



HARMONY GOLD MINING COMPANY LIMITED: HARMONY FREE STATE OPERATIONS

Harmony Defunct Shafts Backfilling Project

**Draft Integrated Water and
Waste Management Plan in
Support of the Water Use
Licence Application**

DWS REF NO.: WU44553

June 2026

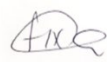
Report Preparation By

Kongiwe Environmental (Pty) Ltd	
Registration Number	2016/135562/07
Telephone Number	+27 (10) 140 6508
Email	info@kongiwe.com
Registered Address	150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa
Mailing Address	PostNet Suite No 163, Private Bag X21, Bryanston, 2021, South Africa
Website	www.kongiwe.com

Report Information

Project	Harmony Defunct Shafts Backfilling Project
Report Title	Integrated Water and Waste Management Plan in Support of the Water Use Licence Application
Client	Harmony Gold Mining Company Limited
Project No.	HARM#019
Compilation Date	2025
Status of Report	Draft

Approval

Verification	Capacity	Name	Signature	Date
By Author	Environmental Consultant	Anela Fixi		22 May 2025
Co-Author	Junior Environmental Consultant	Lubabalo Zongolo		27 May 2026
Reviewed by	Senior Environmental Consultant	Phumla Mngwengwe		25 May 2026
Approved by	Project Director	Grant Cornish-Bowden		28 May 2026

Please consider the Environment before you print this document.

Copyright © 2026 Kongiwe Environmental (Pty) Ltd

All rights reserved. No part of this report may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written consent of Kongiwe Environmental (Pty) Ltd. All content and methodologies remain intellectual property of Kongiwe Environmental (Pty) Ltd. Where applicable, the contents of this document are confidential and protected by legal privilege and must not be distributed to other parties without prior written permission.

This report is to be used for the sole purpose intended and should not be used for any other purpose without prior written permission.

Executive Summary

Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Harmony Gold Mining Company Limited (Harmony) as the Environmental Service Provider tasked with facilitating its Integrated Water Use Licence Application (IWULA) process for the proposed **Harmony Defunct Shafts Backfilling Project** (hereafter the Proposed Project).

As part of the WULA process, a proponent is required to compile an Integrated Water and Waste Management Plan (IWWMP) for mining-related activities. The draft version of the IWWMP has been made available to Interested and Affected Parties (I&APs) for a 60-day public commenting period from **10 June 2026 to Tuesday, 11 August 2026**. Following this commenting period, this report will be updated to include all comments received and thereafter submitted to the Department of Water and Sanitation (DWS) for consideration.

Harmony intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from various plants and Tailing Storage Facility (TSF) areas. Harmony requires a Water Use Licence (WUL), in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA), to undertake the backfilling process.

Illegal mining activities in the Welkom area have become a serious threat to the safety of the Harmony workforce and local communities – and the security of mining infrastructure associated with the shafts. Defunct shafts are the main entry points for illegal miners, who gain access through open shafts. In cases where conventional plugs are installed, illegal miners often bypass these plugs to continue illegal mining activities. The issue of illegal miners has amplified over the last few years with the cessation of operations and decline in economic activity in the Welkom region.

Harmony believes that the accelerated rehabilitation of these defunct shafts through backfilling and closing of the shaft barrels will address illegal ingress into underground operations.

The Proposed Project requires a WUL in terms of the NWA for the triggered Section 21 water uses before it can commence. An IWULA is being prepared and will be submitted in accordance with the Water Use Licence Application (WULA) and Appeals Regulations 2017 published in GNR 267 on 24 March 2017. The IWULA will be supported by numerous technical reports and as well as this IWWMP.

The original intent of an IWWMP was aimed at collating and rationalising the information submitted for WULAs, but subsequently it has also developed to:

- Provide the regulatory authorities with focused and structured information to meet their general information needs;
- Articulate the required management measures and actions to achieve the water and waste related performance on an ongoing basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.

In summary, this IWWMP presents:

- General information pertaining to the operation and a background description of the activity, description of the property and the specific purpose for the development of the IWWMP;
- A broad description of the Proposed Project, products, business and corporate policies;
- Water uses (new, existing, lawful, exemptions and general authorisations);
- Environmental context (climate, groundwater and socio-economic environment);
- Analysis and characterisation of activities (organisational structure, training, awareness, monitoring and control);
- Risk assessment in relation to process water, groundwater and waste (methodology, potential impacts and significance of risks to the environment);
- Water and waste management strategies, specifically focussing on process water, groundwater and waste; and
- The regulatory status of water use activities accompanied by the Section 27 Motivation of NWA.

A detailed list of water use activities are included in Chapter 3. However, the following water use activities will be applied for as part of the Proposed Project:

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

A detailed risk assessment for the activities of the Proposed Project is included in Chapter 5 of this report. The main water uses and waste related risks for the activities are associated with wetland and groundwater impacts. Mitigation measures are discussed in Chapter 5 of this report, with a detailed water and waste management plan included in Chapter 6 of the report. The water and waste management plan focuses on minimising the impact of the activities on water resources.

Table of Content

Executive Summary	ii
1. INTRODUCTION	1
1.1 Activity Background	1
1.1.1 Backfilling Method	2
1.2 Regional Setting and Location of the Activity	2
1.2.1 Applicant Details	4
1.3 Property Details	4
1.4 Purpose of the IWWMP	5
2. CONCEPTUALISATION OF ACTIVITY	6
2.1 Description of Activity.....	6
2.2 Extent of Activity.....	6
2.3 Key Activity Related Processes and Products.....	6
2.4 Activity Life Description	8
2.4.1 Life-Cycle Phases of the Project.....	8
2.5 Activity Infrastructure Description.....	9
2.6 Key Water Uses and Waste Streams	11
2.6.1 Water Uses	11
2.6.2 Water Supply	11
2.6.3 Waste Streams	11
2.7 Organisational Structure of Activity	11
2.8 Business and Corporate Policies Related to the Environment	11
3. REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK	13
3.1 Legislative Framework	13
3.2 Summary of Water Uses	16
3.3 Existing Lawful Water Uses	17
3.4 Relevant Exemptions.....	17
3.5 Generally Authorised Water Uses.....	17
3.6 New Water Uses to be Licensed	17
3.7 Other Authorisations	24
4. PRESENT ENVIROMENTAL SITUATION	25
4.1 Climate.....	25
4.1.1 Regional Climate Rainfall	25
4.1.2 Evaporation	26
4.2 Topography	26
4.3 Geology.....	28
4.3.1 Karoo Supergroup.....	28
4.3.2 Ventersdorp Supergroup	29
4.3.3 Witwatersrand Supergroup	29

4.3.4	Geohydrological Setting	29
4.4	Soils, Land Use and Land Capability	32
4.4.1	Soils	32
4.4.2	Land Use and Land Capability	34
4.5	Water Management Area	36
4.6	Wetlands	36
4.6.1	Wetland Delineation	36
4.6.2	Risk Screening	39
4.6.3	Ecosystem Services	40
4.6.4	Present Ecological State	40
4.6.5	Ecological Importance and Sensitivity	41
4.6.6	Recommended Ecological Category and Recommended Management Objective	43
4.6.7	Buffer Requirements	43
4.6.8	Screening Tool Comparison	47
4.7	Groundwater	49
4.7.1	Aquifer Characterisation	49
4.8	Hydrocensus	50
4.8.1	Groundwater Monitoring Borehole Positions	50
4.8.2	Groundwater Levels Versus Topography	54
4.8.3	Karoo Aquifer	54
4.9	Groundwater Quality	57
4.9.1	Water Quality: Deep Mine Void Water	57
4.9.2	Underground Mine Voids: Operational Tailings Facility	58
4.10	Model Results	60
4.11	Socio-Economic Environment	63
5.	ANALYSIS AND CHARACTERISATION OF ACTIVITY	65
5.1	Site Delineation for Characterisation	65
5.2	Water Supply	67
5.2.1	Potable Water	67
5.3	Waste	67
5.3.1	Non-Mine Residue	67
5.3.2	Tailings for Backfilling	67
5.4	Operational Management	68
5.5	Organisational Structure	70
5.6	Resources and Competence	70
5.7	Education and Training	70
5.8	Internal and External Communication	71
5.8.1	Internal Communication	71
5.8.2	External Communication	71
5.9	Awareness Raising	74

5.10	Monitoring and Control	75
5.10.1	Groundwater Monitoring.....	75
5.10.2	Wetland Monitoring	75
5.11	Waste Monitoring.....	76
5.12	Risk and Impact Assessment / Best Practice Assessment	76
5.12.1	Wetlands Risk and Impact Assessment.....	76
5.12.2	Groundwater Risk Assessment	85
5.13	Mitigation Measures	85
5.13.1	Construction Phase.....	85
5.13.2	Operational Phase.....	89
5.13.3	Decommissioning Phase	90
5.14	Issues and Responses from Public Consultation Process	91
6.	WATER AND WASTE MANAGEMENT	92
6.1	Water and Waste Management Philosophy	92
6.2	Strategies	92
6.2.1	Water Management Strategy	92
6.2.2	Waste Management Strategy	93
6.3	Performance Objectives / Goals	93
6.3.1	Water	93
6.3.2	Waste	94
6.4	Measures to Achieve and Sustain Performance Objectives.....	94
6.5	Options Analysis and Motivation for Preferred Options	94
6.5.1	The Property on which or Location where the Activity is Proposed to be Undertaken.....	94
6.5.2	The Type of Activity to be Undertaken	94
6.5.3	The Design and Layout of the Activity	95
6.5.4	The Technology to be Used in the Activity.....	95
6.5.5	The “No-Go” Option	95
6.6	IWWMP Action Plan	95
6.7	Control and Monitoring.....	96
6.7.1	Monitoring of Change in Baseline Information.....	96
6.7.2	Audit and Report on Performance Measures	96
6.7.3	Audit and Report on Relevance of IWWMP Action Plan.....	96
7.	CONCLUSION	97
7.1	Regulatory Status of Activity.....	97
7.2	Statement of Water Uses Requiring Authorisation, Dispensing with Licensing Requirement and Possible Exemption from Regulation	97
7.3	Key Commitments.....	97
8.	References.....	98

List of Tables

Table 1-1: Shafts to be backfilled	1
Table 1-2: Contact Details	4
Table 1-3: Property Description	4
Table 2-1: Source for Tailings for Each Shaft	6
Table 2-2: Summary of Activities Per Phase.....	8
Table 2-3: Persons Responsible for Implementation of the IWWMP and Future WUL Commitments.....	11
Table 3-1: Applicable National Legislation and Guidelines	13
Table 3-2: Water Use Table	18
Table 4-1: Storm Rainfall Depths for the Area	25
Table 4-2: Monthly and Annual Evaporation at the Harmony Free State Operation	26
Table 4-3: Risk status of the delineated wetlands	39
Table 4-4: Summary of the average Ecosystem Scores of the Assessed Wetland Units	40
Table 4-5: Average Present Ecological State scores for the assessed wetland.....	40
Table 4-6: Aspects considered in the Ecological Importance and Sensitivity assessment	42
Table 4-7: Summary of the REC and RMO categories assigned to the relevant wetlands	43
Table 4-8: Summary of the Screening Tool Versus Specialist Assigned Sensitivities	47
Table 4-9: Groundwater Monitoring Parameters.....	50
Table 4-10: Groundwater Quality Monitoring Location.....	51
Table 4-11: Water Quality of the Deep Mine Void Water	57
Table 4-12: Final Water Quality Results for the Underground Mine Voids and Seepage from the Tailings as Predicted by the Geochemical Model	61
Table 5-1: Waste Management Hierarchy (Jones & Wagener, 2017).....	67
Table 5-2: Harmony Incident Classification Criteria (Harmony Risk Matrix – February 2025).....	69
Table 5-3: Internal Communication Procedure	72
Table 5-4: External Communication Process.....	73
Table 5-5: Environmental Complaints Process.....	74
Table 5-6: Significance ratings matrix	76
Table 5-7: Summative Results of the Risk Assessment Conducted for the Proposed Development (The Biodiversity Company, 2026)	78
Table 6-1: Operational Action Plan	95

List of Figures

Figure 1-1: Proposed Project Location.....	3
Figure 2-1: Schematic of Typical Tailings Settling in Haulages	7
Figure 2-2: Infrastructure Map	10
Figure 3-1: Water Use Map for the Proposed Project.....	22
Figure 3-2: Water Use Map A Section for the Proposed Project.....	23
Figure 4-1: Mean Monthly Rainfall for the Area	25

Figure 4-2 : Topography Map	27
Figure 4-3 : Geology Map	31
Figure 4-4 : Soil Classification	33
Figure 4-5: Land Use Map	35
Figure 4-6: Quaternary Catchments with the Project Area (The Biodiversity Company, 2026).....	36
Figure 4-7: Delineation of the Watercourses Within the PAOI (The Biodiversity Company, 2026).....	37
Figure 4-8: Delineations of the Watercourses Within Cluster 1 Within the PAOI (The Biodiversity Company, 2026).....	38
Figure 4-9: Delineation of the Watercourses Within Cluster 2 Within the PAOI (The Biodiversity Company, 2026)	38
Figure 4-10: Delineation of the Watercourses Within Cluster 3 Within the PAOI (The Biodiversity Company, 2026).....	39
Figure 4-11: Representative Photographs of the Different Identified Features Within the PAOI. A) Seep; B) Depression; and C) Unchanneled Valley-Bottom	39
Figure 4-12: Recommended Buffers for the Identified Wetlands in Relation to the Proposed Development.....	44
Figure 4-13: Recommended Buffers for the Identified Wetlands Within Cluster 1 in relation to the Proposed Development	45
Figure 4-14: Recommended Buffer for the Identified Wetlands Within Cluster 2 in Relation to the Proposed Development	46
Figure 4-15: Recommended Buffers for the Identified Wetlands Within Cluster 3 in Relation to the Proposed Development	47
Figure 4-16: Freshwater Sensitivity for the PAOI	48
Figure 4-17: Aquifers in the Free State Region	50
Figure 4-18: Groundwater Monitoring	53
Figure 4-19: Correlation Between Topography and Groundwater Level	54
Figure 4-20: Regional Interpolated Groundwater Level.....	56
Figure 4-21: Conceptual model Showing an Operational Phase in Which Tailings Are Being Disposed of in the Underground Mine Voids.....	59
Figure 4-22: Schematic of Conceptual Model Compare the Earth Surface Geochemical Environment with the Geochemical Environment of the Deep Mine Voids.....	60
Figure 4-23: Flow Diagram Showing the Coupling of Individual Numeric Models into a Combined Model for the Tailings Deep Mine Void Disposal	60
Figure 4-24: Timeseries Results of the Geochemical Model for the Tailings Operational Phase, Decommissioning and/or Re-processing Phase and the Post- Operational Phase in Which the Tailings Are Disposed of in the Underground Mine Voids.....	62
Figure 4-25: Conceptual Model Showing the Change in Redox State and Thus Mobility of Iron (Fe) and Manganese (Mn) in the Mine Void Water and at the Earth's Surface	62
Figure 5-1: Proposed Project Master Layout Plan	66
Figure 5-2: The Mitigation Hierarchy as Described by the DEA (2013)	76

List of Appendices

The following appendices can be accessed in the link: <https://kongiwe.com/projects/>. Appendix C: Public Participation Report has also been included in this report. Please contact Kongiwe should you require a hardcopy of the appendices.

Appendix A: Wetland Assessment

Appendix B: Groundwater Study

Appendix C: Public Participation Report

Abbreviations and Units

Abbreviation	Description
AMD	Acid Mine Drainage
CRG	Central Rand Group
CRR	Comments and Responses Report
CVB	Channeled Vally-Bottom
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and Environment
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIS	Ecological Importance and Sensitivity
ELU	Existing Lawful Water Use
EMD	Environmental Management Department
EMS	Environmental Management System
EMS	Environmental Management System
Fe	Iron
GA	General Authorisation
GN	Government Notice
GNR	Government Notice Regulation
GVA	Gross Value Added
HGM	Hydrogeomorphic
I&AP	Interested and Affected Party
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LDM	Lejweleputswa District Municipality
MERRA-2	Modern-Era Retrospective Analysis for Research and Applications, Version 2
MLM	Matjhabeng Local Municipality
Mn	Manganese
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MR	Mining Right

Abbreviation	Description
NASA	National Aeronautics and Space Administration
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:WA	National Environment Management: Waste Act, 2008 (Act No. 59 of 2008)
NGO	Non-Governmental Organization
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NWRS	National Water Resource Strategy
PES	Present Ecological State
POAI	Project Area of Influence
PPP	Public Participation Process
REC	Recommended Ecological Category
RMO	Recommended Management Objective
RWD	Return Water Dam
SANAS	South African National Accreditation System
SANS	South African National Standards
SRP	Surface Rights Permits
SWSA	Strategic Water Source Areas
TSF	Tailings Storage Facility
UVB	Unchanneled Vally-Bottom
WMA	Water Management Area
WRD	Waste Rock Dump
WSA	Water Services Act (Act No. 108 of 1997)
WUL	Water Use Licence
WULA	Water Use Licence Application

1. INTRODUCTION

Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed as the Environmental Service Provider tasked with conducting the Integrated Water Use Licence Application (IWULA), as well as the compilation of the Integrated Water and Waste Management Plan (IWWMP) for the proposed hereafter the 'Proposed Project'.

1.1 Activity Background

Harmony Gold Mining Company Limited ('Harmony') has been mining in the Free State since approximately 1950. Harmony intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from plants and Tailings Storage Facilities (TSFs) areas. Harmony requires a Water Use Licence (WUL), in terms of the National Water Act, 1998 (Act No. 36 of 1998), to undertake the backfilling process.

Illegal mining activities in the Welkom region have become a serious threat to the safety and security of the Harmony workforce, mines and associated infrastructure, as well as the host communities. Defunct shafts are the main entry points for illegal miners, who gain access through open shafts. In cases where conventional plugs are installed, illegal miners often bypass these plugs to continue illegal mining activities. The issue of illegal miners has amplified over the last few years with the cessation of operations and a decline in economic activity in the Welkom region.

The open defunct shafts create a serious safety risk, and therefore it is Harmony's intention to rehabilitate these defunct shafts, including backfilling and sealing the barrels, which offers the means of eliminating the risk of illegal entry into underground workings. To achieve this, Harmony is proposing backfilling its defunct shafts, listed in Table 1-1 and shown on Figure 1-1.

Table 1-1: Shafts to be backfilled

Shaft	No.	Type
Harmony	1	Vent
Harmony	3	Main
Harmony	4	Main
Harmony	4	Vent
Harmony	5	Vent
Merriespruit	2	Vent
Saaiplaas	1	Vent
Saaiplaas	2	Main
Saaiplaas	3	Main
Freddies	6	Main
President Steyn	2	Vent

Shaft	No.	Type
Brand	1A	Vent
Brand	3	Vent
Brand	5	Main & Vent
Unisel		Main
Bambanani East		Main
Bambanani West		Main

1.1.1 Backfilling Method

Backfilling is the proposed method for the rehabilitation of the defunct shafts for the Harmony Free State Operations.

Harmony initially used rubble as their preferred backfill material. However, backfilling defunct shafts with rubble can create sparks which pose an explosion risk due to the potential methane concentration in the defunct operations. As a result, the shafts cannot be filled with rubble or waste rock. As an alternative backfilling measure, Harmony is now proposing the use of tailings material to backfill the defunct shafts. Tailings, in the form of slurry, will be pumped into the defunct shafts. The defunct shaft will be filled with tailings up to approximately 300m below surface (which is below groundwater level), after which they will be topped off with rubble. The slurry will be transported via existing overland pipelines, which will be connected to new overland pipelines, transporting slurry to each specific shaft area. Once complete, the pipelines will be stripped and reused. This process therefore removes tailings from surface and subsequently eliminates safety hazards associated with open shafts.

The Proposed Project will be carried out using both existing pipelines and newly proposed temporary connection pipelines. The new pipelines are to be constructed using 300 mm diameter steel and no plinths will be required. The proposed pipelines will be connected to existing infrastructure in areas where disturbance has already occurred. Their alignment will run adjacent to existing pipelines and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

1.2 Regional Setting and Location of the Activity

Harmony's defunct shafts are located throughout Welkom and within the towns of Virginia and Odendaalsrus, in wards 8, 9, 24, 32, and 35 of the Matjhabeng Local Municipality (MLM), which is part of the Lejweleputswa District Municipality (LDM), in the Free State Province. The locality map indicating the Harmony Free State defunct shafts is presented in Figure 1-1.

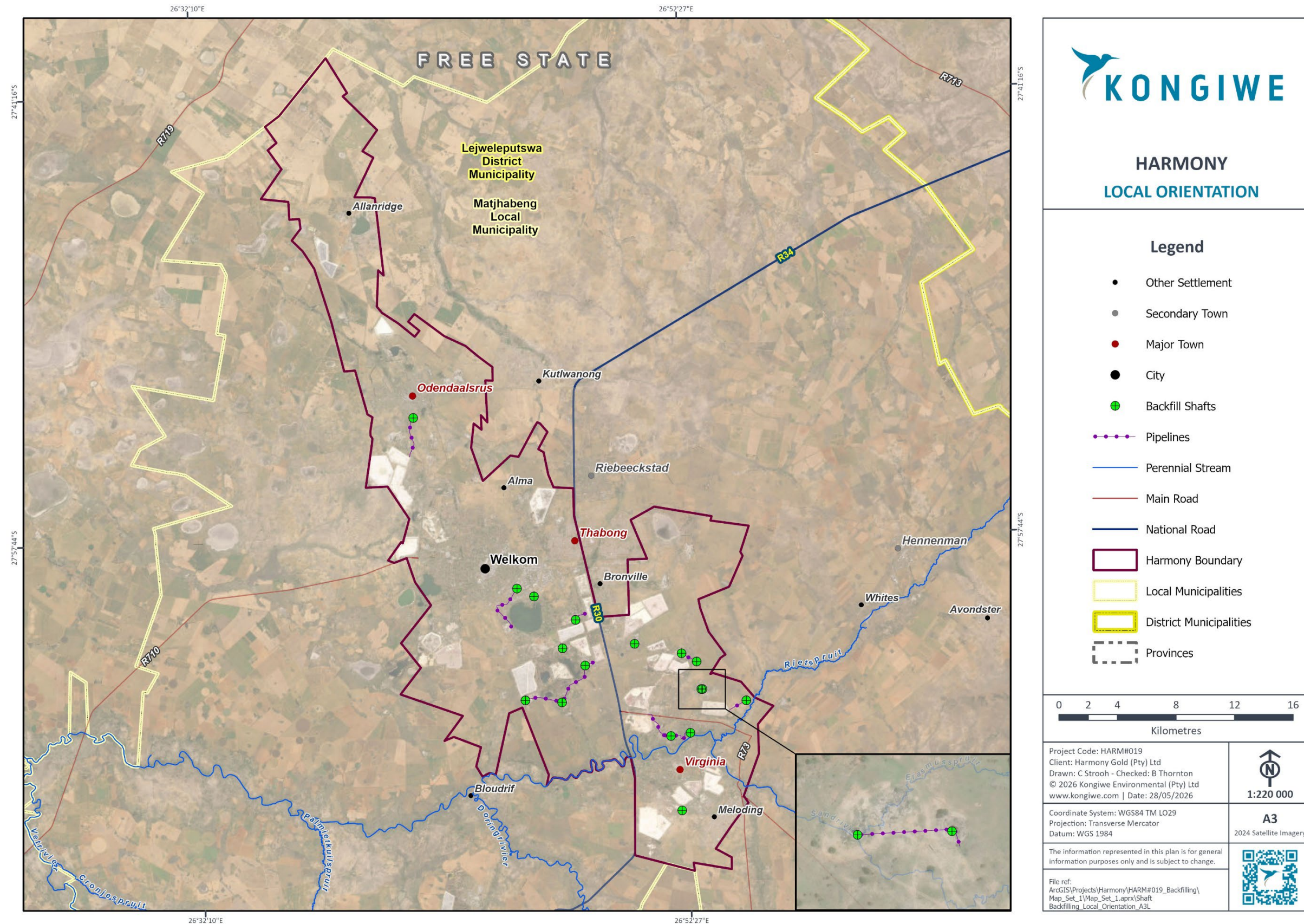


Figure 1-1: Proposed Project Location

1.2.1 Applicant Details

The contact details of the responsible environmental personnel at Harmony are provided in below.

Table 1-2: Contact Details

Applicant	Harmony Gold Mining Company Limited
Registration No.	1950/038232/06
Primary Contact	Melani Nieuwoudt
Alternative Contact	Ipeleng Sebetlele
Head Office Address	Randfontein Office Park, Corner Main Reef Road and Ward Avenue, Randfontein, Gauteng, 1759
Postal Address	PO Box 2, Randfontein, Gauteng, 1759
Telephone	057 904 4781
Fax	N/A
E-mail	melani.nieuwoudt@harmony.co.za
Mine Address	Harmony, Free State

1.3 Property Details

Table 1-3 below lists the properties that are directly affected by the Proposed Project; these are the properties where the Proposed Project activities will be undertaken and therefore triggering a water use. The information is based on WinDeed searches provided by the LexisNexis property database. Harmony has Mining Rights (MRs) over the Project area.

Table 1-3: Property Description

Property Description	Title Deeds	Owner-Windeed
Portion 92 of Harmony Farm 222 RD	T12792/2014	Harmony Gold Mining
Portion 2 of Klippan 14 RD	T33509/2003	Freegold Harmony
Portion 0 (RE) of Harmony Farm 222 RD	T3716/1922	Harmony Gold Mining
Portion 0 (RE) of Jurgens Hof 490 RD	T438/1962	Harmony Gold Mining
Portion 2 of Kalkuil 153 RD	T4442/1970	Matjhabeng Local Municipality
Portion 0 (RE) of Morijah 288 RD	T7615/1976	Harmony Gold Mining
Portion 0 (RE) of President Styen 154 RD	T13527/2010	Harmony Gold Mining
Portion 0 (RE) of Rietpan 17 RD	T33509/2004	Freegold Harmony
Portion 0 of ERF 8165 RD	T30527/2004	Mathabeng Matjhabeng Local Municipality
Portion 1 of Rustgevonden 564 RD	T7057/1983	Harmony Gold Mining

Property Description	Title Deeds	Owner-Windeed
Portio 0n (RE) of Saaiplaas 771 RD	T25744/2004	Harmony Gold Mining
Portion 12 of Saaiplaas 771 RD	T11092/2016	Lozitone Pty Ltd (a subdiary of Harmony Gold Mining)
Portion 6 (An unregistered subdivision of Portion 1) Stuirmanship 92 RD	T6721/2010	Freegold Harmony
Portion 3 of Vaalkranz 220 RD	T6483/1979	Van Den Berg Abraham Paulus
Portion 3 of Voorspoed 132 RD	T17038/2010	Harmony Gold Mining
Portion 11 of Welkom 80 RD	T17038/2010	Harmony Gold Mining
Portion 0 of Welkom 80 RD	T33509/2003	Freegold Harmony

*Where Harmony is not the landowner, it holds Surface Rights Permits (SRPs) or servitude agreements.

1.4 Purpose of the IWWMP

The Proposed Project requires a Water Use Licence (WUL) in terms of the National Water Act, 1998 (Act No 36 of 1998) (NWA) for the triggered Section 21 water uses, before it can commence. An IWULA, supported by an IWWMP, must be prepared and submitted in accordance with the WULA and Appeals Regulations 2017 published in GNR 267 on 24 March 2017.

The original intent of an IWWMP was aimed at collating and rationalising the information submitted for WULAs, but subsequently it has also developed to:

- Provide the regulatory authorities with focused and structured information to meet their general information needs;
- Articulate the required management measures and actions to achieve the water and waste related performance on an ongoing basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.

2. CONCEPTUALISATION OF ACTIVITY

This Section describes the activities, processes and products related to the Proposed Project. It also provides background information of the organisational structure of the water user (i.e., Harmony) and all the business and corporate environmental policies.

2.1 Description of Activity

As described in Section 1.1 above, it is Harmony's intention to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from different plants and TSF areas. The tailings slurry will be transported via existing overland pipelines and with proposed temporary pipelines to reach the specific shaft area. Each shaft will be backfilled within approximately 4-6 weeks. Thereafter, the pipeline which was used to backfill will be removed and reinstalled at the next backfilling shaft.

2.2 Extent of Activity

Harmony intends to backfill and close 17 of its defunct shafts. Figure 1-1 provides a general overview of the Project area.

2.3 Key Activity Related Processes and Products

As stated above, Harmony intends to close its defunct shafts by backfilling them with tailings material. The tailings material will be sourced from Harmony's processing plants and TSFs. The specific tailings source areas for each shaft are shown in Table 2-1 below.

Table 2-1: Source for Tailings for Each Shaft

Shaft	No.	Type	Source
Harmony	1	Vent	Dam 21
Harmony	3	Main	Dam 21
Harmony	4	Main	Central Plant
Harmony	4	Vent	Central Plant
Harmony	5	Vent	Dam 23
Merriespruit	2	Vent	TBC
Saaiplaas	1	Vent	Saaiplaas Plant
Saaiplaas	2	Main	Saaiplaas Plant
Saaiplaas	3	Main	Saaiplaas Plant
Freddies	6	Main	Nooitgedacht TSF
President Steyn	2	Vent	FSS 3 TSF

Shaft	No.	Type	Source
Brand	1A	Vent	Harmony One Plant
Brand	3	Vent	Harmony One Plant
Brand	5	Main & Vent	FSS 6 TSF
Unisel		Main	FSS 6 TSF
Bambanani East		Main	FSS 6 TSF
Bambanani West		Main	FSS 2 TSF

Tailing materials will be deposited into the shafts from the top and will flow downwards, filling the shaft collar and migrating into the haulages. Figure 2-1 illustrate schematic of tailing settling in haulages.

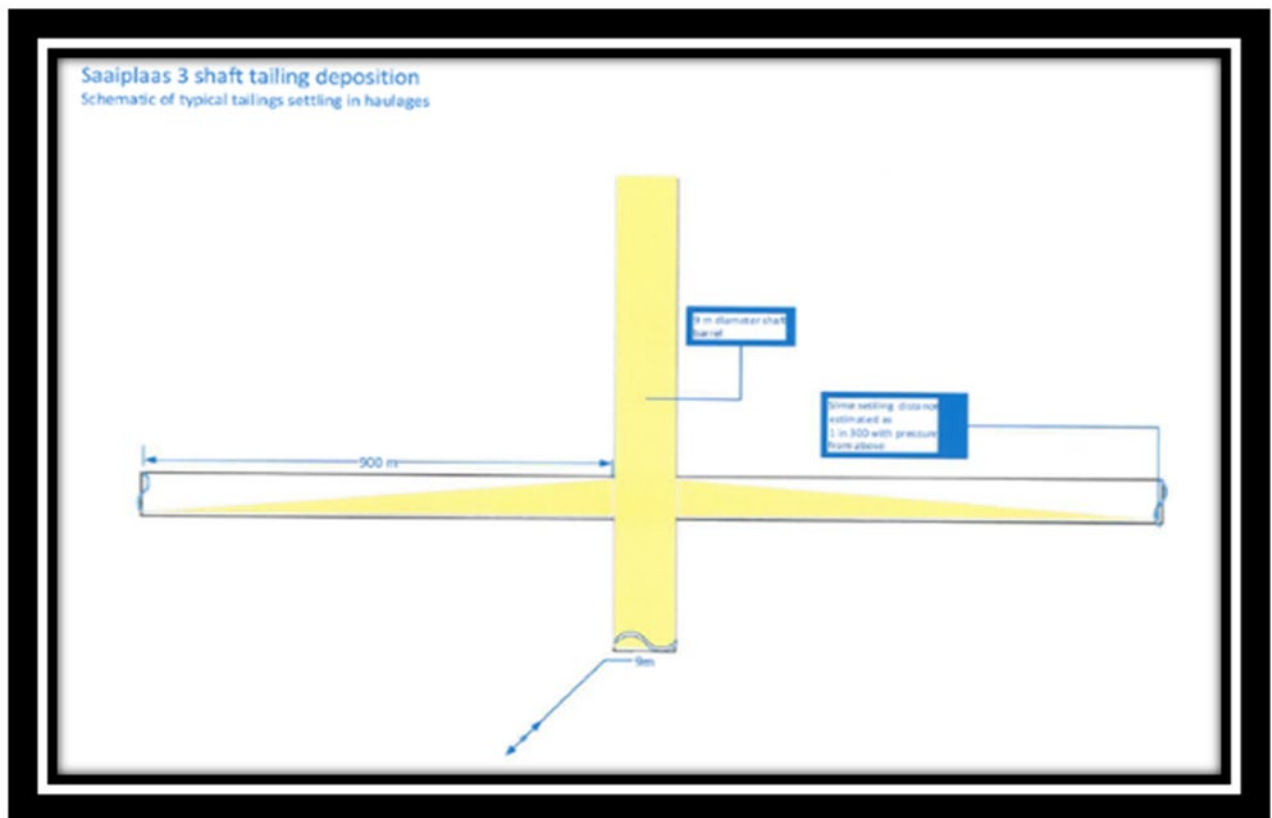


Figure 2-1: Schematic of Typical Tailings Settling in Haulages

2.4 Activity Life Description

The anticipated duration of the Proposed Project is five years. Each shaft will be backfilled within approximately four to six weeks. Thereafter, the pipeline which was used to backfill will be removed and reinstalled at the next backfilling shaft until the Proposed Project is complete.

2.4.1 Life-Cycle Phases of the Project

Table 2-2: Summary of Activities Per Phase

Activity	Description
Pre-Construction	
1	Start implementing monitoring plans.
2	Employment of workers should this be required (minimal).
3	Removal of vegetation.
4	Demolishing of shaft caps that needs to be filled.
Construction Phase	
5	Initiation of a community forum for engagement throughout the Project life-cycle
6	Construction of new pipelines
Operational Phase	
7	Backfilling of shafts with tailings material using pipelines. Followed by topping off with rubble.
8	Community engagement.
Decommissioning	
9	Decommissioning and rehabilitation activities: Demolition of temporary infrastructure such as pipelines, and rehabilitation of the project area.
10	Closure forum to be established with key stakeholders.
Post-Closure	
11	Post- Closure Monitoring.

2.4.1.1 Pre-Construction Activities

Pre-construction activities will include the development and implementation of the required monitoring plans. These plans must be prepared prior to the commencement of the backfilling activities – and continue to be implemented until rehabilitation has been completed. Employment of workers should this be required, removal of vegetation and site clearing, and demolishing of shaft caps that need to be filled will also be conducted during this phase.

