). Prevailing summer daytime wind direction in the proximity of the site is east and north-east, with a few milder winds coming from the north. The autumn months are very windy, with wind coming from all directions. Prevailing winter daytime wind direction in the proximity of the site is mainly from the west; west-northwest; northwest; north-northwest and north. The Mean Annual Evaporation (MAE) at this station is 1 518mm, while interpolation of evaporation data from WR90 indicates a value between 1 550mm and 1 600mm per annum. Evaporation is much less variable, both in terms of seasonal and annual, than the rainfall. Annual totals vary between 1 350 and 1 800mm.

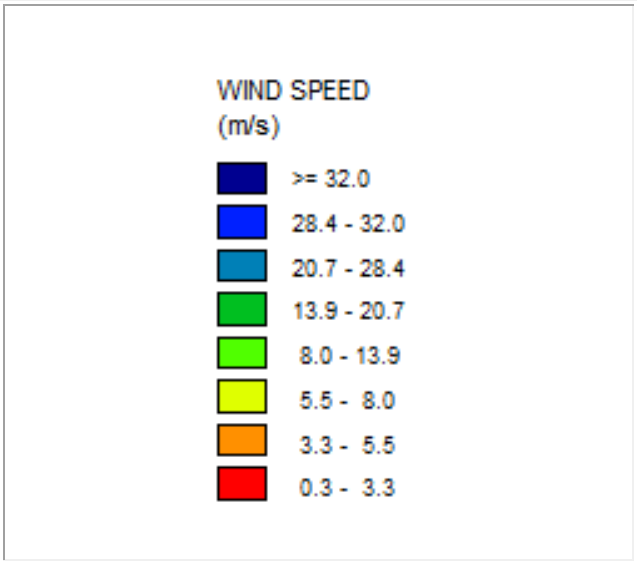
Table 9: Wind rose for Ermelo which indicate dominant wind directions

Dominant Wind Directions - Wind Rose	
	
April	**May**
	
June	**July**
	

August	September
	
October	**November**
	
December	**January**
	
February	**March**



April 2018 to March 2019



Legend

In terms of extreme weather conditions, Ermelo hardly ever experiences snow and the incidences of hail are also limited. However, the trend of hail follows the trend of thunderstorms, which occur in the summer months between October and March. There is a very high incidence of fog in the area, especially during autumn and winter, and sometimes experienced during the summer months.

4.4 SURFACE WATER

Several streams, wetlands and springs are located in the area which drains south and east towards the Witpuntspruit and Vaal River in the Grootdraai Dam, located within the Upper Vaal Catchment.

4.4.1 WATER MANAGEMENT AREA

The Mooiplaats Colliery is situated in the Upper Vaal Water Management Area (WMA 8) specifically the C11B quaternary catchment. Figure 25 presents the WMA and quaternary catchment in relation to the site and catchment information is presented in Table 10. The Vaal River is the main tributary within the area flowing in a north south direction towards the Vaal Dam. Other tributaries include the Witpunspruit, Sterkspruit and Wolwespruit, which drain to the Vaal River.

Table 10: WMA and Quaternary Catchment Information.

WMA	Quaternary Catchment	Catchment Area (km^2)	MAP (mm)	MAE (mm)	MAR (mcm)
Upper Vaal WMA	C11B	536	705	1400	32.37

4.4.2 SURFACE WATER HYDROLOGY

The Mooiplaats Colliery is situated in the Upper Vaal Water Management Area (WMA 8) specifically the C11B quaternary catchment. The Vaal River is the main tributary within the area flowing in a north south direction towards the Vaal Dam. Other tributaries include the Witpunspruit, Sterkspruit and Wolwespruit, which drain to the Vaal River. The hydrological specialist report is included in Appendix E.

The US Army Corp of Engineers (USACE) Hydrologic Engineering Centre River Analysis System (HEC-RAS) model was used to calculate the relevant flood levels. The available 5 m contour data were used to generate a Digital Elevation Model (DEM) in order to analyse the hydraulic flow characteristics of the terrain at the project site. The relevant Manning's roughness coefficients (n) were estimated for channel characteristics, riparian and bank areas based on observations made during the site assessment. Relevant values were obtained via data published in, 'Hec-RAS River Analysis System – Hydraulic Reference Manual Version 4.1' (January 2010).

The Manning's values that were assigned to the river reach were 0.01 for both the river channel and the riverbanks. A constant Manning's value (n) was utilised as the non-perennial watercourse did not have defined banks and as such the vegetation was considered consistent across the relevant cross sections.

The calculated flood extents for the 1:50- and 1:100-year flood events are depicted in Figure 22 and Figure 23 respectively. The flood extents for the 1:50- and 1:100-year flood events illustrate that the extend of the 1:50- and 1:100-year flood events pose a threat to the infrastructure.

Figure 22: Calculated 1:50 year floodlines.

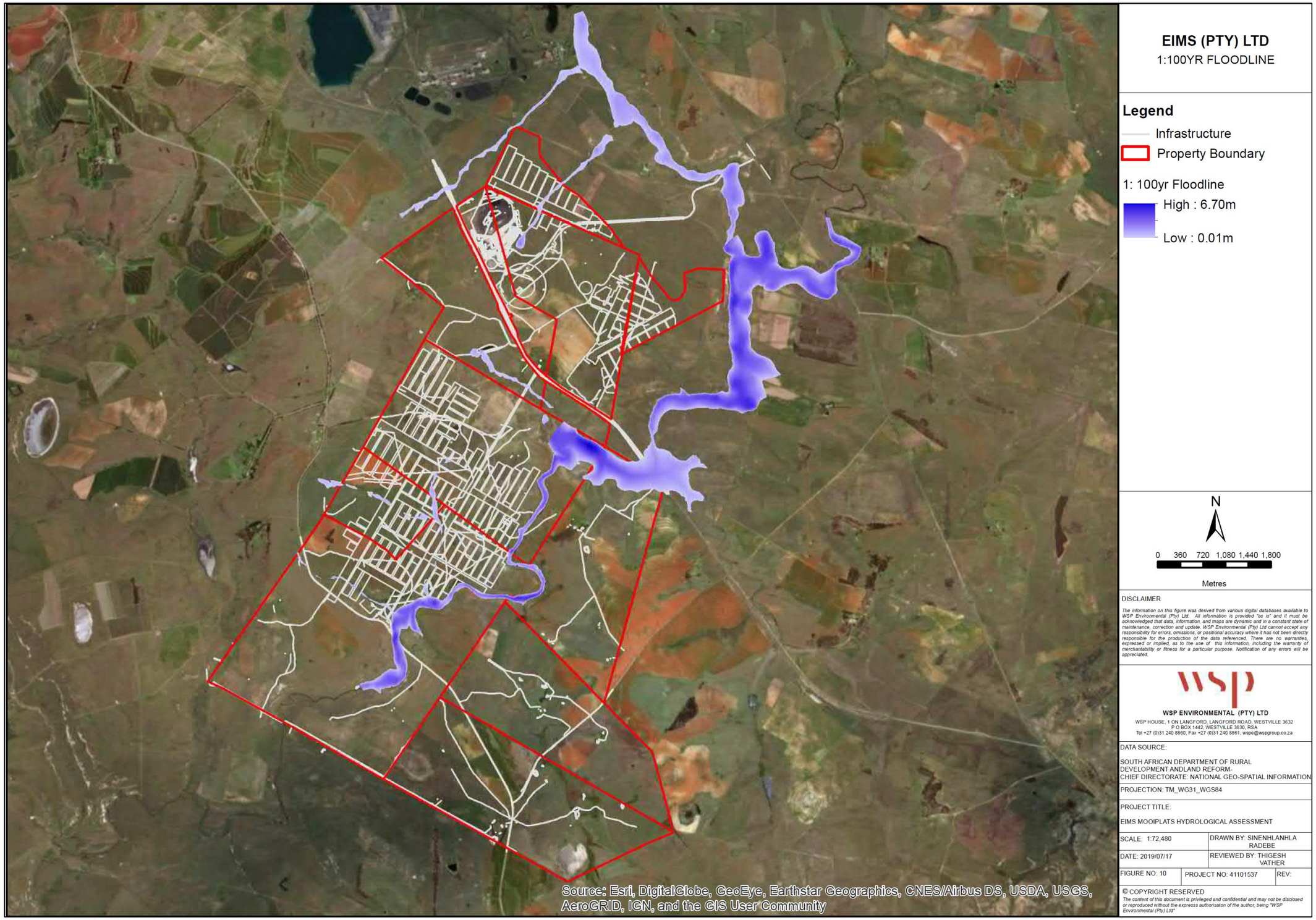


Figure 23: Calculated 1:100 year floodlines.

4.4.3 SURFACE WATER QUALITY

As Mooiplaats Colliery is an existing mine, there is an existing IWUL (Licence no. 08/C11B/AGJ/2141, dated 02 May 2013. As per the conditions of the IWUL, Mooiplaats Colliery is required to conduct monthly surface water monitoring to determine if the chemical water quality and the levels are in line as prescribed in the IWUL. As per the IWUL, there are ten (10) surface water monitoring and fifteen (15) additional surface water monitoring points that are included in the surface water monitoring programme. Refer to Figure 24 for the location of the surface water monitoring points.

Monthly surface water samples are analysed for:

- pH
- Electrical Conductivity (EC) mS/m
- Total Dissolved Salts (TDS) mg/L
- Total Hardness mg/L
- Alkalinity $CaCO_3$/L
- Calcium (Ca) mg/L
- Magnesium (Mg) mg/L
- Sodium (Na) mg/L
- Potassium (K) mg/L
- Fluoride (F) mg/L
- Chloride (Cl) mg/L
- Sulphate (SO_4) mg/L
- Nitrate (NO_3) mg/L
- Aluminium (Al) mg/L
- Iron (Fe) mg/L
- Manganese (Mn) mg/L
- Ammonia (NH_3) mg/L

Water qualities are compared to the IWUL Limits and the In-stream Water Quality Guidelines for the Grootdraai Dam Catchment - Vaal origin. The DWS Water Quality Guidelines (second edition). Volume 5: Agricultural Use: Livestock Watering and the South African National Standard, Drinking Water Standard (Edition 2) (SANS 241:2015) were included as supplementary comparative guidelines and not for compliance purposes.

The monitoring network provides information for risk-based decision making to Mooiplaats management with regard to effectiveness of pollution prevention measures and areas requiring management attention. The results for the surface water monitoring are provided in Table 12 to Table 16.

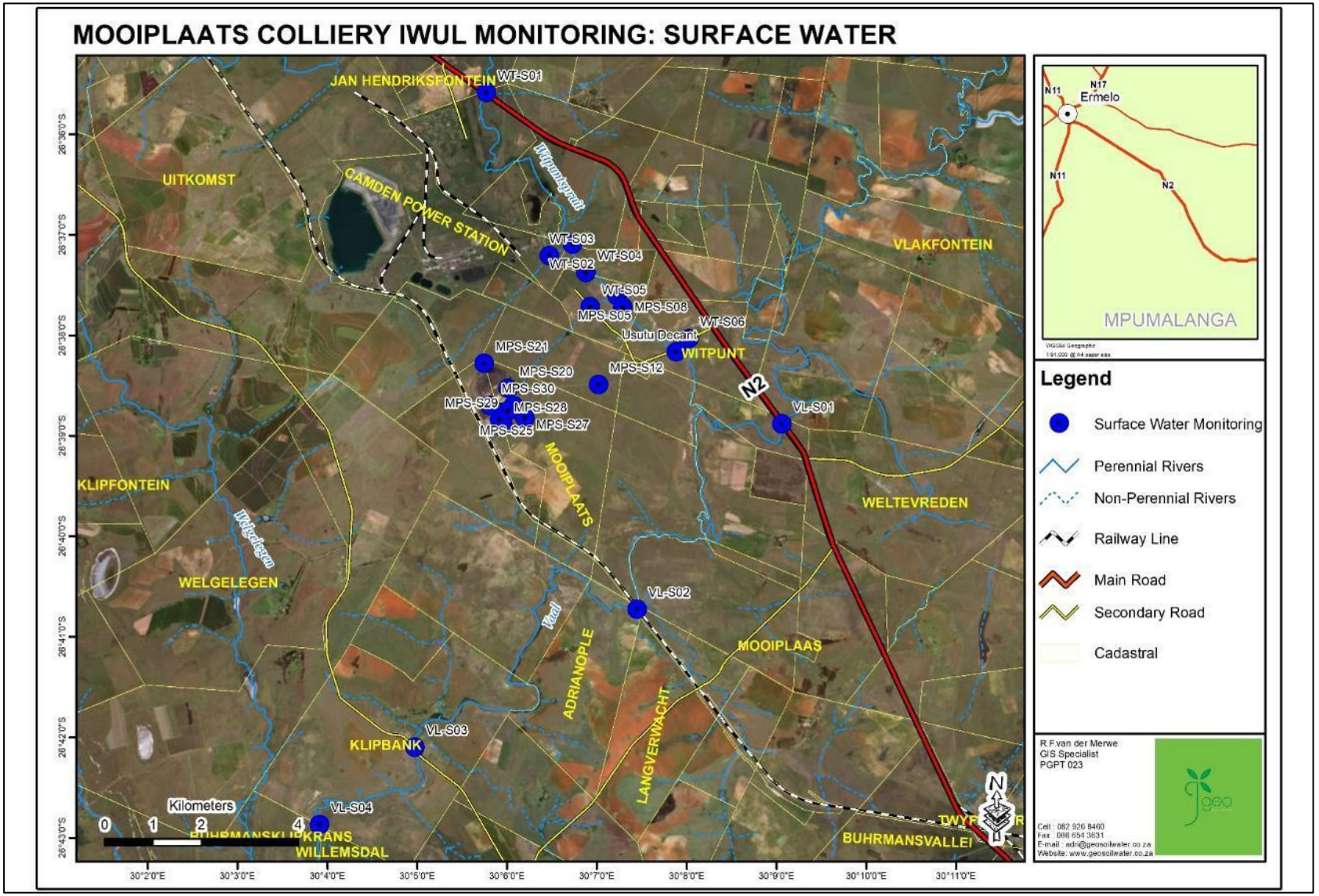


Figure 24: Location of the surface water monitoring points

Table 11: Summary of surface water monitoring points

Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
VL-S01	Vaal River 1 Upstream	S26.64616° E30.09890°	Monthly
VL-S02	Vaal River 2 Downstream 1	S26.64804° E30.15098°	Monthly
VL-S03	Vaal River 3 Downstream 2	S26.67879° E30.12411°	Monthly
VL-S04	Vaal River 4 Downstream 3	S26.70167° E30.08288°	Monthly
WT-S01	Witpuntspruit 1 Upstream	S26.71447° E30.06519°	Monthly
WT-S02	Witpuntspruit 2 Midstream	S26.59307° E30.09617°	Monthly
WT-S03	Witpuntspruit Tributary North DS 1	S26.61826° E30.11211°	Monthly
WT-S04	Witpuntspruit 3 Midstream	S26.62014° E30.10781°	Monthly
WT-S05	Witpuntspruit Tributary South DS 2	S26.62294° E30.11463°	Monthly
WT-S06	Witpuntspruit 6 Downstream	S26.62863° E30.11539°	Monthly
MPS-S08	Witpuntspruit 5 MS	S26.62873° E30.12149°	Monthly
MPS-S12	Witpuntspruit Tributary @ Access Road	S26.64150° E30.11697°	Monthly
MPS-S13	Runoff from Loading Area	S26.64837° E30.09888°	Monthly

Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
MPS-S14	Gen-sub PCD	S26.64616° E30.09890°	Monthly
MPS-S15	Stormwater trench @ Security	S26.64837° E30.09888°	Monthly
MPS-S16	DS Area of Erikson's + Settling Dams	S26.64505° E30.10121°	Monthly
MPS-S20	Erickson Dams	S26.64505° E30.10121°	Monthly
MPS-S21	Main Holdings Dam	S26.64198° E30.10059°	Monthly
MPS-S25	Workshop Trench DS of Workshop	S26.63826° E30.09506°	Monthly
MPS-S27	Witpuntspruit Tributary entering MP	S26.64716° E30.10336°	Monthly
MPS-S28	Confluence of MPS-S13 and MPS-S15	S26.64808° E30.09925°	Monthly
MPS-S29	Storm water @ Offices	S26.64743° E30.09802	Monthly
MPS-S30	Plant PCD	S26.64508° E30.09674°	Monthly
Usutu Decant Surface	Decant from Old Usutu Workings decanting into the Witpuntspruit Upstream of WT-06 – via surface.	S26.63611°E30.13139°	Monthly
Usutu Decant Sump	Decant from Old Usutu Workings decanting into the Witpuntspruit	S26.63611°E30.13139°	Monthly

Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
	Upstream of WT-06 – in cement sumps		

Table 12: Average water quality for waste water monitoring points

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	MPS-S14	MPS-S20	MPS-S21	MPS-S30
pH	-	3.5 – 8.5	6.4 – 8.5	5.0 - 9.5	-	8.15	8.26	8.30	8.32
EC	mS/m	150	25	170	500	120.37	* 359.50	* 509.67	* 394.67
TDS	mg/L	1288	-	1200	3000	692	2055	2800	2590
Total Hardness	mg/L	-	-	-	-	189	610	1201	781
Alkalinity	$CaCO_3$/L	-	75	-	-	234.333	418.333	398.667	312.667
Ca	mg/L	87	-	-	1000	46.767	89.967	205.167	144.700
Mg	mg/L	51.40	-	-	500	17.467	93.600	167.133	102.000
Na	mg/L	725	-	200	200	207.700	434.117	540.983	680.500
K	mg/L	-	-	-	-	10.600	9.933	13.467	9.333
F	mg/L	3.23	0.4	1.5	2	0.833	2.367	2.067	1.433

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	MPS-S14	MPS-S20	MPS-S21	MPS-S30
Cl	mg/L	116.66	20	300	3000	* 143.867	50.633	58.800	50.733
SO_4	mg/L	740	30	500	1000	123.833	* 1122.067	* 1573.333	* 1413.633
NO_3	mg/L	-	0.5	11	-	0.033	1.200	-0.500	0.367
NH_3	mg/L	0.24	-	1.5	-	14.247	0.197	0.220	0.197
Al	mg/L	0.09	-	0.3	5	-0.050	-0.003	0.160	0.127
Fe	mg/L	0.001	-	0.3	10	0.177	-0.050	0.237	0.037
Mn	mg/L	0.15	-	0.1	10	-0.003	0.287	0.357	0.503

Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.

Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin

"-"Indicate values below laboratory detection limit.

"*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.

Table 13: Average water quality for surface and storm water runoff monitoring points

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241: 2011	DWS Livestock Watering	MPS-S13	MPS-S15	MPS-S16	MPS-S25	MPS-S27	MPS-S28	MPS-S29
pH	-	3.5 – 8.5	6.4 – 8.5	5.0 - 9.5	-	7.90	9.02	4.33	7.23	6.45	8.47	7.67
EC	mS/m	150	25	170	500	84.33	60.60	* 708.00	82.80	26.73	50.40	51.30
TDS	mg/L	1288	-	1200	3000	511	339	* 5994	536	164	285	299
Total Hardness	mg/L	-	-	-	-	299	218	2973	338	119	216	189
Alkalinity	$CaCO_3$/L	-	75	-	-	119.000	158.000	39.667	109.000	33.000	109.000	155.000
Ca	mg/L	87	-	-	1000	63.733	47.000	248.333	76.750	31.900	46.200	49.000
Mg	mg/L	51.40	-	-	500	33.967	24.400	571.433	35.600	9.500	24.400	16.100

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241: 2011	DWS Livestock Watering	MPS-S13	MPS-S15	MPS-S16	MPS-S25	MPS-S27	MPS-S28	MPS-S29
Na	mg/L	725	-	200	200	65.700	41.900	676.633	55.600	8.800	30.400	43.100
K	mg/L	-	-	-	-	3.000	2.100	15.567	3.150	10.000	3.900	4.200
F	mg/L	3.23	0.4	1.5	2	-0.067	-0.400	0.117	-0.400	0.400	-0.400	0.400
Cl	mg/L	116.66	20	300	3000	20.300	14.200	40.800	4.000	4.400	11.100	5.500
SO_4	mg/L	740	30	500	1000	253.300	116.900	* 4418.433	297.000	81.600	106.000	89.300
NO_3	mg/L	-	0.5	11	-	-0.833	-2.000	-0.733	-0.800	-2.000	-2.000	-2.000
NH_3	mg/L	0.24	-	1.5	-	0.133	-0.020	2.277	0.910	0.280	0.030	-0.020
Al	mg/L	0.09	-	0.3	5	0.227	0.130	68.037	0.005	0.180	0.070	0.060

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241: 2011	DWS Livestock Watering	MPS-S13	MPS-S15	MPS-S16	MPS-S25	MPS-S27	MPS-S28	MPS-S29
Fe	mg/L	0.001	-	0.3	10	0.430	0.130	361.700	0.080	0.860	-0.050	0.930
Mn	mg/L	0.15	-	0.1	10	0.027	-0.050	72.117	0.185	0.080	-0.050	0.310

- Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.
- Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin
- "-"Indicate values below laboratory detection limit. "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.
- "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.

Table 14: Average water quality for the Witpuntspruit and its tributaries surface water monitoring points

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	WT-S01	WT-S03	WT-S02	WT-S04	WT-S05
pH	-	3.5 – 8.5	6.4 – 8.5	5.0 - 9.5	-	* 3.23	7.51	5.23	5.38	* 3.45
EC	mS/m	150	25	170	500	* 162.90	64.67	* 150.63	* 156.33	* 674.67
TDS	mg/L	1288	-	1200	3000	963	371	992	1108	5261
Total Hardness	mg/L	-	-	-	-	550	234	628	717	2506
Alkalinity	$CaCO_3$/L	-	75	-	-	-3.500	189.667	8.833	8.833	-3.500
Ca	mg/L	87	-	-	1000	107.300	54.400	134.167	149.267	426.333
Mg	mg/L	51.40	-	-	500	68.433	23.867	71.233	83.700	349.967
Na	mg/L	725	-	200	200	55.333	50.800	81.700	85.200	660.667
K	mg/L	-	-	-	-	6.033	5.600	15.133	17.167	37.433
F	mg/L	3.23	0.4	1.5	2	0.167	0.233	0.533	0.200	-0.283

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	WT-S01	WT-S03	WT-S02	WT-S04	WT-S05
Cl	mg/L	116.66	20	300	3000	16.933	20.400	33.100	34.100	47.200
SO_4	mg/L	740	30	500	1000	712.033	101.433	651.267	733.700	* 3742.400
NO_3	mg/L	-	0.5	11	-	-0.833	0.500	-0.267	-0.833	-0.467
NH_3	mg/L	0.24	-	1.5	-	0.960	0.113	0.130	0.163	1.113
Al	mg/L	0.09	-	0.3	5	14.940	0.237	5.013	4.873	25.360
Fe	mg/L	0.001	-	0.3	10	4.567	0.403	0.103	0.103	12.943
Mn	mg/L	0.15	-	0.1	10	5.520	0.710	7.900	8.097	33.893

- Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.
- Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin
- "-"Indicate values below laboratory detection limit.
- "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.

Table 15: Average water quality for the Witpuntspruit and its tributaries surface water monitoring points continued

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	MPS-S08	Usutu Decant Surface	Usutu Decant Sump	WT-S06
pH	-	3.5 – 8.5	6.4 – 8.5	5.0 - 9.5	-	5.75	8.15	7.64	7.08
EC	mS/m	150	25	170	500	* 152.33	* 280.60	* 163.25	* 171.93
TDS	mg/L	1288	-	1200	3000	1071	1857	1096	1143
Total Hardness	mg/L	-	-	-	-	635	202	265	475
Alkalinity	$CaCO_3$/L	-	75	-	-	46.333	1021.000	466.000	242.500
Ca	mg/L	87	-	-	1000	133.167	43.800	62.150	98.000
Mg	mg/L	51.40	-	-	500	73.500	22.600	26.750	56.033
Na	mg/L	725	-	200	200	90.133	649.000	353.950	211.567
K	mg/L	-	-	-	-	15.900	7.800	7.650	10.600
F	mg/L	3.23	0.4	1.5	2	0.133	* 3.900	0.550	1.400

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	MPS-S08	Usutu Decant Surface	Usutu Decant Sump	WT-S06
Cl	mg/L	116.66	20	300	3000	35.533	83.000	41.700	45.200
SO_4	mg/L	740	30	500	1000	695.367	435.100	322.900	575.400
NO_3	mg/L	-	0.5	11	-	-0.833	-0.500	0.600	-0.800
NH_3	mg/L	0.24	-	1.5	-	0.077	0.840	0.050	0.057
Al	mg/L	0.09	-	0.3	5	4.123	-0.050	-0.050	0.633
Fe	mg/L	0.001	-	0.3	10	0.060	-0.050	-0.050	0.007
Mn	mg/L	0.15	-	0.1	10	6.527	1.410	0.010	3.280

- Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.
- Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin
- "-"Indicate values below laboratory detection limit.
- "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.

Table 16: Average water quality for the Vaal River surface water monitoring points

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	VL-S01	VL-S02	VL-S03	VL-S04
pH	-	3.5 – 8.5	6.4 – 8.5	5.0 - 9.5	-	7.47	7.77	7.93	7.90
EC	mS/m	150	25	170	500	23.26	30.95	32.93	32.65
TDS	mg/L	1288	-	1200	3000	125	167	177	183
Total Hardness	mg/L	-	-	-	-	85	106	101	107
Alkalinity	$CaCO_3$/L	-	75	-	-	54.000	71.667	83.667	89.333
Ca	mg/L	87	-	-	1000	15.267	19.900	19.300	20.967
Mg	mg/L	51.40	-	-	500	11.367	13.667	12.867	13.267
Na	mg/L	725	-	200	200	14.933	21.833	25.433	26.067
K	mg/L	-	-	-	-	4.233	4.200	3.800	4.000
F	mg/L	3.23	0.4	1.5	2	-0.200	-0.167	0.167	0.133

Variable	Unit	IWUL Limit	Grootdraai Dam Guidelines Vaal Origin	SANS 241:2011	DWS Livestock Watering	VL-S01	VL-S02	VL-S03	VL-S04
Cl	mg/L	116.66	20	300	3000	16.400	17.300	17.700	17.467
SO_4	mg/L	740	30	500	1000	31.267	48.367	47.700	47.700
NO_3	mg/L	-	0.5	11	-	-0.833	-0.767	-0.500	-0.433
NH_3	mg/L	0.24	-	1.5	-	0.017	0.050	-0.007	0.043
Al	mg/L	0.09	-	0.3	5	0.000	0.070	-0.013	0.080
Fe	mg/L	0.001	-	0.3	10	0.227	0.180	0.113	0.273
Mn	mg/L	0.15	-	0.1	10	-0.050	0.063	-0.013	0.003

- Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.
- Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin
- "-"Indicate values below laboratory detection limit.
- "*" indicate variables exceeding the IWUL limits and GD-VO Guidelines.

The following is a summary of the results:

- Waste water - Water quality from the mine water/pollution control dams monitoring points exceeded WUL limits in terms of EC, TDS, $CaCO_3$, Ca, Mg, Cl, SO_4, NH_3, Al, Fe and Mn. These results are typical of water associated with coal washing/mining activities. It should be noted that although these monitoring points recorded elevated variable concentrations, the water is being contained in appropriate waste water storage facilities and circulated in a closed circuit i.e. dirty water circuit and no water are being released into the receiving environment.
- Storm and Surface Water Runoff - It is evident that the surface runoff water quality within the boundaries of Mooiplaats Colliery is of general good quality (in comparison with the Witpuntspruit) with the exception of MPS-S16. Water quality at MPS-S16 is the result of a lack of maintenance and management during the care and maintenance phase. The effect from the MPS-S16 can still be observed at WT-S05, downstream in a Witpuntspruit tributary. Several measures since the re-commencement of mining activities in 2018 were taken to prevent further pollution (containment and pumping of water back into dirty water system). Water quality will be closely monitored for improvement or deterioration. The sump overflowed on 6 December 2018 for a few hours due to a malfunctioning in the pipe. The incident was reported to DWS and an incident report was submitted.
- Water Quality from the Witpuntspruit is highly impacted upstream of Mooiplaats Colliery indicating a serious pollution source. Although the water quality improves from the upstream monitoring point (WT-S01) towards (with a slight deterioration from WT-S02 to WT-04) downstream (WT-S06) Mooiplaats Colliery, the quality of the instream water is not suitable for the aquatic ecosystem. Although no direct impact via the WT-S05 tributary / monitoring point (downstream of MPS-S16), on the Witpuntspruit was recorded during the reporting period, it is expected that polluted water within the WT-S05 tributary will reach the Witpuntspruit during the wet season. WT-S05 recorded no flow into the Witpuntspruit during the reporting period. Known decant from the Usutu mine downstream of MPS-S08 and upstream of WT-S06 enters the Witpuntspruit, elevating the pH, EC and CaCO3 concentrations. The effect of the decant on the Witpuntspruit and Vaal River will be closely monitored.
- **Vaal River** : Although fewer water quality limits are exceeded in the Vaal river compared to the Witpuntspruit, the change in composition and the deterioration in water quality is evident after the confluence with the Witpuntspruit.