2.4.1.2 Construction Phase Activities

The construction phase will be brief, as the backfilling will be carried out using both existing pipelines and newly proposed temporary connection pipelines. Employment opportunities, if any, would be limited, as Harmony already has an established team currently managing its operations. The communities will be engaged regarding the commencement of activities on site.

The construction phase will include the construction of new 300 mm diameter steel pipelines with no plinths. The proposed pipelines will be connected to existing infrastructure in areas where disturbance has already occurred. Their alignment will run adjacent to existing pipelines and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

2.4.1.3 Operational Phase Activities

Once site preparation and pipelines construction is completed, backfilling will begin. The shafts will be backfilled with tailings material from different plants and TSF in the Free State region. The slurry will be transported via pipelines up to a designated shaft.

The defunct shafts will be filled with tailings up to approximately 300m below surface, after which they will be topped off with rubble. Shaft capping will be undertaken in the near future, following the stabilisation of the backfilled area after sagging and refilling.

During the operational phase, it is advised that continual monitoring of groundwater and wetlands is conducted. This information needs to be collected and used to update specific water models and to monitor and evaluate the impact of backfilling. It is additionally advised that continual site inspections be undertaken to ensure that the recommended mitigation measures are implemented as required.

2.4.1.4 Decommissioning Phase Activities

Once each defunct shaft has been backfilled, the pipelines which were used to backfill will be removed and reinstalled at the next backfilling shaft. After the completion of backfilling of all shafts, the pipelines will be permanently removed.

2.4.1.5 Post - Decommissioning Phase Activities

Once backfilling has been completed, post closure monitoring will be conducted.

Maintenance and Aftercare

Harmony will continue monitoring groundwater using their groundwater monitoring network. The monitoring process will be used to monitor any groundwater deterioration associated with the tailings backfilled into the shafts. Should there be any deterioration identified, Harmony will undertake the recommended mitigation and management measures.

2.5 Activity Infrastructure Description

The proposed pipeline routes and the existing shafts to be backfilled are illustrated in Figure 2-2 below. The new pipelines are to be constructed using 300 mm diameter steel and no plinths will be required.

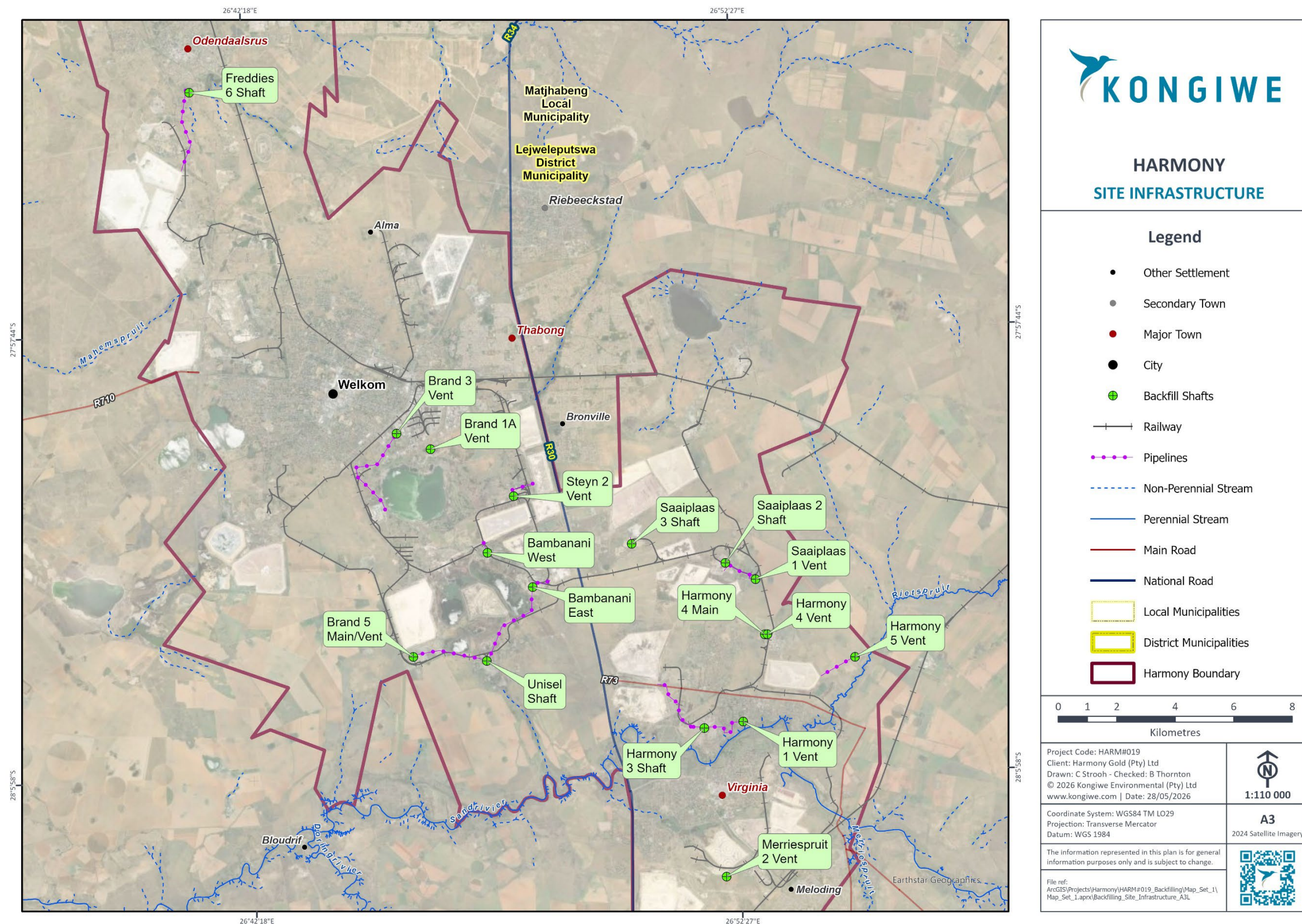


Figure 2-2: Infrastructure Map

2.6 Key Water Uses and Waste Streams

2.6.1 Water Uses

The following water uses are triggered in terms of Section 21 of the NWA:

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

Refer to Section 3.6 for a detailed summary of water uses triggered by the Proposed Project, in terms of the NWA.

2.6.2 Water Supply

2.6.2.1 Potable Water

Potable water is supplied by Vaal Central Water and is used for domestic purposes.

2.6.3 Waste Streams

The anticipated waste streams are from tailings and hydrocarbon waste, as outlined below:

- Hydrocarbons and waste oils from machinery used for construction of pipelines; and
- Tailings waste from plants and TSF's used to backfill the defunct shafts.

The management of waste is discussed in detail in Section 5.3 of this report.

2.7 Organisational Structure of Activity

The persons responsible for the implementation of this IWWMP and the WUL are presented in Table 2-3.

Table 2-3: Persons Responsible for Implementation of the IWWMP and Future WUL Commitments

Harmony One Operations Contact Details	
Postal address	P.O. Box 2, Randfontein 1760
Name	Designation
John Van Wyk	Group Senior Environmental Manager
Ipeleng Sebetlele	Environmental Manager Free State Operations
Melani Nieuwoudt	Senior Environmental Officer

2.8 Business and Corporate Policies Related to the Environment

Harmony aspires to leave a net positive legacy at all operations. Excellence in environmental management performance is regarded as essential to Harmony's business success. Harmony has committed to the following to protect the environment:

- Aim to prevent pollution, or otherwise minimise, mitigate and remediate harmful effects of operations on the environment throughout their lifecycle;
- Ensure that compliance with all applicable environmental laws, regulations and standards is the foundation on which Harmony's environmental performance is built;

- Promote active partnerships with government, community, labour and other relevant organisations for environmental protection and conservation at international, national, regional and local levels;
- Develop, implement and maintain environmental management systems to identify and manage risks, to inform decision making and to drive continual improvement throughout the organisation;
- Set and achieve targets that promote efficient use of resources and reduce environmental exposure and report on progress to relevant internal and external stakeholders;
- Manage hazardous substances safely and responsibly;
- Contribute to biodiversity protection considering ecological values and land-use aspects in investment, operational and closure activities;
- Ensure transparent engagement on environmental issues with communities affected by the Harmony operations and consider their views and concerns in the company's decision making;
- Continue to invest in research and development, as innovation is regarded as core to improving long term environmental outcomes within the realms of economically and ecologically sustainable development; and
- Close mines in a manner that promotes ecological and socio-economic sustainability.

3. REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

This Chapter provides an overview of the policy and legislative context relevant to the Proposed Project.

3.1 Legislative Framework

The foundation for Environmental Preservation is entrenched in the Constitution of South Africa, 1996. Following the birth of democracy in South Africa, legislative and environmental policies and regulations have undergone a large transformation, and various laws and policies were promulgated with a strong emphasis on environmental concerns and the need for sustainable development. The Constitution provides environmental rights (contained in the Bill of Rights, Chapter 2, Section 24) and includes implications for environmental management. The environmental rights are guaranteed in Section 24 of the Constitution, and state that:

“Everyone has the right –

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

To ensure that the various spheres of the social and natural environmental resources are not overlooked, additional legislation and regulations have been promulgated in addition to those contained within the Constitution. The additional legislature and regulations ensure that there remains a key focus on various industries or components of the environment, and to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.

The applicable national legislation and guidelines relevant to environmental management are summarised in Table 3-1 below.

Table 3-1: Applicable National Legislation and Guidelines

Legislation
Constitution of the Republic of South Africa, 1996 Describes the Bill of Rights and is the cornerstone of democracy in South Africa, enshrining the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law. The Bill of Rights states that everyone has the right to an environment that is not harmful to their health or well-being.
National Water Act (Act No. 36 of 1998) (NWA) Section 19 of the NWA sets out the principles for “an owner of land, a person in control of land or a person who occupies or uses land” to: • Cease, modify or control any act or process causing pollution. • Comply with any prescribed waste standard or management practice. • Contain or prevent the movement of pollutants. • Eliminate any source of pollution. • Remedy the effects of the pollution.

Legislation

- Remedy the effects of any disturbance to the bed and banks of a watercourse.

It also describes the actions that can be taken by the catchment management agency to enforce the requirements of the NWA.

The NWA Amendment Act (Act No. 27 of 2014)

This Act makes provision for integration and alignment of the WULA process with applications undertaken in terms of the NEMA and the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

NWA Regulations:

Regulation GN R704

This Regulation is designed to:

- Protect water resources (surface and groundwater);
- Prevent pollution from mining activities; and
- Ensure responsible water use and waste management.

It sets minimum environmental requirements for how mines must manage water, residue (tailings), and waste.

Regulations regarding the procedural arrangements for water use licence applications and appeals (GN R267, Gazette No. 40713, 24 March 2017)

GN R267 sets out:

- The process and requirements for applying for a WUL; and
- The procedures for appeals against decisions.

The General Authorisation (GA) for Section 21(c) and (i) water uses (GN509, Gazette No. 40229, 26 August 2016)

Defines a regulated area of a watercourse as one of the following:

- The outer edge of the 1:100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam.
- In the absence of a determined 1:100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench.
- A 500 m radius from the delineated boundary (extent) of any wetland or pan.

Water Services Act (Act No. 108 of 1997) (WSA)

Provides for the regulation of water boards and the setting of national water quality standards.

National Environment Management Act (Act No. 107 of 1998) (NEMA)

Sections 28 (1) and (3) of NEMA set out the duty of care principle, which is applicable to all types of pollution and must be taken into account in considering any aspects of potential environmental degradation.

Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

Environmental Impacts Assessment Regulations, 2014 as amended

Legislation

These Regulations were developed for the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations.

National Environment Management: Waste Act (Act No. 59 of 2008) (NEM:WA)

Follows the principle that waste generation be avoided, or if it cannot be avoided, waste it is reduced, reused, recycled or recovered, and as a last resort treated and/or safely disposed of. The objectives of this Act are to:

- Minimise the consumption of natural resources.
- Avoid and minimise the generation of waste.
- Reduce, re-use, recycle and recover waste.
- Treat and safely dispose of waste as a last resort.
- Prevent pollution and ecological degradation.
- Secure ecologically sustainable development while promoting justifiable economic and social development.
- Promote and ensure the effective delivery of waste services.
- Remediate land where contamination presents, or may present, a significant risk of harm to health or the environment.
- Achieve integrated waste management reporting and planning.
- Ensure that people are aware of the impact of waste on their health, well-being and the environment.
- Provide for compliance with the measures set out in Paragraph (a).
- Generally, give effect to Section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.

The National Environmental Management Laws Amendment Act, 2002, once fully implemented, will reverse the inclusion of mine residues under NEM:WA and return these to NEMA.

Waste Classification and Management Regulations

The Waste Classification and Management Regulations require that all waste generators must ensure that the waste they generate is classified in accordance with the South African National Standards (SANS) 10234 within 180 days of generation and if the waste is to be disposed of to landfill that the waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal.

Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits 2015

The Regulations specify the requirements relating to residue stockpiles and residue deposits, including assessment of impacts and analysis of risks, characterisation, classification, site selection, design, impact management, monitoring, reporting – as well as decommissioning, closure and post closure management. Refer to Section 3.6 for additional details.

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)

The Act seeks amongst other things, to manage and conserve biological diversity, to protect certain species and ecosystems, to ensure the sustainable use of biological resources and to promote the fair and equitable sharing of benefits arising from bioprospecting involving those resources. The NEM:BA includes a Regulation related to the management of threatened and protected species. A similar Regulation is applied to Threatened Ecosystems. NEM:BA has a set of norms and standards for the development of management plans for both species (e.g. Threatened or Migratory Species) and ecosystems (Endangered or Critically Endangered).

Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA)

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to

Legislation

all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

In addition to the above, the DWS has developed the National Water Resource Strategy (NWRS) to give effect to Section 5 of the NWA. The second edition of the NWRS (NWRS2, DWA 2013) is the primary mechanism to manage water across all sectors towards achieving national government's development objectives. The water sector vision for the NWRS2 is *"Sustainable, equitable and secure water for a better life and environment for all"* and is aligned with the vision of South Africa 2030. Towards achieving this vision, the overall goal is: *"Water is efficiently and effectively managed for equitable and sustainable growth and development"*. The NWRS2 strives to achieve three main objectives (DWA, 2013):

- Water supports development and the elimination of poverty and inequality;
- Water contributes to the economy and job creation; and
- Water is protected, used, developed, conserved, managed and controlled sustainably and equitably.

The core strategies of the NWRS2 (DWA, 2013) include the following:

- Implementation of Equity Policy;
- Putting water at the centre of integrated development planning and decision-making;
- Ensuring water for equitable growth and development;
- Contributing to a just and equitable South Africa;
- Prioritising and ensuring the implementation of water conservation and demand management;
- Optimising and stretching of our available water resources (groundwater, water reuse, desalination (including seawater), water systems optimization and rainwater harvesting);
- Committing to the protection of our water resources and ecosystems;
- Achieving effective and smarter water governance;
- Embedding sustainable business principles and practices in water resources and systems management;
- Implementing a water sector investment framework for infrastructure, human resource capacity and institutions; and
- Engaging the private and water use sectors.

Strategic actions have been developed per sector for the key priority areas. Measures to give effect to the strategies and priority areas at Harmony are discussed in Section 6.2 of this IWWMP.

3.2 Summary of Water Uses

Section 21 of the NWA defines water uses which are governed in terms of the Act and for which a WUL is required. In terms of section 40 (1) of the NWA, "a person who is required or wishes to obtain a licence to use water must apply to the relevant responsible authority for a licence." These water uses, in terms of Section 21, are as follows:

- Section 21 (a) -Taking water from a water resource;
- Section 21 (b) - Storing water;
- **Section 21 (c) - Impeding or diverting the flow of water in a watercourse;**
- Section 21 (d) - Engaging in a stream flow reduction activity contemplated in section 36;
- Section 21 (e) - Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- Section 21 (f) - Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- **Section 21 (g) - Disposing of waste in a manner which may detrimentally impact on a water resource;**

- Section 21 (h) - Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- **Section 21 (i) - Altering the bed, banks, course or characteristic of a watercourse;**
- 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; and
- Section 21 (k) - Using water for recreational purposes.

Section 21 (c) & (i) as well as Section 21 (g) water uses are applicable to the Proposed Project. Section 21 (c) and (i) water uses are triggered by:

- slurry pipelines within regulated wetland areas;

While Section 21 (g) water uses are triggered by:

- backfilling of defunct shafts with tailings material.

3.3 Existing Lawful Water Uses

Section 32(1) of the NWA defines an Existing Lawful Water Use (ELU) as follows:

“An existing lawful water use means a water use:

- *Which has taken place at any time during a period of two years immediately before the date of commencement of this Act and which:*
 - *Was authorised by or under any law which was in force immediately before the date of commencement of this Act;*
 - *Is a stream flow reduction activity contemplated in section 36(1);*
 - *Is a controlled activity contemplated in section 37(1).*
- *Which has been declared an existing lawful water use under section 33.”*

The Proposed Project is a new project and therefore not declared as an ELU.

3.4 Relevant Exemptions

Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (GN R704) have been considered for the Proposed Project. The Proposed Project requires exemption in relation to GN R704. A detailed description of the Project activities for which Regulation GN R704 exemptions is applicable, along with motivations for these exemptions, will be submitted in Phase 3 as part of the IWULA technical documentation.

3.5 Generally Authorised Water Uses

No general authorisations (GA) are applicable as this application is for a mining project which requires full licensing of water use activities.

3.6 New Water Uses to be Licensed

The new water uses to be licensed for the Proposed Project are presented in Table 3-2. The spatial distribution and locations of the new water uses are illustrated in Figure 3-1 and Figure 3-2.

Table 3-2: Water Use Table

ID	Infrastructure/Activity	Description	Purpose of Activity	Materials used to build infrastructure	Dimensions	Properties	Coordinates
Section 21 (c) & (i)							
1	Freddies 6 Shaft Pipeline Crossing	Construction, operation and rehabilitation of the Freddies 6 Shaft Pipeline within 500 m of seeps and crossing two seeps.	Convey slurry to Freddies 6 shaft	Steel	Length: 2903.34 m Width: 0.3 m Height: 0.3 m	Kalkkuil 153 RD, 2 Fregul 443 RD, RE	Start 27° 53' 10.49" S 26° 41' 8.92" E
							End 27° 54' 40.39" S 26° 41' 1.35" E
2	Brand 3 and 1A Vent Pipeline	Construction, operation and rehabilitation of the Brand 3 and 1A Vent Pipeline within 500m of a depression.	Convey slurry to Brand 3 and 1A Vent	Steel	Length: 1063.68 m Width: 0.3 m Height: 0.3 m	Voorspoed 132 RD, RE Welkom 80 RD, 11	Start 27° 59' 50.6" S 26° 45' 13.32" E
							End 28° 00' 11.16" S 26° 44' 46.13" E
3	Brand 3 and 1A Vent Pipeline	Construction, operation and rehabilitation of the Brand 3 and 1A Vent Pipeline within 500m of a depression	Convey slurry to Brand 3 and 1A Vent	Steel	Length: 1158.82 m Width: 0.3 m Height: 0.3 m	Voorspoed 132 RD, RE Welkom 80 RD, 11	Start 28° 00' 30.75" S 26° 44' 43.24" E
							End 28° 01' 0.25" S 26° 45' 8.59" E
4	Brand 5, Unisel, Bambanani East Connection Pipeline Crossing	Construction, operation and rehabilitation of the Brand 5, Unisel, Bambanani East Connection Pipeline within 500m of a depression and a seep, and crossing a seep.	Convey slurry to Brand 5, Unisel, and Bambanani East	Steel	Length: 1839.32 m Width: 0.3 m Height: 0.3 m	Klippan 14 RD, 2	Start 28° 03' 47.46" S 26° 47' 4.96" E
							End 28° 03' 39.39" S 26° 45' 58.77" E
5	Brand 5, Unisel, Bambanani East Connection Pipeline	Construction, operation and rehabilitation of the Brand 5, Unisel, Bambanani East Connection Pipeline within 500m of a depression.	Convey slurry to Brand 5, Unisel, and Bambanani East	Steel	Length: 325.39 m Width: 0.3 m Height: 0.3 m	Klippan 14 RD, 2	Start 28° 02' 44.08" S 26° 48' 9.5" E
							End 28° 02' 54.8" S 26° 48' 9.5" E

ID	Infrastructure/Activity	Description	Purpose of Activity	Materials used to build infrastructure	Dimensions	Properties	Coordinates
6	Saaiplaas 3 Shaft Pipeline	Construction, operation and rehabilitation of the Saaiplaas 3 Shaft Pipeline within 500m of a depression.	Convey slurry to Saaiplaas 1 Shaft	Steel	Length: 186.25 m Width: 0.3 m Height: 0.3 m	Saaiplaas 771 RD, 12	Start 28° 01' 35.36" S 26° 50' 14.73" E
							End 28° 01' 41.4" S 26° 50' 14.89" E
7	Saaiplaas 1 Vent Pipeline	Construction, operation and rehabilitation of the Saaiplaas 1 Vent Pipeline within 500m of a depression.	Convey slurry to Saaiplaas 1 Shaft	Steel	Length: 99 m Width: 0.3 m Height: 0.3 m	Saaiplaas 771 RD, 12	Start 28° 02' 23.84" S 26° 52' 46.68" E
							End 28° 02' 24.06" S 26° 52' 50.2" E
8	Harmony 4 Main and Vent Pipeline	Construction, operation and rehabilitation of the Harmony 4 Main and Vent Pipeline within 500m of a depression and seep.	Convey slurry to Harmony 4 Main and Vent	Steel	Length: 107 m Width: 0.3 m Height: 0.3 m	Rustgevonden 564 RD, 1	Start 28° 3' 26.2" S 26° 53' 4.03" E
							End 28° 3' 25.780" S 26° 53' 0.580" E
9	Harmony 1 Vent Pipeline	Construction, operation and rehabilitation of the Harmony 1 Vent Pipeline within 500m of an unchanneled and channelled valley bottom wetlands.	Convey slurry to Harmony 1 Vent	Steel	Length: 337 m Width: 0.3 m Height: 0.3 m	Harmony Farm 222 RD, RE Harmony Farm 222 RD, 92	Start 28° 5' 7.39" S 26° 51' 47.1" E
							End 28° 5' 2.2" S 26° 52' 30.37" E
10	Harmony 5 Vent Pipeline	Construction, operation and rehabilitation of the Harmony 5 Vent Pipeline within 500m of an of unchanneled valley bottom wetland and a channeled -valley bottom wetland.	Convey slurry to Harmony 5 Vent	Steel	Length: 1704 m Width: 0.3 m Height: 0.3 m	Vaalkranz 220 RD, 3	Start 28° 3' 56.81" S 26° 54' 42.64" E
							End: 28° 3' 51.52" S 26° 54' 53.43" E
Section 21 (g)							
11	Harmony 1 Vent	Backfilling of the Harmony 1 Vent shaft with slurry	Closing/rehabilitation of Harmony 1 Vent	Concrete	Volume: 72 433 m³	Harmony Farm 222 RD,92	28° 5' 2.14" S 26° 52' 31.46" E

ID	Infrastructure/Activity	Description	Purpose of Activity	Materials used to build infrastructure	Dimensions	Properties	Coordinates
12	Harmony 3 Shaft	Backfilling of the Harmony 3 shaft with slurry	Closing/rehabilitation of Harmony 3 Shaft	Concrete	Volume: 87 914 m ³	Harmony Farm 222 RD, RE	28° 5' 8.56" S 26° 51' 42.71" E
13	Harmony 4 Main	Backfilling of the Harmony 4 Main shaft with slurry	Closing/rehabilitation of Harmony 4 Main	Concrete	Volume: 78 062 m ³	Rustegedvonden 564 RD, 1	28° 3' 25.78" S 26° 53' 0.45" E
14	Harmony Vent 4	Backfilling of the Harmony Vent 4 shaft with slurry	Closing/rehabilitation of Harmony Vent 4	Concrete	Volume: 57 655 m ³	Rustegedvonden 564 RD, 1	28° 3' 25.72" S 26° 53' 3.76" E
15	Harmony Vent 5	Backfilling of the Harmony Vent 5 shaft with slurry	Closing/rehabilitation of Harmony Vent 5	Concrete	Volume: 61 557 m ³	Vaalkranz 220 RD, 3	28° 3' 52.44" S 26° 54' 52.89" E
16	Merriespruit Vent 2	Backfilling of the Merriespruit Vent 2 shaft with slurry	Closing/rehabilitation of Merriespruit Vent 2	Concrete	Volume: 88 122 m ³	Morijah 288 RD, RE	28° 7' 53.76" S 26° 52' 7.449" E
17	Saaiplaas Vent 1	Backfilling of the Saaiplaas Vent 1 shaft with slurry.	Closing/rehabilitation of Saaiplaas Vent 1	Concrete	Volume: 346 822 m ³	Saaiplaas 771 RD, RE	28° 2' 24.39" S 26° 52' 50.09" E
18	Saaiplaas Main 2	Backfilling of the Saaiplaas Main 2 shaft with slurry	Closing/rehabilitation of Saaiplaas Main 2	Concrete	Volume: 113 245 m ³	Saaiplaas 771 RD, RE	28° 2' 5.62" S 26° 52' 11.97" E
19	Saaiplaas Main 3	Backfilling of the Saaiplaas Main 3 shaft with slurry	Closing/rehabilitation of Saaiplaas Main 3	Concrete	Volume: 145 947 m ³	Saaiplaas 771 RD, RE	28° 1' 41.76" S 26° 50' 15.94" E
20	Freddies Main 6	Backfilling of the Freddies Main 6 shaft with slurry.	Closing/rehabilitation of Freddies Main 6	Concrete	Volume: 84 592 m ³	Kalkuil 153 RD, 2	27° 53' 13.49" S 26° 41' 13.06" E
21	President Steyn Vent 2	Backfilling of the President Steyn 2 Vent 2 shaft with slurry.	Closing/rehabilitation of President Steyn 2 Vent 2	Concrete	Volume: 45 390 m ³	President Steyn 154 RD, RE	28° 0' 47.51" S 26° 47' 49.32" E
22	Brand Vent 1A	Backfilling of the Brand Vent 1A shaft with slurry	Closing/rehabilitation of Brand Vent 1A	Concrete	Volume: 65 016 m ³	President Steyn 154 RD, RE	27° 59' 53.78" S 26° 46' 6.55" E
23	Brand Vent 3	Backfilling of the Brand Vent 3 shaft with slurry	Closing/rehabilitation of Brand Vent 3	Concrete	Volume: 84 446 m ³	Voorspoed 132 RD, 3	27° 59' 35.84" S 26° 45' 24.33" E

ID	Infrastructure/Activity	Description	Purpose of Activity	Materials used to build infrastructure	Dimensions	Properties	Coordinates
24	Brand Main and Vent 5	Backfilling of the Brand Main and Vent 5 shaft with slurry	Closing/rehabilitation of Brand main and vent 5	Concrete	Volume: 344 480 m ³	Stuirmanship 92 RD, 6	28° 3' 43.83" S 26° 45' 40.38" E
25	Unisel Main	Backfilling of the Unisel Main shaft with slurry.	Closing/rehabilitation of Unisel main	Concrete	Volume: 99 400 m ³	Jurgens Hof 490 RD, RE	28° 3' 49.79" S 26° 47' 12.112" E
26	Bambanani East Main	Backfilling of the Bambanani East Main shaft with slurry.	Closing/rehabilitation of Bambanani East main	Concrete	Volume: 193 621 m ³	Klippan 14 RD, 2	28° 2' 28.79" S 26° 48' 11.17" E
27	Bambanani West Main	Backfilling of the Bambanani West Main shaft with slurry	Closing/rehabilitation of Bambanani West main	Concrete	Volume: 95 833 m ³	Klippan 14 RD, 3	28° 1' 49.86" S 26° 47' 15.34" E

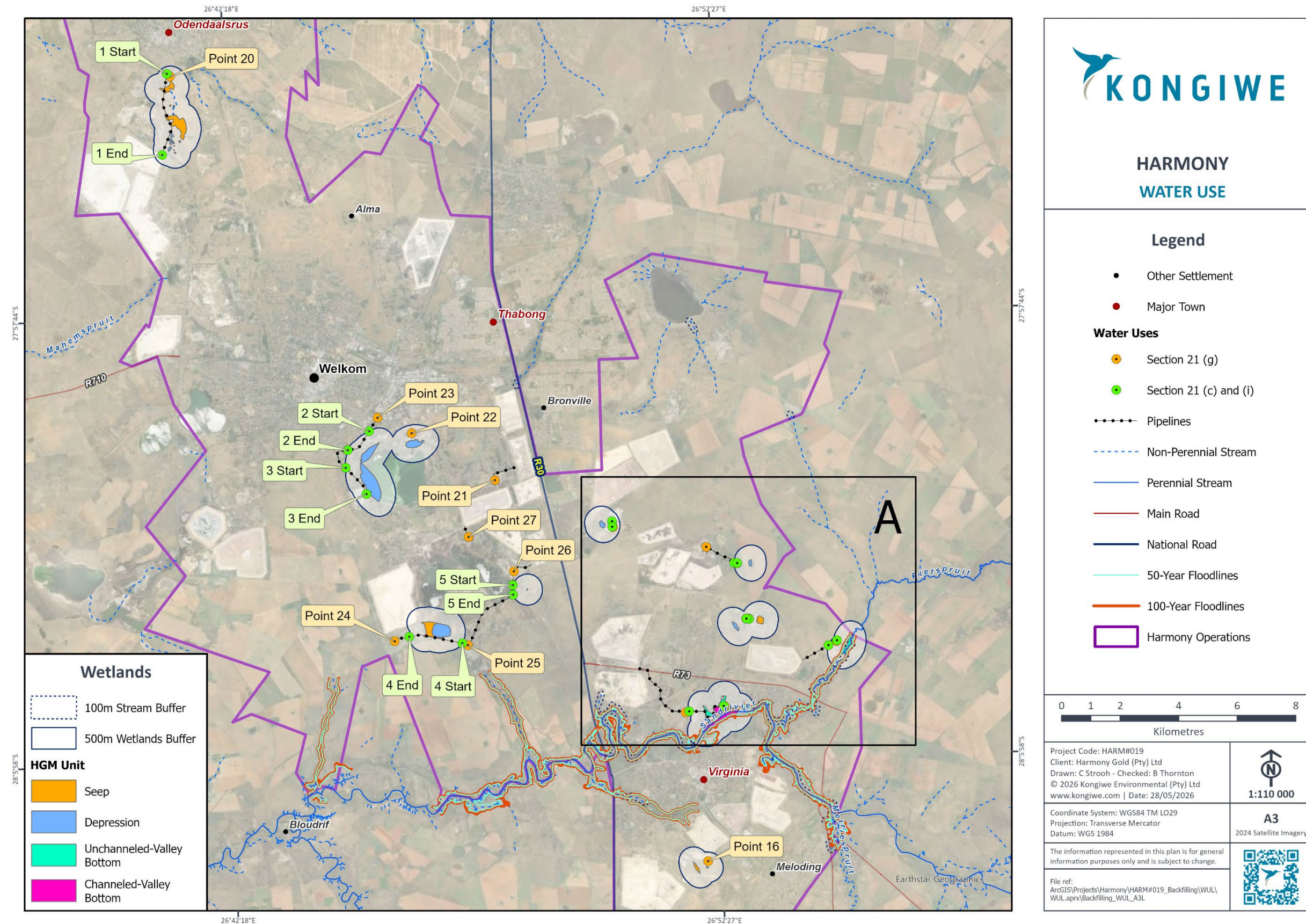


Figure 3-1: Water Use Map for the Proposed Project

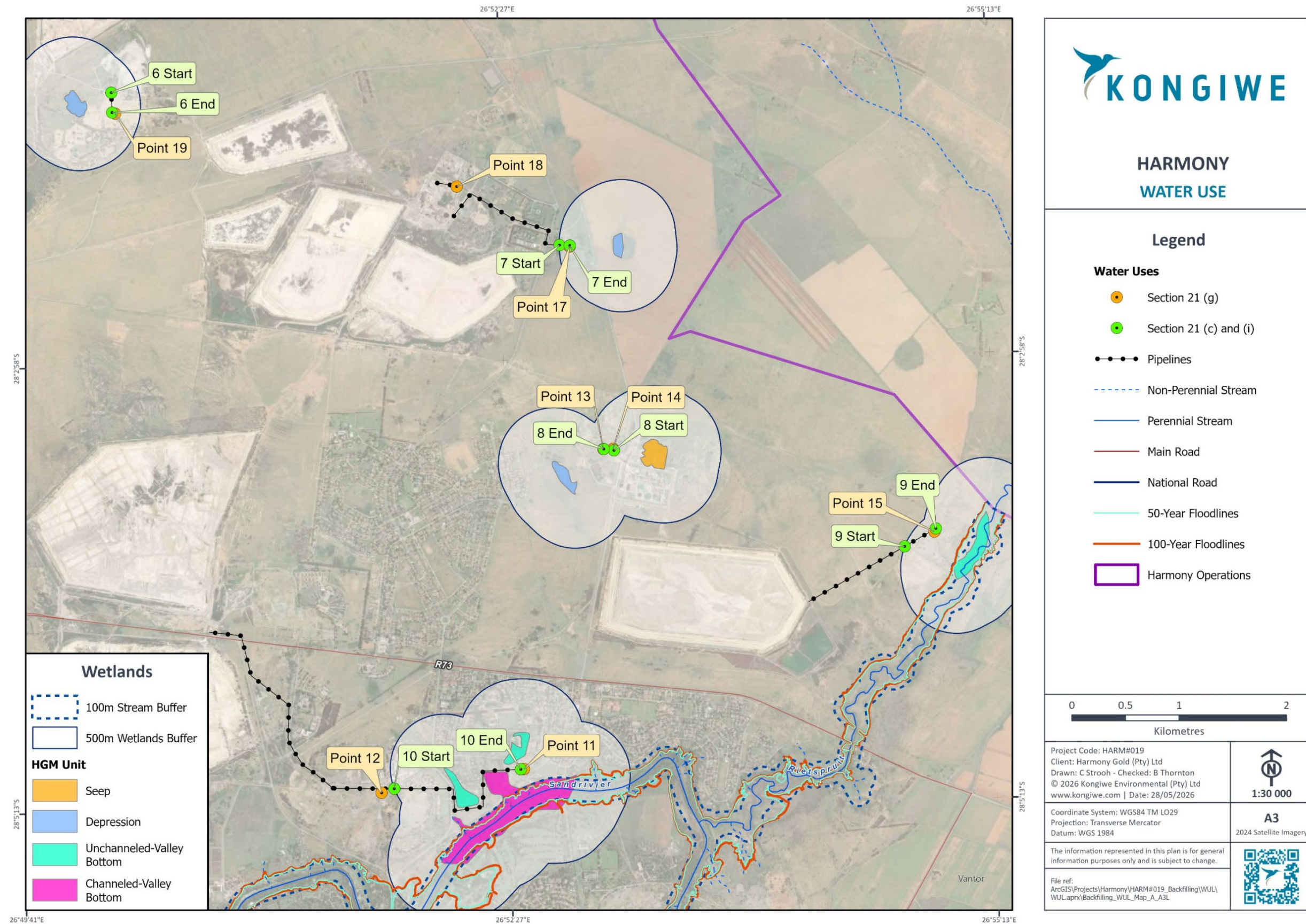


Figure 3-2: Water Use Map A Section for the Proposed Project

3.7 Other Authorisations

The Proposed Project is within Harmony's Mining Right areas which Harmony holds the following Mining Rights for:

- FS 82 MR;
- FS 83 MR;
- FS 84 MR;
- FS 85 MR; and
- FS 227 MR .

4. PRESENT ENVIROMENTAL SITUATION

This Chapter presents information on the status of the biophysical and socio-economic environment associated with the Proposed Project. The assessment is based on available information and the on-site specialist investigations conducted as part of the IWWMP. The full impact assessments undertaken by the independent specialists, including detailed descriptions of the affected environment, are included as appendices of this IWWMP.

4.1 Climate

4.1.1 Regional Climate Rainfall

Rainfall data from 1980 to 2016 was sourced from the National Aeronautics and Space Administration's (NASA's) Modern-Era Retrospective Analysis for Research and Applications, Version 2 (MERRA-2) dataset. The possibility of wet days in Welkom varies notably throughout the year. The mean monthly rainfall is indicated in Figure 4-1. Rainfall is highest in the months of October to April, and lowest over May to September. February has the rainiest days, while July has the fewest rainy days.

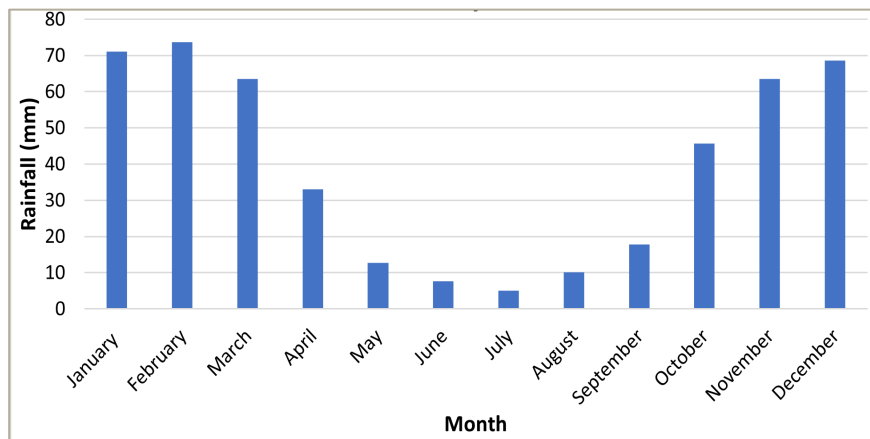


Figure 4-1: Mean Monthly Rainfall for the Area

The storm rainfall depths in the vicinity of Welkom were extracted from the Design Rainfall Estimation in South Africa software programme (Smithers and Schulze, 2002). The programme uses the six closest rainfall stations to a user specified position to calculate the storm rainfall depths. The extracted storm rainfall depths for the project are indicated in Table 4-1.

Table 4-1: Storm Rainfall Depths for the Area

Storm Duration	Storm Rainfall Depth (mm)						
	1:2 yr	1:5 yr	1:10 yr	1:20 yr	1:50 yr	1:100 yr	1:200 yr
5 min	9	13	15	17	20	23	25
10 min	14	19	22	25	30	33	37
15 min	17	24	28	32	38	42	47
30 min	22	30	35	41	48	53	59
45 min	25	34	40	46	55	61	68
1 hr	28	38	45	51	60	68	75

Storm Duration	Storm Rainfall Depth (mm)						
	1:2 yr	1:5 yr	1:10 yr	1:20 yr	1:50 yr	1:100 yr	1:200 yr
1.5 hr	32	43	51	59	69	78	86
2 hr	35	48	56	65	76	85	95
4 hr	41	56	66	76	89	100	111
6 hr	45	61	72	83	98	109	121
8 hr	48	65	77	89	104	117	129
10 hr	51	68	81	93	110	123	136
12 hr	53	71	84	97	114	128	142
16 hr	56	76	90	103	122	136	151
20 hr	59	80	94	109	128	143	159
24 hr	62	83	98	113	133	149	165
1 day	51	69	82	94	111	124	138
2 days	63	85	101	116	136	153	169
3 days	71	96	114	131	154	172	191
4 days	77	104	123	142	167	187	207
5 days	82	111	131	151	178	199	220
6 days	87	117	138	159	187	209	232
7 days	90	122	144	166	196	219	242

4.1.2 Evaporation

Evaporation data from 2000 - 2012 was sourced from the DWS hydrological dataset. The average evaporation based on the data is provided in Table 4-2 (Jones & Wagener, 2017).

Table 4-2: Monthly and Annual Evaporation at the Harmony Free State Operation

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	189	204	225	215	171	159	119	101	77	88	120	161	1869
Minimum	92	99	105	100	95	93	82	76	63	57	64	59	997
Maximum	247	274	315	298	218	218	144	138	97	121	150	234	2197

4.2 Topography

The general topography of the area ranges from 1335 m to 1350. According to the terrain morphological division, they are described as pans and plains (Shangoni, 2009). Figure 4-2 shows the topography of the project area. The elevation within the Project area varies from 1345 metres above mean sea level (mamsl) along the northern side of the Harmony Free State Operations, to 1365 mamsl to the southeastern area of the Project area. The topography in the area has been modified by man-made features such as slimes dams (TSF's), Waste Rock Dumps (WRDs), and solid waste disposal sites.

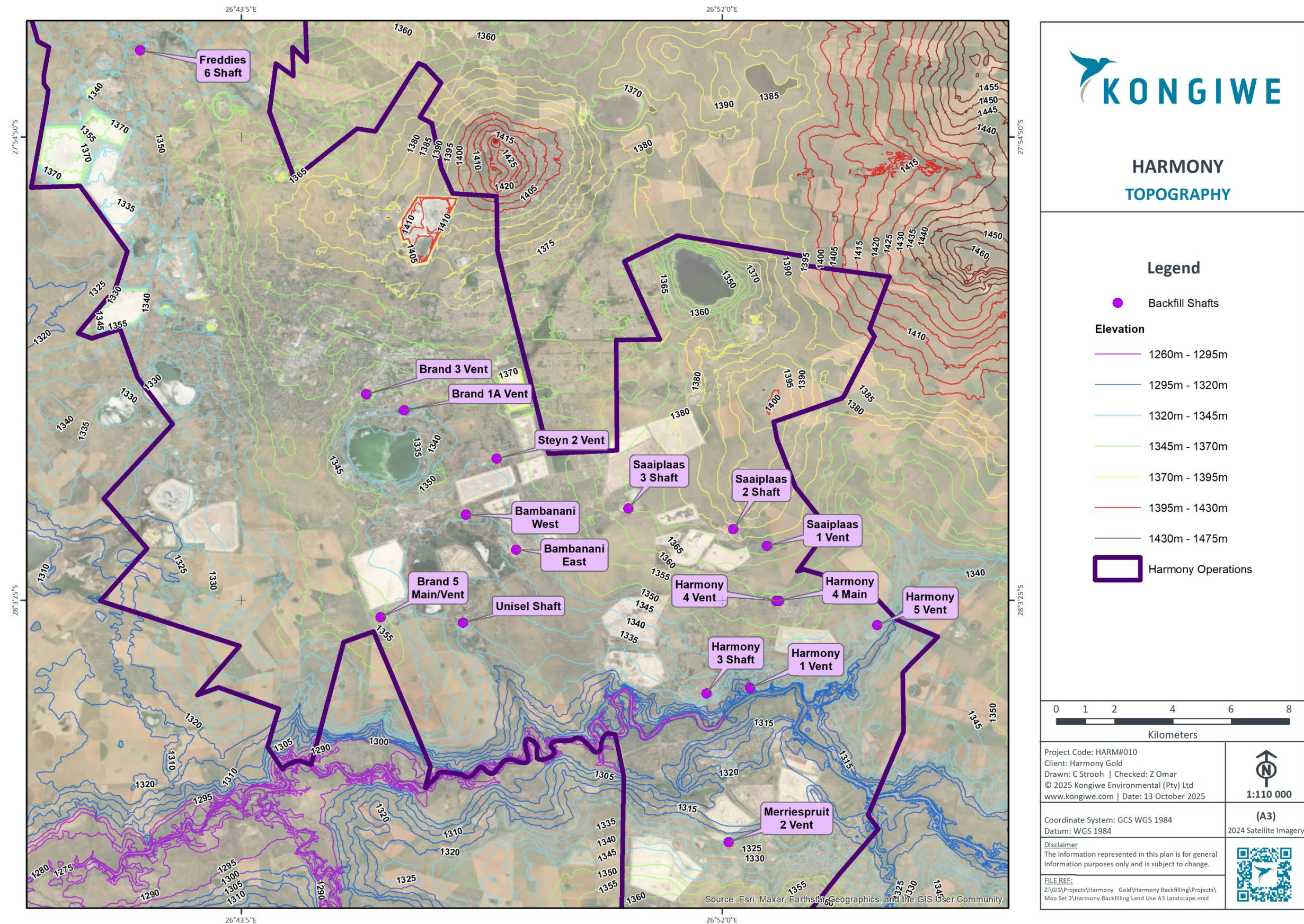


Figure 4-2 : Topography Map

4.3 Geology

The Free State Goldfield which forms as triangle between Allanridge, Welkom and Virginia. produces gold from auriferous bearing reefs situated within sediments of the Central Rand Group of the Witwatersrand Supergroup. A detailed description of the geology of the Welkom Goldfields is provided by in Minter et. al; (1986). In: Anhaeusser, C.R. and Maske, S., Eds., Mineral Deposits of Southern Africa, I. Geol. Soc. S. Afr.

The mine geology, from shallow to deep, consists of the following:

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

4.3.1 Karoo Supergroup

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

According to Tankard et. al. (1982) the Eccca Group (Vryheid Formation) overlies the Dwyka Formation gradationally and comprises predominantly elastic sediments deposited in an extensive landlocked basin experiencing only rare marine incursion. Steyn and Beukes (1977) described the lower Vryheid Formation as upwards-coarsening shale and sandstone cycles, which represent prograding deltaic environments. This in turn is overlain by upwards-fining sandstone and shale cycles, which are of a fluvial origin. The coal beds, which were deposited in the back swamps of meandering river systems, cap the Lower Vryheid lithologies. The depositional environment is believed to be a dendritic channel system that resulted in the deposition of more arenaceous material in the active channels and mud and coal deposited on their floodplains.

Channel closure led to the filling of channels by mud, the establishment of swamps and the deposition of coal beds within them. Similar deltaic and fluvial processes characterise the sediments overlying the coal seams, consisting mainly of alternating sequences of shale and sandstone. The more competent sandstone formations can result in localised hilly terrains. The surface and near surface lithologies comprise topsoil, weathered sandstone and dolerite. The latter is important as it generally forms an impermeable layer, affecting groundwater flow.

Although not exposed on surface the Dwyka Formation underlies the Eccca Group. The Dwyka sediments were deposited during late Carboniferous to early Permian times by glacial processes. The group consists mainly of diamictite (tillite), which is generally massive with little jointing, but it may be stratified in places. The Dwyka diamictite consists of angular to rounded clasts of basement rock embedded in a clay and siltmatrix. Individual clasts measure up to 3m in diameter. Subordinate rock types are conglomerate, sandstone, rhythmite and mudstone (both with and without dropstones).

From a groundwater perspective the Dwyka is considered a very low permeable horizon and classified as an aquiclude. This unit forms a barrier between the upper Karoo aquifer and the lower Witwatersrand aquifer.

Dolerite intrusions are common in this type of geological terrain and represent the roots of the volcanic system and are presumed to be of the same age as the extrusive lavas (Fitch and Miller, 1984). The level of erosion that affected the Main Karoo basin has revealed the deep portions of the intrusive system, which displays a high degree of tectonic complexity. The Karoo dolerite, which includes a wide range of petrological facies, consists of an interconnected network of dykes and sills and it is nearly impossible to single out any intrusive or tectonic event. It would, however, appear that a very large number of fractures were intruded simultaneously by magma and that the dolerite intrusive network acted as a shallow stockwork-like reservoir. Based on the exploration drilling the Karoo Supergroup has an average thickness of approximately 200m.

4.3.2 Ventersdorp Supergroup

The Witwatersrand Supergroup is unconformably overlain by the volcanic and sedimentary rock of the Ventersdorp Supergroup.

Within the Free State Goldfield, the Ventersdorp Supergroup can be divided into the Pniel sequence, the Platberg Group and the basal Kliprivierberg Group consisting of alternating sediments, amygdaloidal and non-amygdaloidal andesitic lavas, luffs and agglomerates (Minter et.al; 1986). Based on the exploration drilling the Ventersdorp Supergroup has an average thickness of 1 300m.

4.3.3 Witwatersrand Supergroup

Within the Free State Goldfield, the Witwatersrand Supergroup, comprising a thick succession of elastic sediments with minor intercalated lava flows, rests on the granites and schist of the Archean Basement. The Central Rand Group of the Witwatersrand Supergroup contains the economic reef horizons mined throughout the basin. The Central Rand Group is dominated by quartzite with minor shale and conglomerate. Several unconformities in the succession are overlain by the economic auriferous paleoplacers (reefs).

The Central Rand Group has been divided into an upper Turffontein Subgroup comprising the Eldorado and Aandenk Formation and a lower Johannesburg Subgroup comprising the Dagbreek, Harmony, Welkom, St Helena and Virginia Formations.

4.3.4 Geohydrological Setting

To understand the geohydrological setting a description of the groundwater occurrence in the region is summarised below.

The Free State mining operations are characterised by two aquifers:

- **A Shallow Weathered and Fractured Karoo Aquifer (Karoo Formations):** A shallow, weathered aquifer exists in the weathered shale and sandstone at an average depth of 10m - 20m below ground level. The most consistent water strike is located at the fresh bedrock / weathering interface:
 - The primary porosity of the Vryheid Formation is very low. Any water bearing capacity is therefore associated with secondary joints, bedding planes and faults. The contact zones of dolerite intrusions are considered the primary source of groundwater flow within the deeper formations.
 - The two aquifers may or may not be hydraulically connected, dependent on the local geology.
- **A Deep Witwatersrand I Ventersdorp Aquifer:** The deep brine Witwatersrand aquifer is situated approximately 300m below surface. This aquifer is thought to be connate (i.e. original formation water) or extremely old (fossil) water and is usually concentrated on geological structures such as fault zones or igneous intrusions (e.g. dykes).

The time gap between the end of the Central Rand Group (CRG) and the start of the Karoo deposition was in the order of 2.3Ga. There is also a significant time gap between the Central Rand Group and the Ventersdorp Supergroup. During these intervening periods, the older rocks were uplifted and exposed to erosion and the near surface rocks to pressure release. This resulted in the forming of fractures in approximately the upper 150 m of the rock succession. Subsequent land surface changes and inundation by a shallow sea allowed marine water to percolate into the network of fractures in the Witwatersrand and Ventersdorp rocks (Young, 1990).

The major fractures that formed during the Ventersdorp tectonic events were filled with water to a depth of several kilometres. The impermeable nature of the overlying Karoo sediments, particularly the Dwyka Formation at the base of the Karoo, effectively sealed off the aquifer (Van Biljon, 1995). Post-Karoo movement and intrusions provided conduits for leakage from the Karoo aquifers to the deep Witwatersrand aquifer. However, the deep aquifer recharge from surface is regarded as negligible and at best localised (Van Biljon, 1995).

This is concluded based on the dewatering of this aquifer over the past 40 years during which the water levels in the Witwatersrand aquifer dropped significantly. Underground dewatering boreholes have dried up in some instances (Van Biljon, 1995).

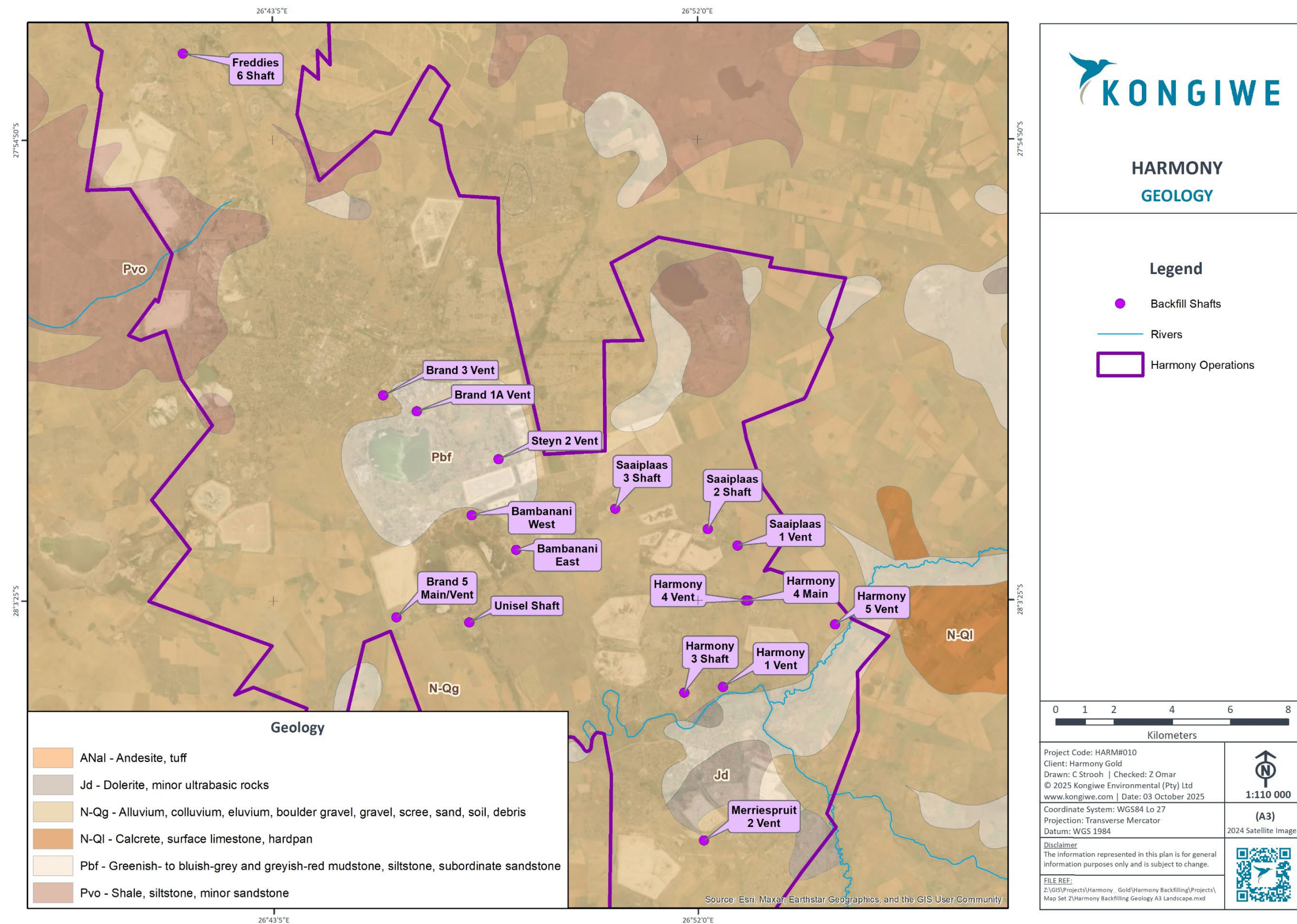


Figure 4-3 : Geology Map

4.4 Soils, Land Use and Land Capability

4.4.1 Soils

The soils in the study area are eutrophic (low leaching potential). The area has loamy sand to the north-east and consists of mostly sands present and sub-dominant on the remaining area. Soil clay class is medium, between 15 and 35%. The swell-shrink potential of the clay is mostly low to very low, however moderate to high swell-shrink potential clays are present to the southern part of the area. Soils have scarce or absent textural transitions with some transition present to the north-west. The dominant land types within the study area (Hydrospatial, 2023) consists of the following soils:

- Bd20, Bc30, Dc8, and Dc9, Bd20 and Bc30 are dominated by permeable Clovelly, Bainsvlei, Avalon and Hutton soils, whilst Dc8 and Dc9, consist mostly of Arcadia, Valsriver, Oakleaf, Katspruit, Hutton and Swartland soils. These soils are all semi-permeable, barring Hutton and Oakleaf which are permeable.

The study area has a low to moderate potential for water erosion and is susceptible to moderately susceptible to wind erosion, this is due to the sandy nature of the soils. Figure 4-4 shows the soil classification of the Project area with Bd20 -Plinthic Catena: Upland duplex and marginalithic soil being the dominant soil type.

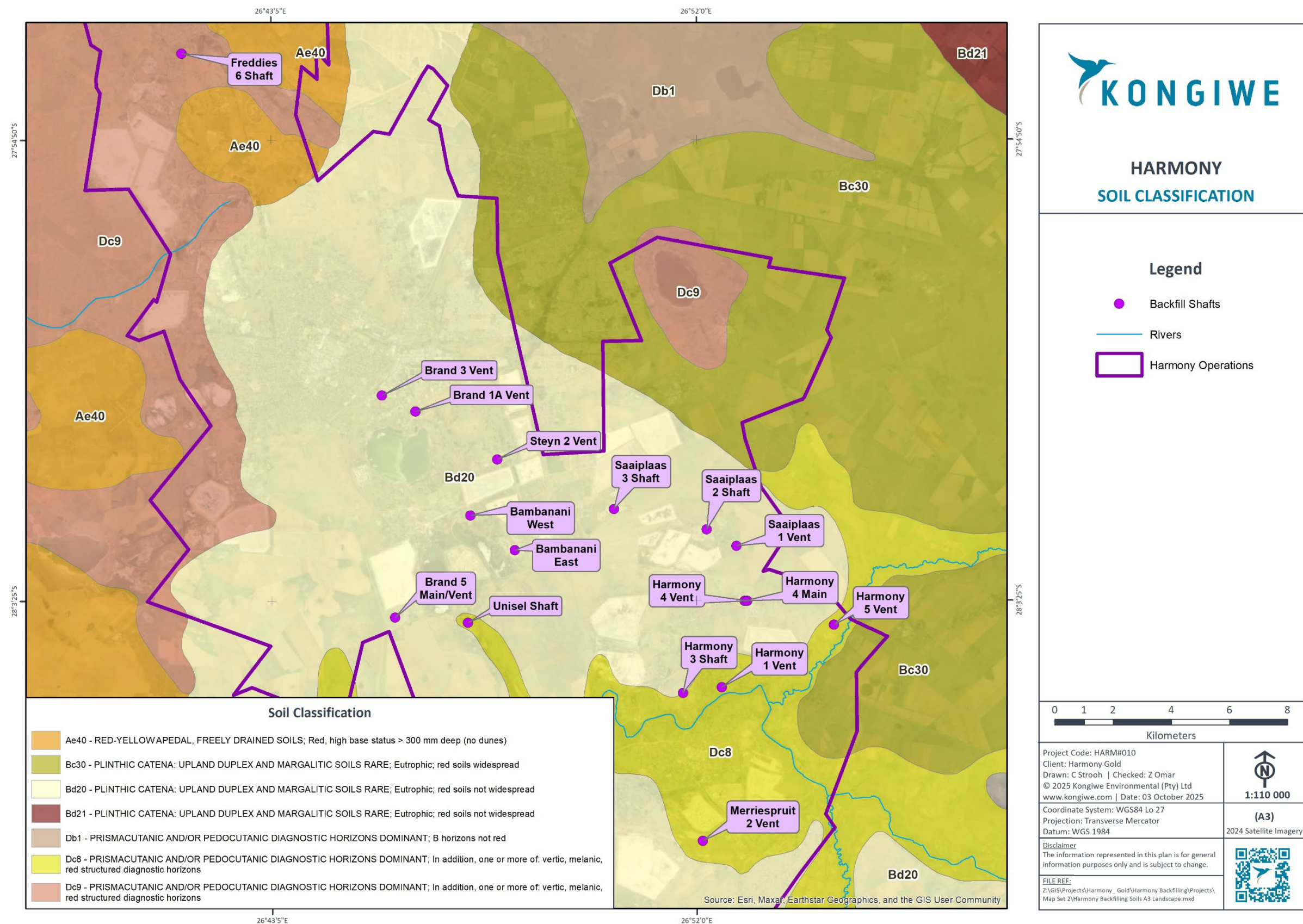


Figure 4-4 : Soil Classification

4.4.2 Land Use and Land Capability

Land cover data was sourced from the Department of Environmental Affairs (DEA) (now the Department of Forestry, Fisheries and the Environment (DFFE)).

Most of the land cover within the Project area is classified as mine tailings and resource dumps, commercial annual crops, natural grassland and formal residential areas. Figure 4-5 illustrates land cover across the Harmony Free State Operations.

Historically the area (pre-mining) was used for grazing and crop planting, but the majority of the area was earmarked for urban extension. Historically, the agricultural production on neighbouring farms consisted of maize crops in summer and wheat in winter, normally planted on a rotational basis. Sunflower crops were alternated with the maize crops on occasion. The Project area is dominated by TSFs, WRDs, residential, grazing and crop production.

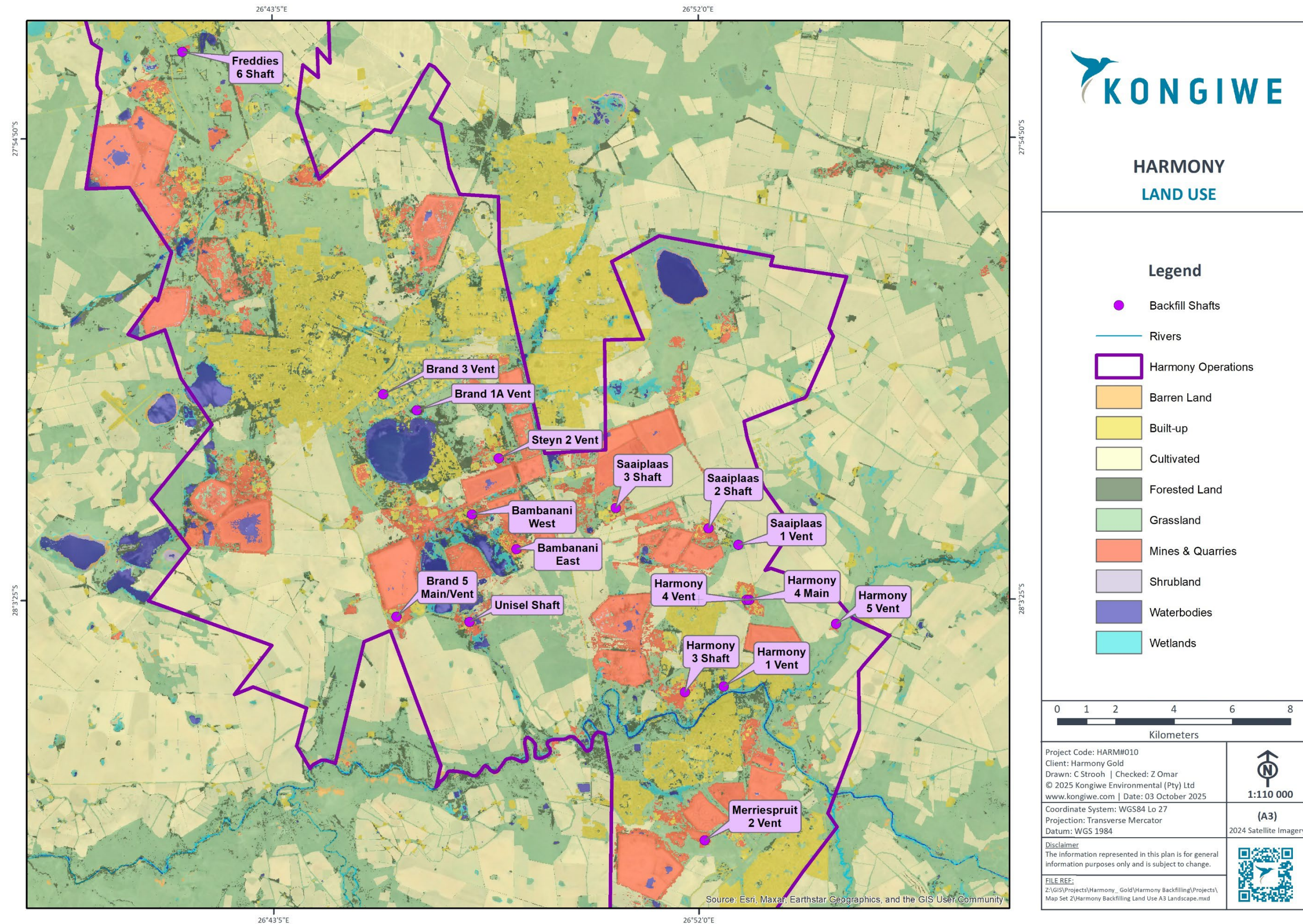


Figure 4-5: Land Use Map

4.5 Water Management Area

The Proposed Project is located within the Highveld Ecoregion, within the Vaal-Orange Water Management Area (WMA). The Proposed Project is located within quaternary catchment C25B, C42J, and C43B as shown in Figure 4-6

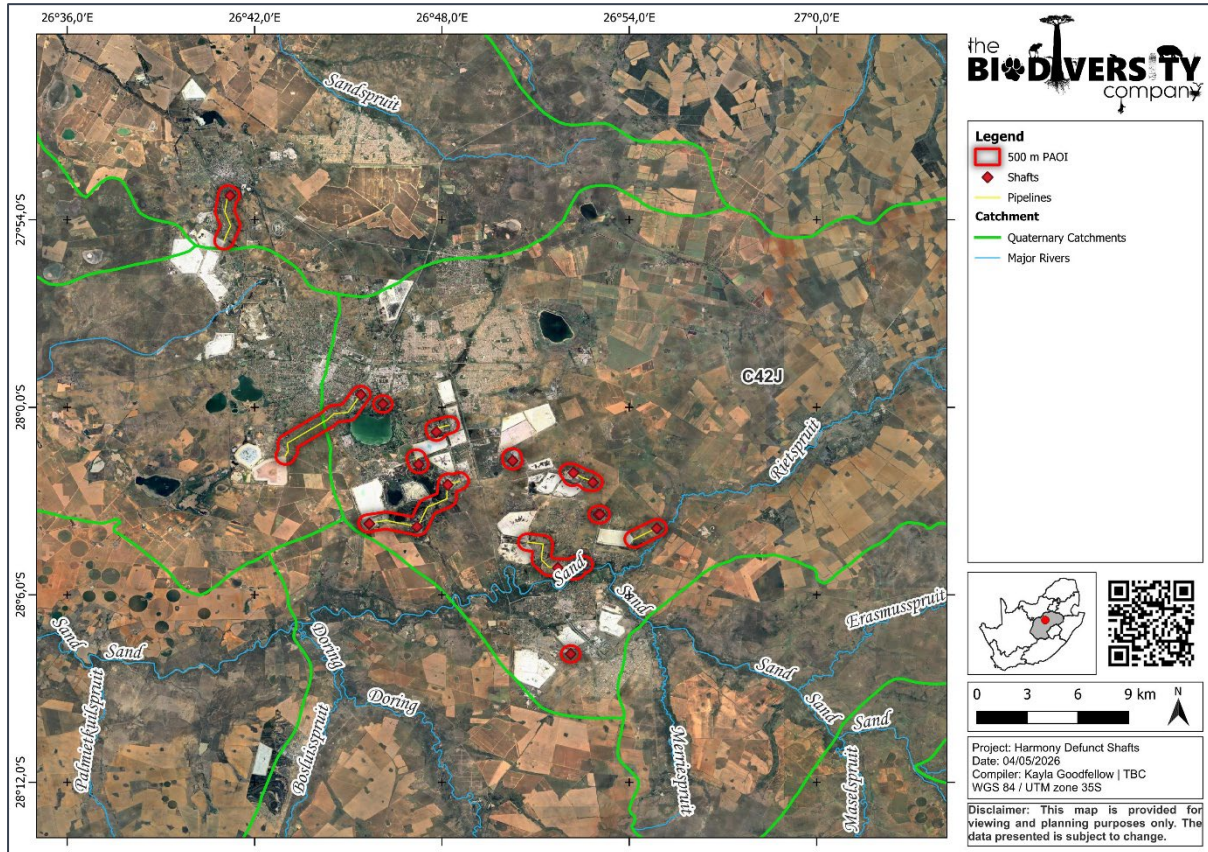


Figure 4-6: Quaternary Catchments with the Project Area (The Biodiversity Company, 2026)

4.6 Wetlands

Refer to Specialist Study: Appendix A –Wetland Impact Assessment

4.6.1 Wetland Delineation

A field survey for the area was undertaken on 28 and 29 April 2026, which is a late wet-season survey, to identify the presence of freshwater features (wetlands) and to delineate their spatial extent. A total of 19 Hydromorphic (HGM) units were identified within the Project Area of Influence (PAOI). The HGM consists of five seep wetlands (HGM 1, HGM 2, HGM 4, HGM 15, HGM 17), ten depression wetlands (HGM 3, HGM 5, HGM 9 – HGM 14, HGM 18 & HGM 19), three unchanneled valley-bottom (UVB) wetlands (HGM 6, HGM8, HGM 16) and one channelled valley-bottom (CVB) wetland (HGM 7) (see Figure 4-7– Figure 4-10).