Although water quality remains relatively stable downstream it is rather dilution than improvement that will be observed further downstream. The source of the Witpuntspruit pollution should be addressed to prevent constant degradation (build-up of contaminants) of the Vaal River system and a complete collapse in the aquatic functions in the long term.

4.4.4 MEAN ANNUAL RUNOFF (MAR)

The larger catchment, in which the project area is situated, consists of quaternary catchment C11A and part of C11B. The Mean Annual Runoff (MAR) is calculated as 79 million cubic meters per annum. The seasonal distribution is very similar to the rainfall distribution. The Water Research Commission (WRC) Report indicates that the C11B

quaternary has a typical runoff response represented by the rainfall/runoff curve. This is particularly helpful for distributing runoff in areas smaller than quaternary level.

The aquifer boundaries for the shallow weathered aquifer in the study area can be seen in Figure 25 and are as follows:

- The Sterkspruit on the north-eastern and eastern side for about 5.5km;
- The Wolwespruit on the south-eastern side for about 3.7km;
- The Witpuntspruit located approximately 2.2km north-east of the study area boundary for about 8km and
- The Vaal River and its tributaries on the southern, south-western and northern side for about 19km.

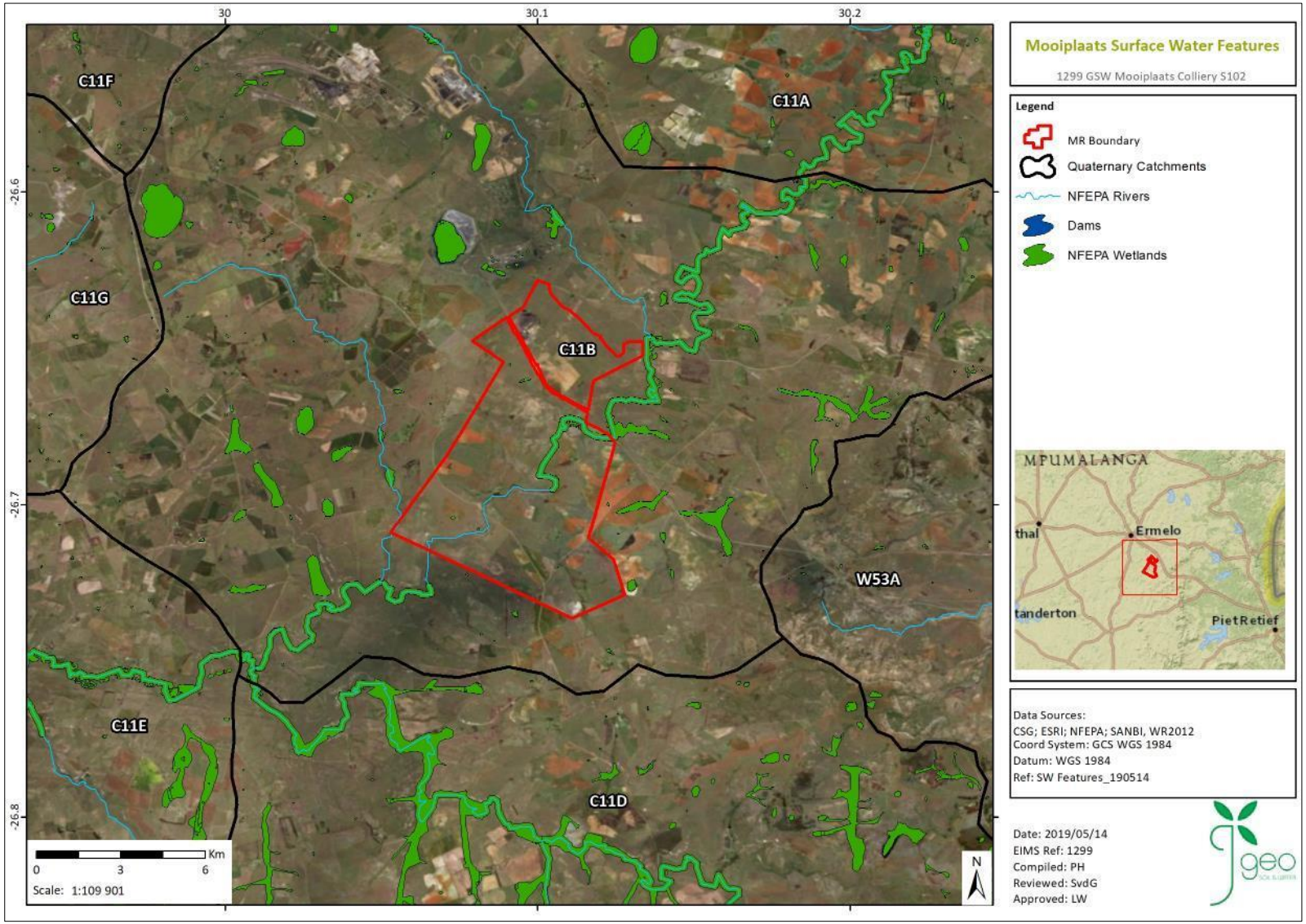


Figure 25: Mooiplaats Colliery surface water features

4.4.5 RESOURCE CLASS AND RIVER HEALTH RECEIVING WATER QUALITY OBJECTIVES AND RESERVE

Surface water and wetland resources were identified and assessed and are presented in Figure 25 and Figure 26 which provides context to the resource class and river health receiving water quality objectives and reserve presented in this section.

The PES for each of the identified wetland groups is presented in Table 17. Overall, most of the wetland systems associated with the Vaal are in a relatively good state and were assessed as Moderately Modified (C). Exceptions included HGM unit 3 which was classified as Largely Natural (B) and HGM unit 4 which was classified as and Largely Modified (D). The two northern HGM units associated with the Witpuntspruit (within the existing mine area) are impacted by the presence of the mine and were rated as Seriously (E) and Moderately Modified respectively.

From a hydrological perspective HGM units 4, 6, 7, 8 and 9 are most impacted. HGM units 4, 7 and 9 are predominantly impacted by crop cultivation and livestock grazing which has served to decrease water retention time within the wetland (due to decreased infiltration rates from tilling practices such as the ridge and furrow technique) while also increasing erosion risk (due to increased runoff from hardened soil crusts and decreased vegetation cover) respectively. With regards to HGM unit 6, the eastern system is impacted by artificially increased water inputs from mining activities together with the associated water quality implications as evidenced by the significant accumulation of precipitated salts immediately downstream. The western system is predominantly impacted by significant flow impediment caused by a railway crossing. For HGM unit 8 hydrological impacts centre on abstraction to service the many agricultural holdings in its catchment as evidenced by the many upstream dams. The hydrological regime of HGM units 1, 2, and 5 is only Moderately Modified by increased water inputs, increased flood peaks and decreased surface roughness respectively, while for HGM unit 3 it remains Largely Natural.

Geomorphologically the most impact systems are HGM units 6 and 8 (Largely Modified D) both of which show signs of erosion. The impacts faced by HGM unit 6 (flow impediment along western system due to infilling of railway, increased water inputs from mining on the eastern system and three small earthen dams) have led to the channelization of these wetlands in their downstream reaches (not yet advanced and may easily be ameliorated during the rehabilitation project). The mine water entering the eastern system has been accompanied by the accumulation of salts and sediments which has been deposited in a broad strip along most of the length of the wetland. The sediment regime of HGM unit 8 has been significantly compromised by the presence of several large, upstream dams which have served to trap sediment and concentrate flows at outlet points. This together with low vegetation cover from livestock grazing, high soil erosivity and a steep catchment slope has led to incensement of the channel banks and minor gully formation. The geomorphology of all seeps and depressions (HGM units 4,5,7 and 9) was assessed as Moderately Modified on account of erosional features. The most notable of which occurs in the form of a large gully along a seep in Portion 2, 295 of the northern prospecting area (26°39'53.61"S 30° 5'44.86"E). The geomorphology of the Vaal River Floodplain (HGM unit 1) and associated valley-bottom systems (HGM units 2 and 3) remains in a Largely Natural state.

In terms of vegetation integrity HGM units 1 and 3 were found to be in a Largely Natural state while HGM units 2,5,8,9 were assessed as Moderately Modified on account of minor agricultural related impacts (livestock grazing, old abandoned croplands). Vegetation was most degraded in HGM unit 4 (due to cop cultivation and high grazing

pressure) and HGM unit 6 (due to mining infrastructure, shallow and deep flooding by dams / impeding features and areas denuded by sediment deposition and salt precipitation).

Table 17: Summary of the scores for the wetland PES.

HGM Unit	Hydrology		Geomorphology		Vegetation		Overall	
	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Vaal								
1	C: Moderately Modified	3.5	B: Largely Natural	1.1	B: Largely Natural	1.8	C: Moderately Modified	2.3
2	C: Moderately Modified	3	B: Largely Natural	1.9	C: Moderately Modified	3.5	C: Moderately Modified	2.9
3	B: Largely Natural	1	B: Largely Natural	1.7	B: Largely Natural	1.6	B: Largely Natural	1.4
4	E: Seriously Modified	6.5	C: Moderately Modified	3.3	D: Largely Modified	4.1	D: Largely Modified	4.9
5	C: Moderately Modified	3.5	C: Moderately Modified	2	C: Moderately Modified	2	C: Moderately Modified	2.6
Witpuntspruit								
6	E: Seriously Modified	6.5	D: Largely Modified	5.5	D: Largely Modified	5.8	E: Seriously Modified	6
7	D: Largely Modified	4	C: Moderately Modified	3.5	C: Moderately Modified	2.9	C: Moderately Modified	3.7
Vaal Southern Tributary								
8	E: Seriously Modified	6	D: Largely Modified	4.8	C: Moderately Modified	2.4	D: Largely Modified	4.6
9	D: Largely Modified	4	C: Moderately Modified	3	C: Moderately Modified	2.4	C: Moderately Modified	3.3

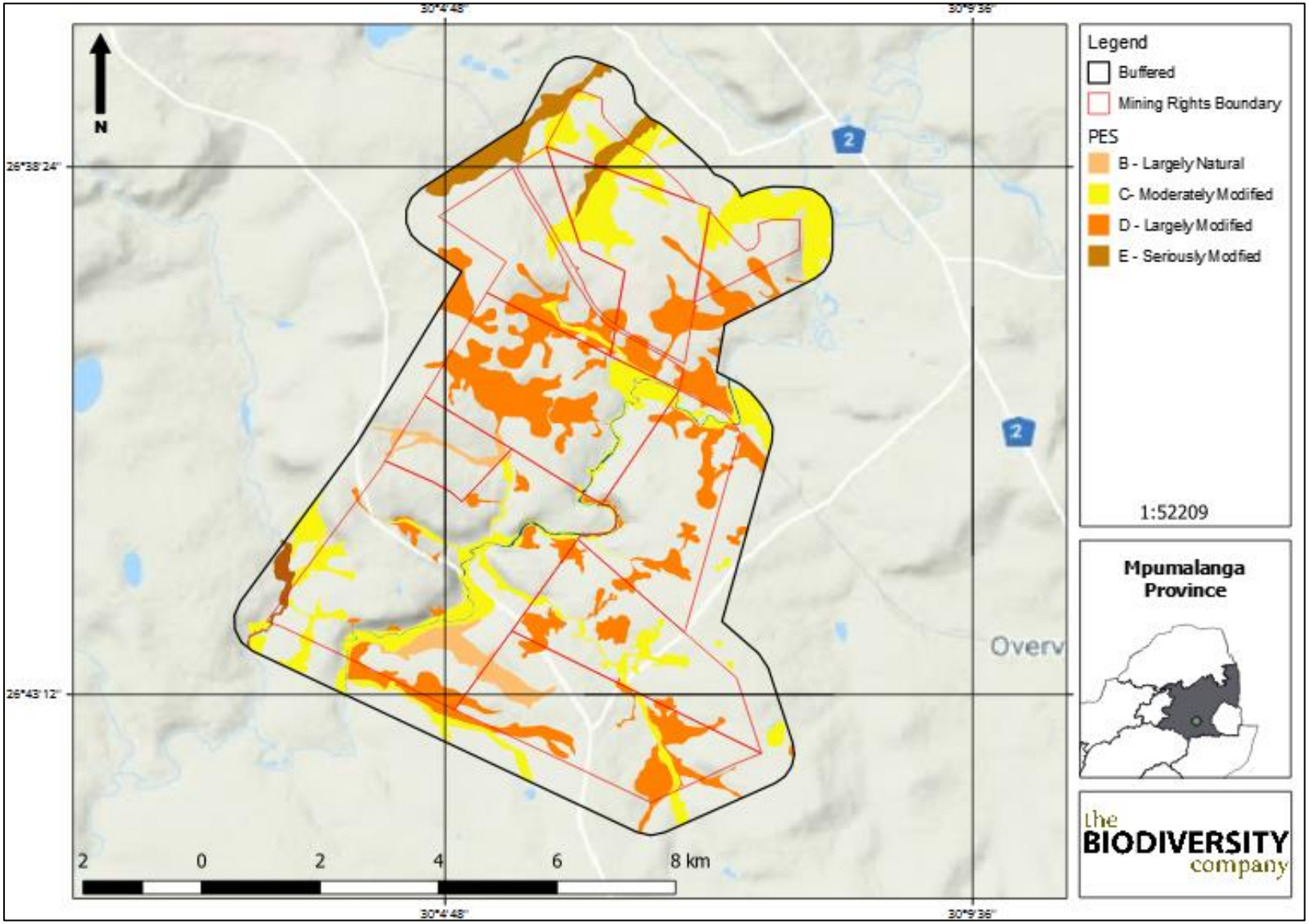


Figure 26: The PES classification for the delineated wetland systems.

The wetland EIS assessment was applied to the wetland groups described above in order to assess the levels of sensitivity and ecological importance of the wetland. The results of the assessment are shown in Table 18. Longstanding and widespread coal production within the Mpumalanga grasslands has placed large pressures on its remaining wetland resources. As such all wetlands within this region are considered important, especially considering the upper catchment nature of most of these highveld systems. Indeed, with the exception of seeps (Endangered), all Mesic Highveld Group 4 wetland HGM types are classified as Critically Endangered and Not Protected according to the NFEPA Wetveg Database. On a regional scale the Vaal and its Southern Tributary Floodplains are classified as Phase 1 FEPAs while the Witpuntspruit in the north is classified as a Phase 4 FEPA. A portion of the Vaal River Floodplain within the expansion area is classified as a Wetland FEPA. Wetlands in Portion 3 of Klipbank 295 IT of the expansion area S102 676PR fall within a protected area according to the MBSP.

At a more local scale the ecological importance and sensitivity of HGM unit 1 scored Very High while most other systems, with the exception of HGM units 4 and 7 (Moderate), scored High. The floodplains, valley-bottom and depression systems within the project area all provide suitable habitat to support a large proportion of the region's wetland dependant species of conservation concern (SCC). Some of the larger and more inaccessible depressions and meander cut-offs within the Vaal River Floodplain (HGM unit 1) provide ideal foraging habitat for both Blue Crane (*Anthropoides paradiseus*) and Grey Crowned Crane (*Balearica regulorum*) and potential breeding habitat for the former. Suitable foraging habitat exists in all HGM units for African Grass-owl and breeding is likely in some of the more remote systems within the prospecting areas. Likewise, the wetland provides foraging habitat for African Marsh Harrier, although suitable breeding habitat in the form of dense reedbeds is lacking. Ideal habitat for Swamp Musk Shrew (*Crocidura mariquensis*) exists in all HGM units. Cape Clawless Otter (*Aonyx capensis*) is likely to occur in the HGM units 1 and 8. Overall, wetlands within the expansion areas are currently not eutrophic, largely intact and retain much of their functionality. Infestations of alien and invasive species is low. As such these wetlands should be considered sensitive and important.

Table 18: The EIS results for the delineated HGM types.

Wetland Importance and Sensitivity	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7	HGM 8	HGM 9
Ecological Importance & Sensitivity	3.7	2.7	2.7	2.0	3.0	2.3	1.7	3.0	2.3
Hydrological/Functional Importance	3.0	2.3	2.6	2.3	2.5	2.2	2.1	2.6	2.3
Direct Human Benefits	0.5	1.9	1.9	1.7	1.9	0.5	1.4	2.3	1.6

4.4.6 WATER USER SURVEY

A hydrocensus user survey within the greater study area was conducted during May 2019 where relevant hydrogeological baseline information was gathered. The aim of the hydrocensus survey is to determine the ambient and background groundwater conditions and applications prior to the proposed expansion activities and to identify potential sensitive environmental receptors i.e. groundwater users in the direct vicinity of the operations. Geosites visited include nine (9) boreholes, thirteen (13) spring localities, five (5) streams/rivers as well as a neighbouring farm dam. Refer to Figure 27 for a map depicting the spatial distribution of geosites with relevant information summarised in Table 19. Of the boreholes and spring localities visited, the majority are in use (>90.0%) with only the two core and exploration boreholes not in use. According to the Upper Vaal ISP the fractured rock aquifers within this WMA are well utilised for rural domestic water supplies and stock watering (DWAF 2004). The groundwater application for domestic purposes is >45.0% while stock watering accounts for ~45.0%. Most

boreholes visited are equipped with submersible pumps (~67.0%) while only one borehole is fitted with a handpump. The two exploration boreholes (HBH04 and HBH09) are not equipped.

Table 19: Hydrocensus user survey: relevant geosite information.

Site ID	Latitude	Longitude	Water level (mbgl)	Water level status	Site type	Site status	Equipment	Water application	Owner	Contact details
F 01	-26.66728	30.15877	0.00	Static	Spring	In use		Domestic	J, Roberts	0731989099
SW 01	-26.66286	30.13757			River				J, Roberts	0731989099
HBH 01	-26.64752	30.11161	94.58	Dynamic	Borehole	In use	Submersible pump	Domestic and livestock	J, Roberts	0731989099
F 02	-26.64674	30.10903	0.00		Spring	In use		Livestock	J, Roberts	0731989099
HBH 02	-26.64503	30.14264	7.38	Static	Borehole	In use	Submersible pump	Domestic and livestock	J, Roberts	0731989099
HBH 03	-26.69440	30.08751	3.75		Borehole	In use	Submersible pump	Domestic	J, Roberts	0731989099
F 03	-26.69637	30.08089	0.00		Spring	In use		Domestic	J, Roberts	0731989099
HBH 04	-26.67525	30.09233	0.00	Static	Borehole	Not in use	Not equipped	Exploration	J, Roberts	0731989099
F 05	-26.67289	30.09085	0.00		Spring	In use		Livestock	J, Roberts	0731989099
HBH 06	-26.67018	30.08004	nawl		Borehole	In use	Handpump	Domestic	J, Roberts	0731989099
F 06	-26.67058	30.07984	0.00		Spring	In use		Domestic	J, Roberts	0731989099
SW 02	-26.70205	30.08271			River				J, Roberts	0731989099
F 07	-26.67981	30.07348	0.00		Spring	In use		Livestock	L. Reyneke	0828851816
HBH 07	-26.67817	30.05782	2.03	Static	Borehole	In use	Submersible pump	Domestic	L. Reyneke	0828851816
F 08	-26.67961	30.05802	0.00		Spring	In use		Domestic	L. Reyneke	0828851816
SW 03	-26.64658	30.09697			Stockpile runoff				Mooiplaats Colliery	
SW 04	-26.64086	30.09761			Dam				Mooiplaats Colliery	
HBH 08	-26.68478	30.11271	9.76	Static	Borehole	In use	Submersible pump	Domestic and livestock	R. Saaiman	0734121967
HBH 09	-26.68044	30.72183	0.00	Static	Borehole	Not in use	Not equipped	Exploration	R. Saaiman	0734121967
F 09	-26.68115	30.12129	0.00		Spring	In use		Livestock	R. Saaiman	0734121967
F 10	-26.68630	30.11962	0.00		Spring	In use		Livestock	R. Saaiman	0734121967
F 11	-26.69017	30.11881	0.00		Spring	In use		Livestock	R. Saaiman	0734121967
F 12	-26.69087	30.11912	0.00		Spring	In use		Livestock	R. Saaiman	0734121967
F 13	-26.70819	30.10675	0.00		Spring	In use		Domestic	J.J. Greetch	0725851650
HBH 10	-26.69237	30.12935			Borehole	In use	Submersible pump	Domestic	Ignis van Rooyen	0826032810
SW 06	-26.64820	30.13124			River				Ignis van Rooyen	0826032810
F 14	-26.62659	30.12177	0.00		Spring	In use		Domestic	W. Meyer	0828004913
SW 07	-26.62673	30.12038			River				W. Meyer	0828004913
SW 08	-26.63563	30.13084			River				W. Meyer	0828004913

Note: NAWL (No Acess to the Water Level) is noted when the water level probe could not reach the static water level due to obstruction, equipment or no access

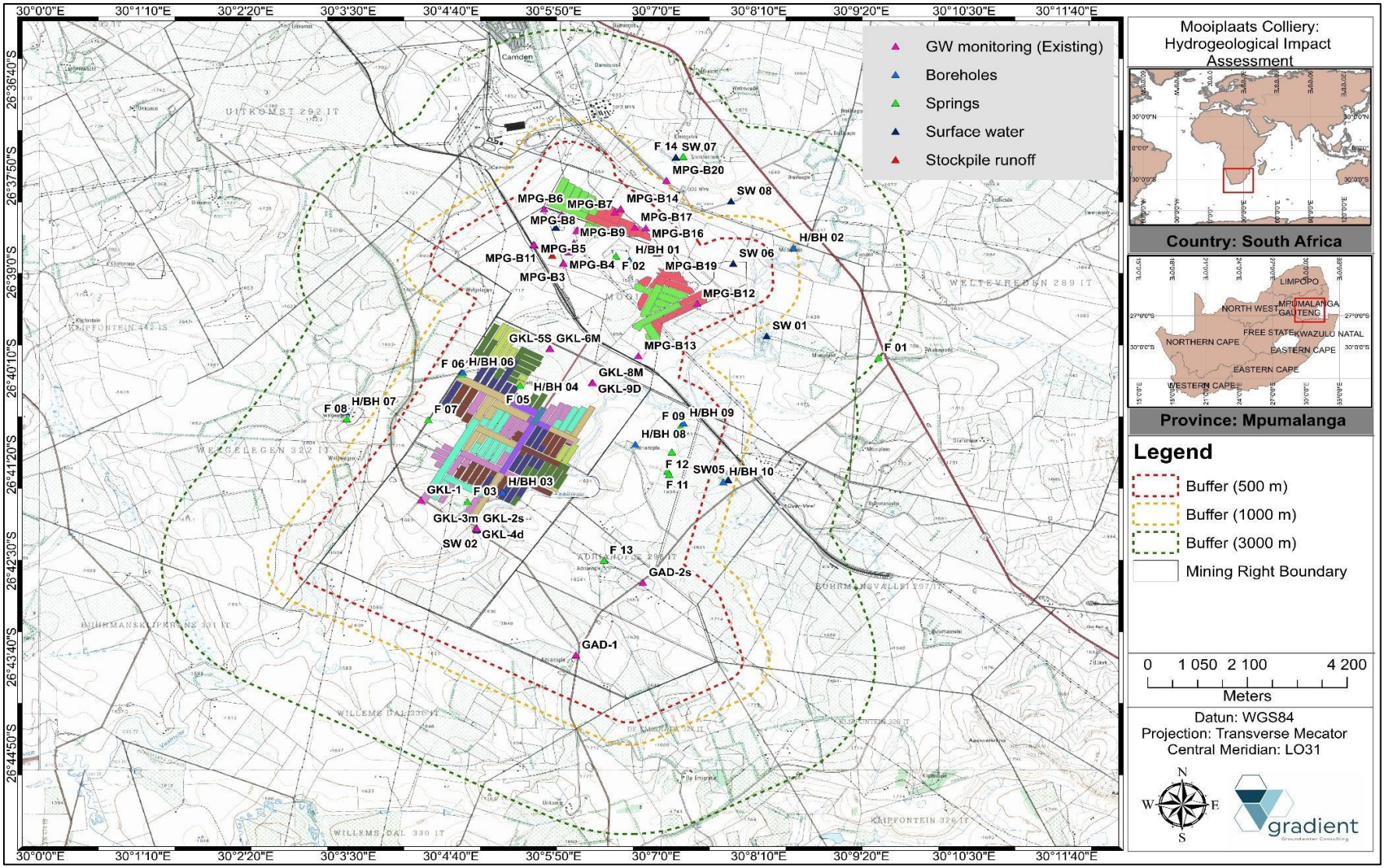


Figure 27: Spatial distribution of hydrocensus user survey geosites.

4.4.7 SENSITIVE AREAS SURVEY

The wetland assessment and sensitivity determination are presented in Section 4.9 where the PES for the various HGM units are presented. In terms of the aquatic ecosystems, the desktop information was obtained from the Department of Water and Sanitation for the three sub quaternary reaches and is summarised in Table 20. The Ecological Importance (EI) of the reach is classified as high due to the high vertebrate communities (excluding fish), high rarity of fish per secondary catchment, moderate instream migration class, and high riparian-wetland zone migration link class. Biodiversity and species richness are rated as high. Habitat diversity and integrity is classed as moderate. Adverse conditions within the reach are due to bed and channel disturbances, erosion, large dams, abstraction, low water crossings, and irrigation.

The Ecological Sensitivity (ES) is categorised as very high as fish and macroinvertebrate taxa are rated as highly sensitive to flow and physico-chemical water modifications. Wetland-riparian vegetation intolerance to water level changes are rated as low.

Table 20: Present Ecological Status for the three Sub-quaternary reaches (DWS, 2018).

Present Ecological State	Ecological Importance	Ecological Sensitivity	Recommended Ecological Category
Witpuntspruit (C11B-1641)			
Class D	**Moderate**	**Moderate**	**C**
Vaal system (C11B-1693)			
Class C	**High**	**High**	**B**
Vaal (C11B-1770)			
Class C	**High**	**High**	**B**
Anthropogenic Impacts			
The following impacts/activities were identified: Urban runoff from Ermelo, Camden power station, ash dump. Road crossings, Instream dams, agriculture,			

The results for the instream and riparian habitat integrity assessment for the Witpuntspruit and Vaal River are presented in Table 21 and Table 22 respectively. The reaches include 5 km of each system associated with the sampling points assessed during the study.

According to the instream habitat index the Witpuntspruit reach was classed as largely modified (class D): A large loss of natural habitat, biota and basic ecosystem functions has occurred. Modifications are associated with channel and bed erosion, resulting in channelized deep reaches of the system. Additional modifications included water quality and flow modifications, predominantly due to influx of pollutants stemming from urban runoff, mining activities, and Camden Power Station. Flow modifications stem from abstraction, and the presence of an artificial wetland located upstream of the project area.

According to the IHIA results the Witpuntspruit riparian habitat integrity in the reach was rated as class C, or moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged. Loss of riparian habitat is associated with over grazing and agricultural activities. Furthermore, the channel modifications within the system has reduced lateral movement of water within the reach.

According to the IHIA results the instream and riparian habitat integrity of the Vaal Reach were rated as Class C, or Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged. Modifications include bank and channel erosion, flow modification due to several instream structures including weirs and low water crossings. Several exotic macrophytes were observed within the reach (e.g. parrots feather, course oxygen weed and watercress), inundating instream and marginal vegetation.

Table 21: Results for the Witpuntspruit habitat integrity assessment.

Instream	Average	Score
Water abstraction	14	7,84
Flow modification	13	6,76
Bed modification	16	8,32
Channel modification	16	8,32
Water quality	18	10,08
Inundation	7	2,8
Exotic macrophytes	5	1,8
Exotic fauna	4	1,28
Solid waste disposal	3	0,72
Total Instream		**52.08**
Category		**D**
Riparian	**Average**	**Score**
Indigenous vegetation removal	12	6,24
Exotic vegetation encroachment	9	4,32
Bank erosion	11	6,16
Channel modification	13	6,24
Water abstraction	7	3,64
Inundation	4	1,76
Flow modification	11	5,28
Water quality	12	6,24
Total Riparian		**60.12**
Category		**C**

Table 22: Results for the Vaal River habitat integrity assessment.

	Average	Score
Water abstraction	13	7,28
Flow modification	11	5,72
Bed modification	7	3,64
Channel modification	10	5,2
Water quality	7	3,92
Inundation	8	3,2

	Average	Score
Exotic macrophytes	12	4,32
Exotic fauna	9	2,88
Solid waste disposal	5	1,2
Total Instream		**62.64**
Category		**C**
Riparian	**Average**	**Score**
Indigenous vegetation removal	9	4,68
Exotic vegetation encroachment	9	4,32
Bank erosion	12	6,72
Channel modification	11	5,28
Water abstraction	12	6,24
Inundation	9	3,96
Flow modification	10	4,8
Water quality	7	3,64
Total Riparian		**60.36**
Category		**C**

4.5 GROUNDWATER

A distribution of borehole water levels recorded as part of the hydrocensus user survey as well as boreholes forming part of the existing groundwater monitoring network were considered and used to interpolate local groundwater elevation and hydraulic head contours. The groundwater levels available from the hydrocensus survey and monitoring boreholes in, and around, the mining areas are summarized in Figure 28. The minimum water level recorded is artesian, 0.0 mbgl, various spring localities were also recorded within the greater study area, with the deepest static water level measured at borehole locality MPG-B16, 29.56 mbgl[5]. The relatively low standard deviation compared to the mean depth to groundwater i.e. Coefficient of Variation (CV) < 100%, suggest a relative steady state groundwater environment.

[5] This is based on groundwater levels measured at surveyed boreholes.

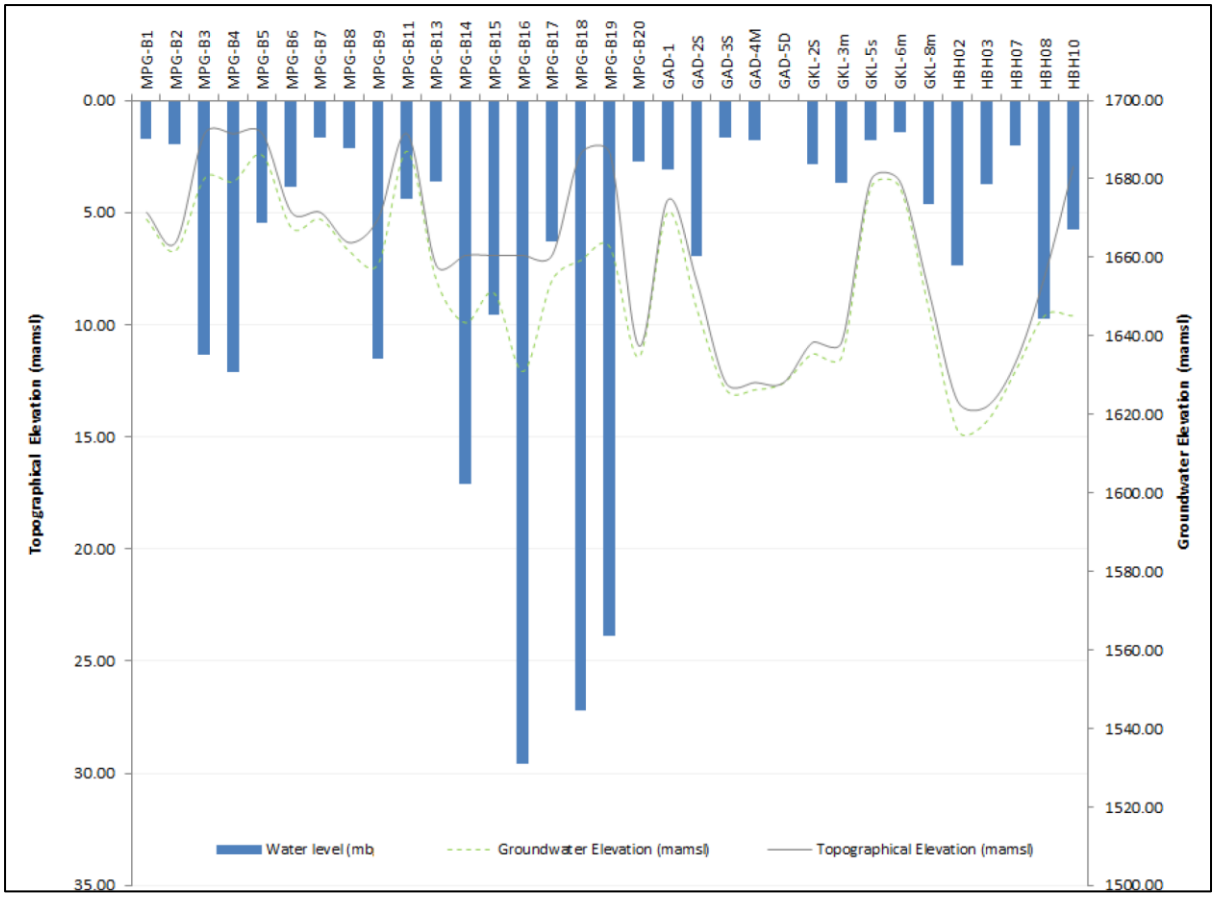


Figure 28: Topographical elevation vs. groundwater elevation correlation graph.

Analysed data indicate that the majority of surveyed water levels correlate very well to the topographical elevation ($R^2 > 0.91$) (Figure 28). Accordingly, it can be assumed that the regional groundwater flow direction is dictated by topography. As suggested, the inferred groundwater flow direction will be towards the lower laying drainage system of the Vaal River transecting the project area and will flow in a general southern to south-eastern direction. Groundwater flow path lines are lines perpendicular to groundwater contours, flow generally occurs faster where contours are closer together and gradients are thus steeper as depicted in Figure 29.

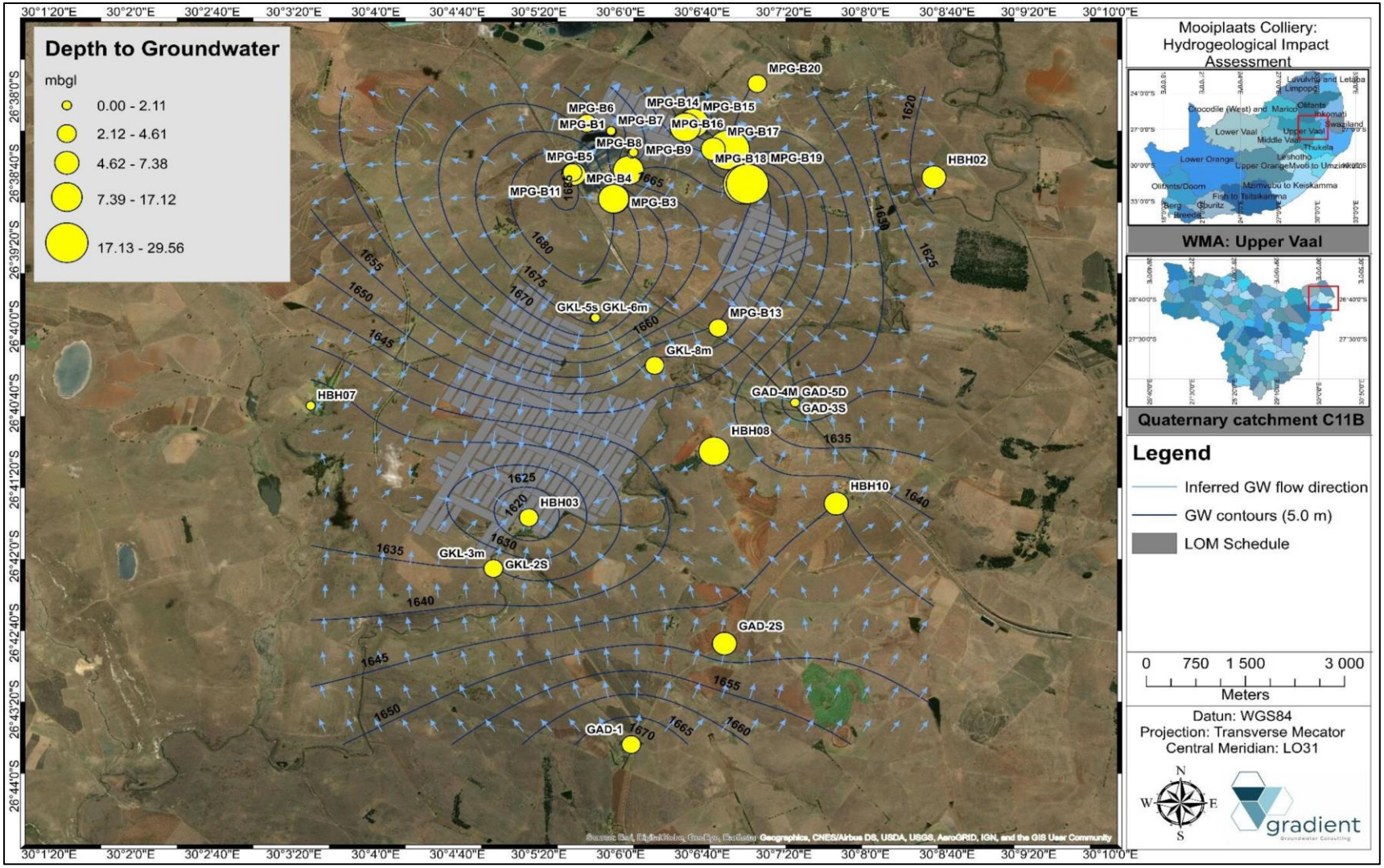


Figure 29: Regional groundwater flow direction and depth to groundwater.

4.5.1 AQUIFER CHARACTERISATION

4.5.1.1 AQUIFER TYPE

The Karoo sedimentary aquifer in the study area can be separated into different zones, classified as aquifers in their own right:

- Perched conditions in the soil horizon:
  - The shallow perched conditions are essentially restricted to finite extending clay lenses present in the soil (soft overburden) horizon. The perched aquifer has unconfined conditions; and
  - No major lateral extension of these zones were found.
- The shallow weathered zone Karoo aquifer and the deep fractured Karoo aquifer:
  - The host rock for these two aquifers is the Karoo sedimentary rocks. A large range of grain size distribution is present, which will not necessarily influence the hydraulic characteristics of the host rock; and
  - The shallow weathered zone aquifer displays unconfined to semi-confined conditions, while the deep aquifer predominantly displays semi-confined to confined conditions.

4.5.1.2 LATERAL AQUIFER DELINEATION

The lateral extent of the aquifer is important in order to set definable limits of any potential contaminant transport and lowering of water levels within the Karoo aquifers. This is due to the aquifer boundaries often being beyond the property boundaries of the mine. The shallow weathered aquifer zone is identified as the aquifer into which contaminants from surface activities will migrate. Any contaminant transport is identified by continuous monitoring of the shallow and deep Karoo aquifer. The groundwater elevation correlates roughly with the topography; therefore, groundwater will generally flow from higher towards lower topographical areas. The flow will not continue infinitely in a certain direction and is confined to boundaries. Two types of aquifer boundaries exist within the study area zone of influence:

- Physical aquifer boundary:
  - I.e. impermeable dolerite dykes and sills, or other geological discontinuities such as groundwater divides; and
- Hydraulic aquifer boundary:
  - I.e. surface water features which act as groundwater discharge boundaries.

The aquifer boundaries for the shallow weathered aquifer in the study area are as follows:

- The Sterkspruit on the north eastern and eastern side, for approximately 8.5km;
- The Wolwespruit on the south eastern side, for approximately 3.7km;
- The Vaal River and its tributaries on the southern, south-western and northern side, for approximately 19 km; and

- Two groundwater divides with a total length of about 6.1km in the west and another two of approximately 1km each in the south-east.

The Vaal River forms a local discharge boundary for the aquifer (groundwater discharge to river) and no flow from the river alluvial system towards the aquifer is supposed. Dolerite dykes and sills present within the aquifer boundaries may act as localised no-flow boundaries, or as preferential pathways, depending on the degree of weathering of the dolerite and the fracturing associated with the intrusions.

4.5.1.3 AQUIFER THICKNESS

The aquifer thickness logged during the drilling of the monitoring boreholes is as follows:

- Perched aquifer:
  - The average depth of the soil horizon is 5 metres below ground level (mbgl). Perched conditions is present in clay lenses within the soil horizon.
- Shallow weathered aquifer:
  - The average depth of this aquifer is between 5mbs - 22 mbs and it will most often be totally saturated as the average depth to the groundwater level is about 4mbs; and
- Deep fractured aquifer:
  - This aquifer is present below 22mbs and the depth is taken as the bottom of the Karoo sedimentary rocks that may be present at a further 100m – 150m below the average depth of the exploration boreholes (140m) drilled in the area.

4.5.1.4 AQUIFER CLASSIFICATION

The Karoo aquifer at Mooiplaats has been classified in accordance with the following definitions for aquifer management classes:

- Sole Aquifer System:
  - An aquifer which is used to supply 50% or more of domestic water for a given area, and for which there are no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial;
- Major Aquifer System:
  - These are 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 (less than 150 mS/m Electrical Conductivity);
- Minor Aquifer System:
  - These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large

quantities of water, they are important for local supplies and in supplying base flow for rivers; and

- Non-Aquifer System:
    - These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risk associated with persistent pollutants.
    - Subject to the baseline information, the following overall classification of the Karoo aquifer in the area could be made:

The Karoo aquifer of the Mooiplaats area can, in general, be classified as a low yielding aquifer. It does have a viable exploitation potential for domestic and stock-watering application and as such is the main water resource to the farming communities in the area. The aquifers will however not support formal irrigation application over any extensive area (>10ha). The shallow weathered aquifer can therefore be classified as a minor aquifer system in terms of aquifer management as discussed above.

4.5.1.5 GROUNDWATER QUALITY

Monitoring occurs at thirty three (33) groundwater monitoring points (refer to Quarterly Water Quality Monitoring Report contained in Appendix M). Thirteen (13) IWUL groundwater points on a monthly basis and the additional twenty (20) groundwater points on a biannual basis depending on environmental conditions and access.

Groundwater samples are analysed for:

- pH
- EC mS/m
- TDS mg/L
- Total Hardness mg/L
- Alkalinity $CaCO_3$/L
- Ca mg/L
- Mg mg/L
- Na mg/L
- K mg/L
- F mg/L
- Cl mg/L
- SO_4 mg/L
- NO_3 mg/L
- Al mg/L

- Fe mg/L
- Mn mg/L
- NH_3 mg/L

Figure 30 below indicates the location of the groundwater monitoring points. Table 23 provides a summary of the location of the groundwater monitoring points. Table 24 provides the average water quality for the Mooiplaats Colliery groundwater monitoring points for October to December 2018, while the groundwater level are presented in Table 25.

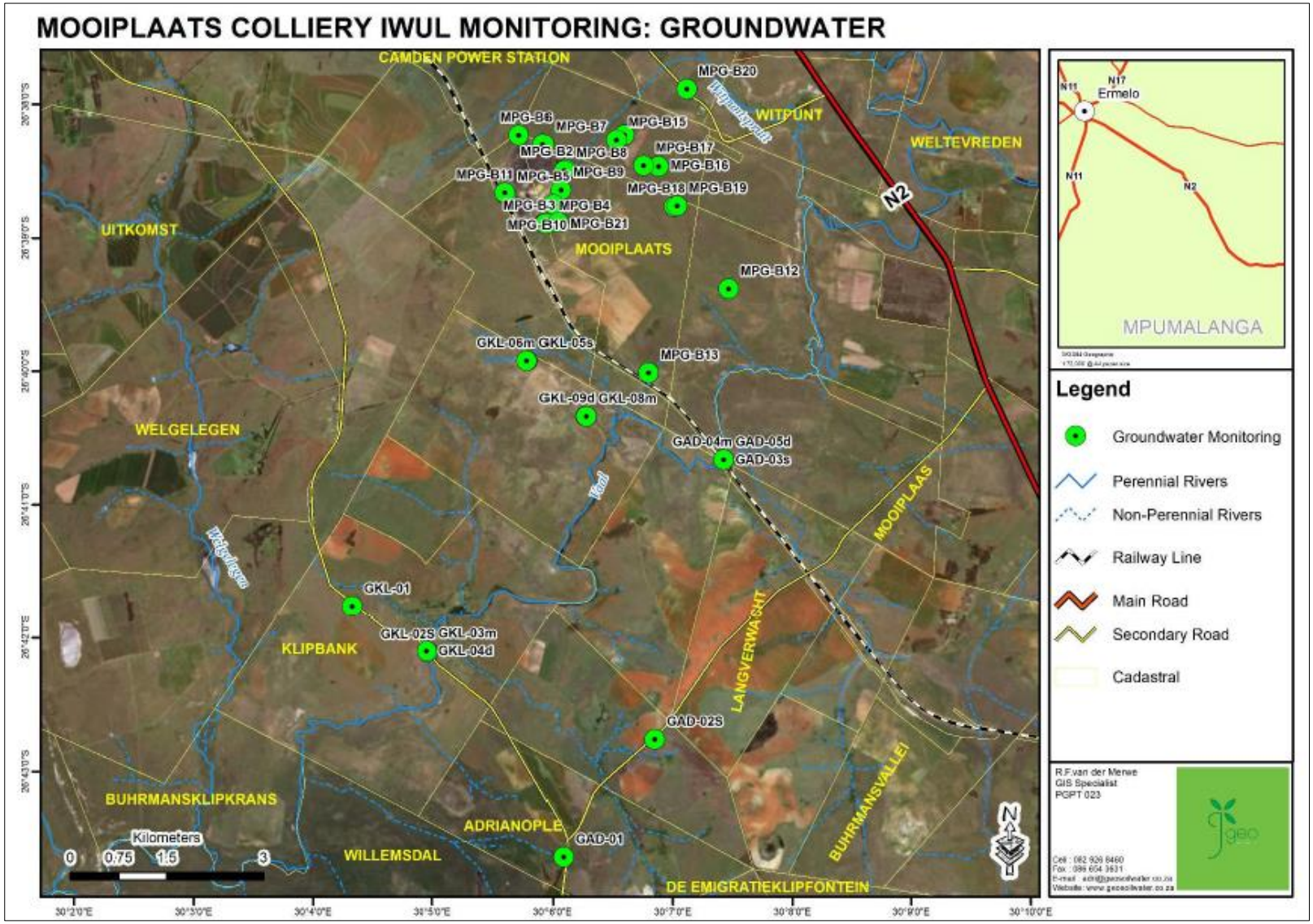


Figure 30: Location of groundwater monitoring reports

Table 23: Summary of groundwater monitoring points

Mooiplaats Colliery Groundwater Monitoring Programme			
Groundwater Monitoring Points			
Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
GKL-1	IWUL Borehole	S26.69603° E30.07208°	Monthly
GKL-4d	IWUL Borehole	S26.70167° E30.08253°	Monthly
GKL-3m	Borehole	S26.70178° E30.08269°	Monthly
GKL-2s	IWUL Borehole	S26.70178° E30.08269°	Monthly
GAD-2s	IWUL Borehole	S26.71269° E30.11414°	Monthly
GAD-1	IWUL Borehole	S26.72733° E30.10144°	Monthly
GKL-9D	IWUL Borehole	S26.67231° E30.10450°	Monthly
GKL-8M	IWUL Borehole	S26.67233° E30.10464°	Monthly
GKL-5S	IWUL Borehole	S26.66542° E30.09647°	Monthly
GKL-6M	IWUL Borehole	S26.66542° E30.09658°	Monthly
GAD-3s	Borehole	S26.67772° E30.12374°	Monthly
GAD-4m	Borehole	S26.67772° E30.12374°	Monthly
GAD-5d	Borehole	S26.67772° E30.12374°	Monthly
MPG-B1	Down gradient (north) of the co-disposal facility.	S26.63843° E30.09878°	Biannually

Mooiplaats Colliery Groundwater Monitoring Programme			
Groundwater Monitoring Points			
Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
MPG-B2	Down gradient (east) of the lined Settling Dams and co-disposal.	S26.64143° E30.10175°	Biannually
MPG-B3	Near the security gate.	S26.64816° E30.09905°	Biannually
MPG-B4	Near the security gate.	S26.64819° E30.09910°	Biannually
MPG-B5	Up-gradient (south-west) of the plant area next to the railway line.	S26.64457° E30.09363°	Biannually
MPG-B6	Adjacent to the return water dam.	S26.63719° E30.09540°	Biannually
MPG-B7	Down gradient (north) of the co-disposal facility.	S26.63832° E30.09870°	Biannually
MPG-B8	Down gradient (east) of the lined Settling Dams.	S26.64160° E30.10155°	Biannually
MPG-B9	Down gradient (east) of the plant area.	S26.64403° E30.10107°	Biannually
MPG-B10	Down gradient (east) of the plant area.	S26.64581° E30.10007°	Biannually
MPG-B11	Up-gradient (south-west) of the plant area next to the railway line.	S26.64435° E30.09344°	Biannually
MPG-B12	At MPN Vunene extension	S26.65633° E30.12443°	Biannually
MPG-B13	South of the mine next to the railway line.	S26.66689° E30.11329°	Biannually
MPG-B14	Between Usutu/MPN	S26.63716° E30.10992°	Biannually
MPG-B15	Between Usutu/MPN	S26.63778° E30.10881°	Biannually

Mooiplaats Colliery Groundwater Monitoring Programme			
Groundwater Monitoring Points			
Locality	Locality Description	Coordinates WGS 84 ddd.ddddd	Monitoring Frequency
MPG-B16	Between Usutu/MPN	S26.64106° E30.11469°	Biannually
MPG-B17	Between Usutu/MPN	S26.64095° E30.11259°	Biannually
MPG-B18	Between Usutu/MPN	S26.64608° E30.11685°	Biannually
MPG-B19	Between Usutu/MPN	S26.64600° E30.11725°	Biannually
MPG-B20	Usutu UG. Borehole intersecting mine at 90 m	S26.63144° E30.11860°	Biannually

Table 24: Average water quality for Mooiplaats IWUL groundwater monitoring points for the reporting period

Average Groundwater Quality for Mooiplaats October - December 2018											
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DWS Livestock Watering**	**GAD-1**	**GAD-2S**	**GKL-1**	**GKL-2S**	**GKL-3m**	**GKL-4D**
pH	-		**6.4 – 8.5**		-	7.14	7.30	7.24	7.60	*9.12	8.63
EC	**mS/m**	**150**	**25**	**170**	**500**	29.70	13.11	36.90	58.27	72.60	*238.10
TDS	**mg/L**	-	-	**1200**	**3000**	159	59	212	316	434	1364
Total Hardness	**mg/L**	-	-	-	-	140	57	160	255	10	11
Alkalinity	**$CaCO_3$/L**	-	**75**	-	-	160.000	45.333	209.000	305.667	393.667	776.333
Ca	**mg/L**	**15.18**	-	-	**1000**	36.133	11.367	41.567	52.800	2.733	2.800
Mg	**mg/L**	**6.96**	-	-	**500**	12.000	7.000	13.700	29.800	0.833	0.900
Na	**mg/L**	**61.55**	-	**200**	**200**	13.733	7.400	18.300	25.633	185.400	562.467
K	**mg/L**	-	-	-	-	2.033	0.733	9.733	1.700	1.100	2.900
F	**mg/L**	**0.30**	**0.4**	**1.5**	**2**	-0.400	*0.567	-0.400	-0.400	*1.300	*2.967
Cl	**mg/L**	**19.97**	**20**	**300**	**3000**	5.400	7.333	10.133	6.067	10.733	*323.933

Average Groundwater Quality for Mooiplaats October - December 2018											
Variable	**Unit**	**IWUL Limit**	**Grootdraai Dam Guidelines Vaal Origin**	**SANS 241:2011**	**DWS Livestock Watering**	**GAD-1**	**GAD-2S**	**GKL-1**	**GKL-2S**	**GKL-3m**	**GKL-4D**
SO_4	**mg/L**	**0.25**	**30**	**500**	**1000**	-4.000	-4.000	-4.000	19.400	-4.000	-0.333
NO_3	**mg/L**	**0.07**	**0.5**	**11**	**-**	-2.000	*1.367	-2.000	-2.000	-0.567	*2.600
NH_3	**mg/L**	**-**	**-**	**1.5**	**-**	0.080	-0.020	-0.020	-0.020	0.610	1.290
Al	**mg/L**	**-**	**-**	**0.3**	**5**	-0.050	0.047	-0.013	0.080	-0.013	0.023
Fe	**mg/L**	**-**	**-**	**0.3**	**10**	0.573	0.443	0.123	0.217	0.183	0.197
Mn	**mg/L**	**-**	**-**	**0.1**	**10**	0.333	-0.050	0.040	-0.050	-0.050	-0.050

- Variables highlighted in grey are specified by the IWUL where the remainder are additional analyses.
- Values highlighted in red exceeds the limits set in the IWUL where variables highlighted in green exceeds the Grootdraai Dam Catchment Guidelines of the Vaal Origin
- "-"Indicate values below laboratory detection limit.
- "*"Indicate variables exceeding the IWUL limits and GD-VO Guidelines.

The groundwater in the Mooiplaats area is of relatively good quality. Although elevated SO_4 concentrations were observed at the groundwater monitoring point towards the Vaal river, **GAD-3s** was unlikely impacted by Mooiplaats Colliery. The presence of SO_4 and Fe can most probably be ascribed to an exposed coal seam or other geological factors as the borehole is drilled to a depth of 6 meters only. The SO_4 concentration lowered from 215mg/L in May 2018 to 118mg/L in November. The water quality will be monitored and investigated should an increase in the concentrations be observed.

GKL-4d and **GAD-5d** are boreholes drilled to a depth of 80 meters. The $CaCO_3$, Na and Cl concentrations elevate the pH and EC concentrations, leading to IWUL Limit exceedances. Elevated $CaCO_3$, Na and Cl can most likely be ascribed to geological conditions and not mining pollution.

MPG-B2 and **MPG-B7** located directly east of co-disposal and settling dams recorded increased concentrations (From May to November) where the remainder of groundwater monitoring points recorded decreases.

When considering all groundwater monitoring points seasonal changes contribute/dictate water quality trends as the pH, EC and Alkalinity (averages) increases and SO_4 decreases at the end of the wet season (May) where the pH, EC and Alkalinity (averages) decreases and SO_4 increases at the end of the dry season (November).

The majority of **groundwater levels** indicated substantial but slight continuous lowering in level which can be ascribed to seasonal fluctuations. **GKL-4d** recorded higher levels in November and December which can possibly be ascribed to a late recharge (due to the drilled depth of the borehole) or a possible collapse in the borehole casing. **GKL-4d** is located at least six kilometres from Mooiplaats mining activities. **MPG-B15** recorded a higher percentage lowering in water level than surrounding water levels. **MPG-B15** is located close to a wetland (within 200 meters) which probably dictate the water level. Water levels will be closely monitored to determine if this is seasonal trends.

Table 25: Mooiplaats groundwater levels for IWUL monitoring boreholes

Mooiplaats IWUL Groundwater Levels						
Date	**GAD-1**	**GAD-2S**	**GKL-1**	**GKL-2S**	**GKL-3m**	**GKL-4D**
May-18	-4.82	-8.99	No Access	-4.21	-4.72	-4.65
Jun-18	-4.95	-9.23	-26.44	-4.24	-4.72	-4.68
Jul-18	-5.07	-9.50	-26.46	-4.29	-4.80	-4.75
Aug-18	-5.145	-9.66	-26.40	-4.31	-4.83	-4.71
Sep-18	-5.33	-9.88	-26.48	-4.37	-4.87	-4.74
Oct-18	-5.48	-10.04	-26.51	-4.43	-4.83	-4.78
Nov-18	-5.44	-10.18	-26.51	-4.31	-4.68	-3.27
Dec-18	-5.48	-10.08	-26.51	-4.46	-4.81	-2.73

Evident from Table 25, all groundwater levels (except **GKL-4d**) showed a slight but continuous lowering in level. The slight lowering in water levels can be ascribed to the dry season as no to very little rain water recharges the

groundwater aquifer during this time. It is expected that the groundwater aquifer will start to recharge after the commencement of the wet season (December/January/February depending on the amount of rains received).

The increase in level at **GKL-4d** can possibly be ascribed to late recharge due to the depth of the borehole (80 meters) or the possible collapse of the borehole casing. The water level will be continuously monitored.

4.5.2 HYDRO-CENSUS

A hydrocensus user survey within the greater study area was conducted during May 2019 where relevant hydrogeological baseline information was gathered. In order not to repeat information in this document, the hydro-census discussion is presented in Section 4.10.

4.5.3 POTENTIAL POLLUTION SOURCE IDENTIFICATION

The main indicator for groundwater contamination is sulphate. During the various stages of geochemical transformation, sulphate will be associated with sodium, calcium and magnesium. TDS or EC indicates the total salt load. Other contaminant indicators associated with sulphate, are pH levels. When low-pH conditions prevail, increased metals concentrations may manifest, such as iron.

4.5.4 GROUNDWATER MODEL

The purpose of a groundwater model is to serve as a tool to evaluate various water management options and scenarios. The model design and parameters are presented in the attached Geohydrological Specialist Report (refer to Appendix D). Various management scenarios were modelled for the purposes of planning and decision making with stress periods listed in Table 26:

1. Scenario 01: Steady pre-mining water balance (∞).
2. Scenario 02a: Base-case scenario – LoM underground dewatering operational phase(s).
3. Scenario 02b: Post-closure underground void re-watering and hydraulic head rebound.
4. Scenario 03a: LoM sulphate pollution plume migration with source term 965 mg/l.
5. Scenario 03b: LoM sulphate pollution plume migration with source term 2500 mg/l.
6. Scenario 03c: Post-closure sulphate pollution plume migration (100-years).
7. Scenario 04a: Mitigation alternative – Seepage capturing/ scavenger boreholes.
8. Scenario 04b: Mitigation alternative – Cut-off trench.
9. Scenario 04c: Implementation of a barrier system for coal stockpile areas.

Table 26: Groundwater model stress periods.