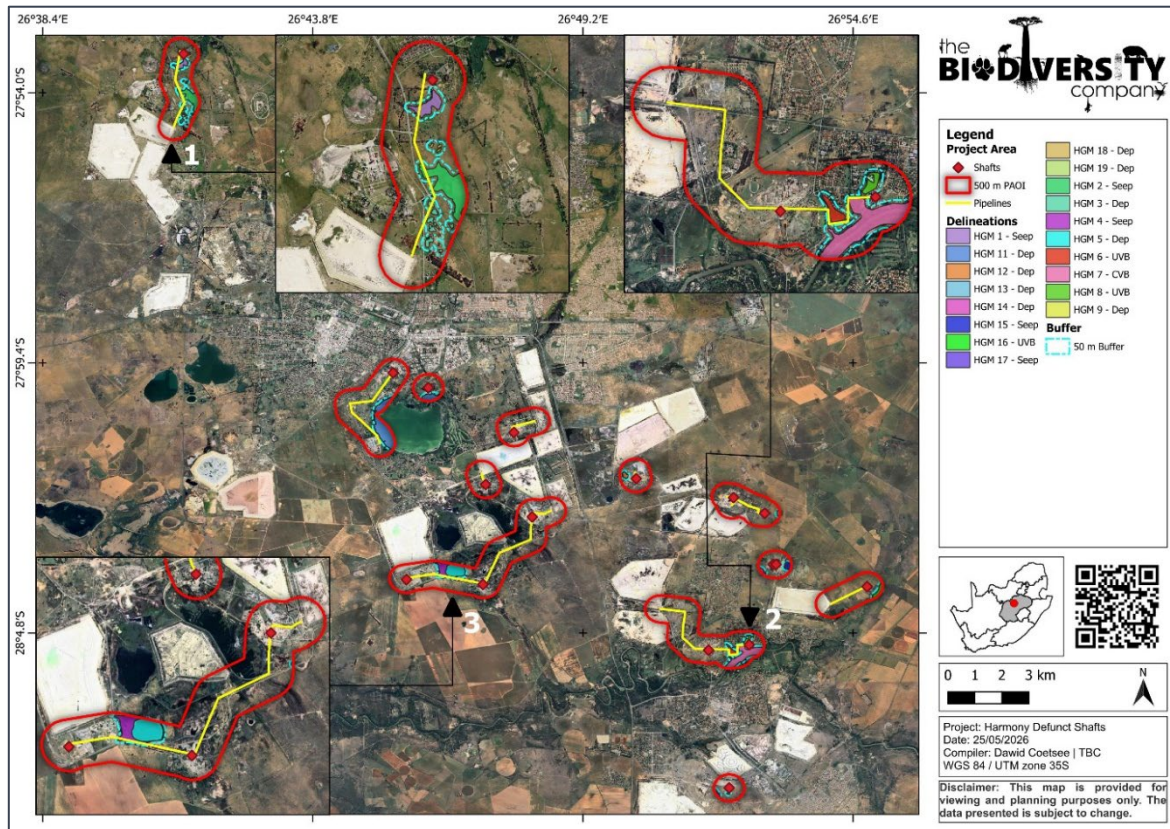


Figure 4-7: Delineation of the Watercourses Within the PAOI (The Biodiversity Company, 2026)

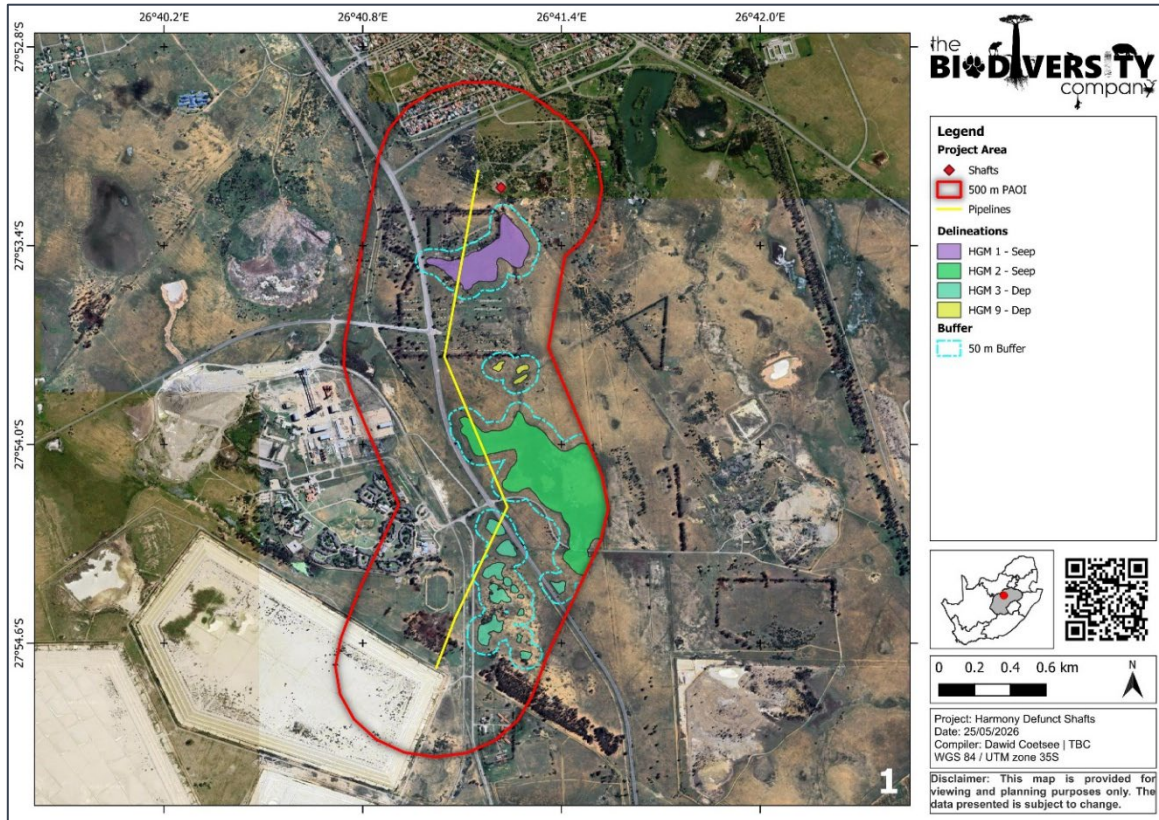


Figure 4-8: Delineations of the Watercourses Within Cluster 1 Within the PAOI (The Biodiversity Company, 2026)

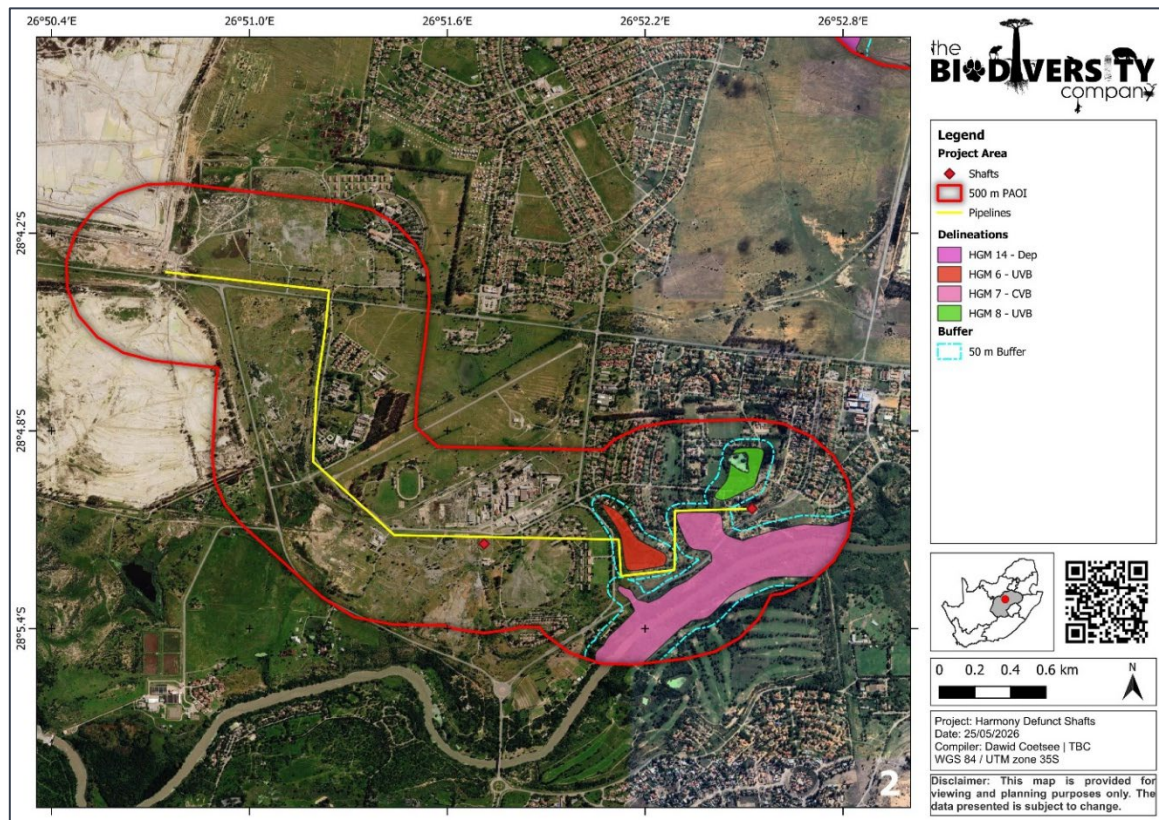


Figure 4-9: Delineation of the Watercourses Within Cluster 2 Within the PAOI (The Biodiversity Company, 2026)

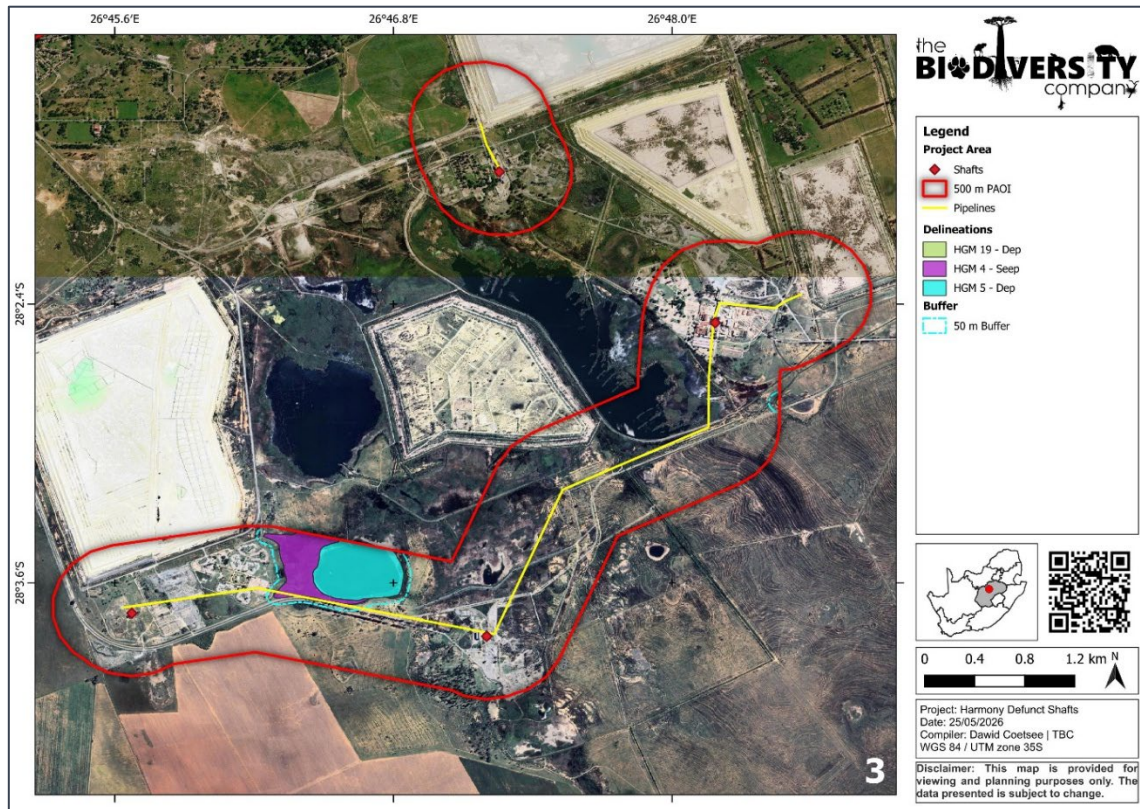


Figure 4-10: Delineation of the Watercourses Within Cluster 3 Within the PAOI (The Biodiversity Company, 2026)



Figure 4-11: Representative Photographs of the Different Identified Features Within the PAOI. A) Seep; B) Depression; and C) Unchanneled Valley-Bottom

4.6.2 Risk Screening

Table 4-3 provides the results of risk screening for the delineated wetlands and provides motivation for each of the determined categories. Only HGMs 1 through to HGM 8 were identified to be “At-Risk”. This is attributed to the proximity of the activities to the watercourses in conjunction with the interconnectivity of the watercourses.

Table 4-3: Risk status of the delineated wetlands

HGM unit	Risk Status	Rationale
HGMs 1 to 8	At Risk	These HGM units were overlapped by the proposed activities, located within proximity of the proposed activities or downslope of the activities and, have therefore been determined as “At Risk”. It is

HGM unit	Risk Status	Rationale
		anticipated that direct and / or indirect impacts to the wetland systems are potential.
HGMs 9 to 19	Not at Risk	These HGM units were situated outside the PAOI (Pipelines) and are not expected to be affected by any direct or indirect impacts associated with the development. As a result, these wetland systems are considered “Not at Risk,” and their functions and habitat integrity are expected to be maintained.

4.6.3 Ecosystem Services

The ecosystem services provided by the relevant HGM units on site were assessed and rated using the WET-EcoServices method (Kotze et al., 2009). The results of the assessment are presented in Table 4-4. The ecosystem services scores of the assessed wetlands ranges from “**Moderately Low**” to “**Moderately High**”.

The delineated wetlands within the Project area provide a range of regulating and supporting ecosystem services despite varying levels of modification. These include attenuation of surface runoff, temporary water storage, maintenance of local hydrological connectivity, sediment trapping, erosion reduction, and enhancement of water quality through the retention and filtration of suspended material and contaminants. Seepage wetlands additionally reflect groundwater-driven processes and contribute to the maintenance of local soil moisture regimes. Collectively, the wetland systems also provide habitat and movement corridors for wetland-associated flora and fauna, thereby supporting ecological functioning within the surrounding landscape.

Table 4-4: Summary of the average Ecosystem Scores of the Assessed Wetland Units

Moderately Low	Intermediate	Moderately High
HGM 3	HGM 1	HGM 7
HGM 5	HGM 2	-
-	HGM 4	-
-	HGM 6	-
-	HGM 8	-

4.6.4 Present Ecological State

The wetlands identified within the Project area have exhibited some degree of modification resulting from natural physical changes as well as anthropogenically induced impacts at both the local and catchment level. Resultingly, the wetlands scored average Present Ecological State (PES) scores within the “D – Largely Modified” PES class. The results of the wetland health and integrity assessment is provided in Table 4-5.

Table 4-5: Average Present Ecological State scores for the assessed wetland

D - Largely Modified	
HGM 1	HGM 5
HGM 2	HGM 6

D - Largely Modified

HGM 3	HGM 7
HGM 4	HGM 8

The list below refers to the present-day local impacts observed within the assessed wetland areas:

- Alterations to hydrology and geomorphology through the presence and operation of existing roads and crossings within the wetland catchment;
- Loss of vegetation through mining activities and urban encroachment;
- Water quality impairments from runoff from impermeable surfaces and contaminated runoff from within the catchment;
- Proliferation of alien invasive vegetation;
- Channel straightening;
- Induced wetness from impoundments, mining activities, and urban encroachment; and
- Erosion of watercourses from altered hydrology and geomorphology.

4.6.5 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) assessment was applied to the HGM units in conjunction with the ecosystem service scores in the preceding sections to assess the levels of sensitivity and ecological importance of the wetlands. Various components pertaining to the protection status of a wetland is considered for the EIS, including Strategic Water Source Areas (SWSA), the NFEPA Wetveg protection status and the protection status of the wetland itself considering the NBA wetland dataset. The results of the assessment are shown in Table 4-6. The wetlands average EIS scores present within the “A – Very High” and “C – Moderate” class.

Table 4-6: Aspects considered in the Ecological Importance and Sensitivity assessment

HGM No.	NFEPA Wet Veg			Wetland Condition (Field Survey)	NBA Wetlands		SWSA (Yes/No)	CBA / ESA (Yes/No)	EIS Class
	Type	Ecosystem Threat Status	Ecosystem Protection Level		Ecosystem Threat Status 2018	Ecosystem Protection Level			
HGM 1, 2, 4 Seep	Dry Highveld Grassland Group 3	Endangered	Not Protected	D Largely Modified	Critically Endangered	Not Protected	No	Yes (CBA, ESA)	A – Very High
HGM 3, 5 Depression		Least Threatened		D Largely Modified	Least Threatened	Poorly Protected		Yes (ESA)	C – Moderate
HGM 6, 8 UVB		Least Threatened		D Largely Modified	Critically Endangered	Not Protected		Yes (ESA)	B – High
HGM 7 CVB		Least Threatened		D Largely Modified	Critically Endangered	Not Protected		Yes (ESA)	B – High

4.6.6 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the wetland areas were determined from the results of the PES and EIS assessments. These assessments indicated that all wetland features within the site had, to an extent, undergone transformation as a result of historical and current impacts. Nevertheless, despite the altered ecological integrity of these systems, they are considered to provide ecological services. The appropriate REC and RMO estimated for the wetland areas is presented in Table 4-7 below.

Table 4-7: Summary of the REC and RMO categories assigned to the relevant wetlands

C – Improve	C/D – Improve	D – Maintain
HGM 1	HGM 6	HGM 3
HGM 2	HGM 7	HGM 5
HGM 4	HGM 8	-

4.6.7 Buffer Requirements

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane et al., 2014). The recommended buffer zones are presented in Figure 4-13 to Figure 4-15. HGM 1, HGM 2 and HGM 4 will have moderate post-mitigation risk rating due to the construction of temporary slurry pipelines and temporary pipeline crossing. Therefore, the post-mitigation buffers for the wetlands in relation to the proposed assessment area were calculated to be 50 m.

In the context of the proposed slurry pipelines, the buffer serves several critical functions: it provides a protective zone to intercept and filter potential pollutants (such as sediment, hydrocarbons, and heavy metals) before they reach the wetland, helps to maintain the natural hydrological regime by reducing surface runoff velocity and promoting infiltration, and safeguards the integrity of wetland habitat for biodiversity. The 50 m buffer is therefore justified as a precautionary measure to minimise these risks, maintain ecosystem services, and comply with the precautionary principle embedded in South African environmental legislation. This width is consistent the minimum necessary to provide effective mitigation for the anticipated impacts of prospecting and potential future mining activities. It should, however, be noted that certain sections of the proposed pipeline are located within wetlands and therefore within the recommended buffer.

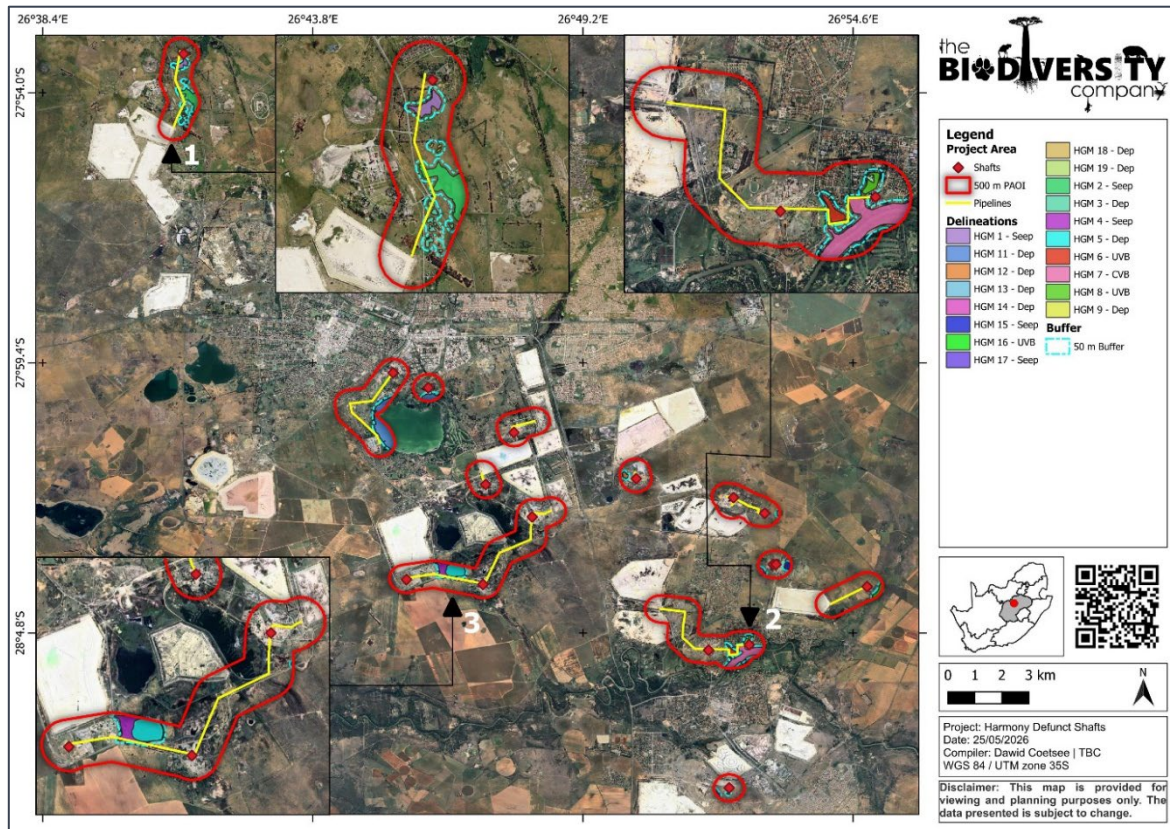


Figure 4-12: Recommended Buffers for the Identified Wetlands in Relation to the Proposed Development

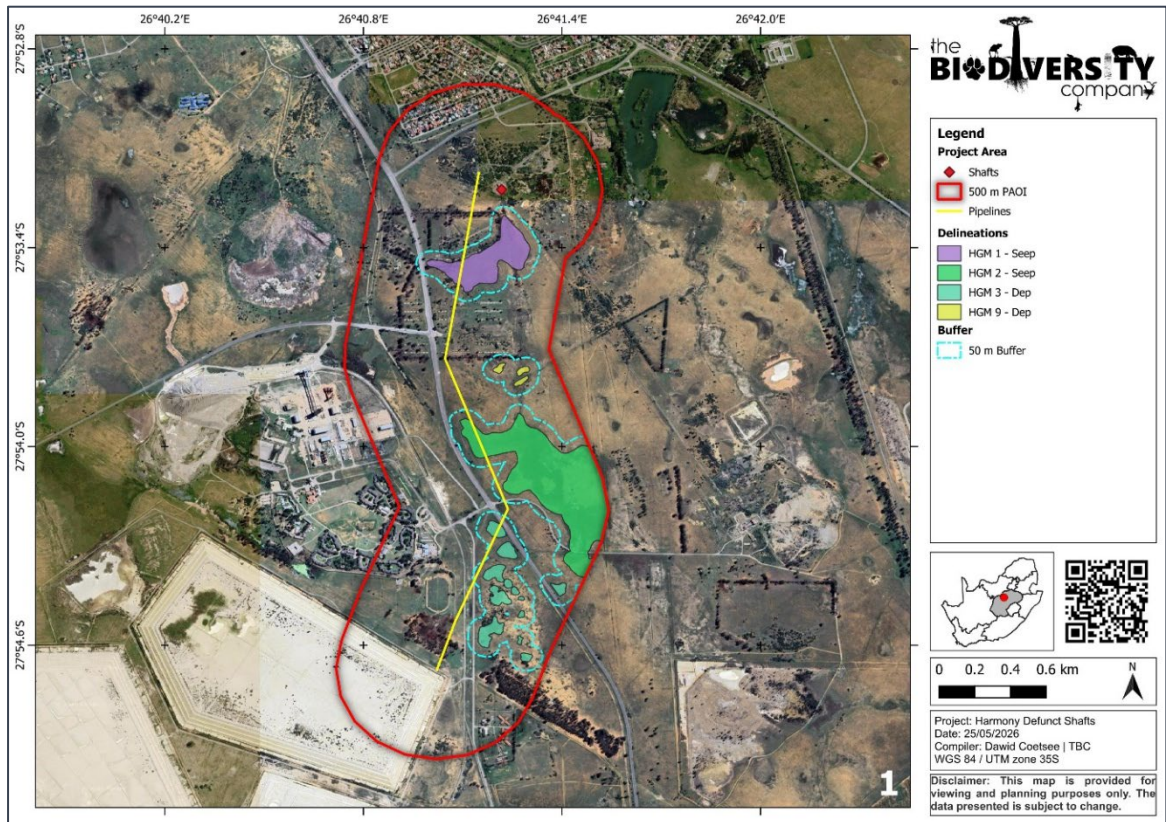


Figure 4-13: Recommended Buffers for the Identified Wetlands Within Cluster 1 in relation to the Proposed Development

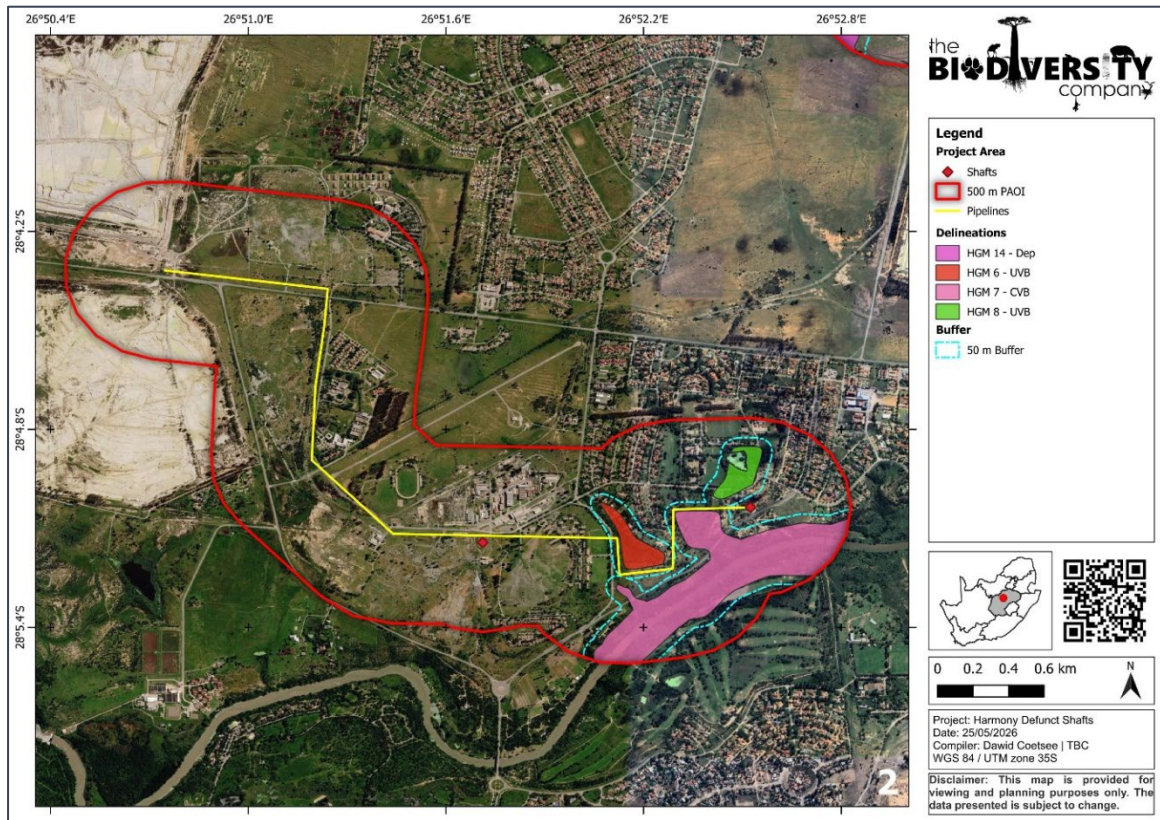


Figure 4-14: Recommended Buffer for the Identified Wetlands Within Cluster 2 in Relation to the Proposed Development

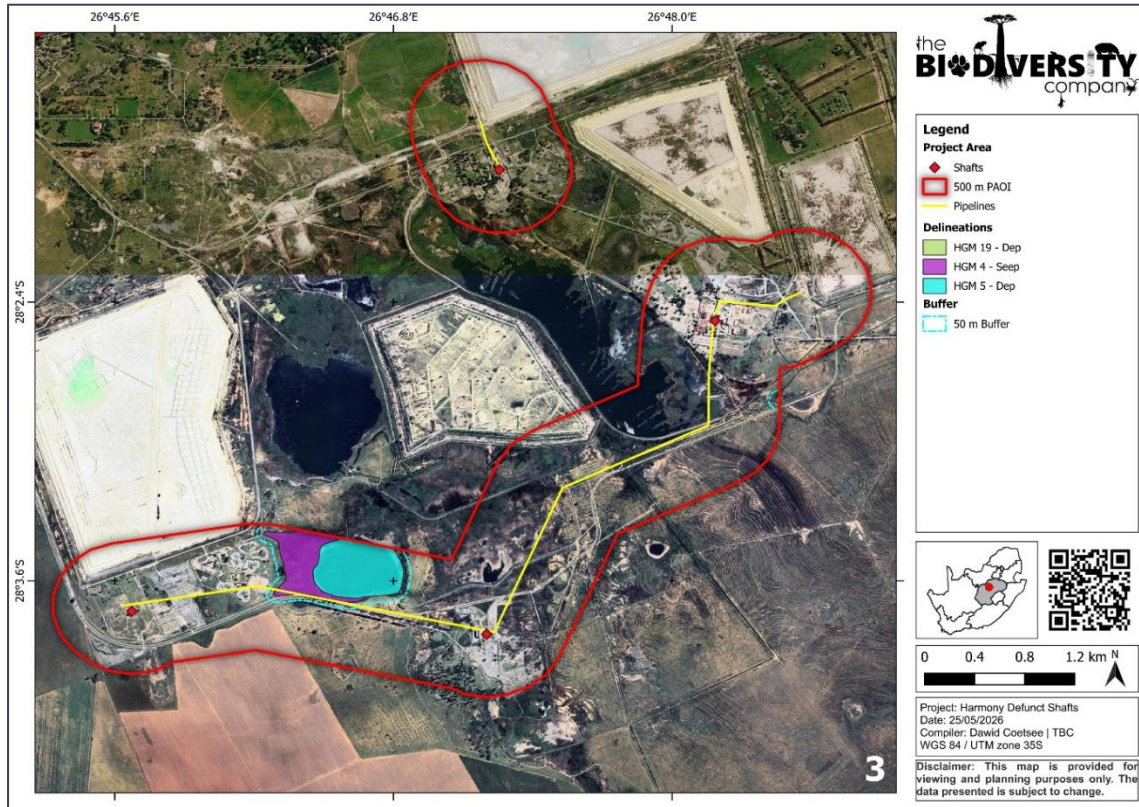


Figure 4-15: Recommended Buffers for the Identified Wetlands Within Cluster 3 in Relation to the Proposed Development

4.6.8 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 4-8 below. A summative explanation for each result is provided as relevant. It should be noted that the National Web-based Environmental Screening Tool allocates sensitivities to freshwater resources identified through the available national freshwater datasets based on their presence (very high) or absence (low). The specialist-assigned sensitivity ratings presented herein for the natural and assessed wetlands have considered the ecological characteristics of the delineated features.

The specialist-assigned sensitivity ratings are informed by desktop screening and field verification, including observed wetland indicators and habitat characteristics, and consideration is given to any observed or likely presence of sensitive fauna and flora. The sensitivities are displayed in Figure 4-16.

Table 4-8: Summary of the Screening Tool Versus Specialist Assigned Sensitivities

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
HGM 1 – HGM 6, HGM 8	Aquatic Biodiversity Theme	Low	Medium	Disputed – Wetland systems were identified in these areas, in contrast to the screening tool results. Although, these wetlands are the smaller systems with reduced connectivity and have reduced ecological function and service provision resulting from

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
				modification in comparison the larger valley-bottom systems identified within the PAOI.
HGM 7		Low	Very High	Disputed – This is a larger intact valley-bottom system which retains good residual function and sensitivity by providing important ecological services. This wetland also has direct hydrological and ecological connectivity within the valley-floor network and downstream perennial systems.
50 m Buffer		Low	Medium	Disputed – Buffers play a role in protecting adjacent wetlands from edge effects and supporting ecological connectivity and their sensitivity is therefore determined by the features they encompass.
Remaining Area		Low	Low	Validated – No natural wetland or freshwater ecosystem identified within this area.

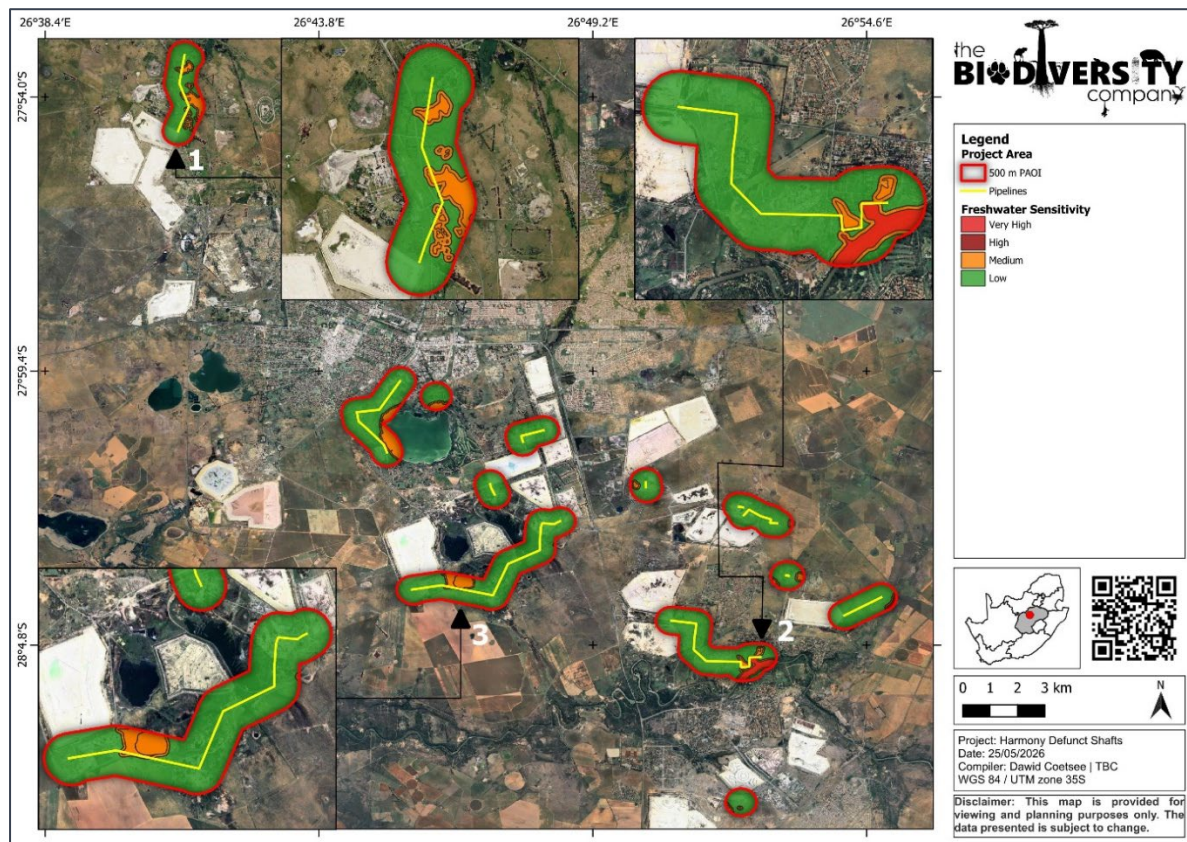


Figure 4-16: Freshwater Sensitivity for the PAOI

4.7 Groundwater

Refer to Specialist Study: Appendix B – Groundwater Study

Harmony is underlain by older strata of the Karoo Supergroup, which are represented by the argillaceous rocks (such as shale, siltstone and mudstone) of the Eccca Group and the arenaceous rocks (such as sandstone) of the Beaufort Group. The hydrogeological environment of the area is represented by a moderately productive resource that comprises mainly of intergranular and fractured aquifers (WRC, 2013).

4.7.1 Aquifer Characterisation

The identified aquifers in the Harmony Free State Operations include the shallow aquifer and the deep aquifer (Figure 4-17). The shallow aquifer is present in the near surface weathered Karoo formations, while the deep aquifer has poor water and is present in the fractured and faulted Witwatersrand and Ventersdorp sequences. The two aquifers are not interconnected. The existence of a persistent impervious layer has led to the occurrence of artesian water intersections and the subsequent development of two distinctly separate water tables within the Welkom Goldfields.

The shallow aquifer is usually confined to semi-confined and is further divided into two sub-units which include the shallow perched aquifer and the deeper fractured rock aquifer. Groundwater seeps from the perched aquifer into the fractured rock aquifer as the two aquifer sub-units are interconnected. The perched aquifer is located in the weathered zone. The depth of the weathered zone is unknown, but this zone typically extends to depths of between two and 10 m below surface and is restricted to the soil and sub-soil horizons.

The base of the perched aquifer is formed by the transition between the weathered and competent rock in places that are associated with clay of ferricrete. The water level is perched and may be artesian in places because of the impermeable shale horizons which results in many natural springs and/or wetlands. Groundwater is found in two predominant places, namely on the contact zones with dolerite intrusions and on the lithological contact between the Karoo sediments and the Ventersdorp lavas.

Pumping from the deep aquifer system was initiated across the Free State Gold Fields in 1952 to dewater working areas. Rest water levels have declined by hundreds of meters since dewatering was initiated. However, no corresponding drop in water levels within the shallow aquifer has been noted as a response to dewatering, providing further evidence that the shallow and deep aquifer systems are not hydraulically connected. The extreme depth of the aquifer and the low permeability of the confining strata ensure that this aquifer receives minimal recharge, which has contributed to the progressive deterioration of water quality within this aquifer (Harmony Saaiplaas EMPR, 2002). The origin of groundwater within the deep aquifer is less well understood but is thought to be connate (original formation water) or extremely old (fossil) and is usually concentrated on geological structures such as fault zones or igneous intrusions (e.g. dykes).

The depth of the fossil aquifer associated with the Witwatersrand rocks was approximated with a finite element simulation program by the WRC to be 300m below surface. Mining prospecting boreholes indicated this level to be between 170 to 270 m.

The original occurrence of artesian water intersections and the subsequent self-evident development of two distinctly separate water tables within the Welkom Goldfields have to be based on the existence of a persistent impervious layer. Considering the fact that the early artesian intersections were always associated with pre-Karoo rocks and the fact that the layers of the Eccca Group represent the only persistent stratigraphic zone in the required position, it has to be accepted that this group represents the impervious layer responsible for the development of artesian conditions. It need hardly be emphasised that the relatively undisturbed, impervious and incompetent nature of the shales of the Eccca Group result in this zone being an ideal barrier between the two water systems. The only possible alternative would be the Ventersdorp Supergroup, but this possibility may

be eliminated without reservation on the grounds that many artesian intersections occurred within this zone and that layers of this group are, by far, too limited in their aerial distribution to explain the observed facts (Bekker, 1986).

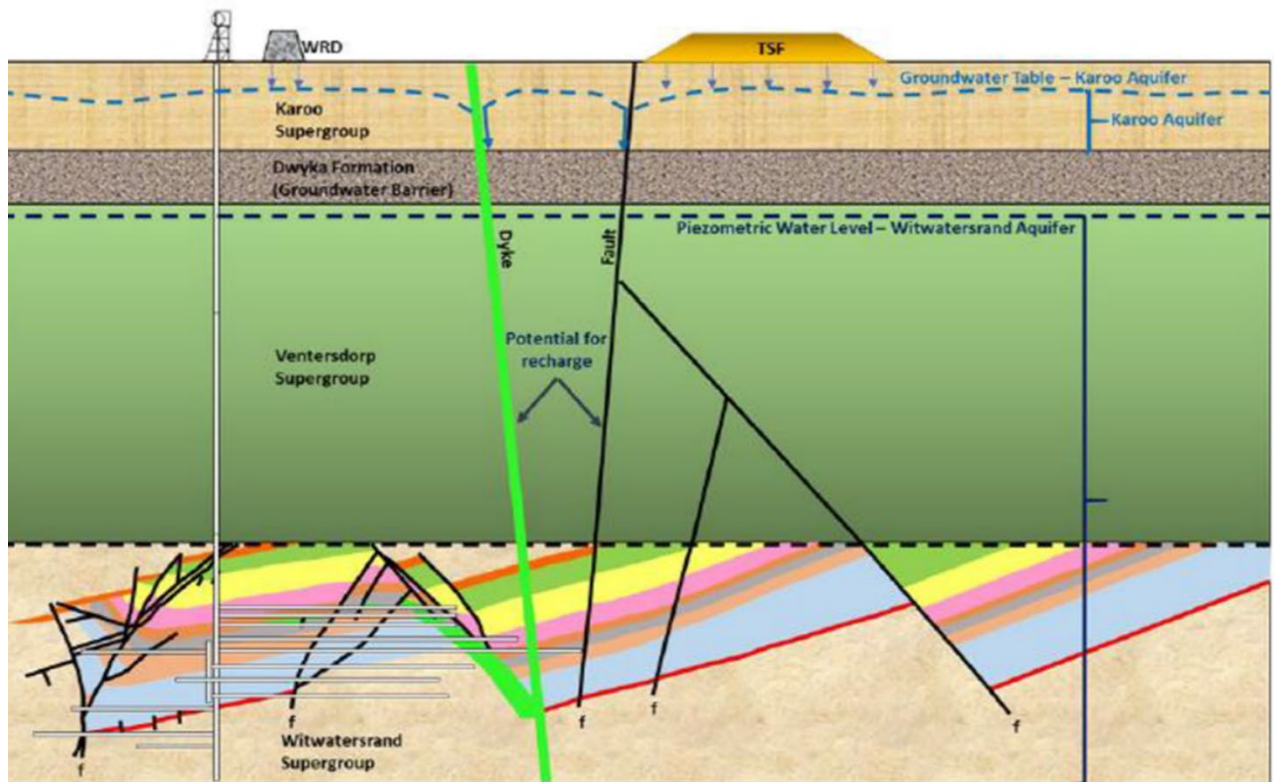


Figure 4-17: Aquifers in the Free State Region

4.8 Hydrocensus

4.8.1 Groundwater Monitoring Borehole Positions

AquiSim Consulting (2025) conducted a hydrocensus across the entire Free State Operations, during which monitoring boreholes were identified. These boreholes are spatially distributed around the TSFs and other Harmony Operation's infrastructure to monitor groundwater conditions, and assess potential impacts associated with Harmony's existing infrastructure and activities. Table 4-9 shows the monitoring parameters while Table 4-10 shows monitoring locations.

Table 4-9: Groundwater Monitoring Parameters

Parameter	Limit	Unit	Source
pH	5-9.7	pH	PGWQR 2013 (GRU 3a)
EC	141.2	mS/m	PGWQR 2013 (GRU 3a)
Calcium carbonate (CaCO_3)	228.4	mg/L	PGWQR 2013 (GRU 3a)
Cl	1113.2	mg/L	PGWQR 2013 (GRU 3a)
NO_2	9.1	mg/L	PGWQR 2013 (GRU 3a)
SO_4	486.1	mg/L	PGWQR 2013 (GRU 3a)
Calcium (Ca)	197.5	mg/L	PGWQR 2013 (GRU 3a)

Parameter	Limit	Unit	Source
Magnesium (Mg)	149.4	mg/L	PGWQR 2013 (GRU 3a)
Potassium (K)	587.6	mg/L	PGWQR 2013 (GRU 3a)
Sodium (Na)	587.6	mg/L	PGWQR 2013 (GRU 3a)
TON		mg/L	

The specific groundwater quality monitoring locations are listed in Table 4-10. For the purpose of the Proposed Project and this report, not all of Harmony Free State Operations' groundwater monitoring boreholes have been included in this table. Only boreholes that are in the vicinity of the Proposed Project area have been considered.

Table 4-10: Groundwater Quality Monitoring Location

Site	Latitude	Longitude
BH 10	28° 00' 25.53" S	26° 46' 29.86" E
BH 11	28° 01' 09.77" S	26° 49' 13.11" E
BH 14	28° 01' 57.58" S	26° 47' 11.13" E
BH 144	27° 54' 57.34" S	26° 39' 08.31" E
BH 15	27° 59' 48.66" S	26° 46' 06.19" E
BH 16	27° 59' 14.89" S	26° 47' 14.97" E
BH 186	28° 01' 20.68" S	26° 46' 29.91" E
BH 188	28° 01' 54.18" S	26° 45' 47.38" E
BH 195	27° 51' 53.10" S	26° 43' 05.69" E
BH 198	27° 51' 40.94" S	26° 42' 52.27" E
BH 1A	28° 00' 35.14" S	26° 48' 10.00" E
BH 211	27° 57' 11.14" S	26° 41' 29.04" E
BH 212	27° 57' 31.93" S	26° 42' 34.63" E
BH 227	28° 01' 07.29" S	26° 44' 46.72" E
BH 228	28° 00' 54.76" S	26° 45' 08.65" E
BH 2A	28° 01' 09.27" S	26° 48' 48.40" E
BH 3	28° 05' 40.11" S	26° 48' 08.71" E
BH 3A	28° 01' 34.45" S	26° 48' 20.75" E
BH 3B	28° 01' 34.64" S	26° 48' 20.57" E
BH 43	27° 56' 21.76" S	26° 40' 35.81" E
BH 6	28° 04' 18.52" S	26° 47' 13.67" E
BH 7	28° 03' 28.61" S	26° 46' 54.54" E
BH 71	27° 54' 16.23" S	26° 39' 30.95" E

Site	Latitude	Longitude
BH 91	27° 58' 17.29" S	26° 41' 47.48" E
BH 16	27° 59' 6.85" S	26° 47' 14.96" E
BH 17	27° 59' 0.96" S	26° 47' 16.84" E
BH 19	27° 58' 44.27" S	26° 47' 36.3" E
BH 1H	28° 03' 13.63" S	26° 50' 1.57" E
BH 20	27° 58' 58.85" S	26° 47' 24.18" E
BH 200	27° 58' 26.34" S	26° 52' 48.09" E
BH 20H	28° 05' 19.47" S	26° 52' 2.59" E
BH 21	27° 59' 2.79" S	26° 47' 30.8" E
BH 25H	28° 06' 40.46" S	26° 54' 20.45" E
BH 27	28° 01' 34.15" S	26° 50' 21.01" E
BH 29	27° 59' 25.63" S	26° 51' 55.74" E
BH 31H	28° 07' 14.14" S	26° 50' 22.13" E
BH 35	27° 59' 26.64" S	26° 51' 37.78" E
BH 44	28° 00' 12.01" S	26° 47' 43.31" E
BH 66	28° 05' 17.72" S	26° 49' 33.83" E
BH 78H	28° 04' 54.3" S	26° 54' 28.17" E
BH 79H	28° 06' 59.37" S	26° 54' 37.16" E
BH 83H	28° 07' 5.04" S	26° 54' 7.95" E
BH 91H	28° 09' 31.11" S	26° 52' 0.78" E
P5	28° 03' 7.76" S	26° 52' 34.3" E
P7	28° 03' 7.96" S	26° 52' 6.07" E
P9	28° 03' 16.27" S	26° 52' 53.54" E

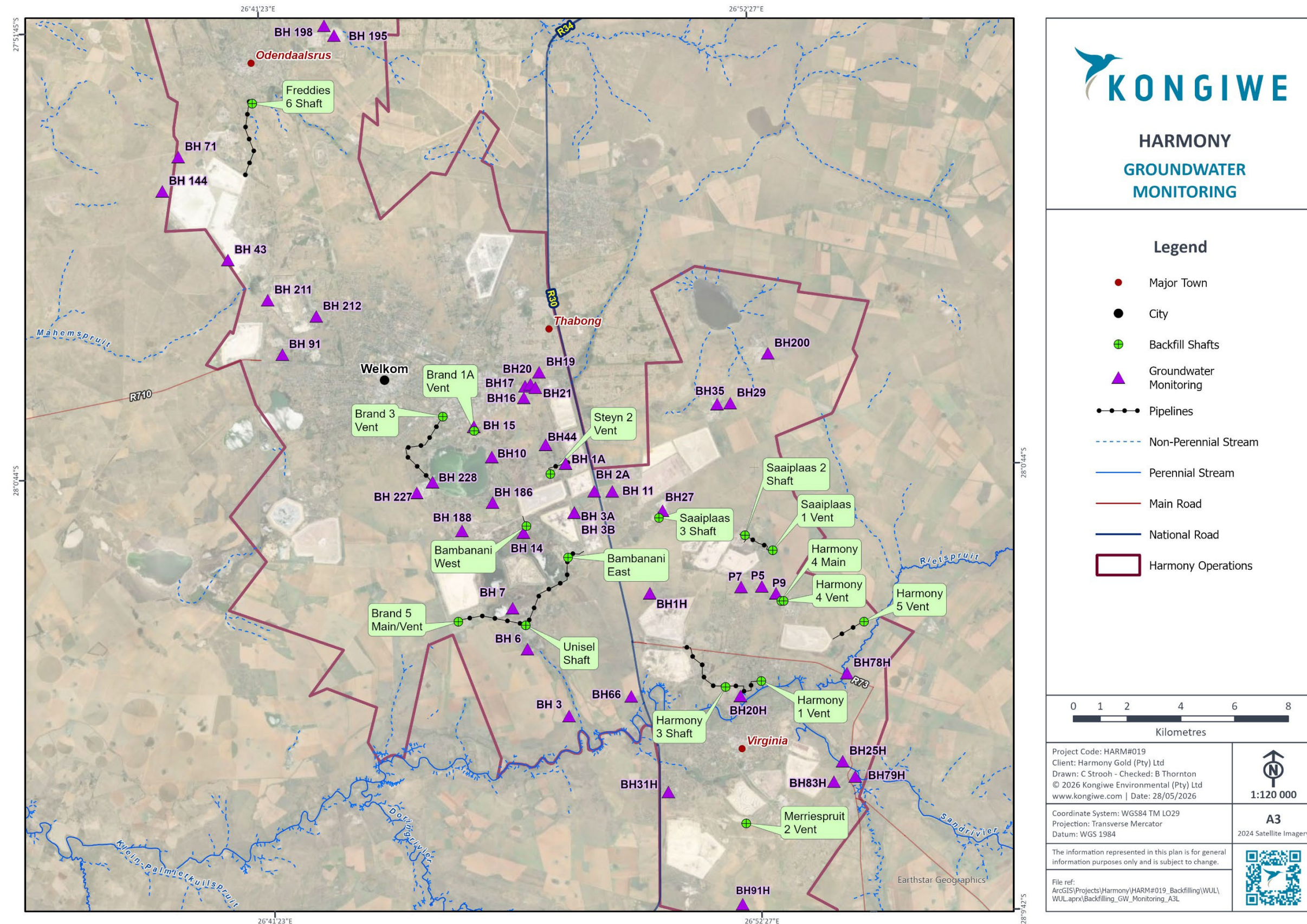


Figure 4-18: Groundwater Monitoring

4.8.2 Groundwater Levels Versus Topography

Water levels across the Harmony Free State Operations mimic the surface topography to a considerable extent. This can be observed in Figure 4-19 where the water level elevations measured in the observation boreholes for Harmony Welkom are correlated with the corresponding surface elevations. A very strong correlation coefficient of 98% is obtained between these two parameters.

4.8.3 Karoo Aquifer

The connectivity between the Witwatersrand and Karoo aquifers can best be investigated through an assessment of the regional groundwater levels. Connections between the Karoo aquifer and the underlying mine workings will manifest in zones of dewatering. The regional groundwater levels will indicate areas where dewatering occurred.

The groundwater levels in this geological environment typically mimics the topography. To test this phenomenon the borehole collar elevations (representing the topography) were plotted against the measured groundwater levels. The result of this exercise is shown in Figure 4-19.

This graph indicates a very good correlation (98%) between the topography and the groundwater level, which suggests that groundwater flow will follow the topographical gradient. If a dewatering cone has developed over the years this correlation will no longer exist. This graph is therefore an indication that groundwater from the Karoo aquifer is not seeping into the underlying mine workings.

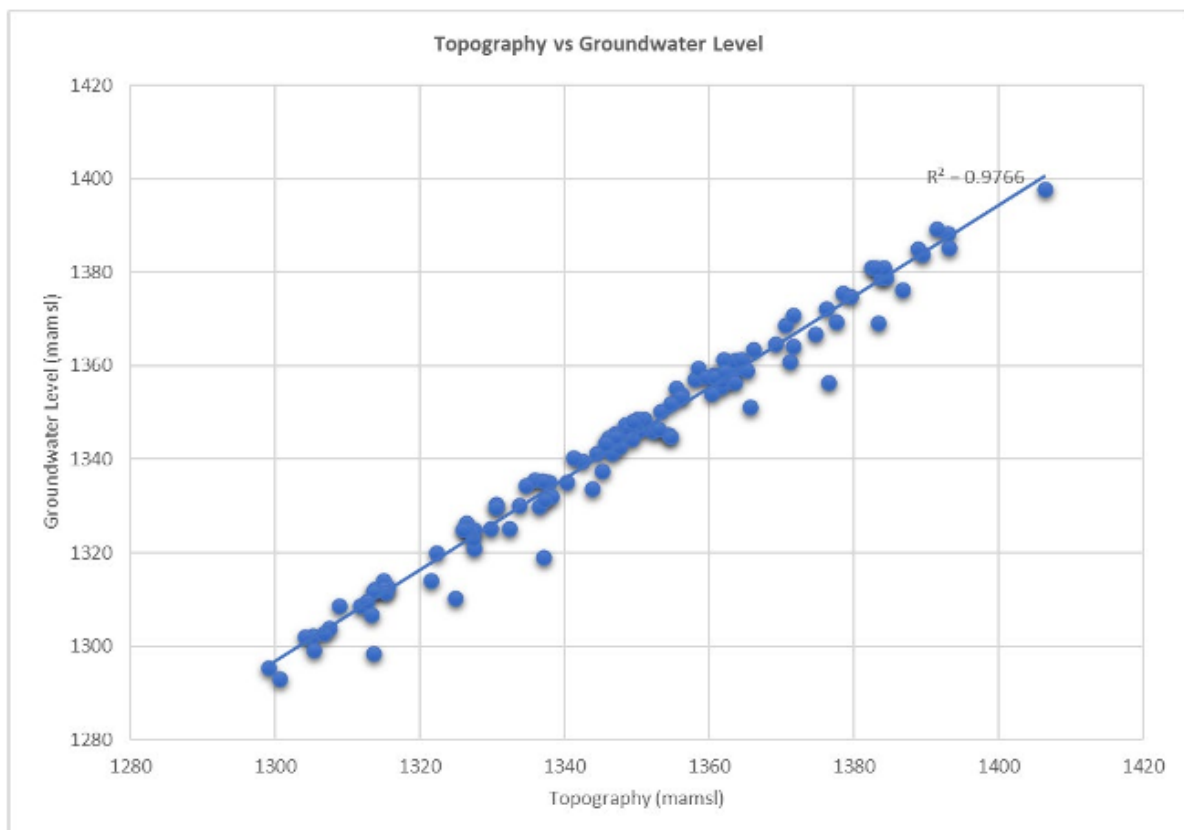


Figure 4-19: Correlation Between Topography and Groundwater Level

The relationship between the topography and the groundwater level is known as the Bayesian relationship. Where this correlation exists, the regional topography can be used to interpolate (Bayesian interpolation) a regional groundwater gradient map. Figure 4-20 depicts the groundwater level elevations, which as expected

mimic the surface contours. As expected, there is no clear evidence of dewatering cones, which confirms that the Karoo aquifer is a perched aquifer, unaffected by the underlying mine workings.

4.8.1 Witwatersrand Aquifer

Groundwater level records in the Witwatersrand aquifer are scarce. Some data is available for the Joel Mine (Van Biljon, 1995) and although it is some distance from the current study area it provides some information that is applicable throughout the basin.

The Joel Mine is located in the southern extremity of the Witwatersrand basin and started operating in 1986. At the time when mining started, the water level was at 775 mamsl, some 600 m below surface.

The Witwatersrand aquifer is a confined aquifer, and the water level is represented by a piezometric or pressure level, which is expected to be consistent throughout the basin. This piezometric level of 775 mamsl that was measured at Joel Mine prior to any dewatering from the mine is thought to represent the original water level in the entire Witwatersrand aquifer.

What was also noticeable at Joel was that between January 1986 and December 1992, the water level in the aquifer dropped 198 m due to dewatering from Joel Mine. Many of the dewatering boreholes that were drilled at Joel Mine dried up during this time as sections of the mine became dewatered. This shows that abstracting from the Witwatersrand aquifer dewateres the aquifer and that there is very little or no recharge to this aquifer.

It is therefore concluded that:

- There is no connection between the Karoo aquifer and the Witwatersrand aquifer;
- Water inflow into the mine workings is derived from the Witwatersrand aquifer and not the Karoo aquifer;
- Once the mine workings re-water, the water level will stabilise at the current piezometric level. This level is currently unknown, but it can be measured by converting the water pressure, as measured in underground water intersections, to a water level (1 Bar= 10 m);
- In any event this water level is not expected to exceed 775 mamsl, which is at least 400 - 500m below the Karoo aquifer; and
- Decant of poor quality mine water into the Karoo aquifer or onto surface through the shafts is not expected to occur.

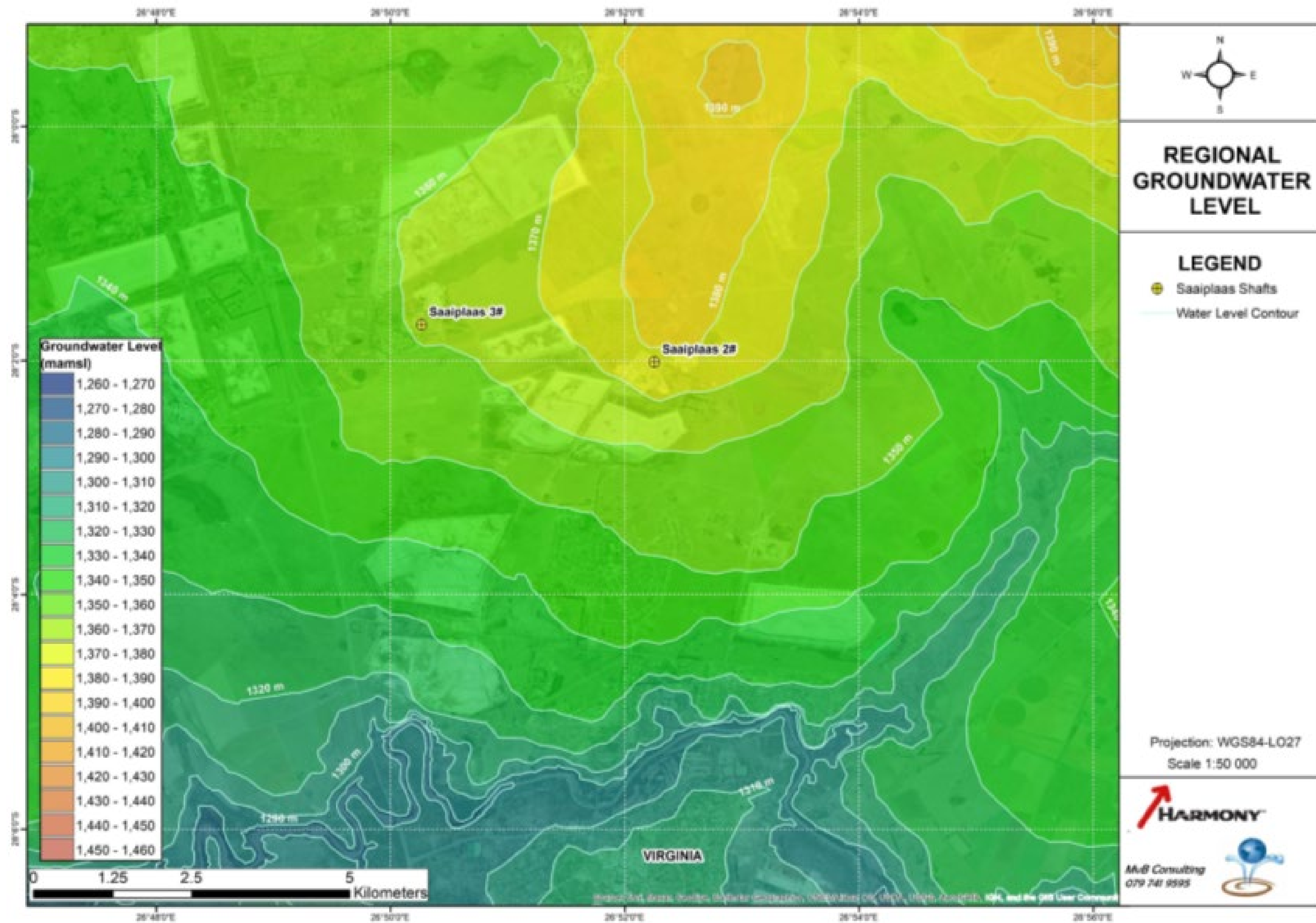


Figure 4-20: Regional Interpolated Groundwater Level

4.9 Groundwater Quality

4.9.1 Water Quality: Deep Mine Void Water

The deep mine void water has a moderately acidic pH of 5.8 and contains, relative to the SANS 241:2015 guideline values, elevated concentrations of dissolved solids, iron, manganese, sodium, sulphate, uranium, nickel, aluminium, calcium, magnesium, and arsenic (Table 4-11).

Table 4-11: Water Quality of the Deep Mine Void Water

Parameter	unit	SANS	Risk	Mine Water
pH	<i>n.a.</i>	5.0-9.7	operational	5.8
EC	mS/m	170	aesthetic	478
TDS	mg/l	1 200	aesthetic	5 578
TAik	<i>mgCaCO₃;tl.</i>	<i>n.g.v.</i>	n.a.	224
Al	mg/l	0.3	operational	0.457
As	mg/l	0.01	chronichealth	0.065
B	mg/l	<i>n.g.v.</i>	n.a.	0.161
Ba	mg/l	0.7	Chronichealth	< 0.010
Ca	mg/l	150	aesthetic/operational	490
Cd	mg/l	0.003	chronichealth	< 0.010
Co	mg/l	0.5	chronichealth	0.067
Cl	mg/l	300	aesthetic	76.00
Cr	mg/l	0.05	chronichealth	< 0.010
Fe	mg/l	2	chronichealth	875
Hg	mg/l	0.006	chronichealth	< 0.010
K	mg/l	50	operational/health	10.7
Mg	mg/l	70	aesthetic/health	162
Mn	mg/l	0.4	chromic health	12
Na	mg/l	200	aesthetic	280
NH ₃ -N	mg/l	1.5	aesthetic	0.70

Parameter	unit	SANS	Risk	Mine Water
Ni	mg/l	0.07	chronichealth	0.081
NO ₃ ,-N	mg/l	12	acutehealthchemical	< 0.1
Pb	mg/l	0.01	chronichealth	< 0.010
PO ₄ -P	mg/l	<i>n.g.v.</i>	n.a.	0.04
SO ₄	mg/l	500	acutehealthchemical	2897
u	mg/l	0.03	acutehealth chemical	0.035
V	mg/l	0.2	chronichealth	< 0.010
Zn	mg/l	5	aesthetic	0.012

Note: Values in bold exceed the SANS limits.

The SANS 241:2015 drinking water standards are shown for comparison purposes only.

4.9.2 Underground Mine Voids: Operational Tailings Facility

Although the aim of groundwater study was to assess the viability of disposal of gold mine tailings in the underground mine voids, it is important to understand the geochemical processes changing the tailings material over time, as these changes have implications for the mobility of potential pollutants in the underground mine voids. Therefore, the conceptual framework for the operational tailings is outlined in Figure 4-21.

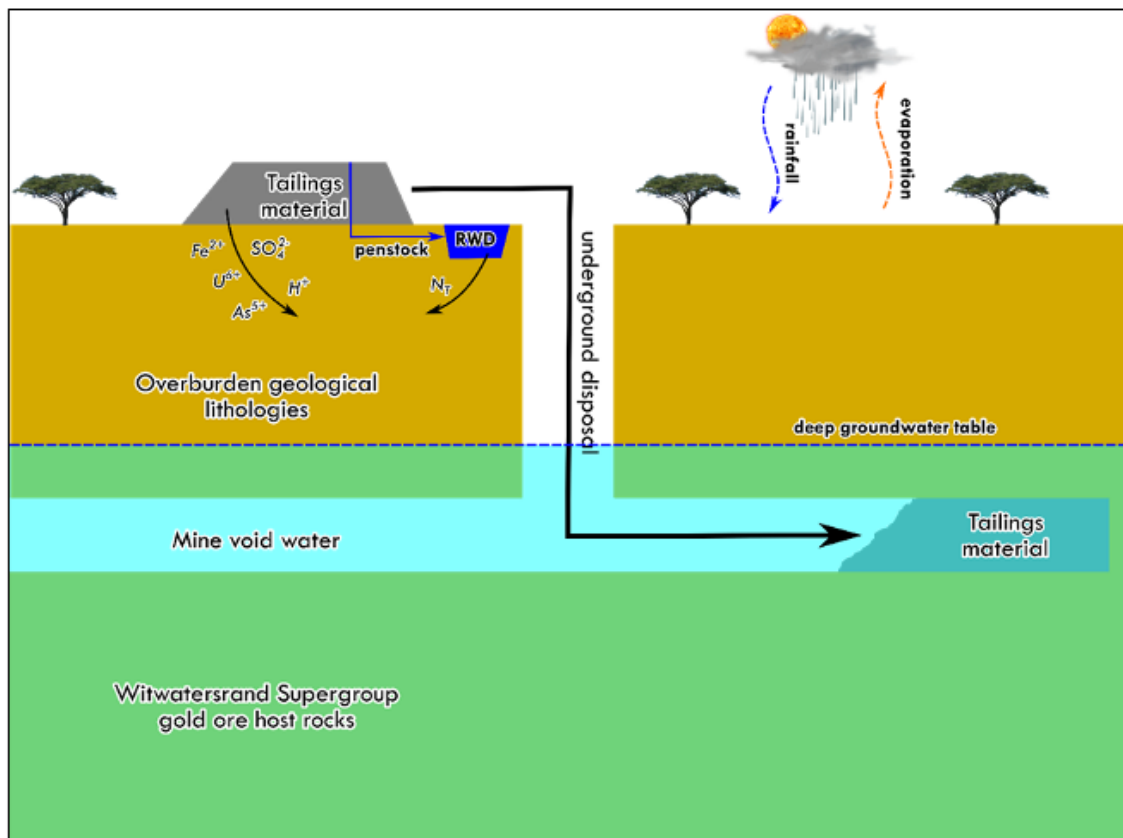


Figure 4-21: Conceptual model Showing an Operational Phase in Which Tailings Are Being Disposed of in the Underground Mine Voids.

The underground mine void geochemical environment is different from the earth's surface, which is in contact with an oxygen-rich atmosphere. The deep mine voids are far less oxygen-rich and even this phase changes when mining operations cease, and the deep voids are allowed to flood with water. These phases are shown schematically in Figure 4-22. The figure compares the earth's surface geochemical environment with the geochemical environment of the deep mine voids, using iron, manganese, and sulphur ions to illustrate the effects of the differences on the mobility of ions.

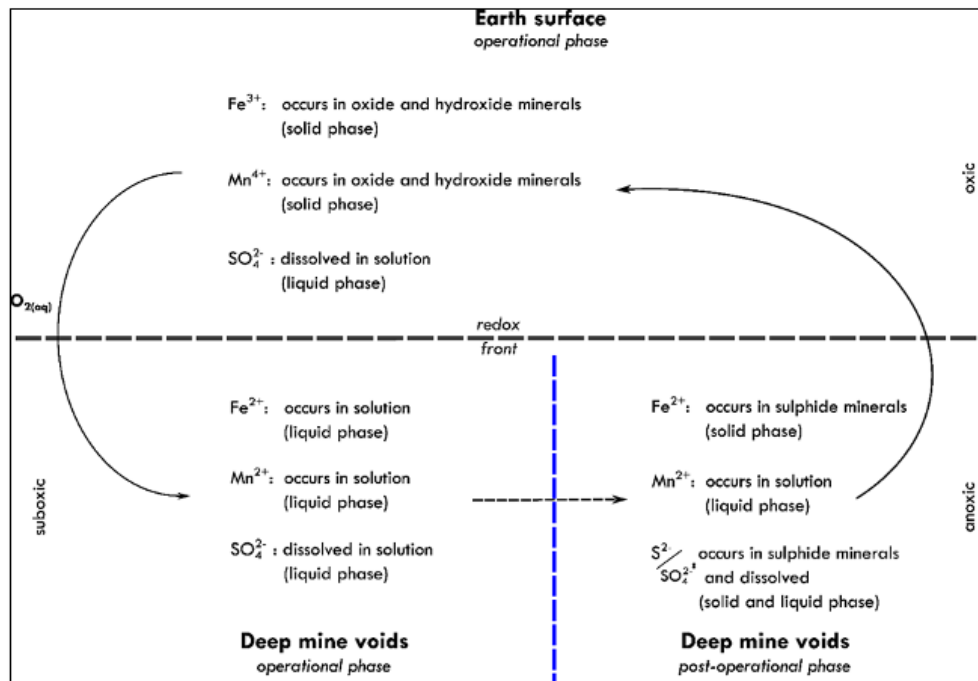


Figure 4-22: Schematic of Conceptual Model Compare the Earth Surface Geochemical Environment with the Geochemical Environment of the Deep Mine Voids

4.9.3 Geochemical Modelling and Environmental Risk

A geochemical model was developed with the purpose of tracking changes in the tailings geochemical system from its operational phase in contact with the Earth's atmosphere where it is disposed of in the deep mine voids and remains in the voids over the long term (more than 100 years).