Stress Period	Description
2019-2029	LoM Operation underground
2030-2080	50-years post closure

Stress Period	Description
2081-2130	100-years post closure

4.5.4.1 SCENARIO 01: STEADY STATE PRE-MINING WATER BALANCE (∞)

In terms of the pre-mining steady state conditions, recharge is assumed the only source of inflow to the system and has been simulated at 1.50E+04 m^3/d, while the largest loss to the groundwater system is via baseflow, $1.40E^{+04}$ m^3/d. An assumption has been made for the total volume of groundwater abstraction from privately owned and community supply borehole accounts to $5.00E^{+02}$ m^3/d.

4.5.4.2 SCENARIO 02A: BASE-CASE SCENARIO – LOM UNDERGROUND DEWATERING OPERATIONAL PHASE(S)

During the mine operational phase, model simulations suggest the average groundwater ingress and underground dewatering volume will be approximately $5.10E^{+02}$ m^3/d (Figure 31). It is expected that the groundwater drawdown will range from 2.0 m to ~ 7.0 m below the static water level (mbsl) i.e. pre-mining water levels covering an estimated area of approximately 13.0 km^2, propagating towards a western as well as north-eastern direction, reaching a maximum distance of ~750 m to the west and 1050 m to the northeast. It is noted that there is not a significant influence on water levels of neighbouring boreholes for the duration of the proposed mining operation. This can be attributed to the proposed underground void depth and hence dewatering levels and proximity of the boreholes to the pit footprints. Baseflow discharges to the Vaal Rivers and Witpuntspruit accounts to approximately 1 326.0 m^3/d during pre-mining conditions, whereas baseflow discharge during the operational life of mine period decreases to ~ 1 117.0 m^3/d. This accounts for an average loss of ~16.0%.

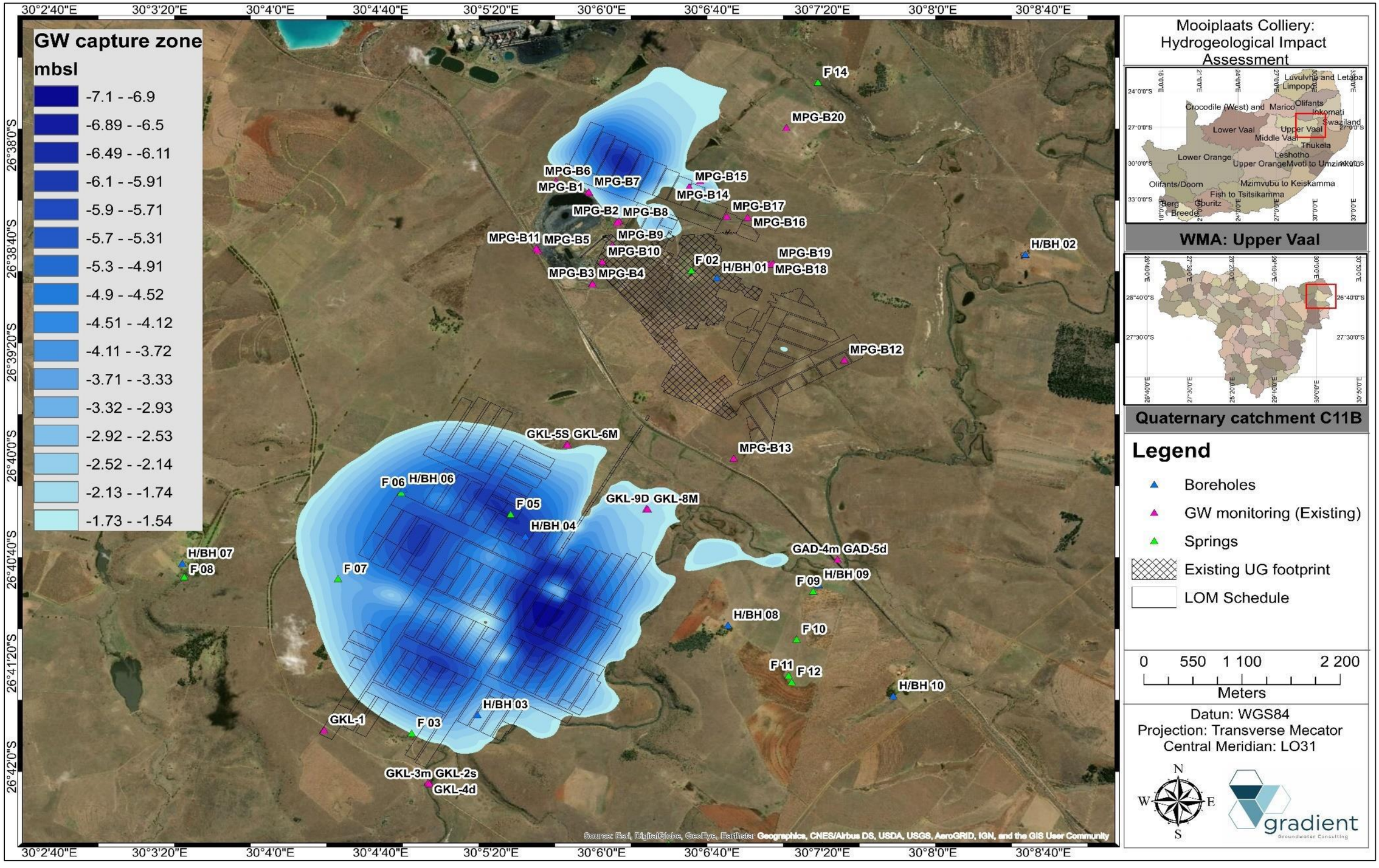


Figure 31: Scenario 02a: Water level drawdown and groundwater capture zone.

4.5.4.3 SCENARIO 02B: POST-CLOSURE UNDERGROUND VOID RE-WATERING AND HYDRAULIC HEAD REBOUND

A mine post-closure scenario was simulated wherein hydraulic head recovery within the zone of influence was evaluated. In order to work out the time the underground void will take to be flooded, and potentially decant, the mine void space must be determined for the underground operations. The expected average groundwater infiltration for the LoM underground operation is estimated at ~ 500.0 m^3/d. In addition to groundwater infiltration there is also flow contribution from groundwater ingress reporting to the underground void (variable depending on specific storativity scenario applied). The flooding curves for the underground operation were determined and from these volumes it is estimated that under average rainfall conditions and specific storage (Sc) values of $10E^{-6}$, the underground will be flooded in ~30 years after ceasing mining activities. It is estimated that for Sc values of $10E^{-5}$, the underground operations will be flooded in ~34 years whereas for Sc values of $10E^{-3}$, the underground void will be flooded after ~37 years.

The proposed depth and geometry of the underground operations allows for the entire footprint to be flooded without any decant expected. Generally, the decant point/zone is the lowest topographical point of the proposed mining footprint which is in direct connection with surface topography. The latter usually occur via a preferred groundwater flow pathway such as shafts/ adits and/or unrehabilitated exploration boreholes. However, if these features are fully rehabilitated no point will exist for surface decant to occur post-closure.

4.5.4.4 SCENARIO 03A: LOM SULPHATE POLLUTION PLUME MIGRATION WITH SOURCE TERM 965 MG/L

The calibrated groundwater flow model was used as basis to perform the solute/mass transport scenarios. Sulphate (SO_4) is a good indicator for coal mine pollution and is generated as a product from ARD (Rikard and Kunkle 1990). This anion is very stable i.e. relatively little decay and/or retardation and was used as source term and contaminant proxy. The source term concentration was derived from the geochemical characterisation and assigned as 965.0 mg/l. Model domain background values were interpreted from the hydrochemical data analysis as gathered during the hydrocensus user survey and assigned as ~ 30.0 mg/l.

In terms of the time-series graph of the mass load of neighbouring boreholes in proximity to the waste facilities (MPG-BH01 and MPG-BH07) monitoring locality MPG-BH01 exceeds the SANS 241:2015 threshold for sulphate after a period of approximately eight years, reaching a maximum concentration of 560.0 mg/l. Figure 32 depicts the expected sulphate pollution plume migration emanating from the existing discard dump and coal stockpile footprints. The pollution plume extent covers an area of approximately 0.72 km^2, reaching a maximum distance of 180.0 m in a general eastern to north-eastern direction. The simulation indicates that no neighbouring boreholes as identified during the hydrocensus user survey are impacted on during the operational life of mine. It is evident from the cross section of the plume migration that the shallow, weathered aquifer is the primary pathway as expected.

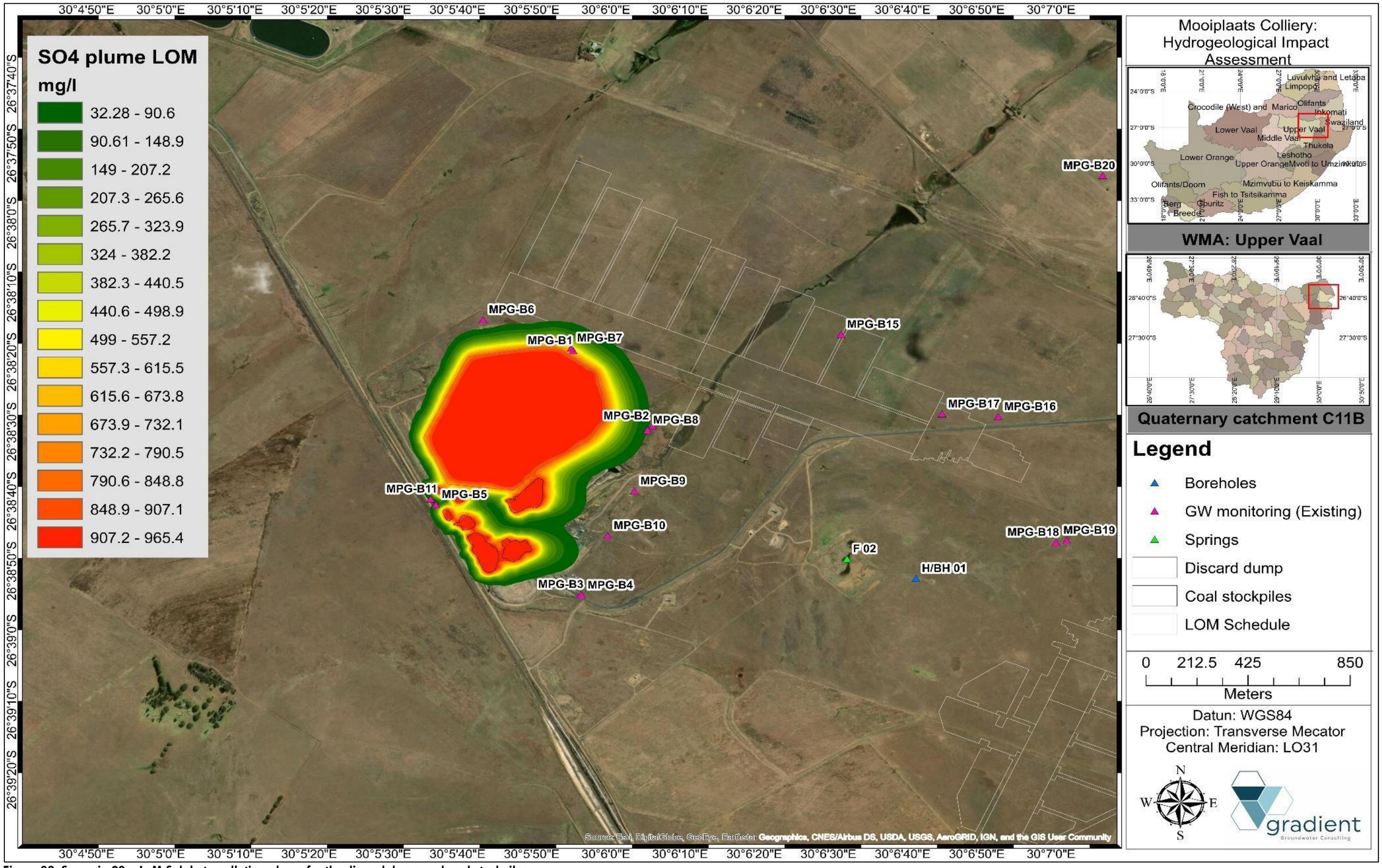


Figure 32: Scenario 03a: LoM Sulphate pollution plume for the discard dump and coal stockpiles.

4.5.4.5 SCENARIO 03B: LOM SULPHATE POLLUTION PLUME MIGRATION WITH SOURCE TERM 2500 MG/L

Scenario 03b was simulated to evaluate the "worst-case" scenario of the sulphate source term and was assigned at 2500 mg/l. Based on this simulation, both monitoring boreholes in proximity to the waste facilities (MPG-BH01 and MPG-BH07) exceed the SANS 241:2015 threshold after a period of only one year's mining and reaches a maximum concentration of ~1430.0 mg/l and 1310.0 mg/l respectively. Figure 33 depicts the expected sulphate pollution plume migration emanating from the existing discard dump and coal stockpile footprints. The pollution plume extend covers an area of approximately 0.78 km^2, reaching a maximum distance of <200.0 m in a general eastern to north-eastern direction. Figure 34 shows the expected pollution plume migration potentially emanating from the underground mined out faces. The pollution plume does not migrate more than ~100.0 m – 150.0 m from the mining footprint for the operational life of mine. The simulation indicates that no neighbouring boreholes as identified during the hydrocensus user survey are impacted on during the operational life of mine.

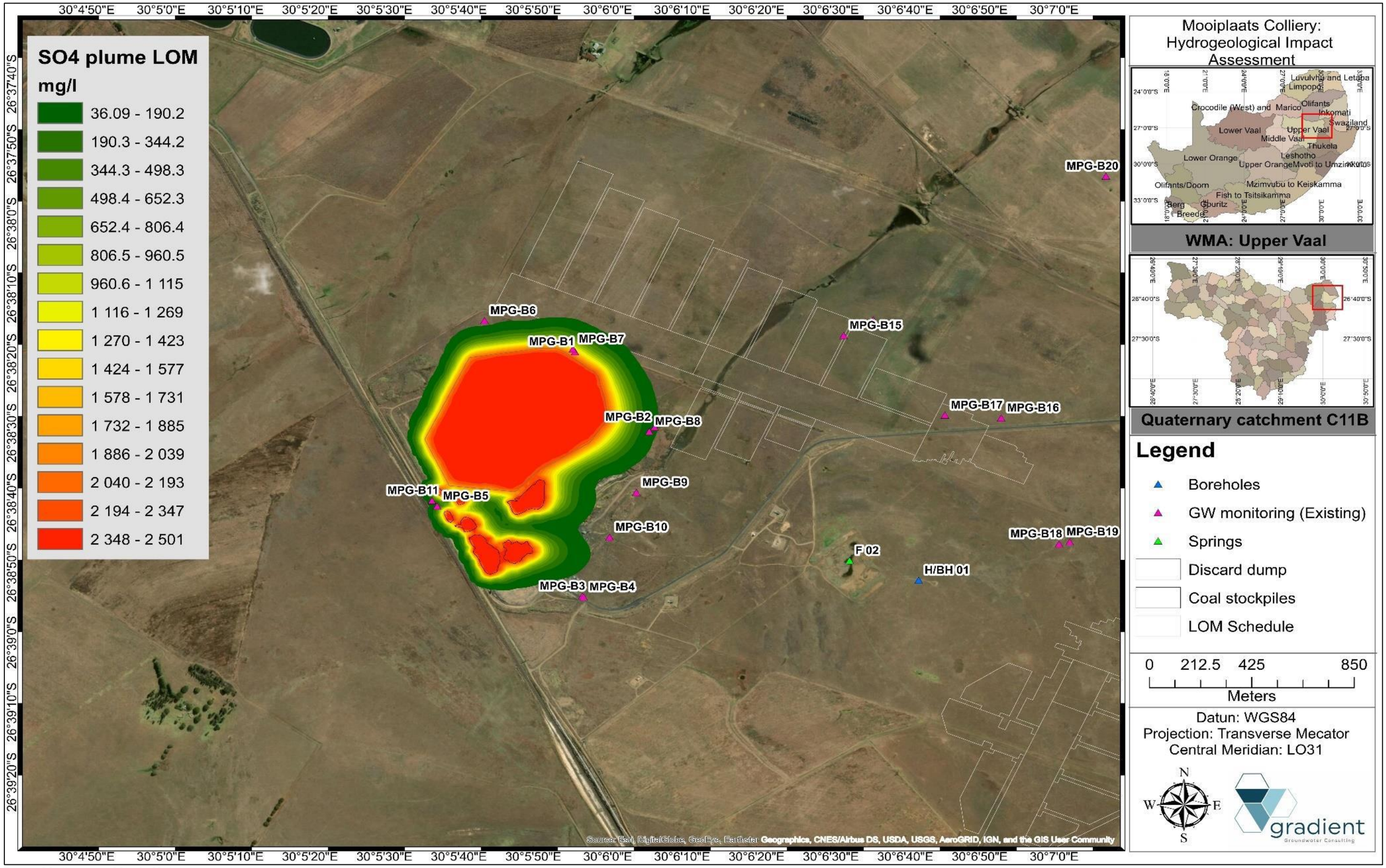


Figure 33: Scenario 03b: LoM Sulphate pollution plume for the discard dump and coal stockpiles (weathered aquifer).

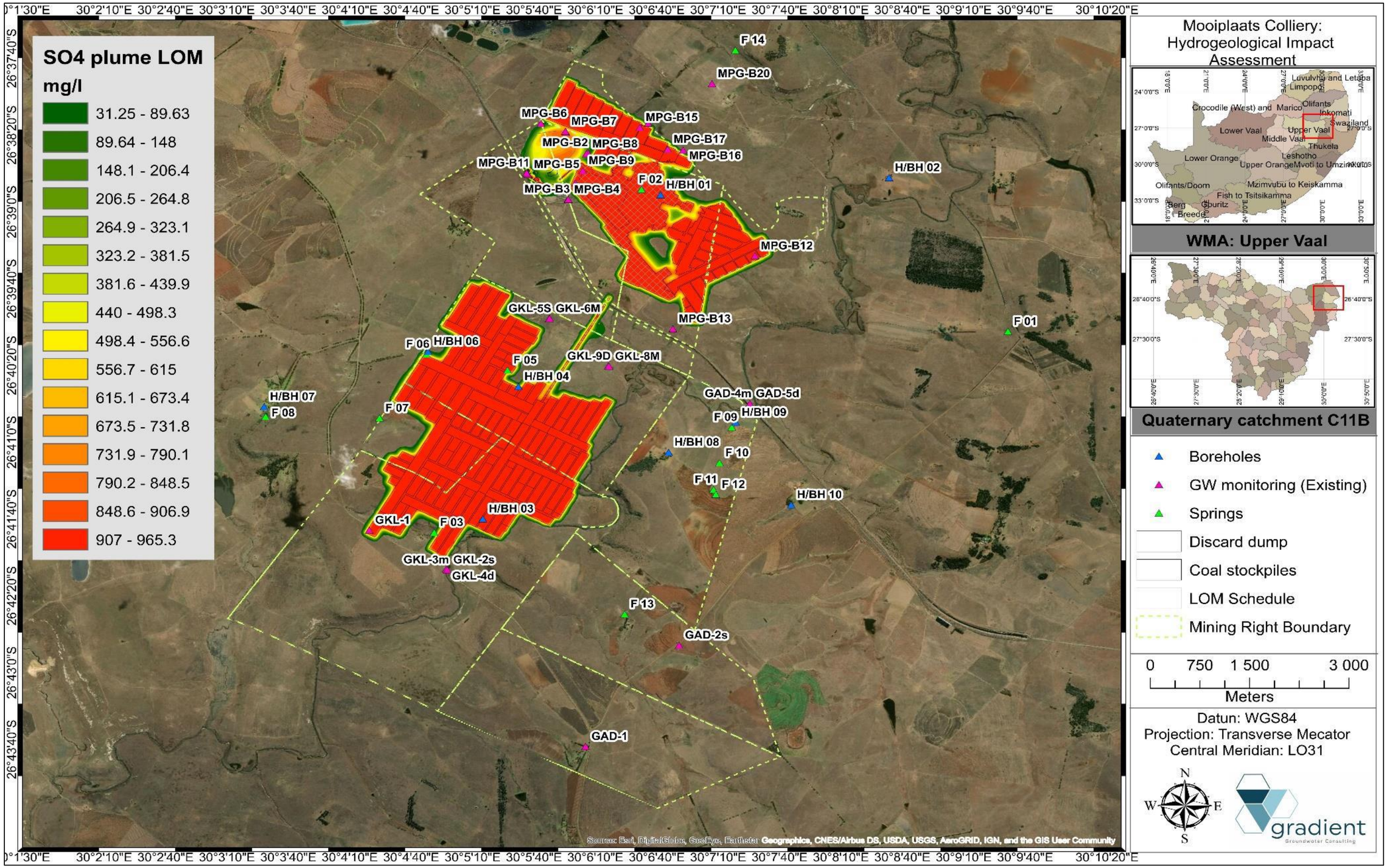


Figure 34: Scenario 03b: LoM Sulphate pollution plume for the underground mining operations (fractured aquifer).

4.5.4.6 SCENARIO 03C: POST-CLOSURE SULPHATE POLLUTION PLUME MIGRATION

A 50-year post-closure as well as 100-year post-closure scenario was simulated for each source term in order to evaluate the pollution plume migration after discontinuing of mining activities. It should be noted that the plume extent will represent a worst case and conservative footprint as the source term was simulated at constant concentration for the duration of the simulation period.

In terms of the mass load of neighbouring boreholes in proximity to the waste facilities, both monitoring localities (MPG-BH01 and MPG-BH07) exceed the SANS 241:2015 threshold after a period of four years and seven years after mining respectively. A maximum concentration of ~790.0 mg/l and 780.0 mg/l are reached respectively.

After a 50-year period the pollution plume extent is approximately 1.23km^2 reaching a total distance of ~530m in a general north-eastern to eastern direction Figure 35. After a 100-year period the pollution plume footprint increases to approximately 1.55km^2 and reaches a maximum distance of 680m towards the north-eastern perimeter and also migrates to the north Figure 36. It should be noted that plume migration stretches beyond the mine lease area to the north. The plume still does not reach any neighbouring boreholes, however two drainages and tributaries of the Witpuntspruit towards the northern and eastern border can potentially be affected post-closure.

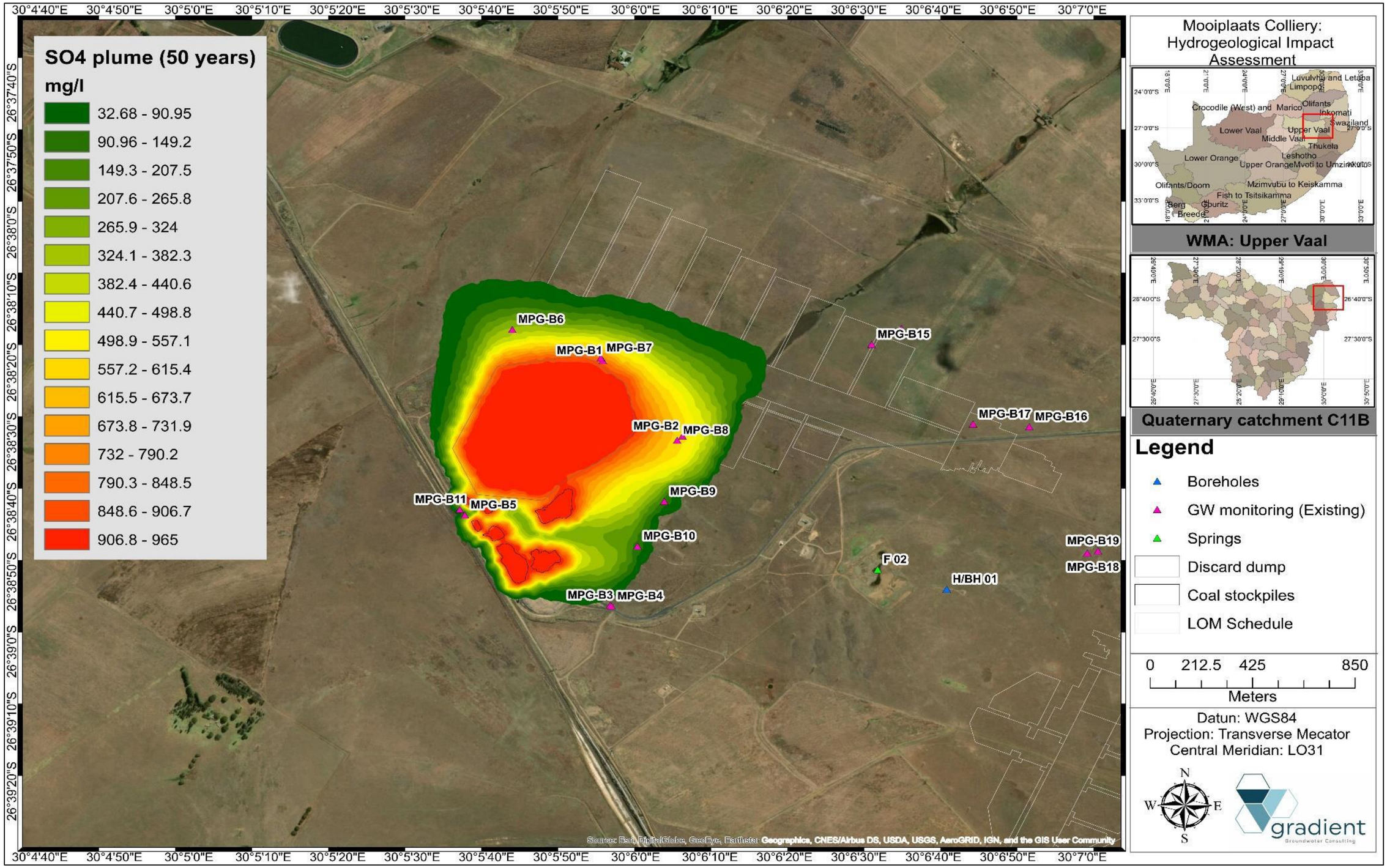


Figure 35: Scenario 03c: Post-closure sulphate pollution plume (50 years).

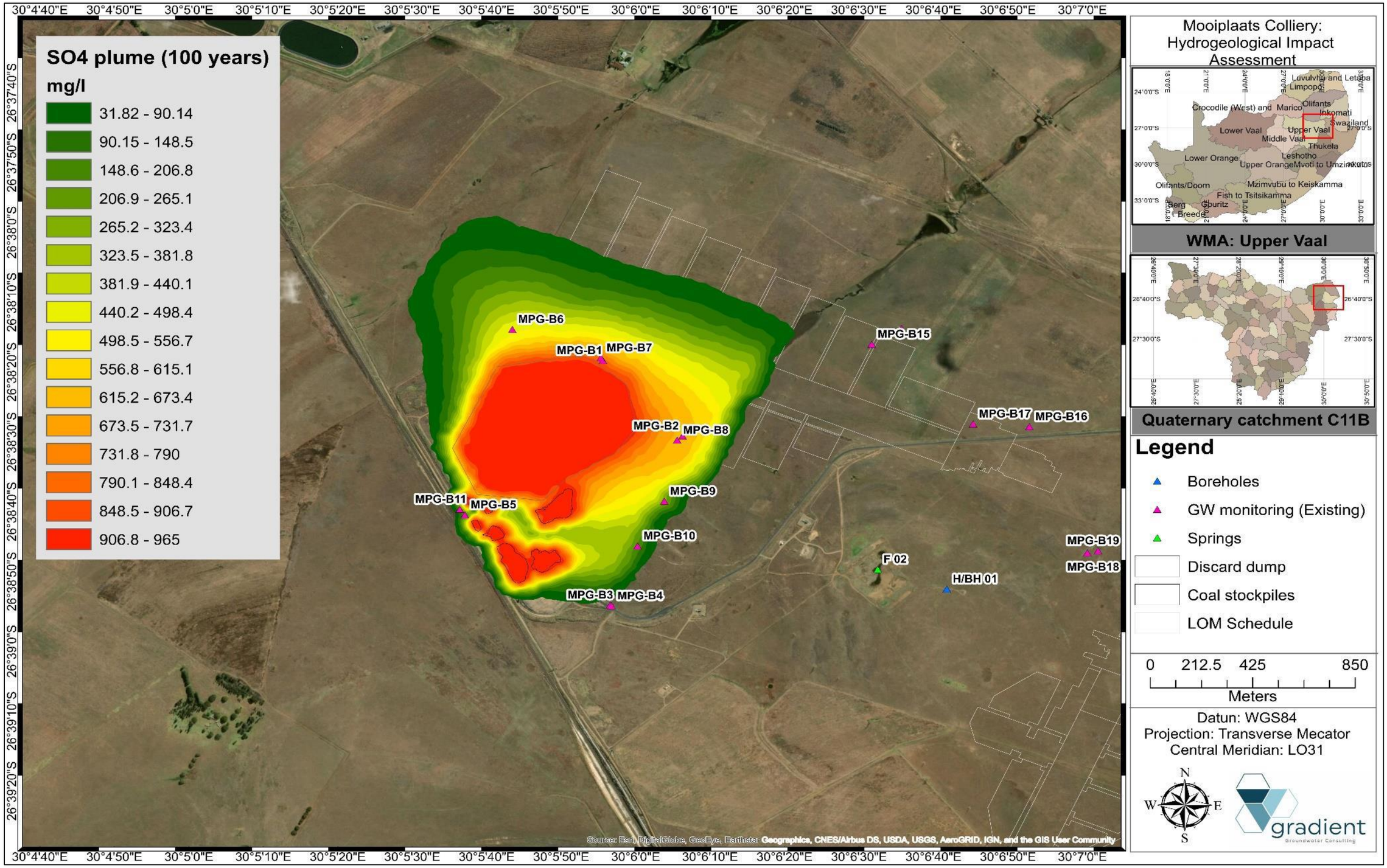


Figure 36: Scenario 03c: Post-closure sulphate pollution plume (100 years).