The model was developed by coupling four individual models into one to assess the geochemical processes and environmental risk due to the disposal of the tailings material into the underground mine voids. The process is schematically shown in Figure 4-23.

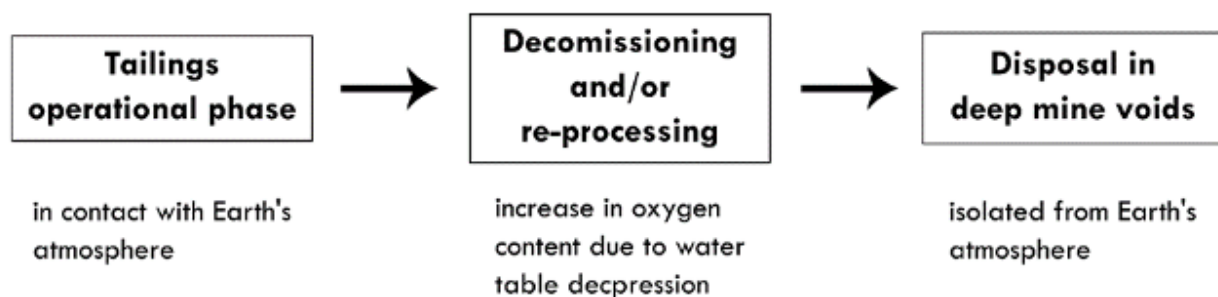


Figure 4-23: Flow Diagram Showing the Coupling of Individual Numeric Models into a Combined Model for the Tailings Deep Mine Void Disposal

4.10 Model Results

The final mine void geochemical model results are shown in Table 4-12. The model indicates that the mine void water is likely to be slightly acidic with a pH of 5.6. The sulphate concentrations are elevated at 3 122 mg/L. The model mine void water is anoxic, implying that the sulphide minerals in the tailings material are not likely to

oxidise and that the sulphate in the mine void water is most likely due to dissolution of sulphate containing minerals and release of sulphate in the tailings pore water to the mine void water system. Over time, the model indicates that the sulphate concentration remains constant (Figure 4-24). The constant sulphate concentration over the long-term indicates that no additional sulphate is being introduced to the mine void water through the oxidation of sulphide minerals.

The model concentrations of arsenic, nickel and uranium are shown to be low. This is due to the precipitation of these elements in metal sulphides, which are stable under the anoxic mine void water conditions. The presence of these sulphides indicates that a small amount of sulphur is reduced to sulphide and immobilised as secondary minerals, but not enough is reduced to significantly reduce the dissolved sulphate in the mine void water. This process could likely be facilitated by introducing sulphur reducing microbes into the mine voids, however, this concept will need to be proven prior to initiation.

The concentrations of iron and manganese in the mine void water is likely to remain elevated. This is due to the subtoxic to anoxic conditions in the mine voids, which favour the soluble species of iron and manganese.

Table 4-12: Final Water Quality Results for the Underground Mine Voids and Seepage from the Tailings as Predicted by the Geochemical Model

Parameter	Abbreviation	Unit	Mine Water	Seepage Water Quality (Decant)
pH	pH		5.6	6.2
Total dissolved solids	TDS	mg/l.	4 694	4142
Aluminium	Al	mg/l.	<0.001	<0.001
Arsenic	As	mg/l.	<0.001	<0.001
Bicarbonate	HCO ₃	mg/l.	242	811
Calcium	Ca	mg/l.	<0.001	1 306
Iron	Fe	mg/l.	854	<0.001
Magnesium	Mg	mg/l.	163	163
Manganese	Mn	mg/l.	12	<0.001
Nickel	Ni	mg/l.	0.018	<0.001
Potassium	K	mg/l.	21	21
Sodium	Na	mg/l.	280	280
Sulphate	SO ₄	mg/l.	3122	1561
Uranium	U	mg/l.	<0.001	<0.001

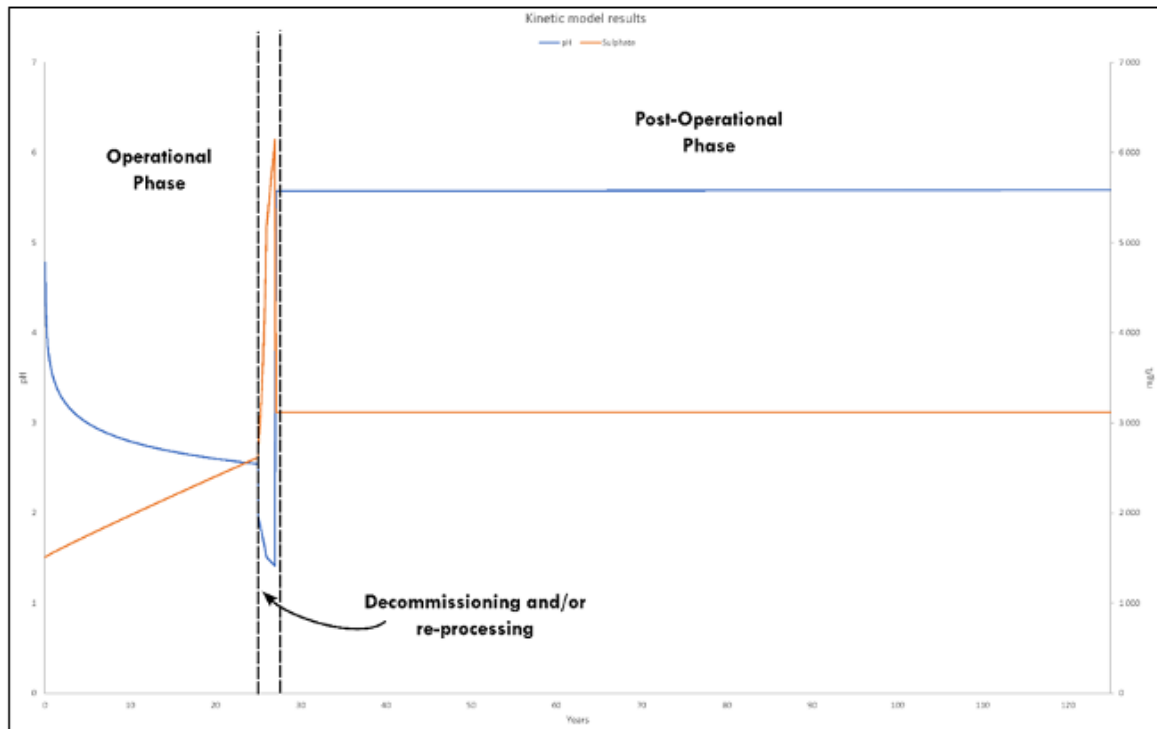


Figure 4-24: Timeseries Results of the Geochemical Model for the Tailings Operational Phase, Decommissioning and/or Re-processing Phase and the Post-Operational Phase in Which the Tailings Are Disposed of in the Underground Mine Voids

However, as soon as deep mine void water with elevated concentrations of iron and manganese reaches the Earth's surface and is brought into contact with oxygen, they will rapidly precipitate in iron and manganese oxide and hydroxide mineral phases e.g., goethite and pyrolusite, thereby immobilising them and removing them from the water column (Figure 4-24, Figure 4-25). Hydrous oxides of iron and manganese typically have large surface areas and can remove metals and metalloids from the water column, thereby further reducing the risk of contamination by these compounds in a decanting scenario.

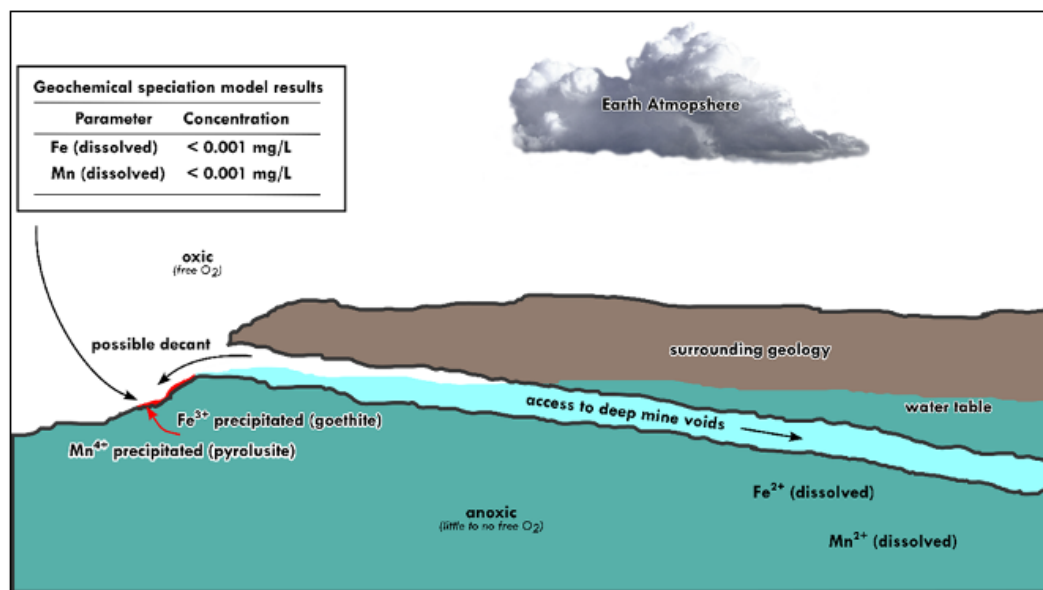


Figure 4-25: Conceptual Model Showing the Change in Redox State and Thus Mobility of Iron (Fe) and Manganese (Mn) in the Mine Void Water and at the Earth's Surface

4.10.1 Acid Mine Drainage

The numeric geochemical model results (Table 4-12) indicate that the pH of the mine void water into which the tailings has been disposed is unlikely to drop below 5.6 over the long term (100 years), implying that the development of Acid Mine Drainage (AMD) is unlikely.

Several studies have indicated that mine water will not decant to surface, but theoretically if the mine void water decants onto the surface, the pH is not likely to drop below 6.2 due to the presence of carbonate minerals in the matrix of the surface geology. Therefore, decanting is also not likely to produce AMD.

The disposal of tailings material in the deep underground mine voids is, from an environmental geochemical perspective, a viable and even desirable management option.

The study concluded that the potential risk to the groundwater environment is minimal for the following key reasons:

- The condition of the shaft, assuming that the liner is intact, will prevent any interaction between the tailings and the adjacent aquifer.
- The risk of mine water decant from the shafts post-mining is very small. The plugging of the shafts with tailings will further diminish this risk and will keep the poor quality mine water in the mine workings.
- The risk of development of AMD conditions from the tailings material in the deep mine voids is negligible. This is due to the low concentration of free oxygen in the deep mine void geochemical system. The risk of development of AMD in a scenario in which the mine void water decants onto Earth's surface is also unlikely.
- In the absence of oxygen and an acid solution, the leaching of metals from the tailings will be negligible.
- If the tailings are deposited below the groundwater level the risk of contaminant seepage will be further reduced. Based on the mine monitoring data, the groundwater level in the Karoo aquifer is <10m below surface. It is recommended that tailings deposition only takes place below the groundwater level.
- Where the existing monitoring networks are lacking, additional boreholes may be required to monitor if any contaminant migration is taking place from the shafts during and after tailings deposition.

4.11 Socio-Economic Environment

The statistics below are derived from Statistics South Africa (StatsSA) in relation to their 2011 Census and 2022 Census.

The population of the MLM makes up approximately 65% of the LDM population. The average annual population growth rate (between the 2011 and 2022) for the MLM was 0.39%, compared to a just 0.18 % at the Provincial level. The population of MLM in 2022 was 439,034, comprising 126,068 households. The proportion of youth (aged 19 years or less) among the MLM population in 2022 was 35%, compared to 33% in 2011. The most populated region in the MLM is Welkom followed by Odendaalsrus and then Virginia.

The extent of informal dwellings among households in the MLM was 20% in 2022, compared to 10% at the Provincial level.

Gender ratio is the proportional relationship between the number of males and females in a population. A ratio greater than 1.0 indicates that the population has more males than females. MLM had a gender ration of 0.92, indicating a greater proportion of females to males.

At the MLM and Provincial levels, Black Africans constituted about 88% of their respective populations in 2011. In 2022, the proportion of the population of Black Africans in the MLM increased to 89%. The proportion of the White population decreased from 10% in 2011 to 9% in 2022.

Approximately 62% of the MLM population spoke Sesotho in 2011, which has since increased to 70% in 2022.

The proportion of the MLM population (aged 20 years and above) with a Matric qualification or higher was 29% in 2022, compared to 20% in 2011.

There has been a general downward trend in the level of access to services in the MLM and the Free State in general. The proportion of households with access to:

- Tap water declined from 95% in 2011 and 88% in 2022;
- Refuse disposal services declined from 87% in 2011 to 56% in 2022; and
- Flush or chemical toilets declined from 82% in 2011 to 80% in 2022.

Although being the largest contributor to the MLM's Gross Value Added (GVA), the mining sector's contribution to total GVA decreased from 36% in 2010 to 30% in 2020. The manufacturing sector contributed 17% of the MLM's GVA in 2020. The finance and trade sectors were also major contributors to the MLM's GVA (13 and 11% respectively). The agricultural sector only contributed 2% of the MLM's GVA in 2020 (Quantec, 2022)

The most critical social issue is the high level of unemployment, a direct result of the closure of the gold mining industry. An estimated 150,000 adults aged between 15 and 64 in the MLM were unemployed in 2021. In 2020, the unemployment rate (i.e., the proportion of the labour force that is unemployed) in the MLM was 27.2%, which was slightly higher than that at the Provincial level of 26.7% (Quantec, 2022). In 2021, approximately 60 per cent of the population lived below the upper-bound poverty line. In 2022, the average monthly household income in the MLM was just R 6725, which was marginally higher compared to that at the Provincial level of R 6441. The mining sector in the area has undergone extensive restructuring, and retrenchment of staff is ongoing. The communities at Welkom, Virginia, Odendaalsrus and Allanridge are particularly affected by this restructuring.

Harmony provides employment to approximately 14,222 people. The company provides significant resources for local economic development, in collaboration with MLM Council.

5. ANALYSIS AND CHARACTERISATION OF ACTIVITY

5.1 Site Delineation for Characterisation

The Proposed Project location is discussed in Section 1.2 of this report. The Project is within Harmony's operational mining boundary. Therefore, the Project site consists of mining-related infrastructure such as processing plants, TSFs, return water dams (RWDs), WRDs, etc.

The baseline environment of the Project area is outlined in Chapter 4 of this report. Refer to Figure 5-1 for the area, infrastructure and locality of the Project.

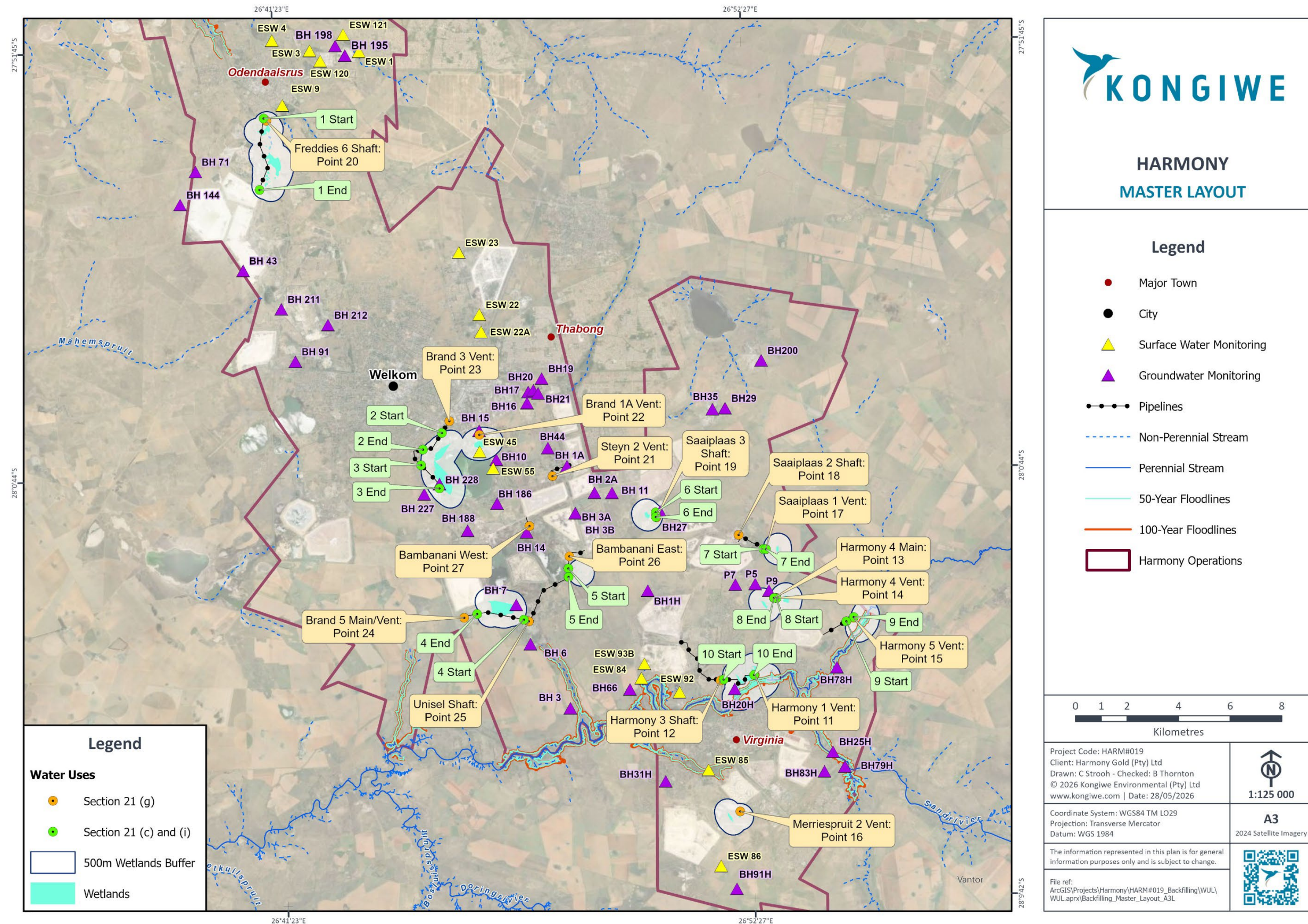


Figure 5-1: Proposed Project Master Layout Plan

5.2 Water Supply

5.2.1 Potable Water

Harmony receives potable water supply from Vaal Central, which is used for domestic purposes.

5.3 Waste

5.3.1 Non-Mine Residue

Waste minimisation is a component of the Harmony's Waste Management Strategy, and the goal is to reduce quantities of waste disposed of to landfills by recycling as much as possible at all operations. The strategy's purpose is to establish and implement a waste management procedure that is applicable to the employees and companies involved in the sorting, loading, transporting, recycling and disposing of waste products generated from the various mining related activities, in compliance with the environmental requirements and legislations.

The procedures to be followed to ensure the effective management of waste are as follows:

- Implementation of waste management practices as per the waste management hierarchy presented in Table 5-1 which includes:
 - The prevention of the generation of waste and the contact of waste with water;
 - The reduction in the amount of waste generated;
 - The re-use and recycling of waste as much as possible; and
 - The disposal of waste on appropriate and authorised facilities if it cannot be re-used or recycled.
- Characterisation of waste to determine the potential risk posed and protection required; and
- Implementation of a waste information system.

Table 5-1: Waste Management Hierarchy (Jones & Wagener, 2017)

The Waste Hierarchy		
Cleaner Production	Prevention	 Order of Importance
	Minimisation	
Recycling	Re-use	
	Recovery	
	Composting	
Treatment	Physical	
	Chemical	
	Destruction	
Disposal	Landfill	

5.3.2 Tailings for Backfilling

5.3.2.1 Waste Classification

A waste classification assessment was conducted for the tailings residue intended for deposition into the defunct shafts. The Harmony tailings residue is classified as Type 3 based on the results of the following analyses:

- Grab slurry sample analysis;
- Composite dry residue sample analysis; and
- Toe drain water analysis.

The waste has been determined to have a low hazard level

5.4 Operational Management

Procedures are in place at Harmony Operations, to deal with potential polluting incidents (Environmental Incident Reporting Procedure) and Harmony Risk Matrix – February 2025). The incident classification criteria are presented in Table 5-2.

Table 5-2: Harmony Incident Classification Criteria (Harmony Risk Matrix – February 2025)

Severity Level	Environmental Impact	Irreversibility	Duration	Extent/Spatial Scale	Exco and ERM Reportable	Board Reportable
5	Disastrous deterioration / disturbance	Irreversible	Beyond ten years	Regional/National/International. Far beyond mine site boundary/area of responsibility Widespread	Yes	Yes
4	Very Significant deterioration / disturbance	Reversible over time	One to ten years	Within mining boundary area/beyond business unit area of responsibility	Yes	Yes
3	Significant deterioration / disturbance	Potential to reverse	Three months to one year	Within business unit area of responsibility	Yes	No
2	Moderate deterioration / disturbance	Quickly reversible	One month to three months	Surrounding area	No	No
1	Insignificant deterioration / disturbance	Easily reversible	Up to one month	Immediate, fully contained area	No	No

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

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

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

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

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

5.5 Organisational Structure

The people that will be responsible for the implementation of the WUL, once issued, and the Action Plan in Section 6, are presented in Table 6-1.

5.6 Resources and Competence

The environmental management resources and systems at Harmony include:

- Infrastructure and equipment e.g. pollution control dams, oil traps etc;
- An Environmental Management System (EMS);
- Personnel including environmental officers, site engineers, and appointed external contractors and consultants;
- The inclusion of environmental training for all new staff;
- The promotion of environmental awareness amongst employees and contractors;
- Annual environmental auditing and reporting;
- Registers including an incident register; and
- Maintenance of a complaints register, clearly stating actions taken on specified dates.

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

5.7 Education and Training

The environmental training and awareness process applicable to the EMS incorporates the following:

- The importance of complying with the Environmental Policy and Procedures;
- The requirements of the EMS;
- Significant environmental aspects and the associates actual or potential impacts, and the benefits of improved environmental performance;
- The roles and responsibilities in achieving compliance with the requirements of the EMS; and
- The potential consequences from not following specific procedures.



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

5.8 Internal and External Communication

5.8.1 Internal Communication

Water targets are reported on a monthly basis by the Environmental Management Department (EMD). The results from the monitoring and comparison of actual water use to the targets are included in monthly reports, which are distributed to all the responsible environmental personnel.

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

Environmental improvements, inspection findings and incidents are included in environmental management reports, which are distributed to all responsible environmental personnel. The internal communication process for environmental issues is presented in Table 5-3.

5.8.2 External Communication

The reporting of incidents that have the potential to cause or have caused water pollution or pollution to the environment is undertaken. Records of all incidents and system malfunctions which may result in the pollution of the water resources are reported to DWS. The incidents are recorded by the individual business units. The external communication process for environmental issues is presented in Table 5-4. The environmental complaints process is presented in Table 5-5.

Table 5-3: Internal Communication Procedure

Internal Communication	Notes	Responsibility / Who	When
1. Significant environment issue (s)  2. Review issue – Environment Management  3. If required (if significant), investigate and report to affected personnel	1. Significant environmental issues are communicated through: - Environmental topics/reports (environmental awareness, on notice boards. - Environmental policy/ EMS procedures, aspect. - Legislation notification or changes. - Roles and responsibilities, defined Key Performance Indicators. - Safety, health and environmental meetings. - Management meetings. - Contractual obligations with interested parties e.g. contractors etc. 2. Review issue. 3. If significant, investigate/ report back to the affected personnel (e.g. via e-mail, section meetings).	1. Environmental Management. 2. Environmental Management. 3. Environmental Management.	As and when required

Table 5-4: External Communication Process

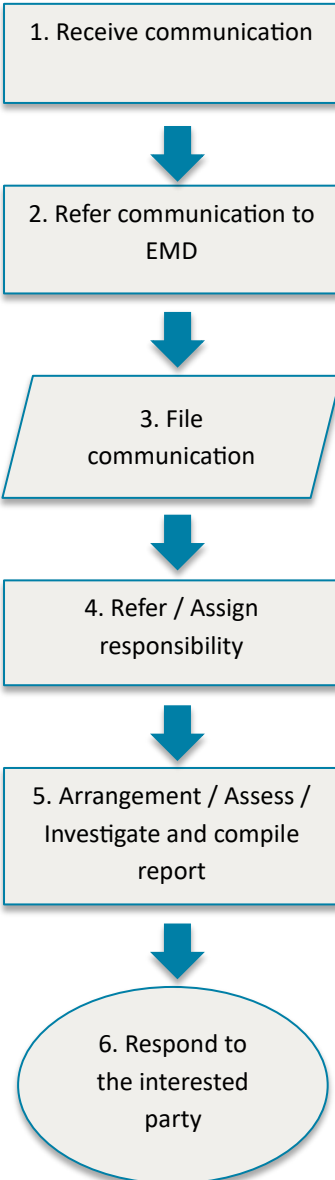
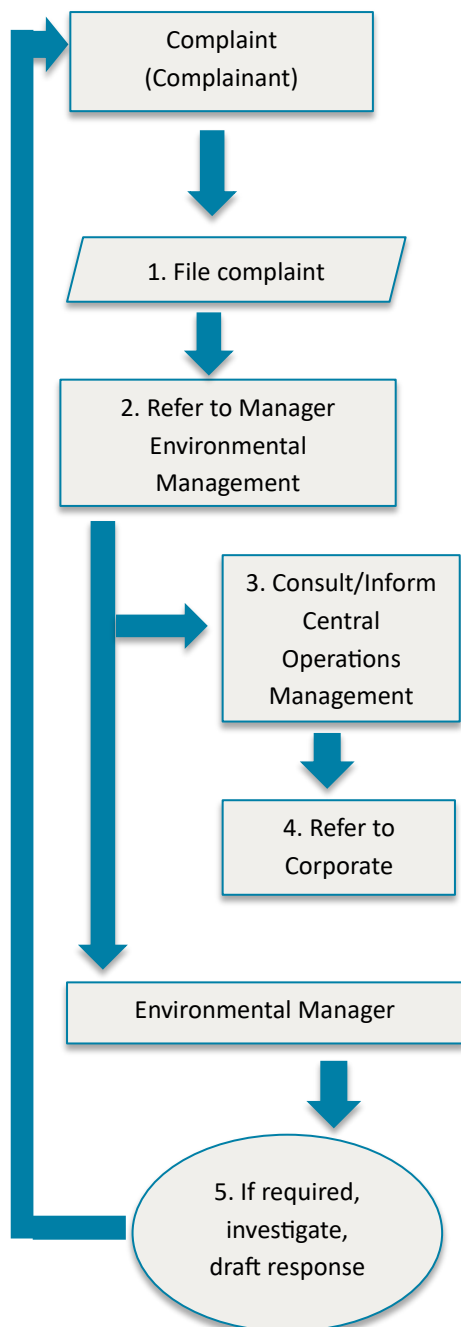
External Communication	Notes	Responsibility / Who	When
 <pre> graph TD A[1. Receive communication] --> B[2. Refer communication to EMD] B --> C[/3. File communication/] C --> D[4. Refer / Assign responsibility] D --> E[5. Arrangement / Assess / Investigate and compile report] E --> F([6. Respond to the interested party]) </pre>	- Received communication on e.g. needs, expectations, etc. from interested parties (e.g. government departments, non-governmental organizations (NGOs)) at meetings, forums, community events, etc. - Refer to Environmental Management. - File communication. - Refer/assign responsibility to relevant Environmental Manager in consultation with Senior Management. - Investigate and determine opportunities for improvement, if required. - Respond and/or report to Interested Party in one of the following methods: - Compile Letter or Report. - Approved Letter or Report. - Distribute letter/report and/or follow up in a forum to interested Party (where required).	- Environmental Management. - Environmental Management. - Environmental Management. - Environmental Management. - Environmental Management. - Environmental Management / Central Operations Mancom.	As and when required

Table 5-5: Environmental Complaints Process

Environmental Complaints Process	Notes	Responsibility / Who	When
 <pre> graph TD A[Complaint (Complainant)] --> B[/1. File complaint/] B --> C[2. Refer to Manager Environmental Management] C --> D[3. Consult/Inform Central Operations Management] D --> E[4. Refer to Corporate] E --> F[Environmental Manager] F --> G([5. If required, investigate, draft response]) G --> A </pre>	Receive complaint from Interested Parties; Refer complaint to the EMD and Stakeholder Engagement Department. - File complaint. - Refer to Environmental Management. - Consult Central Operations Mincom, if required. - If required, consult and inform the EMD. - Address complaint: - Investigate. - Draft and approve response. - Report back to complainant. - Record risk/opportunities to improve the EMS and update the EMS appropriately, if needed.	Any person within Central Operations. - Operations Management / Document and Records Controller - Environmental Management - Environmental Management / Central Operations Mancom - Corporate / Environmental Management - Environmental Management	As and when required

5.9 Awareness Raising

Environmental Awareness Plans have been developed by Harmony and have been incorporated in the ISO 14001 EMS for each business unit, ensuring that all employees, contractors and any other people offering services or doing work on behalf of the company are environmentally aware. The plans inform people of any environmental

risks that may result while conducting their work and the process involved to deal with the risks in order to prevent pollution or the degradation of the environment.

Environmental awareness is communicated through the following:

- Posters;
- Campaigns;
- Briefs;
- Environmental topics;
- Programmes associated with environmental days ;
- Discussions at green area meetings;
- Incident reports and notifications; and
- Group SMS system or Harmony Connect Email awareness system.

5.10 Monitoring and Control

Harmony has an existing water quality and quantity monitoring network. Therefore, the groundwater specialist recommends the use of the existing groundwater monitoring network for this Project using the existing monitoring network. The purpose of the groundwater monitoring program is to proactively identify and implement the actions needed to manage the water-related risks throughout the different phases of the Project.

The Wetland Specialist has provided general monitoring and compliance measures as outlined in Section 5.10 of this report.

Should an incident occur where contamination (concentrations exceeding applicable guideline values) or reduction in community water supply is detected, Harmony will notify the Regional Director of DWS. Harmony will then:

- Identify the source of the contamination/reason for loss of supply;
- Identify, and if necessary, implement, measures for the prevention of this contamination (short and long term)/loss of supply; and
- Determine, and if necessary, implement, any remediation measures including provision of alternative supply of water.

5.10.1 Groundwater Monitoring

As stated above the existing groundwater monitoring network will be used for the Project. The monitoring locations for consideration are in Table 4-10 and Figure 4-18, in Section 4.8 of this report.

5.10.2 Wetland Monitoring

The following general monitoring and compliance measures in relation to wetland impacts have been recommended by the specialist:

- A suitably qualified Environmental Control Officer (ECO) must monitor wetland-related activities prior to disturbance, during construction, operations where necessary, and during decommissioning and rehabilitation.
- Particular attention must be given to wetland crossings, wetland-adjacent pipeline sections, and areas where spills, erosion, or hydrological disturbance have occurred.
- Environmental induction must be undertaken for all personnel working in or near wetland-sensitive areas.
- A record of all wetland-related incidents, spills, leaks, erosion problems, rehabilitation actions, and corrective measures must be maintained on site.

- Contractor method statements must include all relevant wetland protection, pollution control, crossing, and rehabilitation measures.
- Any deviation from approved wetland mitigation measures must be authorised by the ECO where feasible or reported immediately thereafter in the case of emergency actions.
- Compliance with wetland mitigation measures must form part of routine environmental inspections and auditing.

5.11 Waste Monitoring

Waste streams generated at Harmony are monitored and recorded on a monthly basis. A waste management assessment/audit to evaluate the characteristics of the mine's waste streams are completed at all operations or when a process is changed, or a new process is instituted which may influence waste management.

Waste related to the Proposed Project will be factored into the existing waste monitoring assessment/audit undertaken by Harmony.

5.12 Risk and Impact Assessment / Best Practice Assessment

5.12.1 Wetlands Risk and Impact Assessment

The Risk / Impact Assessment considered the indirect impacts, to the wetland systems. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) has been considered for this component of the assessment (Figure 5-2). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, scale, layout, technology and phasing to avoid impacts.

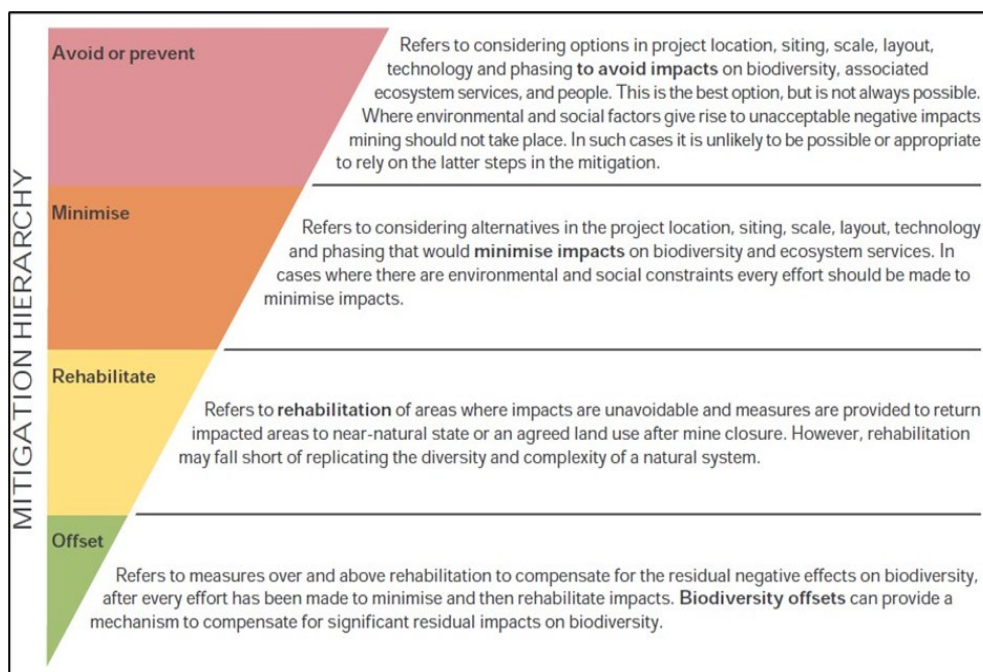


Figure 5-2: The Mitigation Hierarchy as Described by the DEA (2013)

The DWS risk matrix was used to assess impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 5-6.