4.5.4.7 SCENARIO 04A: MITIGATION ALTERNATIVE – SEEPAGE CAPTURING/ SCAVENGER BOREHOLES

A management scenario evaluating the mitigating effect of seepage capturing boreholes i.e. scavenger boreholes on the plume migration were simulated. Boreholes were established down-gradient of both the mine discard dump as well as coal stockpiles as indicated in Figure 37. The pollution plume footprint is reduced by approximately 19.0% with an abstraction volume of ~0.25 l/s per borehole. Increased abstraction will further decrease and constraint the plume footprint, however this will be highly dependent on borehole specific hydraulic parameters as well as functionality. It is recommended that constant discharge aquifer tests be conducted on newly established seepage capturing boreholes in order to optimise borehole yields.

4.5.4.8 SCENARIO 04B: MITIGATION ALTERNATIVE – CUT-OFF TRENCH

A management scenario evaluating the mitigating effect of a sub-surface cut-off trench/sub-surface drain on the plume migration were simulated as depicted in Figure 38. The pollution plume footprint is reduced by approximately >20.0% and is deemed the preferred mitigation alternatives due to operational as well as post-closure management. As such, cut-off trench/sub-surface drains must be installed as soon as possible and maintained during the operational phase.

4.5.4.9 SCENARIO 04C: IMPLEMENTATION OF A BARRIER SYSTEM FOR COAL STOCKPILE AREAS

A management scenario evaluating the mitigating effect of a Class C or GLB+ containment barrier design i.e. Type 3: Low-risk waste for all RoM stockpiles on the plume migration were simulated (Figure 39). The mitigation effect and constraint of the pollution plume is not significant, and the plume is only reduced by ~5 %. This can possibly be attributed to the small footprint of the coal stockpiles and its contribution to the plume.

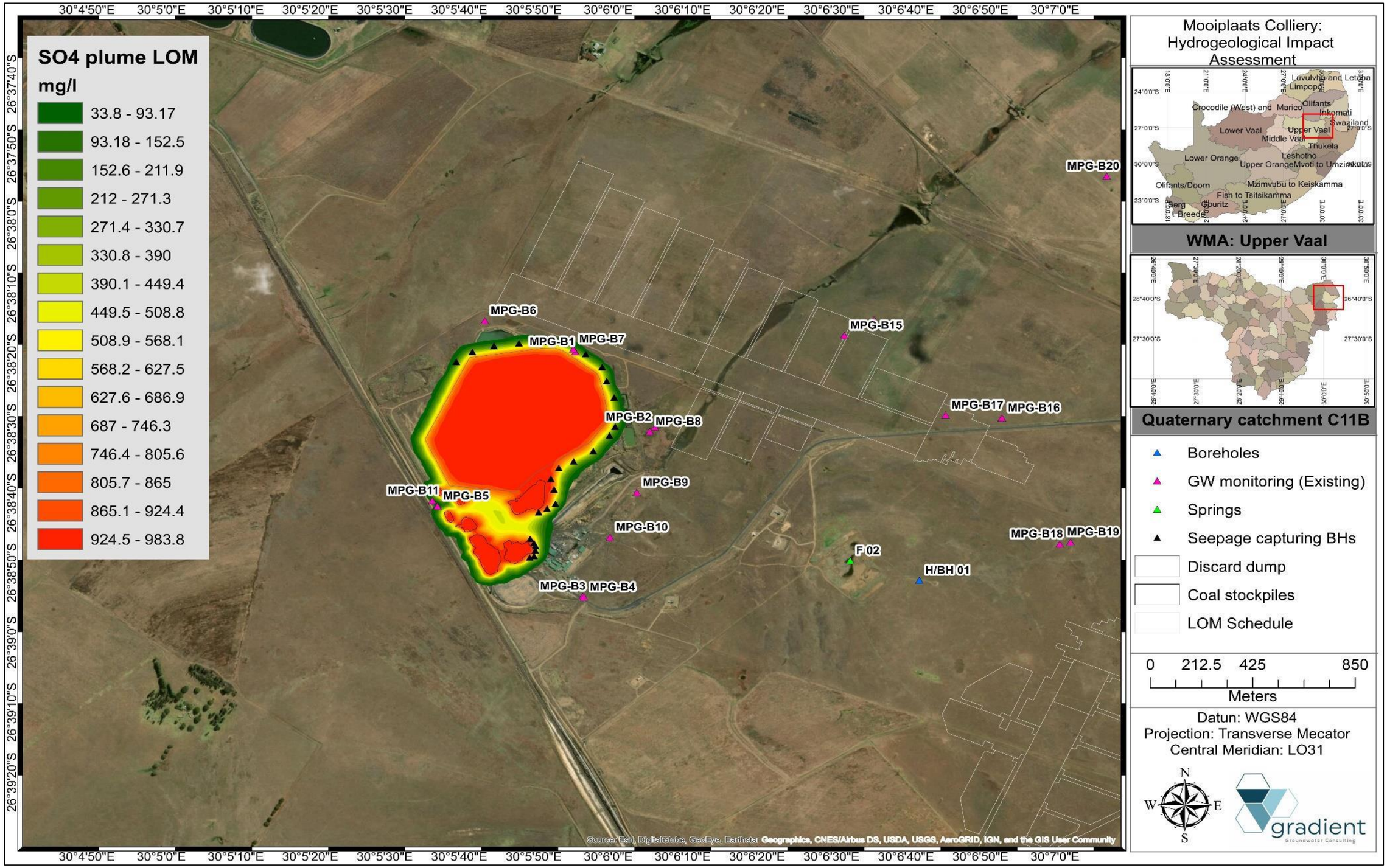


Figure 37: Scenario 04a: Mitigation alternative 01: Seepage capturing boreholes.

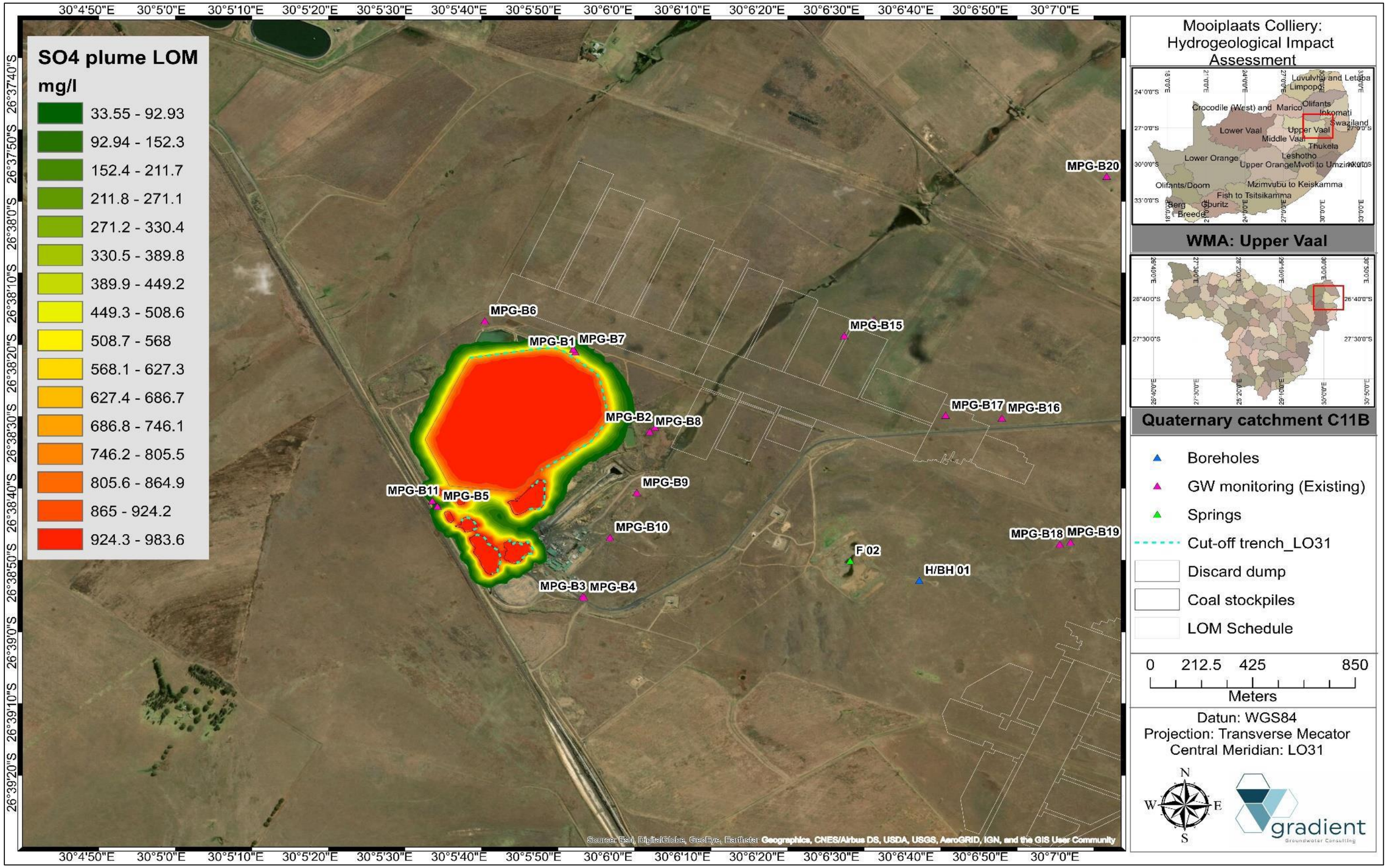


Figure 38: Scenario 04b: Mitigation alternative 02: Implementation of a cut-off trench.

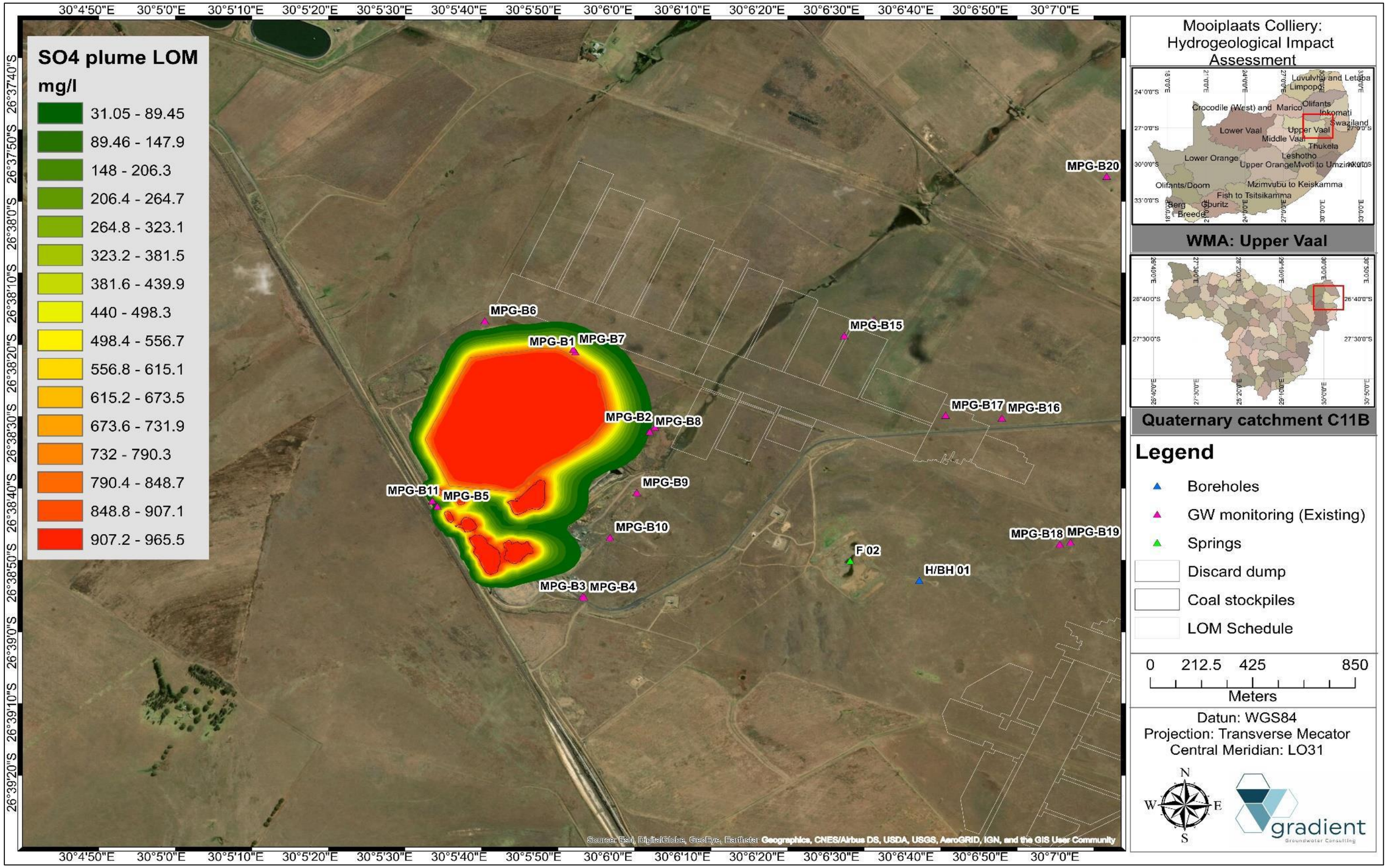


Figure 39: Scenario 04c: Mitigation alternative 03: Lining of coal stockpiles with a barrier system.

4.6 SOCIO-ECONOMIC ENVIRONMENT

The following section provides a summary of the social and economic environment that may be influenced by the proposed project. Information in this section was sourced from Stats SA and the Integrated Development Plans (IDP's) for the Msukaligwa Local Municipality as well as the Gert Sibande District Municipality. The information provided in the IDP's and the Stats SA website are based on a 2011 National census and well as the 2016 Community Survey[6].

According to the National Environmental Management Act (NEMA, 1998) environment refers to the surroundings in which humans exist. When viewing the environment from a socio-economic perspective the question can be asked what exactly the social environment is. Different definitions for social environment exist, but a clear and comprehensive definition that is widely accepted remains elusive. Barnett & Casper (2001) offers the following definition of human social environment:

"Human social environments encompass the immediate physical surroundings, social relationships, and cultural milieus within which defined groups of people function and interact. Components of the social environment include built infrastructure; industrial and occupational structure; labour markets; social and economic processes; wealth; social, human, and health services; power relations; government; race relations; social inequality; cultural practices; the arts; religious institutions and practices; and beliefs about place and community. The social environment subsumes many aspects of the physical environment, given that contemporary landscapes, water resources, and other natural resources have been at least partially configured by human social processes. Embedded within contemporary social environments are historical social and power relations that have become institutionalized over time. Social environments can be experienced at multiple scales, often simultaneously, including households, kin networks, neighbourhoods, towns and cities, and regions. Social environments are dynamic and change over time as the result of both internal and external forces. There are relationships of dependency among the social environments of different local areas, because these areas are connected through larger regional, national, and international social and economic processes and power relations."

The environment influences and constrains behaviour, but behaviour also leads to changes in the environment. The impacts of a project on people can only be truly understood if their environmental context is understood. The baseline description of the social environment will include a description of the area within a provincial, district and local context that will focus on the identity and history of the area as well as a description of the population of the area based on a number of demographic, social and economic variables. Table 27 presents a summary of the socio-economic aspects which may have a bearing on the proposed project.

Table 27: Summary of the socio-economic aspects (Msukaligwa Local Municipality, 2017)

Aspect	Local Municipality
District Municipality	Gert Sibande District Municipality
Province	Mpumalanga Province

[6] It is acknowledged that this data may be outdated as no more recent census has been undertaken (Stats SA) and in addition, the municipal IDP 2017-2022 is still in draft mode and may be updated after review.

<table>
<tr><th>Aspect</th><th>Local Municipality</th></tr>
<tr><td>Municipal Area Size</td><td>6016 km^2</td></tr>
<tr><td>Number of Wards</td><td>19 wards</td></tr>
<tr><td>Population Size</td><td>164 608</td></tr>
<tr><td>Number of households</td><td>51 809</td></tr>
<tr><td>Estimated growth/change in population size from 2001</td><td>~31.9%</td></tr>
<tr><td>Population composition</td><td>Black African (91.7%), White (6.7%), Coloured (0.6%), Indian or Asian (0.9%)</td></tr>
<tr><td>Languages</td><td>Main languages spoken are isiZulu, Afrikaans, SiSwati and English</td></tr>
<tr><td>Age</td><td>Age group 0 – 14 comprising 28% of the total population and 15 – 34 comprising of 41%, while 26% is between 35 and 64 years and 5% is 65 years and above</td></tr>
<tr><td>Gender</td><td>50.39% female, 49.61% male</td></tr>
<tr><td>Education</td><td>
<table>
<tr><td>Education Indicators</td><td>2001</td><td>2011</td></tr>
<tr><td>Number of people 15+ with no schooling</td><td>18 125</td><td>12 213</td></tr>
<tr><td>% Population 15+ with no schooling</td><td>21.7%</td><td>8.2%</td></tr>
<tr><td>% Population 15+ with matric and post matric qualification (%)</td><td>20.5%</td><td>23.6%</td></tr>
<tr><td>% Functional Literacy rate (%)</td><td>58.1%</td><td>51.4%</td></tr>
</table>
</td></tr>
<tr><td>Housing</td><td>The predominant settlement type is a house or brick structure on a separate stand, followed by traditional dwelling/hut structure, flats, townhouse, backyard room or hose then</td></tr>
</table>

Aspect	Local Municipality
	informal settlements. Overall, it is estimated that the housing is 75% formal and 26% informal dwelling type.
Urban development	According to the SDF as well as previous plans of the municipality, the area South to South West of Ermelo town between and along the N11 and R36 roads is a land earmarked for future urban development. Also East of Ermelo town along the N2 Piet Retief Road the area is earmarked for urban housing development. Currently there are number of vacant stands for residential and business development besides the proposed land for future development. Wesselton as a dormitory township for Ermelo, there is also land earmarked for future urban development bounded by N11, Hendrina Road on the West. The said land is owned the municipality and a portion further to the East of this land is privately owned.
Energy	By February 2017, nearly seven million households had been connected to the grid and now have electricity. The successful execution of Eskom's Build and Maintenance programmes helped to ensure stability and an end to load-shedding. Work is continuing to ensure energy security. Renewable energy forms an important part of the energy mix, which also includes electricity generation from gas, nuclear, solar, wind, hydro and coal. Government is committed to the overall Independent Power Producer Programme and is expanding the programme to other sources of energy, including coal and gas, in addition to renewable energy. Eskom will sign the outstanding power purchase agreements for renewable energy in line with the procured rounds.
Access to water	The municipality had over the past years through the District and in partnership with relevant spheres of government strived to meet the millennium target in ensuring access to water for all by 2015. In striving to achieve this target, the municipality has managed to reduce the water backlog to 9%. Though the 9% reflect as a backlog, these affect communities at the farms/rural areas of the municipality where water has been

Aspect	Local Municipality
	provided through boreholes but below the RDP level. Provision of clean drinking water (potable water) is almost addressed with few challenges more especially at rural / farmlands within the municipality. In providing Water, the Municipality shall ensure that water is provided to schools, clinics and all other social amenities. It is therefore ensured that prior to approval of construction of clinics and schools there is water provided to such amenities more especially ensuring that farm schools have water where the farm owners cannot provide. The municipality is a water services authority and therefore responsible for supply of water within its area of jurisdiction.
Nearby towns	Breyton, Camden, Davel, Wesselton, Ermelo, Phumula, KwaZanele
Percentage employment	41,698 in 2011
Percentage unemployment	Unemployment rate stood at 26.8% in 2011 which has decreased by 4.4% to 22.4% in 2016
Largest Employing sector	Agriculture
Largest economic contribution	Transport
Tourism	Government has identified tourism as a key job driver. Tourist arrival numbers for January to November 2016 increased to nine million, an increase of just over a million arrivals from 2015. This represents a 13% growth in tourist arrivals

5 ANALYSIS AND CHARACTERISATION OF ACTIVITY

The following section describes the activity, its associated processes and infrastructure in more detail.

5.1 SITE DELINEATION FOR CHARACTERISATION

The Mooiplaats Colliery is an underground mining operation located close to the town of Ermelo in the Mpumalanga Province. The mine falls in a section of the C11B Vaal River quaternary catchment (Figure 25) area and is situated on a slope that drains directly into the Vaal River.

5.2 WATER AND WASTE MANAGEMENT

The Mooiplaats Colliery will continue to require water in the form of both potable and bulk water (for the wash plant and dust suppression). This section details the various water and waste management activities.

5.2.1 POTABLE WATER SUPPLY

Potable water is obtained from 3 boreholes on site, each supplying an average of around 4000 m^3/annum.

5.2.2 WATER POLLUTION MANAGEMENT

Diversion berms are in place upslope of the shaft area to ensure that all clean run-off water is diverted around and away from the shaft area. All rain water and other dirty water in the shaft area is captured and stored on site in the PCD. Dirty water is not permitted to enter the receiving environment and all dirty water is kept in the close loop dirty water system from where it is reused. The PCD is designed correctly according to Dam Safety Regulations to store a 1:50 year 24 hour storm event and maintain a 0.8m freeboard. Appendix J shows the designs for the PCDs situated at Mooiplaats Colliery.

5.2.3 LIQUID EFFLUENT MANAGEMENT

Upslope diversion berms direct clean run-off around and away from the site of Mooiplaats Colliery. All water falling on and around the shaft area is deemed dirty water and is collected in the Pollution Control Dam (PCD) (Appendix J). Water produced as part of the underground mining, either from dewatering or as part of the mining process is pumped to settling dams via the silt trap. Settled water is transferred into the Erikson dams from where it is reticulated back underground allowing majority of the water being used to be recycled.

5.2.4 SEWAGE

A biological sewage treatment facility has been constructed next to the office and administration buildings. The capacity of the sewage treatment plant is 30 750L / 3.075 m^3 per day. The system is gravity fed. The sewage is collected through a network of sewage pipes which is then routed to the waste water treatment plant for treatment. The certificate issued for the sewage treatment plant classifies the plant as a Class C facility in terms of Section 26 of the NWA and it was registered on the 15th of May 2013.

5.2.5 HAZARDOUS WASTE MANAGEMENT

Hazardous waste is covered to protect it from the elements and is stored in a designated area. It is disposed of by an authorised contractor at a registered H:H waste disposal facility. Used oil is collected in either the oil separator at the workshop or collected in a specialised used oil container located at the waste collection area. Used oil is collected by a registered recycling contractor. Fluorescent tubes are crushed in a specialised 210L crushing drum, which is disposed of along with the other hazardous waste. A waste inventory is kept of all waste types and volumes generated and disposed of or recycled.

5.3 PROCESS WATER

Process water is obtained from 4 boreholes drilled to access water from the old Usutu underground working, with an average abstraction rate of 16 425 m^3/annum per borehole. Make-up water is obtained from the various pollution control facilities on site and dewatering of the active underground sections of the Mooiplaats Colliery.

Water for dust suppression is obtained from dirty runoff water collecting in various pollution control facilities on site. As the Vunene Extension Project includes underground mining only, there is not likely to be a change in the use of process water.

5.4 STORM WATER AND WATER BALANCE

The surface water management for the proposed development and related infrastructure, falls under legislation contained in, amongst others, the NWA, Section 4, dealing with prevention of contamination: The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources. If these measures are not taken, the Catchment Management Agency (CMA) concerned may itself do whatever is necessary to prevent the pollution or to remedy its effects, and to recover all reasonable costs from the persons responsible for the pollution.

A conceptual SWMP was developed for the Mooiplaats Colliery (Appendix E). 'Dirty' and 'clean' water contributing catchments were discretised based on 5m topographical data, and associated activities and key areas of concern were identified. The discretisation of the catchments factored in existing storm water infrastructure, overall functionality and the most practical and feasible implementation of the final SWMP.

Based on the discretised catchments, the required storm water management drainage and storage elements (including channels, pipes, berms and pollution control dams) were defined to ensure appropriate storm water management according to the management principles outlined in the General Notice (GN) 704 of the National Water Act (36 of 1998) and the relevant Best Practice Guidelines (BPGs).

The PCSWMM storm water drainage model (CHI, 2017) was used to size the proposed storm water management infrastructure. PCSWMM is a hydrological rainfall-runoff numerical simulation model suitable for application to both rural and urban environments.

The conceptual SWMP was assessed in terms of the 1:50-year recurrence interval storm event (as per the GN704 requirements) to define the required capacity of the storm water infrastructure (i.e. channels, pipes and PCDs). The GN704 states the following regarding capacity requirements of clean and dirty water systems:

- Confine any unpolluted water to a 'clean' water system, away from any 'dirty' areas;
- Design, construct, maintain and operate any 'clean' water system at the mine or activity so that it is not likely to spill into any 'dirty' water system more than once in 50 years;
- Collect the water arising within any 'dirty' area, including water seeping from mining operations, outcrops or any other activity, into a dirty water system;
- Design, construct, maintain and operate any dirty water system at the mine or activity so that it is not likely to spill into any clean water system more than once in 50-years; and
- Design, construct, maintain and operate any dam or tailings dam that forms part of a dirty water system to have a minimum freeboard of 0.8 metres above full supply level, unless otherwise specified in terms of Chapter 12 of the Act.
- Design, construct and maintain all water systems in such a manner as to guarantee the serviceability of such conveyances for flows up to and including those arising as a result of the maximum flood with an average period of recurrence of once in 50 years.

The proposed plan includes the use of channels, sediment traps and PCDs to manage the runoff from the various contributing catchment areas.

Three main drainage systems were identified within the Mooiplaats Colliery based on land use, and these are shown in Figure 40:

- Plant Area – 'Dirty' water catchments draining to the PCD and Genset Dam;
- Slurry Dam – 'Dirty' water generated on the Slurry Dam; and
- Clean catchments – 'Clean' water generated from the surrounding clean catchments

The plant area was discretised into a total of 20 sub-catchments (SC1-SC19 and the shaft) and this is shown in Figure 40. The slurry dam was discretised into a total of 3 sub-catchments (SD1-SD3) and is shown in Figure 41. The clean catchment draining towards the site was discretised into three sub catchments (C1-C3) and is shown in Figure 42. In order to ensure that 'clean' and 'dirty' water generated from the plant is adequately contained and routed, a storm water management plan was developed for the site. The proposed plan includes the use of channels (prefix 'C'), sediment traps and Pollution Control Dams (prefix 'PCD') to manage the runoff from the various contributing catchment areas. The RoM stockpiles (SC16-SC19) were classified as 'intermediary' as they are currently being rehabilitated and runoff from these areas could be 'clean'. The SWMP treated them as dirty and routed the runoff to the PCD. If the associated storm water runoff meets the relevant water quality standards, discharge into the natural environment can be considered.

Figure 40: Conceptual SWMP plant area.