Table 5-6: Significance ratings matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

The risk assessment was conducted as shown in Table 5-7, under the assumption that the selected wetlands and/or their buffers will be impacted by the proposed development. Wetlands were identified within the assessment area and within the 500 m PAOI, therefore direct and indirect impacts to the watercourse systems are potential. The focus for mitigation was thus placed on minimising potential impacts.

It is anticipated that the Proposed Project will pose **Moderate** and **Low** post-mitigation risks, provided that the suggested mitigations are implemented, given that some activities currently overlap with wetland areas. It is recommended that the pipeline be re-routed to avoid the wetlands and their associated buffers to minimise wetland disturbance in line with the mitigation hierarchy. Should this not be feasible, a wetland compensation plan (rehabilitation) must be developed and implemented and all other mitigation measures suggested to alleviate impacts must be implemented.

In summary, HGM 1, HGM 2 and HGM 4 will have **Moderate** post-mitigation risk ratings due the following:

- Construction of temporary slurry pipelines and associated shaft work areas (intersecting wetlands), specifically in relation to:
 - Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance;
 - Altered hydrology and induced erosion and sedimentation from soil compaction;
 - Storage of chemicals, mixes, and fuels with associated accident spills;
 - Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles; and
 - Hydrocarbon leaks/ spills from operation of vehicles, equipment, and machinery.
- Construction of temporary pipeline crossings, specifically in relation to:
 - Erosion and sedimentation of the freshwater resource; and
 - Impeding flow of water.
- Operation of infrastructure (intersecting wetlands), specifically in relation to:
 - Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses;
 - Loss of native vegetation and habitat fragmentation with proliferation of alien species from vegetation clearance for maintenance of infrastructure; and
 - Water quality impairment from contaminated runoff/ leakage,

All other post-mitigation impact ratings were assessed as **Low**.

Table 5-7: Summative Results of the Risk Assessment Conducted for the Proposed Development (The Biodiversity Company, 2026)

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
CONSTRUCTION	Construction of temporary slurry pipelines and associated shaft work backfilling procedures (intersecting wetlands) Site clearing and preparation. Earthworks including the excavation, reshaping and compacting of project area for pipeline installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Storage and use of hazardous substances associated with accidental spills. Final reshaping, retaining, and landscaping.	Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Altered hydrology and induced erosion and sedimentation from soil compaction	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
		Water quality impairment from contaminated runoff	HGM 1, HGM 2, HGM 4	16	L
			HGM 3	9.6	L
		Storage of chemicals, mixes, and fuels with associated accident spills	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Indiscriminate dumping of waste products or construction materials	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	14.4	L
		Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
		Hydrocarbon leaks / spills from operation of vehicles, equipment, and machinery	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	Construction of temporary slurry pipeline (within 500 m of wetlands) Site clearing and preparation. Earthworks including the excavation, reshaping and compacting of project area for pipeline installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Storage and use of hazardous substances associated with accidental spills. Final reshaping, retaining, and landscaping.	Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	12	L
		Altered Hydrology and induced erosion and sedimentation from soil compaction	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	16.8	L
		Water quality impairment from contaminated runoff	HGM 6, HGM 7, HGM 8	11.2	L
			HGM 5	8.4	L
		Storage of chemicals, mixes, and fuels with associated accident spills	HGM 6, HGM 7, HGM 8	21.6	L
			HGM 5	12.6	L
		Indiscriminate dumping of waste products or construction materials	HGM 6, HGM 7, HGM 8	16.8	L
			HGM 5	12.6	L
		Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles	HGM 6, HGM 7, HGM 8	28.8	L
			HGM 5	16.8	L
		Hydrocarbon leaks / spills from operation of vehicles, equipment, and machinery	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	16.8	L
			HGM 1, HGM 2, HGM 4	32	M

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	Construction of temporary pipeline crossings (intersecting wetlands) Site clearing and preparation Earthworks including the excavation, reshaping and compacting of project area for infrastructure installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Concrete works Temporary flow diversion Final reshaping, retaining, and landscaping.	Erosion and Sedimentation of the freshwater resource	HGM 3	19.2	L
		Loss of aquatic habitat	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	10.8	L
		Impeding flow of water	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	14.4	L
OPERATIONAL	Operation of pipelines (intersecting wetlands) Pumping and transport of tailings slurry via existing and temporary overland	Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses	HGM 1, HGM 2, HGM 4	40	M
			HGM 3	24	L

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	pipelines. Routine access and maintenance of temporary slurry pipelines and associated infrastructure. Leak detection, inspection and repair of pipeline sections, joints and supports. Management of dirty water, return water and slurry-affected water where required. Emergency isolation and spill response.	Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance for maintenance of infrastructure.	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Water quality impairment from contaminated runoff/leakage	HGM 1, HGM 2, HGM 4	36	M
			HGM 3	18	L
	Operation of pipelines (within 500 m of wetlands) Pumping and transport of tailings slurry via existing and temporary overland pipelines. Routine access and maintenance of temporary slurry pipelines and associated infrastructure.	Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses	HGM 6, HGM 7, HGM 8	28.8	L
			HGM 5	21.6	L
		Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation	HGM 6, HGM 7, HGM 8	21.6	L
			HGM 5	12.6	L

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	Leak detection, inspection and repair of pipeline sections, joints and supports. Management of dirty water, return water and slurry-affected water where required. Emergency isolation and spill response.	clearance for maintenance of infrastructure.			
		Water quality impairment from contaminated runoff/leakage	HGM 6, HGM 7, HGM 8	26.4	L
			HGM 5	16.2	L
	Backfilling of defunct shafts with tailings slurry (within 500 m of wetlands) Pumping of tailings slurry into defunct shafts. Management of filling rates, pressures and intake. Monitoring of seepage, overflow, return flows and shaft collar conditions. Management of displaced water, return water, decant and dirty stormwater	Seepage or migration of contaminated water/slurry through fractures, connected workings or preferential pathways	HGM 6, HGM 7, HGM 8	26.4	L
			HGM 5	16.2	L
		Water quality impairment due to mobilisation of historical underground contaminants during filling	HGM 6, HGM 7, HGM 8	26.4	L
			HGM 5	16.2	L
		Daylighting, overflow or breakout of slurry at adjacent shafts, old workings, fractures or low-lying areas	HGM 6, HGM 7, HGM 8	17.6	L
			HGM 5	10.8	L

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	associated with shaft backfilling operations.				
DECOMMISSIONING	Decommissioning of temporary slurry pipelines (Intersecting wetlands) Draining and flushing of temporary slurry pipelines where required. Stripping and removal of temporary pipes, fittings and supports for reuse. Vehicle and machinery access along temporary pipeline routes. Removal of temporary laydown areas and associated materials where required. Rehabilitation of disturbed areas, including reshaping, erosion control and revegetation.	Residual tailings slurry release during pipeline draining or removal causing soil and water contamination	HGM 1, HGM 2, HGM 4	20	L
			HGM 3	9.6	L
		Erosion and sedimentation from disturbance during pipeline removal and rehabilitation	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	14.4	L
		Loss of aquatic habitat	HGM 1, HGM 2, HGM 4	18	L
			HGM 3	10.8	L
		Water quality impairment from accidental discharge of slurry residues, hydrocarbon leaks or sediment-laden runoff	HGM 1, HGM 2, HGM 4	20	L
			HGM 3	9.6	L
		Disturbance to adjacent wetland buffer habitat during access and retrieval	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	10.8	L
		Failure of revegetation and continued proliferation of alien invasive species along disturbed corridors	HGM 1, HGM 2, HGM 4	16	L
			HGM 3	7.2	L

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
	Decommissioning of temporary slurry pipelines (Within 500 m of Wetlands) Draining and flushing of temporary slurry pipelines where required. Stripping and removal of temporary pipes, fittings and supports for reuse. Vehicle and machinery access along temporary pipeline routes. Removal of temporary laydown areas and associated materials where required. Rehabilitation of disturbed areas, including reshaping, erosion control and revegetation.	Persistent altered drainage patterns due to incomplete reinstatement of disturbed surfaces	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	10.8	L
		Residual tailings slurry release during pipeline draining or removal causing soil and water contamination	HGM 6, HGM 7, HGM 8	16	L
			HGM 5	9.6	L
		Erosion and sedimentation of freshwater resources	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	14.4	L
		Impeding flow of water	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	10.8	L
		Hydrocarbon leaks/spills from removal equipment and vehicles	HGM 6, HGM 7, HGM 8	12.8	L
			HGM 5	9.6	L
		Failure of revegetation and continued proliferation of alien invasive species along disturbed corridors	HGM 6, HGM 7, HGM 8	12.8	L
			HGM 5	9.6	L
		Persistent altered drainage patterns due to incomplete reinstatement of disturbed surfaces	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	10.8	L

5.12.2 Groundwater Risk Assessment

Based on the Groundwater Impact Assessment, the study concluded that the potential risk to the groundwater environment is minimal for the following key reasons:

- The condition of the shaft, assuming that the liner is intact, will prevent any interaction between the tailings and the adjacent aquifer;
- The risk of mine water decant from the shafts post-mining is very small. The plugging of the shafts with tailings will further diminish this risk and will keep the poor quality mine water in the mine workings;
- The risk of development of AMD conditions from the tailings material in the deep mine voids is negligible. This is due to the low concentration of free oxygen in the deep mine void geochemical system. The risk of development of AMD in a scenario in which the mine void water decants onto Earth's surface is also unlikely;
- In the absence of oxygen and an acid solution, the leaching of metals from the tailings will be negligible;
- If the tailings are deposited below the groundwater level the risk of contaminant seepage will be further reduced. Based on the mine monitoring data, the groundwater level in the Karoo aquifer is <10m below surface. It is recommended that tailings deposition only takes place below the groundwater level; and
- Where the existing monitoring networks are lacking, additional boreholes may be required to monitor if any contaminant migration is taking place from the shafts during and after tailings deposition.

5.13 Mitigation Measures

In light of the expected impacts from proposed activities, the following mitigation measures have been proposed to lower the intensity of the impacts on the ecological integrity of the wetland catchment and its downslope wetland features.

The focus of mitigation measures should be to reduce the significance of potential environmental impacts associated with the Proposed Project and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community of the wetland areas; and
- Limit the construction area to the defined project areas and only impact those areas where it is unavoidable to do so otherwise.
- If avoidance is not possible, the project should implement site-specific mitigation measures to reduce the extent and severity of impacts; and
- In the event that residual impacts to the wetland cannot be fully avoided and mitigated, a detailed wetland rehabilitation plan must be developed and executed to compensate for any loss of wetland function.

5.13.1 Construction Phase

5.13.1.1 Loss and Disturbance of Wetland Habitat

- Construction activities must be restricted to the approved development footprint and all wetland and buffer no-go areas must be clearly demarcated prior to the commencement of works;
- The final pipeline alignment, temporary access routes, and associated work areas must be micro-sited to avoid delineated wetlands and their associated buffer areas as far as reasonably possible;
- Existing roads, tracks, servitudes, and previously disturbed areas must be used preferentially in order to minimise additional disturbance to wetland habitat;
- No construction camp, laydown area, stockpile area, batching area, workshop area, or storage area may be established within a wetland or its associated buffer area;



- No indiscriminate clearing of vegetation may take place within wetland areas or associated buffer zones;
- The construction footprint must be kept to the minimum area required for the safe execution of the works;
- Vehicles and machinery must remain within demarcated work areas and approved access routes at all times;
- Wetland areas and buffer vegetation may not be used for turning, parking, standing, or temporary storage of vehicles, machinery, pipe sections, rubble, or material;
- Construction personnel must be made aware of wetland no-go areas and the sensitivity of the delineated wetland systems during environmental induction; and
- Disturbed wetland-adjacent habitat must be rehabilitated following completion of works.

5.13.1.2 Loss and Fragmentation of Habitat

- The width and extent of disturbance associated with pipeline installation and shaft-related activities must be minimised as far as practicably possible;
- Temporary access through natural or semi-natural wetland-adjacent vegetation must be avoided where existing disturbed routes can be used;
- Repeated unnecessary movement of vehicles and machinery through wetland margins and wetland buffer areas must be prohibited;
- Works within sensitive areas must be completed in the shortest practicable timeframe to reduce prolonged habitat disturbance;
- Open disturbed areas must not be left unnecessarily exposed or uncleared for extended periods where this may contribute to ongoing habitat fragmentation; and
- All temporarily disturbed areas must be reinstated and rehabilitated after completion of construction activities.

5.13.1.3 Proliferation and Establishment of Alien Invasive Vegetation

- Disturbance to wetland and wetland buffer vegetation must be minimised to reduce the establishment of alien invasive species;
- Disturbed areas must be monitored for the emergence and spread of alien invasive vegetation during and after construction;
- Any alien invasive species established within disturbed areas must be removed using appropriate control methods;
- Vehicles and machinery must be restricted to approved routes to reduce the spread of alien invasive propagules;
- Topsoil, fill, and any imported material used on site must be free of alien invasive plant material as far as reasonably possible;
- Rehabilitated areas must be monitored to ensure that indigenous vegetation is re-establishing and that alien invasive species are not becoming dominant; and
- Alien invasive plant control must continue until the disturbed area is considered stable and adequately rehabilitated.

5.13.1.4 Alteration of Hydrology / Surface Flow

- Natural surface flow paths into and through wetland systems must be maintained at all times;
- Construction activities may not obstruct, divert, canalise, concentrate, or impound diffuse flow into or out of wetland areas;

- Temporary access routes, stockpiles, pipe placement, berms, trenches, spoil ridges, and other temporary works may not be positioned so as to alter natural drainage patterns;
- Particular care must be taken in seep wetlands and valley-bottom systems where localised disturbance may alter diffuse or shallow subsurface flow;
- Temporary works must not create wheel ruts, channels, embankments, or impoundments that could redirect runoff toward or away from wetlands;
- Where disturbance to the soil profile occurs, affected areas must be reinstated to approximate pre-construction contours as soon as practicable;
- Any construction-related ponding, diversion of flow, localised flooding, or abnormal drying of wetland areas must be rectified immediately; and
- Where crossings are required, the chosen method must minimise interruption of wetland hydrology and allow continued movement of water across the wetland system.

5.13.1.5 Induced Erosion and Sedimentation

- No stockpiling of soil, rubble, spoil, trench material, or pipe material may take place within wetlands or associated buffer areas;
- All excavated or excess material must be placed in approved areas outside wetlands and their associated buffers;
- Topsoil and subsoil must be stockpiled separately where stripping is required, and stockpiles must be protected from erosion;
- Stockpiles may not be placed in positions where runoff could transport material into wetlands or where they may impede drainage;
- Appropriate erosion and sediment control measures must be installed prior to and during construction where there is a risk of sediment entering wetland areas;
- Such controls may include silt fences, sediment traps, berms, sandbags, brush packing, contouring, or similar appropriate measures;
- Exposed soils must be stabilised as soon as practicable after completion of works in each section;
- Particular attention must be given to disturbed areas on slopes draining toward wetlands and to wetland crossing points;
- All disturbed areas must be protected against erosion until vegetation cover has been re-established;
- Should erosion, gulying, scouring, or sediment deposition occur, remedial action must be implemented immediately and
- No stormwater runoff from disturbed work areas may be discharged directly into wetlands in a manner that causes erosion or sedimentation.

5.13.1.6 Soil Compaction and Disturbance of Hydromorphic Soils

- Disturbance of hydromorphic, saturated, or poorly drained soils must be avoided as far as reasonably possible;
- Machinery access through soft seepage and valley-bottom wetland areas must be avoided unless specifically authorised as part of an approved crossing or access arrangement;
- Where temporary disturbance of such soils is unavoidable, the affected area must be kept to the minimum practicable extent and duration;
- Rutting, churning, and unnecessary trafficking within wetland margins and buffers must be prevented; and
- Where compaction has occurred within disturbed wetland-adjacent areas, soils must be loosened during rehabilitation where required to restore infiltration and promote vegetation establishment.

5.13.1.7 Water Quality Impairment / Pollution of Wetlands

- No fuel, oil, grease, chemicals, cement, wash water, wastewater, slurry, or other hazardous or contaminated substances may be allowed to enter any wetland or associated buffer area;
- All fuels, oils, chemicals, and hazardous substances must be stored in secure bunded areas located outside wetlands and associated buffer zones;
- Bunded areas must be of sufficient capacity to contain spills and leaks;
- Refuelling and servicing of vehicles and machinery must only take place within designated areas outside wetlands and their associated buffers;
- Drip trays must be used during refuelling, servicing, and maintenance activities;
- Spill kits must be available at all active construction fronts, refuelling points, maintenance areas, and wetland-adjacent work areas;
- All site personnel must be inducted and trained in spill prevention, spill response, and pollution control procedures.
- Portable sanitation facilities must be placed outside wetlands and their associated buffers and must be serviced regularly to prevent leakage or overflow;
- All waste must be collected and disposed of at a registered/licensed waste disposal facility;
- No waste, litter, rubble, wash water, surplus material, or contaminated material may be dumped, buried, or burned within wetland areas or associated buffers.
- No concrete mixing, batching, or washout may take place within wetlands or where runoff could enter wetlands unless undertaken on an appropriately contained surface in an approved area;
- Dirty water generated at work areas may not be allowed to drain uncontrolled toward wetlands and must be managed within designated controlled areas and
- In the event of a spill or leak, the source must be stopped immediately, the affected area contained, contaminated material removed where required, and the incident reported immediately to the ECO and site management.

5.13.1.8 Slurry-Specific Contamination Risk

- Given that the project involves the transfer of tailings slurry, strict slurry containment and emergency response measures must be implemented throughout construction;
- Temporary slurry pipelines must be installed, supported, and maintained in a manner that minimises the risk of rupture, leakage, joint failure, overflow, or uncontrolled discharge;
- Particular attention must be given to pipeline sections located upslope of wetlands, near seepage areas, at low points, at bends, and at joints where leakage risk may be elevated;
- Pipeline sections in proximity to wetlands must be inspected regularly during installation and prior to commissioning;
- A slurry leak response procedure must be in place prior to the commencement of transfer activities;
- If slurry is released, pumping must be stopped immediately and containment measures must be implemented before the material reaches any wetland area;
- Slurry-contaminated soil or sediment must be removed where necessary and disposed of appropriately;
- Clean-up and remediation measures must be implemented in a manner that does not cause unnecessary secondary disturbance to wetland soils or vegetation; and
- Any area affected by slurry contamination must be reinstated and stabilised following remediation.

5.13.1.9 Wetland Crossing Controls

- Wetland crossings must be avoided wherever feasible through route refinement and micro-siting;
- Where avoidance is not possible, crossings must be located at the least sensitive practicable point;

- All wetland crossings must be approved prior to construction and must be clearly shown on the final construction layout;
- A site-specific method statement must be prepared for each unavoidable wetland crossing before construction commences;
- The method statement must include the approved crossing location, access method, construction sequence, equipment requirements, footprint extent, spoil handling, stormwater controls, erosion and sediment controls, pollution prevention measures, spill response actions, rehabilitation measures, and rainfall/flood contingency procedures;
- The wetland crossing footprint must be restricted to the minimum practicable width and duration;
- No unnecessary widening of access or work areas may take place at wetland crossings;
- Construction materials, spoil, equipment, and waste may not be stored within wetland crossing areas unless specifically required for the immediate works and approved as such;
- Natural flow paths through the wetland must be maintained throughout the crossing construction period;
- Following completion of the crossing, the affected area must be reinstated to approximate pre-disturbance contours and stabilised against erosion;
- Disturbed wetland vegetation at crossing points must be rehabilitated as soon as practicable following completion of the works; and
- Where scour or bank instability is likely, suitable stabilisation measures must be installed.

5.13.2 Operational Phase

5.13.2.1 Loss and Continued Disturbance of Wetland Habitat

- Operational access to the temporary slurry pipeline must be restricted to approved routes and authorised personnel only;
- No routine operational access through wetlands or wetland buffers may occur unless required for inspection, emergency response, or authorised maintenance;
- Disturbance associated with maintenance activities must be limited to the minimum area and duration required to safely undertake the work;
- No parking, laydown, or storage of material may occur within wetlands or associated buffers during operational activities; and
- Any areas disturbed during maintenance or repair must be reinstated and rehabilitated following completion of the works.

5.13.2.2 Alteration of Hydrology / Erosion / Sedimentation

- The pipeline route and associated disturbed areas must be inspected regularly for evidence of ponding, altered flow, erosion, sediment deposition, rutting, or scouring;
- Any evidence of altered hydrology or runoff concentration associated with the pipeline route must be corrected as soon as practicable;
- Erosion and sediment control measures implemented during construction must be maintained for as long as required;
- Maintenance access may not create new erosion channels or flow diversion into wetland systems; and
- Disturbed areas resulting from repair or maintenance works must be stabilised immediately after the completion of works.

5.13.2.3 Water Quality Impairment and Contamination Risk

- All slurry transfer infrastructure must be routinely inspected for leaks, corrosion, weakened joints, damaged sections, or any other sign of failure;
- Inspection frequency must be increased in high-risk areas, including sections adjacent to wetlands and wetland buffers;
- A leak detection and response procedure must be implemented and maintained for the duration of slurry transfer operations;
- Spill response materials suitable for slurry and hydrocarbon containment must be available at all high-risk operational areas;
- In the event of a leak or spill, pumping must be stopped immediately and containment measures implemented without delay;
- Any contaminated soil or sediment must be removed and disposed of appropriately where necessary;
- Clean-up activities must be undertaken in a manner that prevents secondary erosion, sedimentation, or unnecessary disturbance of wetland areas;
- No uncontrolled discharge of dirty water, slurry, wastewater, or contaminated runoff may occur toward wetlands during operation; and
- No refuelling, vehicle servicing, waste storage, or uncontrolled maintenance activities may occur within wetlands or associated buffer areas.

5.13.2.4 Alien Invasive Vegetation and Rehabilitation Maintenance

- Disturbed wetland-adjacent areas must be monitored during operation for alien invasive vegetation establishment;
- Any alien invasive species recorded within disturbed or rehabilitated areas must be controlled or removed;
- Previously rehabilitated areas must be inspected to assess vegetation establishment, stability, and recurrence of erosion; and
- Additional rehabilitation or stabilisation measures must be implemented where vegetation establishment is poor or where erosion reoccurs.

5.13.2.5 Tailings Contaminant Migration within Shafts

- Ensure that the shaft liner is intact;
- Tailings are to be deposited below groundwater level; and
- Where the existing monitoring networks are lacking, additional boreholes may be required to monitor if any contaminant migration is taking place from the shafts during and after tailings deposition.

5.13.3 Decommissioning Phase**5.13.3.1 Disturbance Associated with Pipeline Removal**

- Prior to removal, all temporary slurry pipelines must be drained and, where necessary, flushed in a controlled manner;
- No slurry, flushing effluent, contaminated water, or residual material may be discharged into wetlands or their associated buffers;
- Pipeline removal must be undertaken within the minimum footprint necessary to complete the work safely;
- Unnecessary access through wetlands and buffer areas during removal activities must be prohibited;

- All pipeline sections, supports, anchors, markers, waste, and associated infrastructure must be removed from wetland and buffer areas following decommissioning; and
- Wetland and buffer no-go areas must remain demarcated during decommissioning activities.

5.13.3.2 Residual Contamination and Pollution Risk

- Any residual slurry contamination encountered during decommissioning must be contained and cleaned up immediately;
- Contaminated soil or sediment must be removed where necessary and disposed of at an appropriate facility;
- Spill kits and pollution response materials must remain available until all slurry infrastructure has been removed and rehabilitation completed; and
- Decommissioning activities must be supervised to ensure that no secondary contamination of wetlands occurs during dismantling and removal.

5.13.3.3 Rehabilitation and Reinstatement

- All disturbed areas must be rehabilitated following the removal of temporary infrastructure;
- Reinstatement must restore, as far as reasonably possible, pre-disturbance contours, drainage characteristics, and vegetation cover;
- Compacted soils within disturbed wetland-adjacent areas must be loosened where required before topsoil replacement;
- Stored topsoil must be replaced over disturbed areas where applicable;
- Re-vegetation must make use of locally appropriate indigenous species or an approved indigenous seed mix suited to the affected habitat;
- Disturbed areas must be stabilised against erosion until vegetation cover is re-established;
- Rehabilitated areas must be monitored for erosion, subsidence, poor vegetation establishment, alien invasive plant establishment, and persistent hydrological disturbance; and
- Corrective action must be implemented where rehabilitation failure is identified.

5.14 Issues and Responses from Public Consultation Process

The Public Participation Process (PPP) has been developed to ensure compliance with the IWULA process. The PPP offers stakeholders a fair opportunity to be informed about the IWULA and to raise issues and concerns for enhanced project benefits. The primary objectives of the PPP include:

- Meaningful, inclusive and timeous participation of interested and affected parties (I&APs);
- Identification of issues and concerns of key stakeholders and I&APs with regard to the IWULA (i.e. focus on important issues);
- Promotion of transparency and an understanding of the WULA and its potential environmental (social and biophysical) impacts;
- Accountability for information used for decision-making.
- Serving as a structure for liaison and communication with I&APs; and
- Assisting in identifying potential social and biophysical impacts associated with the Proposed Project.

All comments raised by I&APs during the Public Review from Wednesday, 10 June 2026 to Tuesday, 11 August 2026 will be included in the Comments and Responses Report (CRR), which will be submitted as part of the IWULA to be reviewed by the DWS.

Refer to Appendix C for the Public Participation Report which outlines the full PPP to be undertaken for the Proposed Project.

6. WATER AND WASTE MANAGEMENT

6.1 Water and Waste Management Philosophy

Harmony is a values-driven company and incorporates the following values that relate to the environment at the Harmony operations:

- Harmony respects the environment;
- Harmony is committed to continually improve on their processes to prevent pollution, minimise waste, increase their carbon efficiency and make use of natural resources; and
- Harmony is committed to developing innovative solutions to mitigate environmental and climate risks.

6.2 Strategies

6.2.1 Water Management Strategy

Harmony has compiled its own Water Management Strategy. According to this strategy, water is considered to be critical to Harmony's business, and the security of water supply is vital to the company's growth. The strategy is based on the following principles:

- Water conservation and water demand management;
- Harmony recognises that South Africa is a water scarce country and water is a competing resource. The conservation of surface and groundwater, both quality and quantity, is integral to Harmony's planning process;
- Integrating water management and efficiencies: All new mining developments consider water management at all phases of the developments;
- Harmony recognises water as a critical resource for local communities, and that early and consistent community engagement and investment is valuable to its operations and the implementation of projects. Harmony will aim to understand and manage the company's operations to avoid impacts on communities and will provide support where possible. Local communities are always included in Harmony's risk assessment consultation process to ensure that the risk of water unavailability is managed appropriately;
- Acknowledging water in respect to climate change: Harmony's operations plan and design for adaptations to climate change, which drive the conservation and design criteria for the storage and treatment of water in areas that have increased or reduced rainfall. This also ensures that appropriate adaptation measures are in place to sustainably respond to changing climatic parameters; and
- Water management at mine closure: Latent and residual impacts of mining activities, including the impact on water resources and water bodies are taken into consideration during mine closure planning. Harmony is committed to addressing mine closure in a holistic manner. Current water usage and discharge activities are monitored, and the future scenarios and the impact of the operations on water from a regional perspective are considered. Legacy issues around acid mine drainage are also considered as part of the decommissioning and closure programmes.

A number of programmes have been developed by Harmony to assist in achieving improved water performance, which include:

- A water standard that articulates good practice and minimum expectations for responsible water management;
- Group targets that cascade down to operational targets to drive continual improvement;
- Harmony is actively driving integrated water management and regional water management to optimise water use and promote a holistic approach to water in the group; and

- Legacy AMD issues are being addressed through regional strategies with Harmony's own operations and peers.

6.2.2 Waste Management Strategy

Harmony has compiled its own Waste Management Strategy. This strategy was developed to establish and implement a waste management procedure applicable to individuals and companies that are involved in the sorting, loading, transporting, recycling and disposal of waste products generated from the various Harmony operations in compliance with the environmental legislation and requirements.

The waste management hierarchy of controls will be considered during the planning of new activities, and these controls must also be considered in a proactive manner for existing activities. The following should be considered to ensure that the hierarchy of controls is considered:

- **Waste prevention:** Is it possible to prevent the generation of waste?
- **Waste minimisation:** Is it possible to minimise the waste?
- **Resource recovery:** Is it possible to recover or recycle the waste?
- **Waste treatment:** Is it possible to treat the waste, reducing the waste or its toxicity?
- **Waste disposal:** If the waste being generated cannot be prevented, minimised, recovered/recycled or treated it must be disposed of at a suitable waste disposal facility.

6.3 Performance Objectives / Goals

6.3.1 Water

Harmony has set the following objectives based on the Water Management Strategy:

- Improving water efficiency: Harmony aims to conserve water as a natural resource by improving the company's water efficiencies through reuse and recycling. Internal targets and peer benchmarking guide Harmony's aim to work efficiently, as these relate to water usage;
- Protecting water: Harmony is cognisant of the nature of mining impacts on the receiving environment; therefore Harmony prioritises the management of water to ensure that the company operates with the requirements for future generations in mind. Harmony aims to reduce its impact on surface and groundwater from a water quality perspective through the following:
 - Remediating contamination;
 - Pro-actively preventing pollution;
 - Managing water at source;
 - Gearing all operations to zero discharge for all South African Operations.
- Accounting for the value of water: Harmony recognises the need for water use in terms of current operations, especially regarding the impact of climate change on its future growth strategy. Harmony also recognises that water management and accountability require an interdisciplinary and multidisciplinary synthesis in order to achieve success; and
- Partnerships for success. Multi-stakeholder engagement is required with technical partners, communities, government and industry partners. Harmony recognises that its operations compete with other local users for water resources and the company therefore engages with important stakeholder groups of other users to minimise the potential for competition and conflict over the scarce resource. Harmony is therefore facilitating water management with local government to try and assist the managing of sanitation and water clean-up.

Harmony has set the following aims to give effect to the Water Management Strategy:

- To comply with all relevant legislation in the host countries in which Harmony operates;

- To conserve the natural resources by improving the company's water efficiencies through reuse and recycle. Ensuring that the water is treated and discharged into the receiving environment should it be required for it to be returned to the source;
- Groundwater systems would be conserved as far as practicable by:
 - Understanding the impact of Harmony's operations on the fissure water;
 - Limiting Harmony's drawdown;
 - Eliminating where possible potential impacts to the groundwater; and
 - Monitoring and controlling possible plumes.
- Surface water will be conserved as far as practicable by:
 - Pre-empting the impact from Harmony's mining operations on surface water sources;
 - Limiting Harmony's operational dependency on potable and freshwater resources; and
 - Limiting Harmony's discharges and, where possible, drive a zero-discharge philosophy.

6.3.2 Waste

Harmony aims to implement an integrated waste management system for the management of waste material, as per DWS and DFFE's requirements, as well as the Waste Management Strategy for the Harmony operations. These must be adhered to at the Harmony operations to ensure the effective management of waste:

- Waste management practices must take cognisance of the waste management hierarchy as required by DWS and DFFE;
- A waste management assessment must be undertaken; and
- A waste management inventory must be compiled and reviewed annually or when a new waste type is being generated.

6.4 Measures to Achieve and Sustain Performance Objectives

All objectives and targets set related to water and waste management are captured in Harmony's EMS and are driven through action plans. Part of the system entails an annual review to assess progress against targets and objectives.

6.5 Options Analysis and Motivation for Preferred Options

6.5.1 The Property on which or Location where the Activity is Proposed to be Undertaken

The Proposed activity involves the backfilling of the already existing defunct shafts. Therefore, there are **no alternative sites**.

Existing and new pipelines will be used for the transportation of tailings into the shafts. The new pipelines will be connected to existing pipelines. Their alignment will run adjacent to existing pipelines and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

6.5.2 The Type of Activity to be Undertaken

The only optional activity for Harmony is to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from different plants and TSF areas. The tailings slurry will be transported via existing overland pipelines up to a designated shaft, after which new pipeline segments will be installed to reach the specific shaft area. Once complete, the pipelines will be stripped and reused.

The open defunct shafts create a serious safety risk. Harmony initially used rubble as their preferred backfill material. However, defunct shafts backfilling with rubble can create sparks which pose an explosion risk due to

the methane concentration in the defunct operations. As a result, the shafts cannot be filled with rubble or waste rock. As an alternative backfilling measure, Harmony is now proposing the use of tailings material to backfill the defunct shafts. This has led to the 'preferred Activity'.

6.5.3 The Design and Layout of the Activity

The current layout plan for the Proposed Project are considered as the preferred layout plan. The layout plan is dictated by the existing location of the shafts. The proposed pipeline routes have been determined based on the existing pipeline routes. As mentioned above, these proposed slurry pipelines will be connected to existing pipelines in areas where disturbance has already occurred.

6.5.4 The Technology to be Used in the Activity

The preferred option is to transport slurry via pipelines to the defunct shafts. This option offers a combination of efficiency, safety and cost-effectiveness.

6.5.5 The "No-Go" Option

The option of the Proposed Project not proceeding would mean that the environmental and social status would remain the same as current. This implies that both negative and positive impacts would not take place. As such, the short-term negative impacts on the environment would not transpire; equally so, the long-term positive impacts associated with the closing of defuncts shafts would not occur. The "No-Go" Option also assumes the continuation of the current land use of the proposed project area, implying open shafts and the absence of new slurry pipelines.

6.6 IWWMP Action Plan

Action Plans have been developed to address aspects relating to the phases of the Project requiring attention or additional measures. The Action Plans are presented in Table 6-1 and will be reviewed on an annual basis.