Figure 41: Conceptual SWMP slurry/co-disposal am

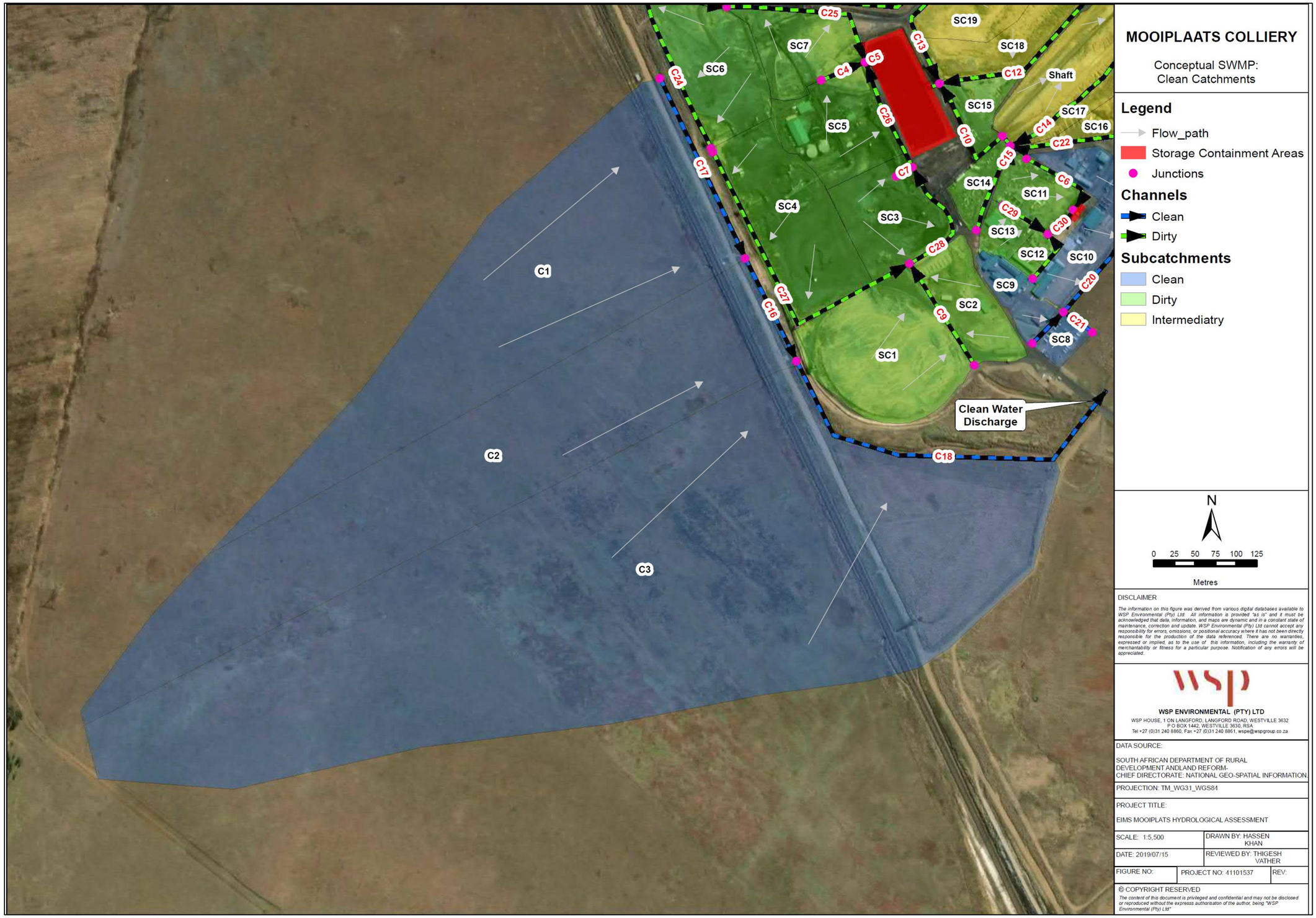


Figure 42: Conceptual SWMP clean catchments.

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

The water balance is, therefore, utilised as a management tool, for example, in simulating the effect of additional water management measures or the effect of expansion projects on the water management system. Assessment of the water balance will reveal the areas of concern for water management at the mine as well as non-compliance with the requirements of Regulation GN 704, dated 1999.

An annual average static water balance associated with the colliery was calculated showing all the inflows and outflows associated with each component. The process flow diagram for the Mooiplaats Colliery was based on the water balance diagram received from the client (Water Balance 2017.pdf) (Figure 43). The process flow diagram shows that the mine obtains all of its water from groundwater.

The annual average salt and water balance was calculated and depicted as stipulated in the DWS BPG G1 (Figure 44). The Mooiplaats Colliery operations use and process an average of 8 million cubic metres of water per annum.

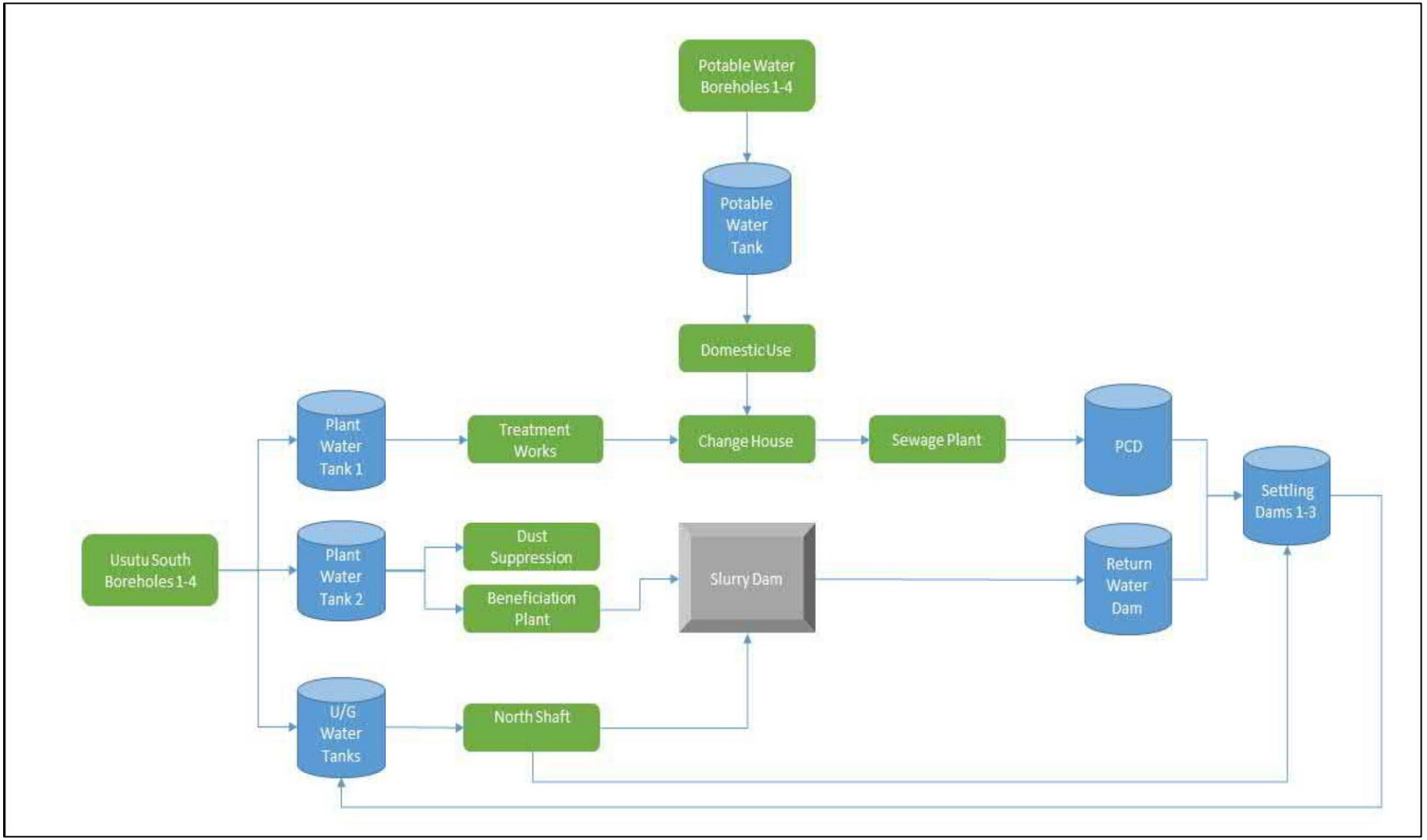


Figure 43: Process flow diagram.

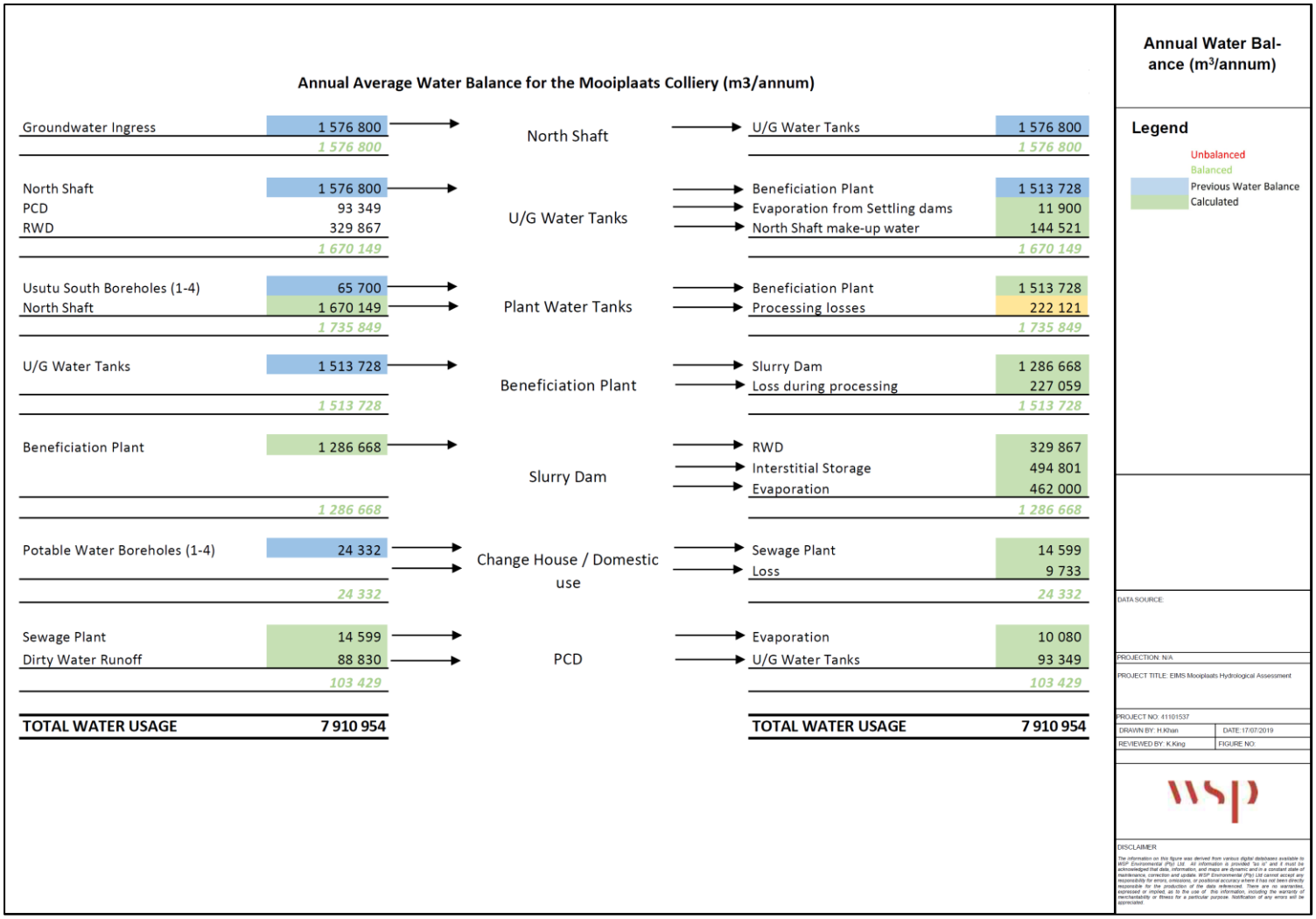


Figure 44: Annual water balance (m3/annum).

5.5 GROUNDWATER

To prevent repetitions within this report template, refer to Section 4.12, as well as Section 5.15. The Hydrogeological Specialist Study is attached in Appendix E.

5.6 WASTE

Several waste streams are likely to originate from the activities associated with day to day activities in the workplace. Some of these waste streams may not be hazardous, but the majority may contain a component(s) that may require special treatment. The nature of these waste streams may also vary due to composition and physical form. In order to make informed decisions on determining the appropriate waste management options to handle, treat and dispose of waste, the different waste streams must be identified in terms of hazardous and non-hazardous wastes.

Waste streams at the Mine can be categorised into 5 (five) different streams, based on similar health and environmental concerns namely:

- General Waste:
    - Domestic wastes – general waste, plastics, food, organic, non-hazardous, putrescible consisting of, combustible material, cardboard, wood, etc.;
    - Paper waste – paper waste recycling initiative; and
    - Rubber/plastic Wastes – valves, conveyors and hoses.

On-Site Management: Currently general waste is collected and stored in bins and skips and sorted in the salvage yard for off-site reselling or disposal.

- Industrial Waste:
    - Building rubble;
    - Scrap metal; and
    - Yard cleanings and sweepings.
- Hazardous Wastes – acids, alkalis, heavy metal sludge and solutions, asbestos wastes and other harmful substances as effluent or solids.
- Oily wastes – hydrocarbons, oils, grease, diesel, petrol, paraffin, hydraulic oils, etc.; and ○ Chemicals.

On-Site Management: Collected by registered waste management contractor for off-site disposal (waste manifests) at a licensed waste disposal site.

Carbonaceous waste is disposed of on the co-disposal dump.

5.7 OPERATIONAL MANAGEMENT

The operational management of the activities in terms of the water and waste management are detailed in the following sections. This included the organisational structure, competence training and awareness and the internal and external communication.

5.8 ORGANISATIONAL STRUCTURE

The organizational structure for the Applicant is presented in Section 2.7 above and Sections 5.9 to 5.12 below includes a discussion of resources and competencies, as well as the internal and external communication processes that are implemented.

5.9 RESOURCES AND COMPETENCE

The success of environmental management is dependent upon the commitment of the organization, at all levels, to environmental excellence. Commitment to this IWWMP will benefit both the organization's business success and the community in which it operates. This commitment requires that the organization provide the necessary resources for employee training, reference material and reporting procedures. Senior executives and line managers will be held responsible and accountable for the health and safety of personnel while on duty, as well as the environmental impacts caused by mining activities. The mine will conduct its operations responsibly and with due care and regard to the impact on the environment. It is the policy of the Applicant to strive to eliminate the adverse environmental effects of all its activities and take an active role in raising the environmental awareness and responsibility of all employees, suppliers, contractors and customers.

To achieve and surpass this objective, the company endeavours to:

- Conduct all its activities in an environmentally responsible manner;
- Conform to all relevant legislation as a minimum standard;
- Ensure that all its operations have appropriate policies, procedures and facilities so that such standards can be met;
- Promote environmental awareness by continuous training, motivation and leading by example;
- Implement effective environmental management and reporting systems at all operations, that encompasses auditing, monitoring and decisive intervention;
- Conduct regular review of conformance to requirements and achievement of objectives at Board level;
- Use raw materials and resources prudently;
- Promote the recycling of used and waste materials;
- Apply the principles of continuous improvement to environmental performance;
- Develop and maintain positive relationships with all affected and interested parties, governmental departments, environmental agencies and the public; and
- Participate in environmental governance.

The overall success of environmental management is dependent upon the commitment of the organisation, at all levels, to ensure environmental excellence. Commitment to structured and effective management plan will benefit both the organisation's success and the community in which it operates. This commitment requires that the organisation provide the necessary resources for employee training, reference material and reporting and response procedures. Senior executives and line managers shall be held responsible and accountable for health and safety of personnel while on duty as well as the environmental impacts caused by mining activities.

The competence of the work force is ensured through selection, training and awareness in health, safety and environmental matters. Continual evaluation measures must be implemented to ensure that performances with regard to social, health and well-being are improved and environmental management is effectively implemented throughout the lifespan of operations. Regular reviews of the company's performance are necessary during and after operations to ensure that procedures are appropriate and to ensure the desired environmental outcomes are being achieved.

The overall management responsibility for the Environmental Management Officer (EMO) rests with project management during construction and the General/Mine Manager during operation and closure. An executive committee is to take responsibility for the impacts associated with Mooiplaats Colliery. The SHE Manager on site is responsible for ensuring that the plan remains effective and relevant. Although the company will ultimately be responsible for environmental management, it will also be the responsibility of all engineering, procurement and construction (EPC) contractors to adhere to the plan. Specific requirements for environmental management relative to their areas of operation are to be detailed in their respective contracts. Mooiplaats Colliery is to have dedicated teams of highly specialised and dedicated environmental personnel. That are committed to the environmental policies and procedures. These teams and individuals will act and respond to operations to ensure environmental compliance. The performance and implementation of the MPRDA EMP to be audited by an independent external party every second year. Findings, mitigating actions required, as well as a responsible person and schedule is listed in audit reports.

The management requirements that is the responsibility of the SHE Manager are as follows:

- Community liaison to update communities on changes to project design, potential impacts as well as health and safety;
- Develop and implement environmental training and awareness plans, including protected and indigenous species awareness and control of declared category 1, 2 and 3 invader species;
- Ensure that environmental monitoring, recording and reporting is conducted (monitoring data should be available to the Department on request);
- Implementation of an Environmental Management System (EMS); Implementation of internal and external environmental audits;
- Managed document control; and
- Overview of the EMP and IWWMP implementation.

All contractors and personnel who are appointed are to be suitable qualified and trained. They must at all times be aware of the safety of themselves, the Mooiplaats Colliery as well as the environment. Education and training is to include emergency preparedness (ex. fire outbreaks, environmental disasters, etc.). It is furthermore advised

that the applicant design and implement the following as part of socio-economic upliftment in the Local and District Municipality:

- Education and Training (including adult basic education and training); Hard-to-fill vacancies;
- Leaderships;
- Portable skills programmes; Skills development plan; and Skills programmes.
- Socio-economic upliftment objectives should include:
- Aims to facilitate the improvement of numeracy and literacy amongst the operation's workforce;
- Commitment from all stakeholders to remove barriers and to build a visible, usable, credible and sustainable vehicle for effective and creative lifelong learning; and
- To generate consensus between partners (i.e. local government and communities surrounding the area of operation) regarding the criteria and systems within which the integrity and quality of the program is protected.

In compliance with ISO 14001, ISO 9001 and OHSAS 18001; mine management has adopted a safety, health, environment and quality awareness and training procedure that includes all employees at the mine. The procedure has a training and awareness component, which is followed up by a report and recording component, and then with a review and evaluation component. The relevant training organisation, in conjunction with the SHE Officer, is responsible for ensuring that Job Specific Training, as required as a result of identified significant environmental aspects, is compiled and provided for personnel or persons performing that function. Management of the mine is required to attend training on environmental management, which will include requirements of the SHE Management System, significant impacts, establishment of objectives and programs and maintenance of the SHE Management System.

Records of this training must be retained by the SHE Officer or the relevant training organisation. The SHE Officer is responsible for managing the implementation of specific action items in the EMPR and IWWMP.

All personnel and contractors tasked with specific aspects of the project or the implementation of the EMPR and IWWMP must have the requisite knowledge, skills and training to perform that specific work. Consequently, the training is designed to assist the SHE Officer, relevant personnel and contractors, to perform their functions in respect of the implementation and monitoring of the EIA / EMPR and SHE Management System, and may include the following:

- Communication of the environmental risks for each phase of the project; Content of the EIA / EMPR, including the action plans;
- Current knowledge of environmental regulatory requirements;
- Material impacts predicted through the assessment process; and
- Methods required in order to perform the action items in a competent and efficient manner

5.10 EDUCATION AND TRAINING

Training and environmental awareness is an integral part of environmental management of a mine. The mine must ensure that all relevant employees are trained and capable of carrying out their duties in an environmentally

responsible and compliant manner and are capable of complying with the relevant environmental requirements. Environmental Awareness at Mooiplaats Colliery is addressed and conducted by means of two (2) main components namely training and communication.

Environmental awareness training at the mine will be attended to during induction for new employees and in refresher courses for ex-leave employees by means of an audio-visual environmental awareness video. Apart from own employees, the operation also makes use of numerous contractors to undertake different components of their mining activities. Each contractor will be responsible for its own environmental awareness training for its employees.

The principles to be adhered to by the mine and the contractors are based on the following:

- Environmental awareness is addressed at top management level;
- Workers receive awareness training on all environmental and SHE procedures;
- Training aids includes the use of photographs, posters and live demonstrations;
- The workers whose jobs have the greatest potential for environmental impact are identified and receive specific training in impact prevention and remediation; and
- Records are kept of environmental awareness training and all new employees receive induction before they are allowed to work on site.

5.11 INTERNAL AND EXTERNAL COMMUNICATION

The Public Participation Process (PPP) is a requirement of several pieces of South African Legislation. The aim of public participation is to ensure that all relevant interested and affected parties (I&AP's) are meaningfully notified, consulted and their opinions considered during the course of the project. The methodology applied to the PPP, must be one of openness, transparency and collaboration between the EAP and I&AP's. All documentation pertaining to the IWWMP will be made available to the public for comment in accordance with the relevant regulations. All comments received will be included in the IWWMP to be submitted to the DWS for adjudication, as well as in the Public Participation Report that will be included in Appendix H.

5.11.1 INTERNAL COMMUNICATION

The following channels will be used to communicate pertinent environmental information to the appropriate levels.

- E-mails;
- Posters;
- Management briefs;
- Management meetings;
- SHE meetings;
- Site meetings; and
- Notice boards.

5.11.2 EXTERNAL COMMUNICATION

Social impacts already start in the planning phase of a project and as such it is imperative to start with stakeholder engagement as early in the process as possible. A stakeholder engagement plan will assist Mooiplaats Colliery to outline their approach towards communicating in the most efficient way possible with stakeholders throughout the life of the project. Such a plan cannot be considered a once off activity and should be updated on a yearly basis to ensure that it stays relevant and to capture new information. Stakeholders must provide input in the Stakeholder Engagement Plan.

The Mooiplaats Colliery Stakeholder Engagement Plan should have the following objectives:

- To identify and assess the processes and/or mechanisms that will improve the communication between local communities, the wider community and the mine;
- To improve relations between the mine's staff and the people living in the local communities (Arbor and commercial farmers);
- To provide a guideline for the dissemination of information crucial to the local communities in a timely, respectful and efficient manner; and
- To provide a format for the timely recollection of information from the local communities in such a way that the communities are included in the decision making process.

The Stakeholder Engagement Plan should be compiled in line with International Finance Corporation (IFC) Guidelines and should consist of the following components:

- Stakeholder Identification and Analysis: time should be invested in identifying and prioritizing stakeholders and assessing their interests and concerns;
- Information Disclosure: information must be communicated to stakeholders early in the decision-making process in ways that are meaningful and accessible, and this communication should be continued throughout the life of the project;
- Stakeholder Consultation: each consultation process should be planned out, consultation should be inclusive, the process should be documented and follow-up should be communicated.
- Negotiation and Partnerships: add value to mitigation or project benefits by forming strategic partnerships and for controversial and complex issues, enter into good faith negotiations that satisfy the interest of all parties;
- Grievance Management: accessible and responsive means for stakeholders to raise concerns and grievances about the project must be established throughout the life of the project;
- Stakeholder Involvement in Project Monitoring: directly affected stakeholders must be involved in monitoring project impacts, mitigation and benefits. External monitors must be involved where they can enhance transparency and credibility;
- Reporting to Stakeholders: report back to stakeholders on environmental, social and economic performance, both those consulted and those with more general interests in the project and parent company;

- Management Functions: sufficient capacity within the company must be built and maintained to manage processes of stakeholder engagement, track commitments and report on progress; and
- It is of critical importance that stakeholder engagement takes place in each phase of the project cycle and it must be noted that the approach will differ according to each phase. The stakeholder analysis done in Section 6 of this report must inform the stakeholder engagement strategy.

5.11.3 GRIEVANCE MECHANISM

In accordance with international good practice, Mooiplaats Colliery should establish a specific mechanism for dealing with grievances. A grievance is a complaint or concern raised by an individual or organisation that judges that they have been adversely affected by the project during any stage of its development. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts, or perceived impacts. The International Finance Corporation (IFC) standards require Grievance Mechanisms to provide a structured way of receiving and resolving grievances. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders. The mechanism must not impede access to other judicial or administrative remedies.

The grievance mechanism should be based on the following principles:

- Transparency and fairness;
- Accessibility and cultural appropriateness;
- Openness and communication regularity;
- Written records;
- Dialogue and site visits; and
- Timely resolution.

Based on the principles described above, the grievance mechanism process involves four stages:

- Receiving and recording the grievance;
- Acknowledgement and registration;
- Site inspection and investigation; and
- Response.

5.12 AWARENESS RAISING

All employees and contractors have to undergo environmental and awareness training, which broadens the base of people that acts as custodians of the environment. The mine supports the comprehensive set of policies, standards and guidelines that the company applies for the various facets of the business, amongst which are:

- Safety, health, environment and risk, quality and community;
- Equity in employment;

- Information Systems;
- Compliance with the law; and
- Relationships with Governments.

The Applicant has established and maintains procedures for the internal communication between the various levels and functions of the operation. Environmental incidents are reported by either employees or I&APs via two distinct routes:

- Incident reporting directly to the surface environmental officer: I&AP's or employees report directly to the surface environmental officer, who then reports to the technical services manager who finally reports to the general manager; and
- Incident reporting to the respective head of department: Any incident is reported by an I&AP or an employee to the employees' respective head of department, who in turns reports to the technical services manager. The technical services manager reports to the surface environmental officer and general manager respectively.

5.13 MONITORING AND CONTROL

Several environmental impacts will require on-going monitoring during various phases of the proposed project. The purpose of monitoring is not merely to collect data, but to provide information necessary to make informed decisions on managing and mitigating potential impacts. Monitoring, therefore, serves the following functions

- Serve as early warning system to detect any potential negative impacts;
- To provide information to feedback into management controls to avoid, prevent or minimise potential negative impacts;
- Provide quantitative data that can serve as evidence for the presence of negative impacts or the lack thereof; and
- Allows for trending, modelling and prediction of future conditions or potential impacts.

5.13.1 SURFACE WATER MONITORING

The design and implementation of the surface water monitoring network will be undertaken in accordance with the Best Practice Guidelines G3: Water Monitoring Systems (DWAF, 2006). The aim of the surface water monitoring network is to assist with overall water management including but not limited to the following:

- Pollution prevention;
- Assess the performance of pollution prevention; and
- Develop a more holistic understanding of current, baseline water quality on site and the changes that result from mining activities.

As discussed in Section 4.7, Mooiplaats Colliery has an existing monitoring programme which is included in Appendix N, as per the requirements of the existing WULA.

5.13.2 GROUNDWATER MONITORING

As Mooiplaats Colliery is an existing coal mine, a groundwater monitoring programme has already been implemented, as per the requirements of the guidelines documented in Best Practice Guideline G3 Water Monitoring Systems (2007) available from the DWS. A monitoring plan is necessary due to the following reasons:

- Accurate and reliable data forms a key component of many environmental management actions; and
- Water monitoring is a legal requirement.

The most common environmental management actions require data and thus the objectives of water monitoring include the following:

- Development of environmental and water management plans based on impact and incident monitoring (facilitate in decision-making, serve as early warning to indicate remedial measures or that actions are required in certain areas) for the mine and region;
- Generation of baseline/background data before project implementation;
- Identification of sources of pollution and extent of pollution (legal implications or liabilities associated with the risks of contamination moving off site);
- Monitoring of water usage by different users (control of cost and maximising of water reuse);
- Calibration and verification of various prediction and assessment models (planning for decommissioning and closure);
- Evaluation and auditing of the success of implemented management actions (ISO 14000, compliance monitoring);
- Assessment of compliance with set standards and legislation (EMPs, water use licenses); and
- Assessment of impact on receiving water environment.

Effective groundwater monitoring systems on a mine consist of the following components:

- Groundwater quality monitoring system;
- Groundwater flow monitoring system; and
- Data and information management system.

When designing the monitoring system, the following issues should also be taken into consideration:

- Potential or actual water use;
- Aquifer or catchment vulnerability;
- Toxicity of chemicals;
- Potential for seepage or releases;
- Quantities and frequency of release to the environment (point and non-point); and
- Management measures in place to minimise risk.

The groundwater monitoring points as well as the parameters that are currently measured in terms of water quality are indicated in Section 4.13.5.

5.13.3 BIOMONITORING

Biomonitoring is conducted at the Mooiplaats Colliery as per the requirements of the WUL during the summer and the winter. The biomonitoring is currently conducted at 4 sampling points namely:

- Mooi1: Upstream point of the Witpuntspruit.
- Mooi2 (WS): Downstream point of the Witpuntspruit.
- Mooi3: Upstream point of the Vaal River.
- Mooi4: Downstream point of the Vaal River.

The location of these biomonitoring and toxicological monitoring sites are illustrated in Figure 45.

Figure 45: Mooiplaats Colliery bio-monitoring points.

The recent SASS analysis conducted at the monitoring points (Mooi1, Mooi3 and Mooi4) illustrated an increase of biotic integrity since the last high flow survey conducted in 2016 to Largely Natural (Class B). Site Mooi2 biotic integrity remained unchanged classed as Largely Modified (Class D). A large reduction in biotic integrity occurs at the bio-monitoring site Mooi2 which is where the unnamed tributary associated with the Mooiplaats Colliery enters the Witpuntspruit, as habitat availability is not responsible for the decline attention should be placed on the water quality of this tributary. Possible causes for the reduction in water quality includes natural decant from the Mooiplaats Colliery and agricultural activities.

From the water quality data, it can be observed that the river system is still in an impacted state. The main influences can be attributed to agriculture, stream impediments and historical/current mining activities. The overall ecological category for the study area was in line with the categorisation as conducted by DWA in 2012, the water quality was not in line with the parameters stipulated in the WUL as well as the Grootdraai Dam Forum instream water quality guideline.

The aquatic resources near the study area have already been significantly disturbed by mining and agricultural activities in the area, as well as some impacts because of the existing ash dam and associated infrastructure of the Camden Power Station.

The annual wet and dry season monitoring programme should be maintained until a closure certificate has been issued. It is also of paramount importance to ensure that dirty water management infrastructure is well maintained throughout the life of the mine.

5.13.4 WASTE MONITORING

The Applicant will develop and implement a waste management plan, which complies with the principles of the NEMWA and provides a mechanism for the effective management of waste throughout the LoM. This plan has to ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste, etc. The objectives of a waste monitoring programme are to identify and sufficiently manage waste related impacts through:

- Avoiding and minimising waste;
- Reducing and recycling waste; and
- The prevention of pollution.

Solid waste must be monitored in accordance with the waste management conditions detailed below:

- The Applicant shall develop and maintain a hazardous substance register for all hazardous materials that shall be kept on site. Material Safety Data Sheets (MSDS) must be available on site at the point of use and readily accessible for all hazardous substances stored;
- All equipment must be inspected regularly (daily) to ensure that it is in good working condition, clean, and free from leaks of oil, petrol, diesel, hydraulic fluid and contaminating compounds;
- Daily inspections shall be carried out to ensure such spill prevention measures are in place and remain effective;
- The Applicant shall maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes.

5.13.5 STORMWATER MANAGEMENT STRUCTURES

Storm water structures (channels, silt traps, dirty water containment facilities and energy dissipaters) should be monitored every year in September, before the rainy season begins, for any blockages or breaches. They should further be monitored immediately after every storm event during the rainy season. Should blockages or breaches occur, immediate action should be undertaken to remove debris and / or repair breaches. Monitoring should be undertaken by the onsite Environmental Officer or maintenance manager. Inspections should be recorded and should include the following:

- Date of inspection;
- Rainfall amount received;
- Photographs of blockages and / or breaches witnessed;

- What action were taken to fix issues and amount of time taken to address issues; and
- Photographs post action taken.

The inspection reports should be presented to the DWS.

5.14 RISK ASSESSMENT / BEST PRACTICE ASSESSMENT

An risk assessment was undertaken for this IWWMP in line with the DWS Risk Assessment Matrix (GN 509 of 26 August 2016) for the watercourses and wetlands (Table 29) and the Hydrology and Geohydrology impacts are assessed according to the methodology presented below (Table 30). The following prediction and evaluation of impacts is based on the mining activities conducted at the project area.

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. The receptors and resources are also identified, which allows for an understanding of the impact pathway and assessment of the sensitivity to change.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The values for the likelihood and consequence (severity, spatial scope and duration) of the impact are then used to determine whether mitigation is necessary.

The following criteria have been used to describe magnitude and significance of impacts in a systematic manner:

- Extent or spatial scale of the impact;
- Intensity or severity of the impact;
- Duration of the impact;
- Mitigatory potential;
- Acceptability;
- Degree of certainty; and
- Impact Magnitude/Significance.

Describing the impacts in terms of the above criteria, provides a consistent and systematic basis for the comparison and application of scoring impacts. The rating for each criterion is provided in Table 28.

Table 28: Criterion for Risk assessment

Rating	Comment
Impact criteria: Intensity or severity of the impact	
High	Disturbance of pristine areas that have important conservation value.
	Destruction of rare or endangered species.

Rating	Comment
Medium	Disturbance of areas that have potential conservation value or are of use as a resource.
	Complete change in species occurrence or variety.
Low	Disturbance of degraded areas that little conservation value.
	Minor change in species occurrence or variety.
Impact criteria: Duration of the impact	
High (Long term) (more than 15 years)	Permanent
	Beyond decommissioning
	Long term (more than 15 years)
Medium (Medium term) (5 to 15 years)	Reversible over time
	Lifespan of the project
	Medium term (5-15 years)
Low (Short term) (0 to 5 years)	Quickly reversible
	Less than the project lifespan
	Short term (0-5 years)
Mitigatory potential	
High:	High potential to mitigate negative impacts to the level of insignificant effects
Medium:	Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent some negative effects.
Low:	Little or no mechanism to mitigate negative impacts.
Acceptability	

Rating	Comment
High (Unacceptable)	Abandon project in part or in its entirety
	Redesign project to remove impact or avoid impact
Medium (Manageable)	With regulatory controls
	With project proponent's commitments
Low (Acceptable)	No risk to public health
Degree of certainty	
Definite	More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible:	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact, or the likelihood of an impact occurring.
Categories for the rating of impact magnitude and significance	
High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or a combination of these. Social, cultural and economic activities or communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur.
Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be

Rating	Comment
	required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low	Impact is of a low order and therefore likely to have a little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.
No impact	Zero impact.

Table 29: Impact Assessment (DWS Risk Matrix) for wetlands and watercourses.

Activity	Aspect / Impact	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Without Mitigation	With Mitigation
Underground Mining	Blasting (dislodging of rock)	2	2	1	2	1.75	3	4	8.75	2	3	1	3	9	78.75	Moderate	Low
	Fractures in bedrock	2	1	2	2	1.75	3	4	8.75	3	2	1	3	9	78.75	Moderate	Low
	Disruption (draining of aquifers)	3	1	2	1	1.75	3	4	8.75	3	2	1	3	9	78.75	Moderate	Low
	Operation of machinery, vehicles and equipment	1	2	2	2	1.75	2	2	5.75	3	2	1	1	7	40.25	Low	Low
Underground Mining	Blasting (dislodging of rock)	3	2	3	3	2.75	3	2	7.75	2	3	1	3	9	69.75	Moderate	Low
	Fractures in bedrock	3	2	3	3	2.75	3	2	7.75	3	2	1	3	9	69.75	Moderate	Low
	Disruption (draining of aquifers)	4	2	3	3	3	3	2	8	3	2	1	3	9	72	Moderate	Low
	Operation of machinery, vehicles and equipment	1	2	2	2	1.75	2	2	5.75	3	2	1	1	7	40.25	Low	Low
Closure: Underground Mining	Pollution of water resources	1	4	2	2	2.25	3	5	10.25	3	2	1	1	7	71.75	Moderate	Low
	Management of water quality	1	2	2	2	1.75	2	5	8.75	3	2	1	3	9	78.75	Moderate	Low
	Operation of machinery, vehicles and equipment	1	2	2	2	1.75	2	5	8.75	3	2	1	1	7	61.25	Moderate	Low
Vent Shafts	Clearing of vegetation	1	1	1	2	1.25	1	1	3.25	1	4	1	2	8	26	Low	Low
	Stripping and stockpiling of topsoil	1	1	1	1	1	1	1	3	1	3	1	2	7	21	Low	Low
	Establish working area	1	1	1	1	1	1	1	3	1	2	1	2	6	18	Low	Low
	Digging of settling pond	1	1	1	1	1	1	1	3	1	1	1	1	4	12	Low	Low
	Construct shaft collar	1	1	1	1	1	1	1	3	1	3	1	2	7	21	Low	Low
	Drilling of pilot hole	1	1	1	2	1.25	1	1	3.25	2	3	1	1	7	22.75	Low	Low

Activity	Aspect / Impact	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Without Mitigation	With Mitigation
	Reaming	1	1	1	1	1	1	2	4	3	2	1	1	7	28	Low	Low
	Installation of goose neck	1	1	1	1	1	1	1	3	1	1	1	1	4	12	Low	Low
	Creation of berm for storm water	1	1	1	1	1	1	1	3	1	2	1	2	6	18	Low	Low
	Erection of fence (security / access control)	1	1	1	2	1.25	1	1	3.25	1	1	1	2	5	16.25	Low	Low
	Water use for drilling	1	1	1	1	1	1	1	3	2	2	1	2	7	21	Low	Low
	Removal of pilot cuttings	1	1	1	1	1	1	1	3	1	2	1	2	6	18	Low	Low
	Vehicle access	1	1	1	2	1.25	1	2	4.25	3	3	1	2	9	38.25	Low	Low
	Leaks and spillages from machinery, equipment & vehicles	1	1	1	1	1	1	2	4	3	3	1	3	10	40	Low	Low
	Solid waste disposal	1	1	1	2	1.25	1	2	4.25	2	2	1	2	7	29.75	Low	Low
	Human sanitation& ablutions	1	1	1	1	1	1	2	4	2	2	1	3	8	32	Low	Low
	Re-fuelling of machinery and vehicles	1	1	1	1	1	1	2	4	2	2	1	2	7	28	Low	Low
Vent Shafts	Shaft collar	1	1	1	1	1	1	4	6	1	1	1	2	5	30	Low	Low
	Fence	1	1	1	2	1.25	1	4	6.25	1	1	1	1	4	25	Low	Low
	Berm for storm water management	1	1	1	1	1	1	4	6	1	1	1	2	5	30	Low	Low
Closure: Vent Shafts	Removal of structures	1	1	1	2	1.25	1	2	4.25	2	3	1	2	8	34	Low	Low
	Backfill of shaft	1	1	1	1	1	1	2	4	1	1	1	2	5	20	Low	Low
	Capping with concrete slab	1	1	1	1	1	1	2	4	1	2	1	2	6	24	Low	Low

Table 30: Hydrology and geohydrology impact assessment.

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Mine dewatering can potentially have a negative impact on groundwater and surface water quantities. Lowering of regional groundwater levels due to a depletion in aquifer storage will cause the formation of a cone of depression i.e. groundwater zone of influence and consequently lowering of the regional phreatic/ piezometric levels.	Alternative 1	Operation	-9	-9	High	2	2	1.25	-11.25
Should the groundwater zone of influence i.e. capture zone reach local drainages, a reduction in groundwater contribution to baseflow of local rivers and streams will occur.	Alternative 1	Operation	-11	-11	Medium	1	2	1.13	-12.38
Poor quality leachate may emanate from underground mined out faces which will have a negative impact on water quality.	Alternative 1	Operation	-7.5	-7.5	High	2	2	1.25	-9.38
Poor quality leachate may emanate from various source areas and waste generated, e.g. coal stockpiles, discard dump, pollution control dam, slurry ponds, dirty roads, etc. which will have a negative impact on water quality.	Alternative 1	Operation	-15	-6	High	2	2	1.25	-7.50
Mobilisation and maintenance of mine heavy vehicle and machinery on-site may cause hydrocarbon contamination of surface water and groundwater resources. Impact on groundwater quality due to hydrocarbon contamination caused by mine heavy vehicles and machinery.	Alternative 1	Operation	-10.5	-6	High	2	2	1.25	-7.50
Poor storage and management of hazardous chemical substances on-site may cause surface water and groundwater pollution.	Alternative 1	Operation	-9	3.5	High	2	2	1.25	4.38
Surface and groundwater deterioration and siltation due to contaminated stormwater run-off.	Alternative 1	Operation	-9	-6.75	High	2	2	1.25	-8.44
Mine dewatering effects lessening, post-operational re-watering and flooding of underground mine void.	Alternative 1	Rehab and closure	9	9	High	2	2	1.25	11.25
Poor quality leachate may emanate from underground mined out faces which will have a negative impact on water quality.	Alternative 1	Rehab and closure	-6	-6	High	2	2	1.25	-7.50
Seepage of poor water quality caused by leachate of sulphide bearing minerals from mine waste facilities including discard dumps as well as defunct waste facilities.	Alternative 1	Rehab and closure	-15	-5	High	2	2	1.25	-6.25
Alteration to stormwater drainage and increase in recharge of aquifer due to poor and incorrect rehabilitation.	Alternative 1	Rehab and closure	-7.5	-4.5	High	2	2	1.25	-5.63
Increased runoff	Alternative 1	Construction	-9	-3	Medium	1	1	1.00	-3.00
Hydrocarbon contamination	Alternative 1	Construction	-7.5	-1.25	Medium	1	1	1.00	-1.25
Sedimentation	Alternative 1	Construction	-9	-3.5	Medium	1	1	1.00	-3.50
Increased runoff	Alternative 1	Operation	-12	-4.5	Medium	1	1	1.00	-4.50
Change in flow regime	Alternative 1	Operation	-11.25	-4	Medium	1	1	1.00	-4.00

Impact	Alternative	Phase	Pre-mitigation ER	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Surface water contamination	Alternative 1	Operation	-17	-4.5	Medium	1	1	1.00	-4.50
Increased runoff	Alternative 1	Decommissioning	-9	-3	Medium	1	1	1.00	-3.00
Hydrocarbon contamination	Alternative 1	Decommissioning	-7.5	-1.25	Medium	1	1	1.00	-1.25
Sedimentation	Alternative 1	Decommissioning	-9	-3.5	Medium	1	1	1.00	-3.50

5.15 ISSUES AND RESPONSES FROM PUBLIC CONSULTATION PROCESS

A PPP is being undertaken for the Applicant. I&AP's will be provided opportunities throughout the process to provide comment and thereby participate in the PPP. I&AP's will be afforded an opportunity to review and comment on the draft IWWMP. The draft IWWMP will be made available to all registered I&AP for a period of 60 days from the 13 March 2020 until 13 May 2020. The Public Participation Report describing the PPP for this WUL application will be attached as Appendix H to this IWWMP on completion of the public review and comment period.

5.16 MATTERS REQUIRING ATTENTION / PROBLEM STATEMENT

The following matters require attention:

- The proposed SWMP needs to be implemented;
- The groundwater model needs to be updated on a regular basis.
- Annual wet and dry season bio-monitoring must be undertaken.
- Monthly surface and groundwater monitoring must be undertaken.

5.17 ASSESSMENT OF LEVEL AND CONFIDENCE OF INFORMATION

The assessment undertaken by the specialist included the following assumptions and limitations:

5.17.1 WETLAND AND AQUATIC ASSESSMENT

- The use of two of the main wetland indicators namely hydromorphic soils and hydrophytic vegetation was somewhat limited in some of the seep areas that have been extensively transformed through commercial crop cultivation practices;
- Whilst every effort is made to ground truth and assess all wetland systems, it is not possible assess the entire extent of the project area. A combination of professional experience, desktop data and survey findings are used to reduce this limitation as much as possible, and extrapolation of data and satellite imagery is used for delineations in these areas;
- Wetlands within the 500 m regulated area were considered but not explicitly sampled and delineated in-field, wetland delineations within these areas should be considered desktop;
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side;
- A wetland buffer zone was not determined for the proposed underground mining areas, but a recommended buffer area has been determined for the proposed ventilation shafts;
- The information provided herein for the aquatic assessment was incorporated from the ongoing biomonitoring being undertaken for Mooiplaats Colliery. Information herein is incorporated from the 2018 aquatic biomonitoring programme. This report should be read on conjunction with the biomonitoring report; and

- Aquatic sampling points are located in the vicinity of the active mining area and are associated with the Vaal and Witpuntspruit systems.

5.17.2 HYDROLOGY AND STORM WATER SPECIALIST STUDY

The following assumptions were made during the calculation of the annual average water balance:

- It was assumed that plant water supply is equal to 48l/s. This was based on the water balance diagram received from the client;
- It was assumed that groundwater ingress to the North Shaft is equal to 50l/s. This was based on the water balance diagram from the client;
- Water usage data was obtained for three months only (August-October 2018). These values were extrapolated were possible for an annual average water balance;
- It was assumed that borehole abstraction would be equal to the maximum limit within the water use licence application; and
- It was assumed that 40% of the water loss would occur within the change house. This was based on the water balance calculations from the client.

5.17.3 GEOHYDROLOGY SPECIALIST STUDY

- The scale of the investigation was set at 1:50 000 resolutions in terms of topographic and spatial data, a lower resolution of 1:250 000 scale for geological data and a 1: 500 000 scale resolution for hydrogeological information;
- The Digital Elevation Model (DEM) data was interpolated with a USGS grid spacing of 25 m intervals;
- Rainfall data and other climatic information was sourced from the WR2012 database;
- Water management and catchment-based information was sourced from the GRDM and Aquiworx databases;
- The concept of representative elementary volumes (REV) have been applied i.e. a scale has been assumed so that heterogeneity within a system becomes negligible and thus can then be treated as a homogeneous system. The accuracy and scale of the assessment will result in deviations at point e.g. individual boreholes;
- No site characterisation boreholes were drilled as part of this investigation and aquifer parameters as well as hydrostratigraphic units were assumed based on historical investigation and similar studies conducted;
- The investigation relied on data collected as a snapshot of field surveys and existing monitoring data. Further trends should be verified by continued monitoring as set out in the monitoring program;
- Groundwater divides have been assumed to align with surface water divides and it is assumed that groundwater cannot flow across this type of boundaries;
- Model calibration was achieved by assigning a ratio of 1:1 for Hydraulic Conductivity (K) in x and y directions, with a ratio of 1:10 in the z direction i.e. anisotropic aquifer;

- Perennial rivers within the model domain have been treated as gaining type streams. As such groundwater is lost from the system via baseflow to local drainages;
- The numerical groundwater flow model was developed considering site specific information. It should be stated that influences from neighbouring mining developments were not taken into consideration as part of this investigation;
- Prior to development of the groundwater model, the system is in equilibrium and therefore in steady state i.e. quasi steady state; and
- Where data was absent or insufficient, values were assumed based on literature studies and referenced accordingly.

6 WATER AND WASTE MANAGEMENT

The following section describes water and waste aspects at the Applicants project area, as well as the related operational processes.

6.1 WATER AND WASTE MANAGEMENT PHILOSOPHY

The general principle of water management is the recognition that water is a scarce resource. This in turn leads to the other principles, such as water use minimisation (water conservation) or reuse of water and pollution prevention or the limitation of pollution of water.

Water that exceeds the quality, as set by DWS shall not be released from site, with the exception of emergency conditions, but it must be reused, thus reducing the quantity of intake of clean water. The Applicant will endeavour to:

- Continually seek ways to improve its performance in terms of consumption, and water related impacts;
- Reduce consumption of clean water;
- Implement pollution prevention at source;
- Maximise, recycling and reuse of dirty storm water and process water;
- Implementation of process water treatment to facilitate reuse; and
- Collect, contain dirty storm water and process water on site for preferential use as process water.
- The hierarchical management approach comprises the implementation of best practice measures to minimise water consumption and reduce impacts on water resources, by:
- Implementing measures to ensure compliance with relevant water and waste legislation and with other standards to which the organisation subscribes;
- Proactively identifying and implement actions that are required to achieve the water and waste related objectives;
- Implement these actions in an open and transparent manner;
- Implement on-going water and waste related monitoring to support legal compliance;

- Continually seeking ways to improve the performance of water and waste management systems, process and objectives; and
- Encourage open and transparent communication with regulatory authorities and other interested and affected parties within the context of the National Water Resource Strategy and Local Catchment Management Strategies.

6.2 STRATEGIES

6.2.1 SURFACE WATER

The general principle of water management is the recognition that is a scarce resource. This principal is guided by water use minimisation (water conservation) or re-use of water and pollution prevention or the limitation of pollution of water.

The goal of the Applicant is to minimise water consumption, impacts to the environment, running costs and to achieve environmental legal compliance, whilst maintaining adequate water supply as not to compromise the mining operations and supply of coal to industry. The following objectives are, therefore, set for the project:

- Water conservation by minimising water use. Water is reused wherever possible;
- Prevention of water pollution where possible;
- Minimise impacts on water resources and receiving water environment;
- Achieve and maintain legal compliance;
- Continuous mining operation to supply market need; and
- Production of quality coal for industry.

In order to achieve the above objectives, the Applicant is committed to uphold the following broad commitments:

- All water that can remain unpolluted will be kept separate and dirty water areas will be minimised;
- The use of water resources for processing and mining activities will constantly be evaluated to ensure that their use is optimised;
- No water will be discharged unless authorised by the DWS, especially water that exceeds the catchments water quality objectives, as set out by the National Authority, with the exception of emergency conditions if safety should demand so; and
- Dirty water catchments will be minimised and kept separate from clean catchments and all water contained here shall be re-used as far as possible, thus reducing the quality or raw water extracted;
- All the relevant principles contained in DWA's Best Practice Guidelines (BPG) will be utilised to guide mine design and management practices. The Applicant will also ensure compliance with GNR 704 of the NWA and is applying for the relevant exemption indicated in Section 3.3 above.

6.2.2 WETLANDS AND AQUATIC ECOLOGY

Management actions should consider that the main impacts of the development are likely to be to water quality, as well as water quantity (flows) within receiving watercourses. As such, the main objectives for management are:

- To take all reasonable measures to prevent any disturbance, damage or impact to aquatic ecosystems outside of mining footprint;
- Minimise and prevent disturbance to wetlands and watercourses;
- Prevent impacts to water quality;
- Prevent and minimise erosion and sedimentation;
- Prevent flow changes in receiving watercourses;
- Effective bio-monitoring programme be implemented as soon as possible to assess and mitigate negative impacts on aquatic ecosystems;
- Manage biodiversity; and
- On-going rehabilitation.

6.2.3 GROUNDWATER

In order to prevent repetition in retaining the GNR 267 heading requirements for IWWMP's, kindly refer to Section 5.5 and Section 5.15.

6.2.4 WASTE

The following waste management strategies will be implemented:

- The waste management plan will ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc;
- The Mine and Contractor(s) will comply with the environmental management principles referenced in the NEMA. In respect of waste management, the 'cradle-to-grave' principle in particular must be adhered to so as to ensure accountability for correct waste handling, storage and disposal;
- The waste management system will provide for adequate waste storage (in the form of waste skips and bins with lids), waste separation for recycling, and frequent removal of non-recyclable waste for permanent disposal at an appropriately licensed waste disposal facility. No waste material is to be disposed of on site. Under no circumstances may there be any burial of waste underground or on the site;
- Waste will be separated into reusable, recyclable and non-recyclable waste, and shall be further separated as follows:
    - Hazardous waste, consisting of substances that may be harmful to the receiving environment, and, therefore, require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel.

- General waste, consisting of non-hazardous substances and substances that cannot be recycled. Examples include (but are not limited to) construction rubble, excess construction materials that cannot be reused.
- Recyclable waste, (where volumes are sufficient to make recycling feasible) will preferably be deposited in separate bins. Recyclable material includes paper, tins and glass.

- The mine will implement a waste removal regime that ensures waste containers do not exceed their capacity before being removed from site for disposal;
- Environmental awareness training given to workers on site will include appropriate waste management practices to be implemented on site;
- Particular caution is to be exercised with regards to handling of hazardous waste, to ensure that it does not spill or leak from the waste collection containers. Refuse must also be protected from rain, which may cause pollutants to leach out;
- Littering will be strictly prohibited. The site shall remain in a neat and tidy condition at all times. If required, the Applicant shall make use of regular litter patrols to remove litter and ensure the site remains clean, neat and tidy; and
- The mine will maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes.

6.3 PERFORMANCE OBJECTIVES AND GOALS

The Applicant has an Occupational Health, Safety and Environmental Policy in place, which outlines the mine's commitment towards environmental management and which provides the framework for all environmental activities on the mine. The policy is aimed at achieving excellence and ensuring continual improvement in the mine's endeavour to create a sustainable environment. There is a continual process of reviewing to assess the impacts of the mine's activities on the environment. The performance objectives are summarised in Table 31 below.

Table 31: Performance objective for the Applicant

Item:	Performance objective:
Process Water:	Required water quality standard
	Re-use and recycling of process water
	Accurate water balance (hour meter flows)
Ground Water:	Prevent deterioration of ground water quality
	Prevent aquifer contamination
Storm / Surface Water:	Clean and dirty water separation

Item:	Performance objective:
	Diversion of clean storm water runoff around the mine area
	Collection and containment of contaminated water
Waste:	Ensure legal proper disposal of waste at registered sites
	Minimize waste generation
	Re-use of recycle if possible
	Ensure proper storage before disposal to prevent pollution of environment

6.4 MEASURES TO ACHIEVE AND SUSTAIN PERFORMANCE OBJECTIVES

The IWWMP action plan identifies measures to achieve the water and waste related objectives. Refer to Section 6.6 below.

6.5 OPTION ANALYSES AND MOTIVATION FOR IMPLEMENTATION OF PREFERRED OPTIONS

Option analysis was not conducted as part of this report. The mine has an existing EMPR for which alternatives have been considered. Closure phase water management options were identified and assessed by the Hydrogeologist and the modelled scenarios are presented in Section 4.5.4.

6.6 IWWMP ACTION PLAN

This part of the IWWMP details the actions that will be taken to ensure that the objectives and measures set out in Section 5 and Section 6 above, as well as the commitments made throughout the rest of this document, are achieved. The main purpose of this section of the IWWMP is to identify the direct actions to be taken by the mine, as well as to allocate responsibility for the implementation of these actions and set a target in terms of the timeline(s) within which the actions will be achieved. The action plan included in Table 32 focuses on the measures that will be implemented during the construction, operational and decommissioning phases of the mine.

Table 32: IWWMP Action Plan

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
STAFF AND MANAGEMENT AWARENESS					
Staff awareness program and training	Risk mitigation	The Applicant must inform its employees of risk associated with their operations and make sure that all employees are trained prior to undertaking any activity associated with their operations. Ensure that the Contractor and key personnel are aware of the relevant provisions of the EMPR, sensitive environmental features and agreements made with individual landowners and/or land users.	Permanent/ Continuous	Reducing in incidents and identified risks	Management EMPR

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
ii.) Appoint Contractors Environmental Officer (CEO)	Oversee and enforce EMPR.	The Applicant's management to assign a team that will monitor EMPR implementation and compliance by the employees. Enforcement should be applied to those employees that are not complying.	Permanent/ continuous	• Management satisfied with CEO performance based on EMPR implementation	Management • EMPR • Compliance checklists • Audit reports
SITE OPERATION					
Water for human consumption	Water and soil pollution, health	Water for human consumption shall be available at the site offices and at other convenient locations on site. All drinking water must be from a legal source and comply with recognised standards for potable use. The Applicant shall comply with the	Weekly monitoring of waste and effluent removal/ disposal	• Adequate quantities of potable water, • Proper effluent disposal	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		provisions of the NWA and its Regulations pertaining to the abstraction of water from rivers and streams and the use thereof. All effluent from the office shall be collected and disposed of properly, (e.g. chemical toilets should be emptied). If this is not feasible (due to the construction duration or other difficulties), all effluent water from the camp / office sites shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans dams etc). Only domestic type wastewater shall be allowed to enter this drain.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		The effluent system should comply with provisions of the NWA.			
Sewage	Soil and water pollution; Waste disposal	Ensure that the sewage plant is working.	Weekly monitoring of sewage facilities, maintenance and disposal	• Adequate and operation sewage treatment/disposal	Management • EMPR • Compliance checklists
Waste Management	Soil and water pollution; Waste disposal	Where practically possible, general waste on-site must be reused or recycled. Bins and containers must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Weekly monitoring of waste clean-up	No waste or litter accumulation on site	Management EMPR Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Solid Waste	Soil and water pollution; Waste disposal	A refuse control system shall be established for the collection and removal of refuse. Bins and containers must be available on-site for collection, separation, and storage of waste (such as wood, metals, general refuse etc.). Solid waste shall be stored within a designated area that is covered, utilising plastic wheelie bins for collection and disposal. Disposal of solid waste shall be at a DWS licensed landfill site or at a site approved by DWS in the event that an existing operating landfill site is not within reasonable distance from the site. No waste shall be burned or buried at or near the site	Weekly monitoring	No waste or litter accumulation on site Proof of disposal certificates. No burning of waste.	Management EMPR Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		offices, or anywhere else on the site.			
Wastewater	Soil and water pollution;	The Applicant shall comply with the provisions of the NWA and its Regulations pertaining to the storage and reuse of wastewater collected on site. Wastewater collection ponds should be lined and in compliance with the NEMWA and other legal requirements.	Monthly monitoring	• No ground and water contamination	Management • EMPR • Compliance checklists
Litter	Soil and water pollution; Waste disposal	No littering by construction workers shall be allowed. During the construction and operation period, the facilities shall be maintained in a neat and tidy condition	Bi weekly monitoring	• No waste or litter accumulation on site • Proof of disposal certificates. • Availability and maintenance of litter / refuse collection facilities.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		and the site shall be kept free of litter. Measures shall be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work the contractor shall provide litter collection facilities for later safe disposal at approved sites.		• No burning of waste.	
Hazardous waste	Soil and water pollution Waste disposal	Hazardous waste such oils etc. shall be disposed of in a DWS approved landfill site. Any spillage shall be attended to immediately and affected areas shall be promptly reinstated to the satisfaction of the engineer.	Weekly monitoring	• No spillages or direct disposal. • No waste or litter accumulation on site • Proof of disposal certificates. • Proof of reinstatement following any spillages.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
				• No burning of waste.	
Control at the workshop	Soil and water pollution; Waste disposal	Management and maintenance of plant and machinery will be strictly monitored according to the subsections below, regardless whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop). All maintenance, including washing and refuelling of plant on site shall take place at designated locations at the workshop area. All machinery servicing areas shall be bunded.	Monthly monitoring	Random visual inspection during site visits.	Management EMPR Compliance checklists
Hazardous Material Storage	Soil and water pollution	Petrochemicals, oils and identified hazardous substances shall only be	Weekly monitoring	• No hazardous waste accumulation on site	Management • EMPR

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
	Waste disposal	stored under controlled conditions. All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry. The Applicant should ensure that they keep proof that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Before containment or storage facilities can be erected the Applicant should ensure that preventative measures are put in place to mitigate against pollution of		• Proof of disposal certificates. • No burning of waste. • Suitable and adequate hazardous substance storage areas. • Proof of submission and approval from the Employers Environmental Manager/Environmental Officer.	• Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		the surrounding environment from leaks or spillage. The preferred method shall be a concrete floor that is bunded. Any deviation from the method will require proof from the relevant authority that the alternative method proposed is acceptable to that authority. The proposals shall also indicate the emergency procedures in the event of misuse or spillage that will negatively affect an individual or the environment.			
Fuel and Gas Storage	Soil and water pollution; Waste disposal	Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. An adequate bund wall, at least 110% of the volume stored,	Weekly monitoring	Inspect bunded area for leaks / drainage Proof of disposal certificates. No burning of waste.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		shall be provided for fuel and diesel areas to accommodate any leakage spillage or overflow of these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. Any leakage, spillage or overflow of fuel shall be attended to immediately. Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area. Storage of hazardous substances must comply with construction regulations under the OHSA.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Oil and Lubricant Waste	Soil and water pollution; Waste disposal	Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier. Oils collected in this manner, shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company.	Weekly monitoring	• Inspect bunded area for leaks / drainage • Proof of disposal certificates. • No burning of waste.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		All used filter materials shall be stored in a secure bin for disposal off site. Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials.			
Soil and Stockpile Management	Soil erosion	Topsoil shall be removed from all areas where physical disturbance of the surface will occur and shall be stored and adequately protected. The Applicant will provide for the stripping and stockpiling of topsoil from the site for later re-use. Topsoil is considered to be the natural soil	Monthly monitoring	• Visual inspection of stockpiles	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		covering, including all the vegetation and organic matter. Depth may vary at each site. The areas to be cleared of topsoil shall include the storage areas. All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled or windrowed topsoil shall be removed by hand. Soils contaminated by hazardous substances shall be disposed of at an approved DWS waste disposal site. The topsoil stockpiles shall be stored, shaped and sited in such a way that they do not interfere with the flow of water to cause damming or			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		erosion, or itself be eroded by the action of water. Stockpiles of topsoil shall not exceed a height of 2m, and if they are to be left for longer than 6 months, shall be analysed, and if necessary, fertility improved before replacement. Stockpiles shall be protected against infestation by weeds. The Applicant shall ensure that no topsoil is lost due to erosion – either by wind or water. Areas to be top-soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Drainage / Storm water Management	Soil erosion /storm water management	The quality, quantity and flow direction of any surface water runoff shall be established with the aid of a qualified engineer prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities. Before a site is developed or expanded, it shall be established how this development or expansion will affect the drainage pattern. No water source shall be polluted in any way due to proposed development.	Weekly monitoring	• Visual inspection, no excessive soil erosion or sedimentation.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		No wastewater may run freely into any of the surrounding environment or neighbouring properties. The contractor shall implement the storm water design in accordance with the approved Storm Water Management Plan. The Applicant and Contractor(s) shall ensure compliance with the requirements of the NWA and GN 704. All areas susceptible to erosion shall be protected by ensuring that there is no undue soil erosion resultant from construction and/or mining activities. Berms shall be constructed where necessary to direct all runoff into the storm water system.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		Care must be taken to avoid scouring and erosion and suitable measures should be placed in areas where runoff concentrates, in order to detain the sediment load and slow down the runoff. All erosion damage shall be repaired as soon as possible as directed by the Environmental Representative. Consideration shall be given to the placement of silt traps or barriers where the soils are of a dispersive nature or where toxic fluids are used in the construction process. The silt traps must be large enough to contain runoff so			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		that they function properly under heavy rain conditions.			
Stockpiles	Soil erosion Visual impact Noise	No construction and operation related activities including stockpiling, temporary storage areas, temporary and permanent access routes, and temporary working areas are to take place within the area beyond the demarcated site boundary. The Applicant shall plan their activities so that materials in so far as possible, can be transported directly to, and placed at, the point where they will be used. The areas for the stockpiling of excavated and imported	Weekly monitoring	• Visual inspection, no excessive dust	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		material shall be indicated and demarcated on the site plan, together with the contractor's proposed measures for prevention, containment and rehabilitation against environmental damage. The areas chosen shall have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor shall at all times ensure that they are: • Positioned and sloped to create the least visual impact;			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		• Structurally sound and present no safety risk; • Constructed and maintained so as to avoid erosion of the material and contamination of surrounding environment; and Kept free from all alien/undesirable vegetation. After construction, any areas no longer required for operation shall be re-instated to its original condition. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed and maintained until closure from the Environmental Advisor and the relevant National Authority is received.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		In all cases, Environmental Advisor shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their clause only when they have been satisfactorily rehabilitated.			
Spillages	Soil & water pollution	Watercourses such as streams, rivers, dams, etc. shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, and organic materials. In the event of a spillage, the Applicant should arrange for professional service	Weekly monitoring	• Visual inspection	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		providers to clear the affected area. All spills must be dealt with as per the Emergency Response Procedure. Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed.			
Areas of Specific Importance	• Loss of populations of threatened plant species • Loss of habitat of threatened animal species	Any area, as determined and identified as sensitive or of special interest within the site (e.g. wetlands) shall be treated according to the express instructions contained	Weekly monitoring	• No vegetation has been unnecessary removed, (photo graphic evidence)	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
	• Loss of indigenous natural vegetation (primarily grassland) • Erosion and siltation due to change in runoff and drainage patterns • Establishment and spread of declared weeds and alien invader plants. • Noise impacts on local residents	in these specifications or the approved EMPR. The overriding principle is that such defined areas requiring protection shall not be changed. • No unnecessary vegetation clearing will be allowed in natural vegetation areas.			
Dust Control	Nuisance pollution	Dust caused by strong winds and operational activities shall be controlled by means of water spray vehicles. Exposed soils and material stockpiles shall be protected against wind erosion. The	Monthly monitoring	Routine observation, no complaints from residents	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors A dust monitoring system needs to be put in place to ensure that dust falls within the acceptable limits as per the ambient air quality standards			
Alien Vegetation	Habitat destruction	The Applicant shall establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Monthly monitoring	Visual inspection, vegetation removal record by contractor, no unnecessary vegetation clearing	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		The Applicant shall be held responsible for the removal of alien vegetation within the boundary of the site disturbed during construction. This includes, for example, service roads, stockpile areas, and wherever material generated for or from construction has been stored temporarily.			
DECOMMISSIONING PHASE					
Decommissioning	Decommissioning and rehabilitation	Any additional licensing or permitting requirements must be identified prior to any decommissioning activities commence. Prior to the decommissioning a detailed decommissioning plan must	Weekly	Routine check for EMPR availability and awareness.	Management EMPR Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		be prepared. This plan should aim to follow the waste management hierarchy (reuse, recycle, reduce and dispose) in order to prevent unnecessary wastes. All waste which require disposal must be disposed of at a suitably licenced facility. An inventory of infrastructure and wastes together with the ultimate destination (e.g. recycler, waste disposal) should be kept for future records. A rehabilitation plan must be prepared by a suitably qualified specialist. The sites must be rehabilitated to the pre-construction condition or alternatively to align with the surrounding land-uses at the time. The rehabilitated site			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		must be protected from future erosion.			
Decommissioning	Decommissioning and rehabilitation	The area where the site offices are placed will require rehabilitation at the end of the contract. All construction material, including concrete slabs shall be removed from the site on completion of the contract, to the Applicants satisfaction.	Weekly	Routine check for EMPR availability and awareness.	Management • EMPR • Compliance checklists
Decommissioning	Decommissioning and rehabilitation	Any disturbed areas should be rehabilitated with natural vegetation endemic to the area as soon as possible after decommissioning.	Weekly	Routine check for EMPR availability and awareness.	Management • EMPR • Compliance checklists

6.7 CONTROL AND MONITORING

In order to determine the impact of the facility on the surface and groundwater regimes, monitoring systems have been implemented, by which data can be continually gathered and analysed, with corrective action being taken as required. Refer to Section 5.13.

6.8 MONITORING OF CHANGE IN BASELINE INFORMATION

The results of the monitoring plan will be submitted to the relevant DWS directorates, as well as other government departments as required in terms of management objectives, action plan and applicable legislation and other legislative requirements.

6.8.1.1 SURFACE WATER MONITORING

As detailed in Section 4.7 above surface water monitoring is currently undertaken at Mooiplaats Colliery. The Applicant will need to amend the surface water monitoring to ensure that it is in line with any conditions specified in the amended WUL.

6.8.1.2 BIOMONITORING

The Biodiversity Company undertook biomonitoring on behalf of Mooiplaats Colliery in 2018. The biomonitoring points are indicated in Figure 46.

The biomonitoring indicated that the Witpuntspruit is largely modified and that the Vaal River reach considered as part of the study is moderately modified. The Ecostatus determination indicated that the Witpuntspruit was in a moderately modified state. This was attributed to serious water quality and flow modifications to the reach. Furthermore, the presence of a largely intact macroinvertebrate and fish communities indicated stable, but modified conditions.

The study found that the Vaal River reach assessed was in a moderately modified state. This was attributed to habitat modifications within the reach, as aquatic biota was found to be largely natural to moderately modified. Several key macroinvertebrate taxa were absent from the system, indicating moderate to long term impacts.

Spatial and temporal trends of the study indicated that a deterioration of water quality was observed between the up and downstream sites on the Witpuntspruit, indicating an influx of pollutants from the Mooiplaats Colliery as observed by elevated solids at the site MPD. It is recommended that sediment analysis and detailed water chemistry analysis be conducted within the aquatic systems associated with the Mooiplaats Colliery to identify additional pollutants entering the tributary at site MPD, and within the Witpuntspruit. The source of these pollutants should immediately be identified, as an increase in pollutants was also noted in previous studies. Once the pollutions source is identified, the source should be halted. The biomonitoring should be continued and additional monitoring points should be included.

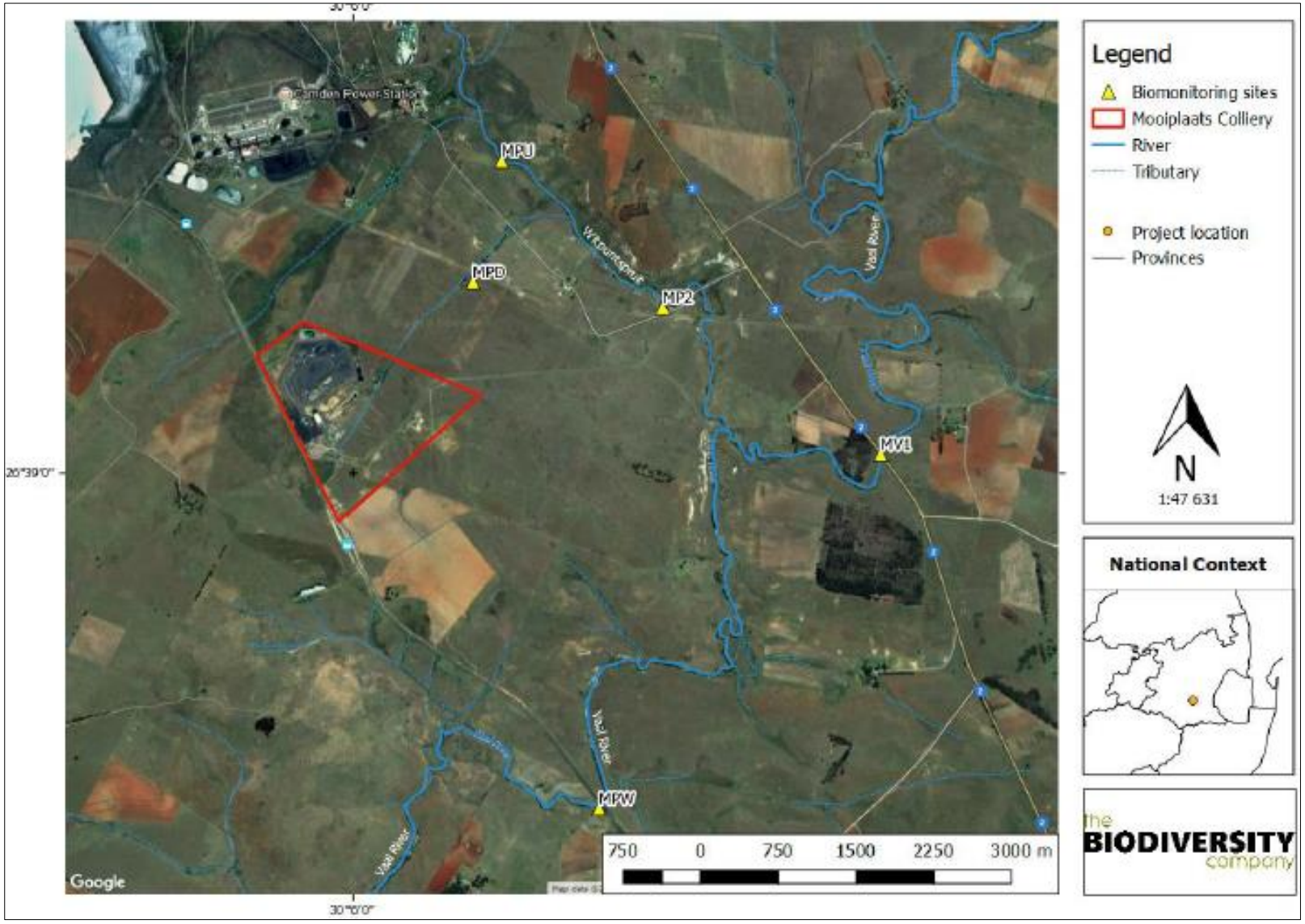


Figure 46: Biomonitoring points for the Mooiplaats Colliery

6.8.1.3 GROUNDWATER MONITORING

As detailed in Section 4.13.5, groundwater monitoring is currently undertaken at Mooiplaats Colliery. The groundwater monitoring plan should be amended as proposed by the Geohydrologist (refer to Section 5.15 and Appendix D).

6.9 AUDIT AND REPORT ON PERFORMANCE MEASURES

The WUL and other applicable authorisations require that regular formal audits be undertaken in order to assess the compliance with, amongst others, the WUL and IWWMP. As such, the applicant will cater for this requirement through regular internal and external audits in line with the frequency required by the WUL (usually on an at least an annual basis) and the other applicable authorisations.

6.10 AUDIT AND REPORT ON RELEVANCE OF IWWMP ACTION PLAN

The existing WULAs requires that the efficacy of the measures proposed as part of the action plan be reviewed and updated where required. As such, the IWWMP action plan will be reviewed and updated in line with the frequency required by the WUL and the other applicable authorisations. A copy of the last WUL audit report is attached in Appendix L.

7 CONCLUSION

This section provides the concluding statements relating to the regulatory status of the activity, the motivation of the activity in terms of Section 27 of the NWA and the proposed WUL amendments.

7.1 REGULATORY STATUS OF ACTIVITY

The Operation has an approved Mining Right (MP 30/5/1/2/68MR), as well as existing WUL (Ref #; 08/C11B/AGJ/2141). Mooiplaats Colliery is proposing to extend its mining operation and is also planning to include the Mooiplaats Colliery Vunene Project area. These activities trigger additional water uses that need to be licenced in terms of the NWA. Amendment also need to be made to the existing WUL.

7.2 STATEMENT OF WATER USES REQUIRING AUTHORISATION, DISPENSING WITH LICENCING REQUIREMENT AND POSSIBLE EXEMPTION FROM REGULATION

The NWA includes considerations set out in Section 27(1) that must be applied in the assessment of licence applications for water use. The objective of this section is to provide the necessary information required in terms of Section 27(1) to allow the DWS to evaluate this application.

7.2.1 SECTION 27(1)(A)

Existing Lawful Water Uses

The current WUL (Licence No.) authorises various water uses in terms of Section 21 (a), (b), (e), (f) (g) and (j) of the NWA (refer to Section 3.1 and Appendix A). The applicant may require that some conditions be amended.

7.2.2 SECTION 27(1)(B)

The Need to Redress the Results of Past Racial and Gender Discrimination

One objective of the NWA is to address past racial and gender discrimination and to alleviate poverty in South Africa; therefore, it is of utmost importance to support and stimulate economic development in order to realise the upliftment of previously disadvantaged groups and/or individuals.

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7.2.3 SECTION 27(1)(C)

Efficient and Beneficial Use of Water in the Public Interest

The IWWMP of the mine has been developed in accordance with the DWS's hierarchy of water use. Recommendations stemming from this IWWMP document have been incorporated in setting the relevant objective, targets and management plans steering towards a goal of efficient and beneficial use of water in the public interest. Refer to Section 6.1 for a description on the objective and management plans steering towards a goal of efficient and beneficial use of water in the public interest.

7.2.4 SECTION 27(1)(D)

Socio Economic Impact

The mine provides the following socio-economic benefits:

- Employment;
- Training; and
- Local economic development.

7.2.5 SECTION 27(1)(E)

Any Catchment Management Strategy Applicable to the Relevant Water Resources

The catchment management agency for the Vaal River System was established on 29 January 2016, through the promulgation of GNR 81 in terms of the NWA and is called the Vaal River Catchment Management Agency. This notice specified the following amongst others:

- The Vaal Water Management Area (WMA) is the result of the consolidation of the Upper, Middle and Lower Vaal catchments. The Vaal Water Management Area occupies the Central North Eastern area of South Africa. It extends to Ermelo in Mpumalanga, just west of Swaziland in the east across to Kuruman in the Northern Cape to the West. To the northwest, the WMA borders Botswana and the Crocodile (West) and Olifants Catchments. Johannesburg sits on the boundary of the CMA. To the south east it is bounded by Lesotho;
- The major water uses in the water management area include industrial, mining sectors, power generation, commercial agriculture (including stock watering, small and large irrigation schemes, dry land farming and forestry), nature conservation, as well as urban and rural human settlements;
- The business case of the Vaal River Catchment Management Agency has been approved;

- All initial, inherent and delegated functions will be performed in the Vaal River CMA; and
- A Water Resource Management charge will be billed by the Vaal River CMA in accordance with Section 57(2) of the NWA.

The following impacts have been considered for this IWWMP:

- The direct impact of physical structures (environmental constraints to construction e.g. of weirs or dams);
- The implications of allocating and licensing water for use. Forestry and irrigation are examples of users where development based on water can mean the transformation of extensive areas of otherwise 'natural' environments;
- The allocation of water for equity. will include approaches towards the application of Schedule 1 Use, General Authorisations, the revitalisation of irrigation schemes, etc.;
- Failure to support equity, or appropriate development – noting the consequential impacts of poverty;
- Sanitation systems and the impacts on groundwater quality;
- The implementation of the Reserve; and
- The ability to monitor and manage compliance, thus protecting the resource and with it the environment.

All decisions regarding water are critical to the environment. Decisions must be made on a balance of social, economic and ecological costs and benefits, considering both the immediate and the long-term, and always with an eye out for the unintended consequence. It is the intention of the Internal Strategic Perspective (ISP) (DWS, 2004) to provide the basis for integrated decision-making. The principles of environmental management underpin every strategy developed in this document.

There are a number of strategic areas with a particularly strong biophysical/ ecological emphasis. These include:

- The Reserve (groundwater, rivers, wetlands and estuaries);
- Water quality - surface and groundwater;
- The approach towards the clearing of Invasive Alien Plants;
- The management of wetlands;
- Land degradation. Erosion and sedimentation (land care); and
- Land use and especially how this is impacted by land reform and the re-allocation of water.
- The roles of co-operative governance and the need for awareness raising and capacity building are key strategic elements of many strategies. In reality all strategies and all aspects of management have a strong interaction with the biophysical environment. This ISP captures these concerns in discussion and through a strategic approach emphasises the will of the DWS to manage the environment to the best benefit of the country and its people (DWS, 2004).

7.2.6 SECTION 27(1)(F)

The Likely Effect of the Water Uses to be Authorised on the Water Resources and on the Water Users

The economy of the Upper Vaal Management area consists of widespread urbanisation, mining and industrial activity, which relate to gold and coal deposits in the area occur in the northern part of the water management area. Collectively, mining and industrial development in the Upper Vaal River water management area produce a total of 45 % of South Africa's Gross Domestic Product (GDP). Economic activity in the rest of the Upper Vaal water management area mostly relates to livestock farming and rain fed cultivation (Hall and Jennings, 2007; NWRS, 2004). Due to ongoing economic growth and continued urbanisation, further growth in water demand is expected in the area. It is therefore paramount that water allocation decisions are made, taking cognisance of only marginal potential for further resource development. The main water use in the Upper Vaal is, therefore, shared by the industrial, urban and mining sectors, which account for 80% of water usage. Irrigation accounts for 9% of water usage and power generation accounts for 7%. The remainder is used for supply to rural areas. These percentages do not include water transfer in and out of the management areas. Aside from these usages, water is also transferred in and out of the Management areas. The Upper Vaal area transfers water out to the Crocodile, Marico and Olifants Management areas and transfers water in from the Thukela, Usutu & Mhlatuze Management areas as well as from Lesotho as per the agreement between South Africa and Lesotho via the Lesotho Highlands Water Project. The Upper Vaal area has an impact on Botswana, Lesotho, Namibia, Zimbabwe, Mozambique and Swaziland (DWA, 2014).

7.2.7 SECTION 27(1)(G)

The Class and Resource Quality Objectives of the Water Resources

A summary of the water resource classes for Integrated Units of Analysis (**Figure 47**) and Mooiplaats falls within the UA2 resource unit. The PES for the resource unit is a Class C and the recommended Ecological category is also a Class C. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization; or Class II indicating moderate protection and moderate utilization; and Class III indicating sustainable minimal protection and high utilization.

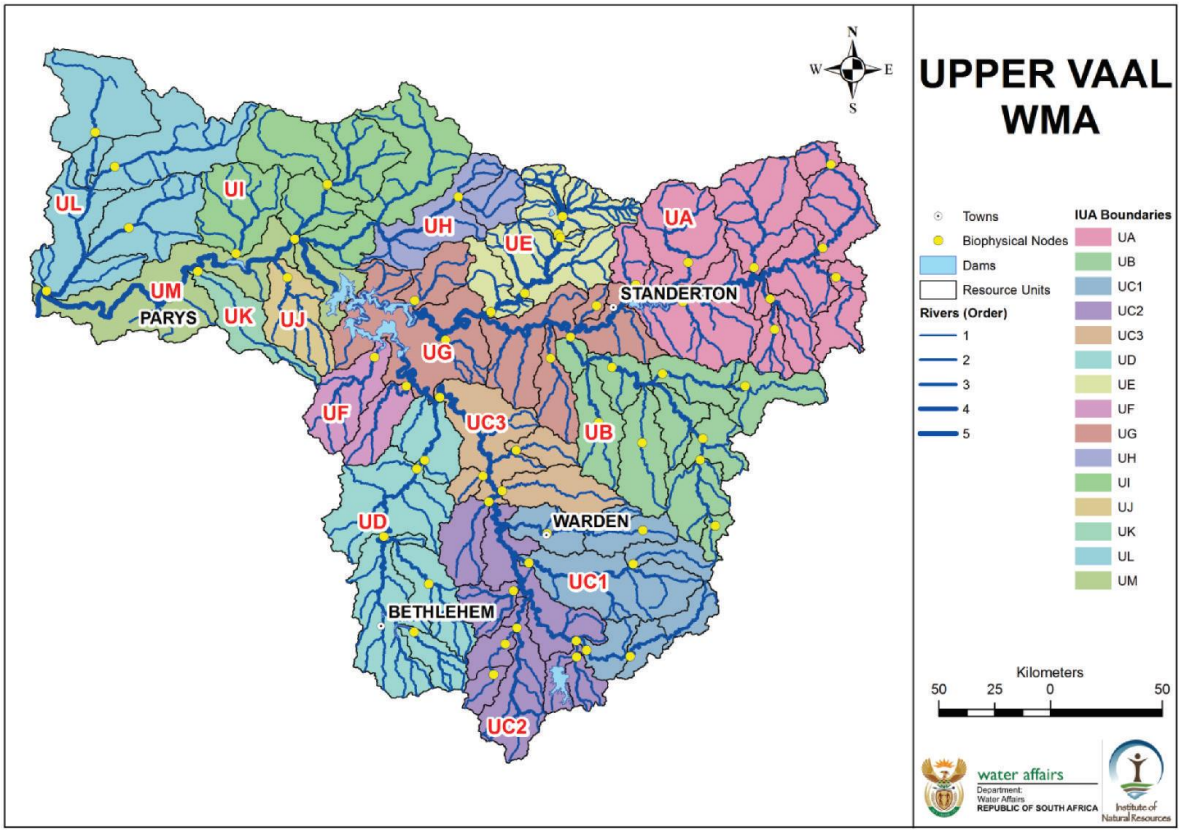

Figure 47: Classification of significant water resources (river, wetlands, groundwater and lakes) in the upper, Vaal water management areas (WMA)

7.2.8 SECTION 27(1)(H)

Investments Already Made and to be Made by the Water User in Respect of the Water Use in Question

The Applicant has made several investments in respect of applying for the existing WUL, including:

- Undertaken an EA process;
- Conducted a GN 704 Audit to identify any shortcomings in respect to compliance with the said Regulations;
- Developed an Integrated Water and Waste Management Plan detailing specific alterations required;
- Updated the Water balance as a management tool for all water use activities taking place at; and
- Implemented water use optimisation strategies, which include improved monitoring and control.

In terms of this IWWMP, the Applicant has made investments in terms of the following:

- Updating of the IWWMP;
- Undertaken a wetland delineation study;
- Updated the hydrogeological model; and

- Updated the hydrological study.

7.2.9 SECTION 27(1)(I)

The Strategic Importance of the Water Use to be Authorized

As demonstrated from the mining activities, the mine would not be able to proceed without the existing WUL. The mine provides important socio-economic advantages to the community and to South Africa. Authorising the additional water uses will ensure the LoM continues for an additional 16 years (2019 to 2034).

7.2.10 SECTION 27(1)(J)

The Quality of Water in the Water Resource. Which may be required for the Reserve and for Meeting International Obligations

The following reservations apply with respect to the transfer of water into and out of the water management area, and the provision of water for future growth:

- The existing transfer of 491 million m^3/a from Lesotho, which is to be increased to 835 million m^3/a after the commissioning of Mohale Dam in Lesotho. – reserved by international agreement for use in and transfer from the Upper Vaal water management area;
- Existing transfers from the Thukela water management area up to the installed capacity of 630 million m^3/a. The yield benefit in the Vaal System is 736 million m^3/a – reserved in the Thukela water management area;
- Future large-scale water resources development on the Thukela River is reserved mainly for transfer to the Upper Vaal water management area. Current planning allows for an additional transfer of 475 million m^3/a – reserved in the Thukela water management area;
- Existing transfer of 55 million m^3/a from the Buffalo River in the Thukela water management area to the Upper Vaal water management area – reserved in the Thukela water management area;
- Transfers from the Usutu to Mhlatuze water management area at the current capacity of 63 million m^3/a – reserved in the Usutu to Mhlatuze water management area;
- Existing transfers from the Upper Vaal water management area to the Olifants water management area of 36 million m^3/a for power generation, plus an allowance of 38 million m^3/a for future growth reserved in the Upper Vaal water management area;
- Transfers from the Upper Vaal water management area through the Rand Water distribution system to meet requirements in the Crocodile (West) and Marico water management area which are in excess of the capacity of the local resources in the Crocodile (West) and Marico water management area. Currently this amounts to 514 million m^3/a and is projected to increase to 723 million m^3/a. As an upper high growth scenario, transfers may need to increase to 1 125 million m^3/a;
- Releases from the Upper Vaal water management area along the Vaal River to users in the Middle Vaal and Lower Vaal water management areas to meet their realistic needs that cannot be supplied from own resources. Little change is expected from the current transfer of 828 million

m^3/a, although it may increase to about 910 million m^3/a in 2025 under the high growth scenario – reserved in the Upper Vaal water management area;

- Current surplus transfer capacity into the Upper Vaal water management area is to be reserved for growth in urban, industrial and mining water requirements in the Upper Vaal and Crocodile (West) and Marico water management areas, and is not to be used for commercial irrigation;
- The allocation of surplus yield in the Upper Vaal water management area will be subject to national authorisation as it can be allocated to users in the Upper, Middle, Lower Vaal as well as Crocodile (West) and Marico and Olifants water management areas; and
- The Upper Vaal water management area forms the central component of the Vaal River System, which extends over several water management areas. As water resources management in the Vaal River System impacts to some degree on the water quantity and quality in all the interlinked water management areas, management of the Vaal River System is to be controlled at a national level.

7.2.11 SECTION 27(1)(K)

The Probable Duration of Any Undertaking for Which Water is to be Authorized

It is anticipated that the project would have a lifespan of 16 years, (2019 to 2034), before it would be decommissioned.

7.3 KEY COMMITMENTS

The Applicant is committed to implementing and reviewing the IWWMP action plan included into this document (Refer to Section 6.6 above).

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