Table 6-1: Operational Action Plan

Performance Objectives	Management Measure	Responsible Department	Timeframe
Groundwater			
Minimise the impact on local groundwater resources	Tailings are to be backfilled below groundwater level	Environmental/ Management	Ongoing
	Undertake groundwater quality monitoring as required		
	Implement the required monitoring to confirm the success of the implemented groundwater protection/mitigation measures		
Sensitive Landscapes			

Performance Objectives	Management Measure	Responsible Department	Timeframe
Minimise impact on the wetlands and sensitive areas in and around Project area	Implement a wetland monitoring programme to assess the ongoing impacts on the wetlands in and around the Project area to determine changes and loss of vulnerable wetland types	Management/Environmental	Ongoing

6.7 Control and Monitoring

6.7.1 Monitoring of Change in Baseline Information

Reports of the updated Baseline information (for the Project) will be submitted to the DWS (as required) and other formal institutions as stipulated by management objectives, conformance targets and applicable legislation and other legal requirements.

6.7.2 Audit and Report on Performance Measures

Internal and external WUL audits will be conducted as per the requirements of the WUL once issued.

6.7.3 Audit and Report on Relevance of IWWMP Action Plan

An audit of the IWWMP Action Plan should be conducted at least once annually by an independent external auditor, while internal audits should be conducted bi-annually or as stipulated by the WUL.

7. CONCLUSION

7.1 Regulatory Status of Activity

This is a new development, and the activities applied for are new water uses requiring authorisation. Activities will only commence once approval of all the relevant authorities has been granted. The proposed water uses are set out in Section 3.2.

7.2 Statement of Water Uses Requiring Authorisation, Dispensing with Licensing Requirement and Possible Exemption from Regulation

This is a new application, and the water uses requiring authorisation are listed in Table 3-2.

A detailed description of the project activities for which Regulation GN R704 exemptions is applicable, along with motivations for these exemptions, will be submitted in Phase 3 as part of the IWULA technical documentation.

7.3 Key Commitments

Harmony is committed to the correct implementation of the IWWMP Action Plan contained in this report and the WUL conditions that will be stipulated in the WUL once issued.



8. References

AquiSim Consulting (October 2025), 2025 Free State Radiological Public Safety Assessment: Groundwater Flow and Mass Transport Model Development. Report Reference: ASC-1018F-6, Pretoria.

Barbour, M.T., Gerritsen, J. & White, J.S. 1996. Development of a stream condition index (SCI) for Florida. Prepared for Florida Department of Environmental Protection: Tallahassee, Florida.

Dallas, H.F. 1997. A preliminary evaluation of aspects of SASS5 (South African Scoring System) or the rapid bioassessment of water in rivers with particular reference to the incorporation of SASS5 in a national biomonitoring programme. South African Journal of Aquatic Science, 23: 79-94.

Dallas, H.F. 2007. River Health Programme: South African Scoring System (SASS) Data Interpretation Guidelines. Report produced for the Department of Water Affairs and Forestry (Resource Quality Services) and the Institute of Natural Resources.

Department of Water Affairs and Forestry (DWAf) 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.

Department of Water and Sanitation (DWS). 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Secondary: C23K. Compiled by RQIS-RDM: <https://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx>. Accessed on 05 February 2022.

Department of Water and Sanitation (DWS). 2016. Classes and Resource Quality Objectives of Water Resources for Catchments of the Middle Vaal. Report Reference: 469, Pretoria.

Department of Water and Sanitation (DWS) 2018. Proposed Reserve Determination of Water Resources for the Vaal Catchment. Report reference: 42127, Pretoria.

Department of Water and Sanitation (DWS). 2019. Determination of Water Resource Classes and Resource Quality Objectives for Mokolo, Matlabas, Crocodile (West) and Marico Catchments. Notice 526 of 2019. Government Gazette: No:42775. 18 October 2019

Department of Environment, Forestry and Fisheries (DEFF), 2022. Screening Report for an Environmental Authorization or for a Part Two Amendment of an Environmental Authorisation as Required by the 2014 EIA Regulations – Proposed Site Environmental Sensitivity

Department of Water Affairs (DWA). 2011. Procedures to Develop and Implement Resource Quality Objectives. Department of Water Affairs, Pretoria, South Africa

Dickens, C. W. S. and Graham, P.M. 2002. The South African Scoring System (SASS) Version 5: Rapid bioassessment method for rivers. African Journal of Aquatic Science. 27 (1): 1 -10.

EIMS (March 2019), Environmental Management Programme MVH, Unisel, Saaiplaas, Masimong, Brand. Report Reference: 30/5/1/2/2/82 MR, Johannesburg.

Harmony (June 2018), Social and Labour Plans 2018 to 2022.

Hydrospatial (Pty) Ltd, (December 2023), Conceptual Stormwater Management Plan for the Harmony Gold Mining Company Limited: Free State Operations. Report Reference: KON024.

Gerber, A. & Gabriel, M.J.M. 2002. Aquatic Invertebrates of South African Rivers Field Guide. Institute for Water Quality Studies. Department of Water Affairs and Forestry. 150pp

International Union for Conservation of Nature (IUCN) 2021. The IUCN Red List of Threatened Species. Version 2020-3. <https://www.iucnredlist.org>. Accessed 17 March 2021

Jones & Wagener (May 2017), Harmony Gold Free State Operations Integrated Water and Waste Management Plan. Report Reference: JW134/16/F141 – Rev 1, Johannesburg.

Kleynhans CJ, Louw MD. 2007. Module A: EcoClassification and EcoStatus determination in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Resource Commission and Department of Water Affairs and Forestry report. WRC Report No. TT 329/08.

Kleynhans, CJ. 1996. A qualitative procedure for the assessment of the habitat integrity status of the Luvuvhu River (Limpopo System, South Africa) Journal of Aquatic Ecosystem Health 5:41-54.

Kotze DC, Marneweck GC, Batchelor AL, Lindley DC, Collins NB. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

LDM (2022), Lejweleputswa District Municipality – Integrated Development Plan 2022-2027.

Macfarlane., D M and Bredin., I. 2017. Buffer zone Guidelines for Wetlands, River and Estuaries Part 1: Technical Manual

Macfarlane, D.M., Dickens J., Von Hase F. 2009. Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries. Final literature review. Report produced for the Department of Water Affairs and Forestry. Submitted to: Water Research Commission. INR Report No:400/09

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

National Water Act (NWA). 2016. Act 36 of 1998. New Nine (9) Water Management Areas of South Africa. National Gazettes, No. 40279 of 16 September 2016

Nel, J. L., Driver, A., Strydom, W. F., Maherry, A. M., Petersen, C. P., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. R. & Smith-Adao, L. B. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources, WRC Report No. TT 500/11. Water Research Commission, Pretoria.

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

Republic of South Africa (RSA) 2016. Classes and resource quality objectives of water resources for catchment of the Middle Vaal. 22. No. 39943. Published in Government Gazette No. 469 dated 22 April 2016.

Rowntree, K. and Ziervogel, G., 1999. Development of an Index of Stream Geomorphology for the Assessment of River Health. National Aquatic Ecosystem Biomonitoring Programme.

Rountree KM, Wadeson RA and O'Keeffe J. 2000. The Development of a Geomorphological Classification System for the Longitudinal Zonation of South African Rivers. South African Geographical Journal 82 (3): 163-172.

SANBI. (2017). Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

Shangoni Management Services (March 2010), Harmony Gold Mining Company Limited Environmental Management Programme. Report Reference: FS 30/5/1/2/2/82 MR, Pretoria.

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

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

South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.2020.

Skelton, P.H. (2001). A complete guide to the freshwater fishes of southern Africa. Struik Publishers, South Africa.

SRK Consulting 2020a. Harmony Gold – Central Operations. Integrated Water and Waste Management Plan in Support of the Water Use Licence Application. Report Number 548500/Central WULA

SRK Consulting 2020b. Harmony Gold – Harmony 1 Operations. Integrated Water and Waste Management Plan in Support of the Water Use Licence Application. Report Number 548500/Harmony 1 WULA

SRK Consulting 2020c. Harmony Gold – Joel Operations. Integrated Water and Waste Management Plan in Support of the Water Use Licence Application. Report Number 548500/Joel WULA

SRK Consulting 2020d. Harmony Gold – Saaiplaas Operations. Integrated Water and Waste Management Plan in Support of the Water Use Licence Application. Report Number 548500/Saaiplaas WULA

SRK Consulting 2020e. Harmony Gold – Target Operations. Integrated Water and Waste Management Plan in Support of the Water Use Licence Application. Report Number 548500/Target WULA

Tate RB, Husted A. 2015. Aquatic macroinvertebrate responses to pollution of the Boesmanspruit river system above Carolina, South Africa. African Journal of Aquatic Science. 1-11.

The Biodiversity Company (August 2025), Water Resource Baseline and Risk Assessment for the Harmony Free State Operations Welkom, Free State, South Africa. Report Reference: CL202109(08) DG

The Biodiversity Company (May 2026), Wetland Functional and Impact Assessment for the Proposed Harmony Free State Defunct Shafts Backfilling Project, Matjhabeng Local Municipality, Lejweleputswa District Municipality, Free State Province, South African. Report Reference: Harmony Defunct Shafts Backfilling.

Thirion, C. A. 2007. Module E: Macroinvertebrate Response Assessment Index in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report. Pretoria, South Africa: Department of Water Affairs and Forestry.

Water Research Commission (WRC) (April 2013), Groundwater Reserve Determination for the Middle Vaal Water Management Area. Report Reference: KV313/13.

Wepener V, Van Vuren JHJ, Chatiza FP, Mbizi Z, Slabbert L, Masola B. 2005. Active biomonitoring in freshwater environments: early warning signals from biomarkers in assessing biological effects of diffuse sources of pollutants. Physics and Chemistry of the Earth 30: 751–761.



Appendix A: Wetland Functional and Impact Assessment



Wetland Functional and Impact Assessment for the Proposed Harmony Free State Defunct Shafts Backfilling Project

**Matjhabeng Local Municipality, Lejweleputswa
District Municipality, Free State Province, South
Africa**

5/25/2026

Prepared by:

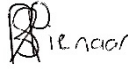
The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	Wetland Functional and Impact Assessment for the Proposed Harmony Free State Defunct Shafts Backfilling Project	
Specialist Theme	Aquatic Biodiversity Theme – Wetland Baseline and Impact Assessment	
Project Reference	Harmony Defunct Shafts Backfilling	
Report Version	5/25/2026	
Environmental Assessment Practitioner		
Technical Support	Dawid Coetsee (Can. Sci. Nat. 152512)	
Technical Support	Kayla Goodfellow (SACNASP candidate 17778 (pending)) ¹	
Responsible Specialist	Rian Pienaar (SACNASP Pr. Sci. Nat. 135544)	
Declaration	The Biodiversity Company and its associates act as independent consultants in accordance with the requirements of the South African Council for Natural Scientific Professions. We confirm that we have no affiliation with, or vested financial interest in, the proponent, other than remuneration for professional services rendered in terms of the Environmental Impact Assessment Regulations. We have no conflicting interest in the proposed activity or any secondary developments arising from the authorisation of the project, and our work has been undertaken objectively and in accordance with accepted scientific principles.	

¹All work was completed under the supervision of a Professional Registered Scientist (Rian Pienaar - Pr. Sci. Nat. 135544)

Table of Contents

1	Introduction.....	8
1.1	Background	8
1.2	Scope of Work.....	9
1.3	Project Description and Technical Information.....	9
1.4	Assumptions and Limitations	11
1.5	Key Legislative Requirements.....	12
1.6	National Water Act (NWA, 1998)	12
1.7	National Environmental Management Act (NEMA, 1998).....	13
2	Results & Discussion	13
2.1	Desktop Dataset Assessment	13
2.1.1	Climate.....	13
2.1.2	Soils and Geology.....	14
2.1.3	Hydrological Characteristics	14
2.1.4	Ecologically Important Landscape Features.....	15
2.2	Wetland Field Survey	18
2.2.1	Delineation.....	19
2.2.2	Risk Screening.....	22
2.2.3	Classification and Description	23
2.3	Wetland Functional and Ecological Assessment	26
2.3.1	Functional Assessment.....	26
2.3.2	Present Ecological State.....	28
2.3.3	Ecological Importance and Sensitivity	29
2.3.4	Recommended Ecological Category and Recommended Management Objective	30
2.4	Buffer Requirements	30
2.4.1	Regulation Zones.....	33
2.5	Site Sensitivity Verification	36
2.5.1	Desktop Ecological Sensitivity.....	36
2.5.2	Screening Tool Comparison	37
3	Risk Assessment.....	39
3.1	Mitigation Measures	43
3.1.1	Construction Phase	44
3.1.2	Operational Phase	48

3.1.3	Decommissioning Phase	50
3.1.4	General Monitoring and Compliance Measures	51
4	Conclusion.....	52
4.1	Risk and Impact Statement	52
4.2	Specialist Opinion.....	52
5	References	53
6	Appendix C – Specialist Declaration of Independence	55
7	Appendix D – Specialist CVs	56

List of Tables

Table 1-1	Shafts to be backfilled	10
Table 1-2	A list of key legislative requirements	12
Table 2-1	Summary of Relevance of the Proposed Project to Ecologically Important Landscape Features 15	
Table 2-2	Wetland Types Identified According to the NFEPA Dataset at the Infrastructure Sites ...	17
Table 2-3	Summary of wetland area within the PAOI	19
Table 2-4	Risk Status of the Delineated Wetlands.....	22
Table 2-5	Wetland Classification as per SANBI Guideline (Ollis et al., 2013)	23
Table 2-6	Classes for Determining the Likely Extent to Which a Benefit is Being Supplied	26
Table 2-7	Summary of the Average Ecosystem Scores of the Assessed Wetland Units	27
Table 2-8	The Present Ecological State Categories (Macfarlane et al., 2020)	28
Table 2-9	Average Present Ecological State Scores for the Assessed Wetland	28
Table 2-10	Description of Ecological Importance and Sensitivity Categories	29
Table 2-11	Aspects Considered in the Ecological Importance and Sensitivity Assessment	29
Table 2-12	Recommended Ecological Category and Recommended Management Objectives for Water Resources based on Present Ecological State and Ecological Importance and Sensitivity Scores 30	
Table 2-13	Summary of the REC and RMO Categories Assigned to the Relevant Wetlands	30
Table 2-14	Legislated Zones of Regulation.....	33
Table 2-15	Summary of the Screening Tool Versus Specialist Assigned Sensitivities.....	38
Table 3-1	Significance Ratings Matrix.....	39
Table 3-2	Summative Results of the Risk Assessment Conducted for the Proposed Development	41

List of Figures

Figure 1-1	Location of the Proposed Project.....	9
Figure 1-2	Project Components and PAOI	11
Figure 2-1	Local Climate (Mucina & Rutherford, 2006).....	13
Figure 2-2	Catchment Details and Major Rivers for the PAOI.....	14
Figure 2-3	Topographical Inland Water Areas and River Lines that Intersect the PAOI.....	15
Figure 2-4	Wetland Features Identified Within the PAOI According to the South African Inventory of Aquatic Ecosystems Dataset	16
Figure 2-5	Wetland Features Identified Within the PAOI According to the NFEPA Dataset.....	17
Figure 2-6	Biodiversity Sector Plan Overlay for the PAOI.....	18
Figure 2-7	Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)	19
Figure 2-8	Delineation of the Watercourses within the PAOI	20
Figure 2-9	Delineations of the Watercourses within Cluster 1 within the PAOI	21
Figure 2-10	Delineations of the Watercourses within Cluster 2 within the PAOI	21
Figure 2-11	Delineations of the Watercourses within Cluster3 within the PAOI	22
Figure 2-12	Representative Photographs of the Different Identified Features within the PAOI. A) Seep; B) Depression; and C) Unchannelled valley-bottom	22
Figure 2-13	Amalgamated Diagram of a Typical Hillslope Seep, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)	24
Figure 2-14	Amalgamated Diagram of a Typical Depression Wetland, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)	24
Figure 2-15	Amalgamated Diagram of a Typical Unchannelled Valley Bottom, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013).....	25
Figure 2-16	Amalgamated Diagram of a Typical Channelled Valley-Bottom, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013).....	25
Figure 2-17	Recommended Buffers for the Identified Wetlands in relation to the Proposed Development	31
Figure 2-18	Recommended Buffers for the Identified Wetlands within Cluster 1 in relation to the Proposed Development.....	31
Figure 2-19	Recommended Buffers for the Identified Wetlands within Cluster 2 in relation to the Proposed Development.....	32
Figure 2-20	Recommended Buffers for the Identified Wetlands within Cluster 3 in relation to the Proposed Development.....	32
Figure 2-21	Zones of Regulation in relation to the Identified Watercourses Within the PAOI	34

Figure 2-22 the PAOI	Zones of Regulation in relation to the identified Watercourses Within Cluster 1 Within 34
Figure 2-23 the PAOI	Zones of Regulation in relation to the identified Watercourses Within Cluster 2 Within 35
Figure 2-24 the PAOI	Zones of Regulation in relation to the identified Watercourses Within Cluster 3 Within 35
Figure 2-25	Aquatic Biodiversity Theme Sensitivity for the Proposed Sites 37
Figure 2-26	Freshwater Sensitivity for the PAOI 38
Figure 3-1	The Mitigation Hierarchy as Described by the DEA (2013) 39

Abbreviations

PAOI	Project Area of Influence
TSF / TSFs	Tailings Storage Facility / Facilities
WUL	Water Use Licence
WULA	Water Use Licence Application
GA	General Authorisation
DWS	Department of Water and Sanitation
GN	Government Notice
NWA	National Water Act
EAP	Environmental Assessment Practitioner
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
CARA	Conservation of Agricultural Resources Act
SACNASP	South African Council for Natural Scientific Professions
NBA	National Biodiversity Assessment
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
NFEPA	National Freshwater Ecosystem Priority Area
CBA	Critical Biodiversity Area
ESA	Ecological Support Area
HGM	Hydrogeomorphic
UVB	Unchannelled Valley-Bottom
CVB	Channelled Valley-Bottom
PES	Present Ecological State
EIS	Ecological Importance and Sensitivity
REC	Recommended Ecological Category
RMO	Recommended Management Objective
DWAF	Department of Water Affairs and Forestry
SANBI	South African National Biodiversity Institute
WET-EcoServices	Wetland Ecosystem Services Assessment Tool
ECO	Environmental Control Officer
RAM	Risk Assessment Matrix
SWSA	Strategic Water Source Area
BAR	Basic Assessment Report
EIA	Environmental Impact Assessment
DEA	Department of Environmental Affairs
ARC	Agricultural Research Council
WRC	Water Research Commission

1 Introduction

1.1 Background

The Biodiversity Company was commissioned by Harmony Gold Mining Limited ('Harmony') to conduct a wetland baseline and impact assessment in support of the water use authorisation process for the proposed project to backfill its defunct mine shafts ('the Project'), located in the Matjhabeng Local Municipality, Lejweleputswa District Municipality, Free State Province (Figure 1-1). A 500 metre (m) area has been demarcated for the Project to facilitate the identification of wetlands within the regulatory zone. This area is referred to as the Project Area of Influence (PAOI).

Harmony Gold Mining Company Limited (Harmony) intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from plants and Tailings Storage Facilities (TSFs). Harmony requires a Water Use Licence (WUL), in terms of the National Water Act, 1998 (Act No. 36 of 1998), to undertake the backfilling process.

This assessment has been completed in accordance with the requirements of the published Government Notice (GN) 4167 by the Department of Water and Sanitation (DWS) (previously GN 509 of 2016 and GN 3139 of 2023). The said notice was published in the Government Gazette (no. 49833) under Section 39 of the National Water Act (Act no. 36 of 1998) (NWA) in December 2023, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 4167 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential water use) qualifies for a GA under GN 4167 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), provided the identified risks are all considered a low risk, and the applicant is listed under Appendix D1 or Appendix D2 of the same notice. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regard to the ecological viability of the proposed development and related activities.

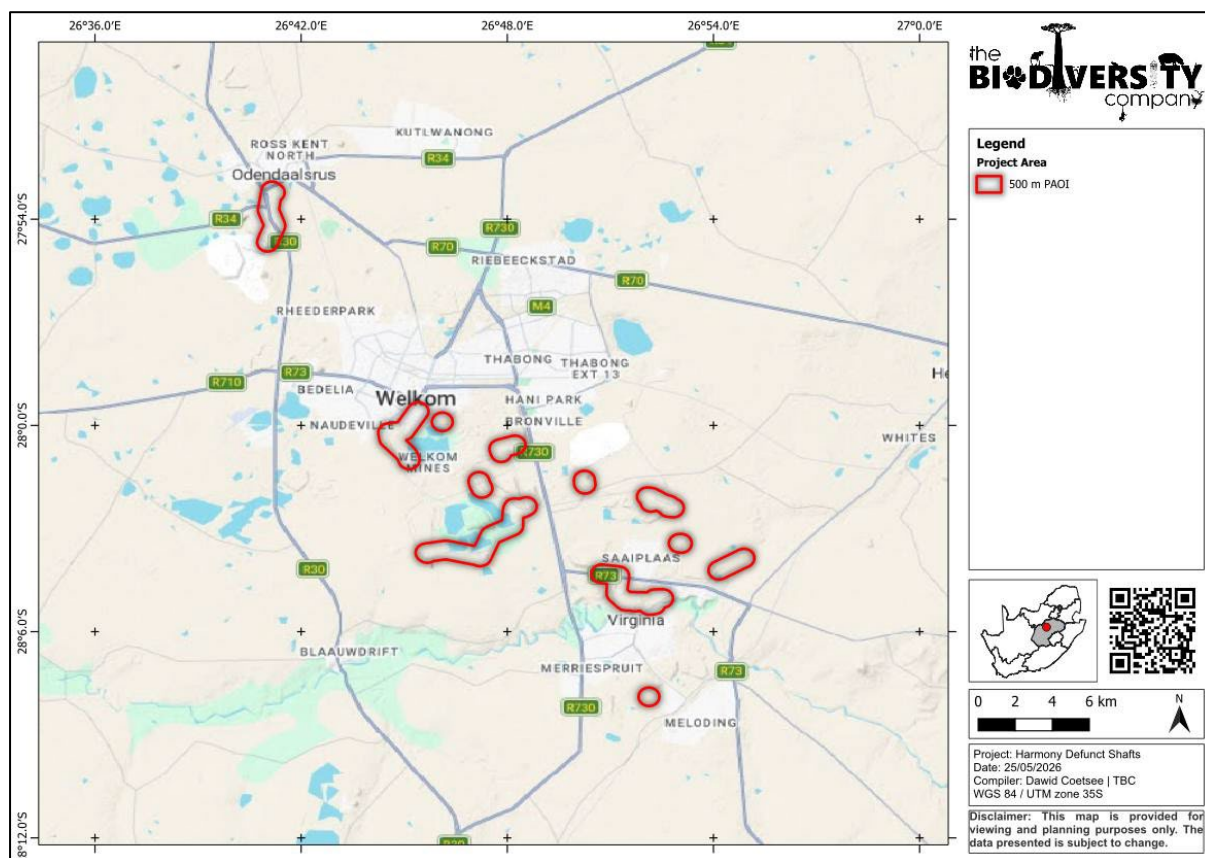


Figure 1-1 Location of the Proposed Project

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- A desktop assessment of available and related datasets to provide context of the freshwater biodiversity of the Project area and to indicate potential wetland areas;
- The delineation, classification and assessment of wetlands within 500 m of the project area;
- An assessment of the related impacts through the use of the Risk Assessment (DWS, 2023);
- The provision of recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

1.3 Project Description and Technical Information

Harmony intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from plants and Tailings Storage Facilities (TSFs). Harmony requires a Water Use Licence (WUL), in terms of the NWA, to undertake the backfilling process.

Illegal mining activities in the Welkom region have become a serious threat to the safety and security of the Harmony workforce, mines and associated infrastructure, as well as the host communities. Defunct shafts are the main entry points for illegal miners, who gain access through open shafts. In cases where conventional plugs are installed, illegal miners often bypass these plugs to continue illegal

mining activities. The issue of illegal miners has amplified over the last few years with the closing down of shafts and a decline in economic activity in the Welkom region.

The open defunct shafts create a serious safety risk and Harmony believes that promptly rehabilitating these defunct shafts, including backfilling and sealing the barrels, offers the most suitable means of eliminating the risk of illegal entry into underground workings. To achieve this, Harmony is proposing the backfilling of 16 defunct shafts, listed in Table 1-1

Table 1-1 Shafts to be backfilled

Shaft	No	Type
Harmony	1	Vent
Harmony	3	Main
Harmony	4	Main
Harmony	4	Vent
Harmony	5	Vent
Merriespruit	2	Vent
Saaiplaas	1	Vent
Saaiplaas	2	Main
Saaiplaas	3	Main
Freddies	6	Main
President Steyn	2	Vent
Brand	1A	Vent
Brand	3	Vent
Brand	5	Main & Vent
Unisel		Main
Bambanani East		Main
Bambanani West		Main

Backfilling Method

Harmony initially used rubble as their preferred backfill material. However, defunct shafts backfilling with rubble can create sparks which pose an explosion risk due to the methane concentration in the defunct operations. As a result, the shafts cannot be filled with rubble or waste rock. As an alternative backfilling measure, Harmony is now proposing the use of tailings material to backfill the defunct shafts. Tailings, in the form of slurry, will be pumped into the defunct shafts. The defunct shafts will be filled with tailings up to approximately 300 m below surface, after which they will be topped off with rubble. The slurry will be transported via existing overland pipelines up to a designated shaft, after which new pipeline segments will be installed to reach the specific shaft area. Once complete, the pipelines will be stripped and reused. This process therefore removes tailings from surface and subsequently eliminates safety hazards associated with open shafts.

The proposed backfilling will be carried out using both existing pipelines and newly proposed temporary connection pipelines. The new pipelines are to be constructed using 300 mm diameter steel and no plinths will be required. The proposed pipelines will be connected to existing infrastructure in areas where disturbance has already occurred. Their alignment will run adjacent to existing pipelines and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

Life of Operation

The anticipated duration of the project is five years, with temporary pipelines installed for the duration of each specific shaft to be backfilled.

The 500 m PAOI is displayed in Figure 1-2 along with the proposed project components.

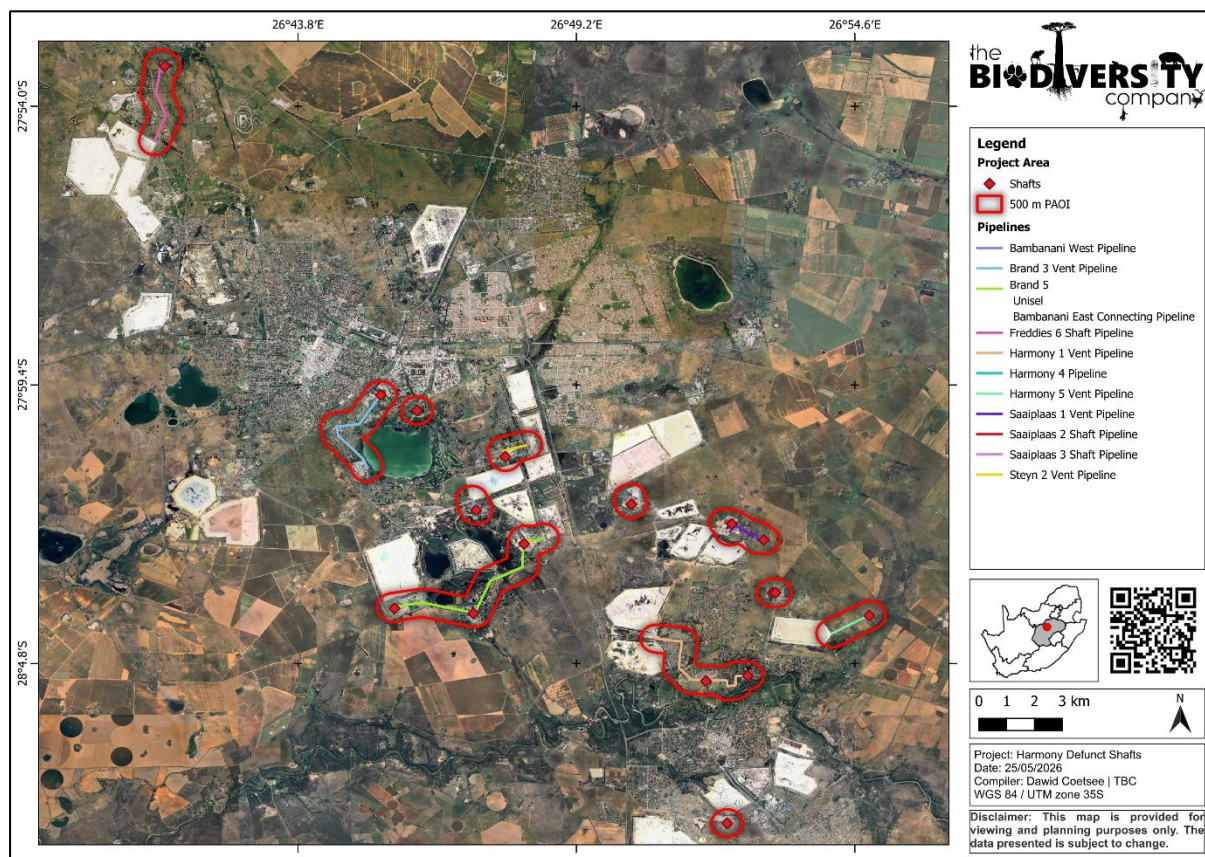


Figure 1-2 Project Components and PAOI

1.4 Assumptions and Limitations

The following aspects were considered as limitations:

- It has been assumed that the spatial files provided to the specialist are accurate;
- Only the proposed boundary of the Assessment Area was provided during the time of the field survey;
- Freshwater features within the larger 500 m PAOI were delineated and assessed via desktop with areas within the Assessment Area taking precedence for field verification and assessment;
- Areas characterised by external wetland attributes were the focus for this assessment, where potential wetlands were thereafter confirmed by soil form indicators;
- Representative sampling within the assessment area was conducted and by its nature would result in some areas of the assessment area not being covered on foot. However, the results derived were sufficient to derive a meaningful baseline of the PAOI in the context of freshwater ecosystems; and

- The GPS used for water resource delineations is accurate to within five metres. Therefore, the wetland delineation plotted digitally may be offset by a maximum of five metres to either side.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-2 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-2 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	National Environmental Management Act (Act No. 107 of 1998) (NEMA)	To provide for the effective protection and controlled utilisation of the environment and for matters incidental thereto.
		Minimum content for specialist reports.
	NEMA: Environmental Impact Assessment Regulations (2014), as amended, with cognisance of Appendix 6 requirements in GNR 326 (7 April 2017).	Listed activities, in terms of the NEMA (1998) and the EIA Regulations (as amended in April 2017) that require authorization before initiating any development or infrastructure, must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation.
	NEMA: Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020)	The minimum criteria for reporting. Protocol for the specialist assessment and minimum report content requirements.
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection.
	National Environmental Management: Waste Act (Act No. 59 of 2008)	The regulation of waste management to protect the environment.
	National Water Act (Act No. 36 of 1998) (NWA)	To provide for the regulation of water uses. Section 21 of the Act defines various water uses that require authorisation from the Department of Water and Sanitation (DWS), including taking/ storing water and discharging waste
	NWA: Government Notice (GN) 4167 (previously GN 509 of 2016 and GN 3139 of 2023)	Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses and the provision to apply for a General Authorisation subject to usage and outcome of the Risk Assessment Matrix.
Provincial (Free State)	NEMBA: Alien and Invasive Species Regulations (2014) (GNR R598, 1 August 2014). NEMBA: Alien and Invasive Species Lists (2020) (GN 1003, September 2020)	The regulation and management of alien invasive species.
	Conservation of Agricultural Resources Act, 1983 (Act No.43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
Provincial (Free State)	Free State Province Biodiversity Plan: Technical Report v1.0 (2016)	A spatial tool comprising of set of maps of biodiversity priority areas accompanied by contextual information and land-use guidelines for use in land-use and development planning, environmental assessment and regulation, and natural resource management.

1.6 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;

- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

1.7 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

2 Results & Discussion

2.1 Desktop Dataset Assessment

2.1.1 Climate

This region is characterised by a warm-temperate summer rainfall climate with the average annual precipitation being approximately 530 mm (Figure 2-1). High summer temperatures are common for this region with severe frost occurring throughout the winter (on average 37 days per year) (Mucina & Rutherford, 2006).

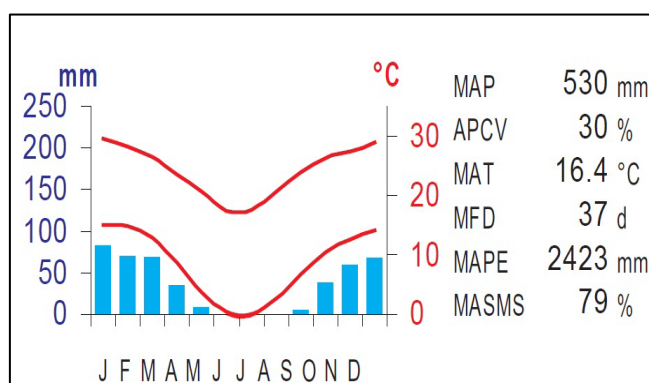


Figure 2-1 Local Climate (Mucina & Rutherford, 2006)

2.1.2 Soils and Geology

The geology of the area is characterised by aeolian and colluvial sands overlying mudstone, sandstone, and shale of the Karoo Supergroup. Older basement gneiss and andesite of the Ventersdorp Supergroup occur to the north. Soil forms associated with the project area include the Bd, Bc, Ae, and Ba land types (Mucina and Rutherford, 2006).

According to the Land Type Database (Land Type Survey Staff, 1972–2006), the PAOI is predominantly characterised by the following land types:

- Bd land type: Consisting of a plinthic catena, these upland duplex and marginal soils are rare, and eutrophic and/or mesotrophic red soils are not widespread.
- Dc land type: Soils are characterised by prismacutanic and/or pedocutanic diagnostic horizons, together with one or more of the following: vertic, melanic, and red structured diagnostic horizons.

2.1.3 Hydrological Characteristics

The PAOI falls within the Highveld Ecoregion, within the Vaal-Orange Water Management Area (WMA). At a finer scale, within the C25B, C42J, and C43B quaternary catchment. The fine scale hydrological features are presented in the following section.

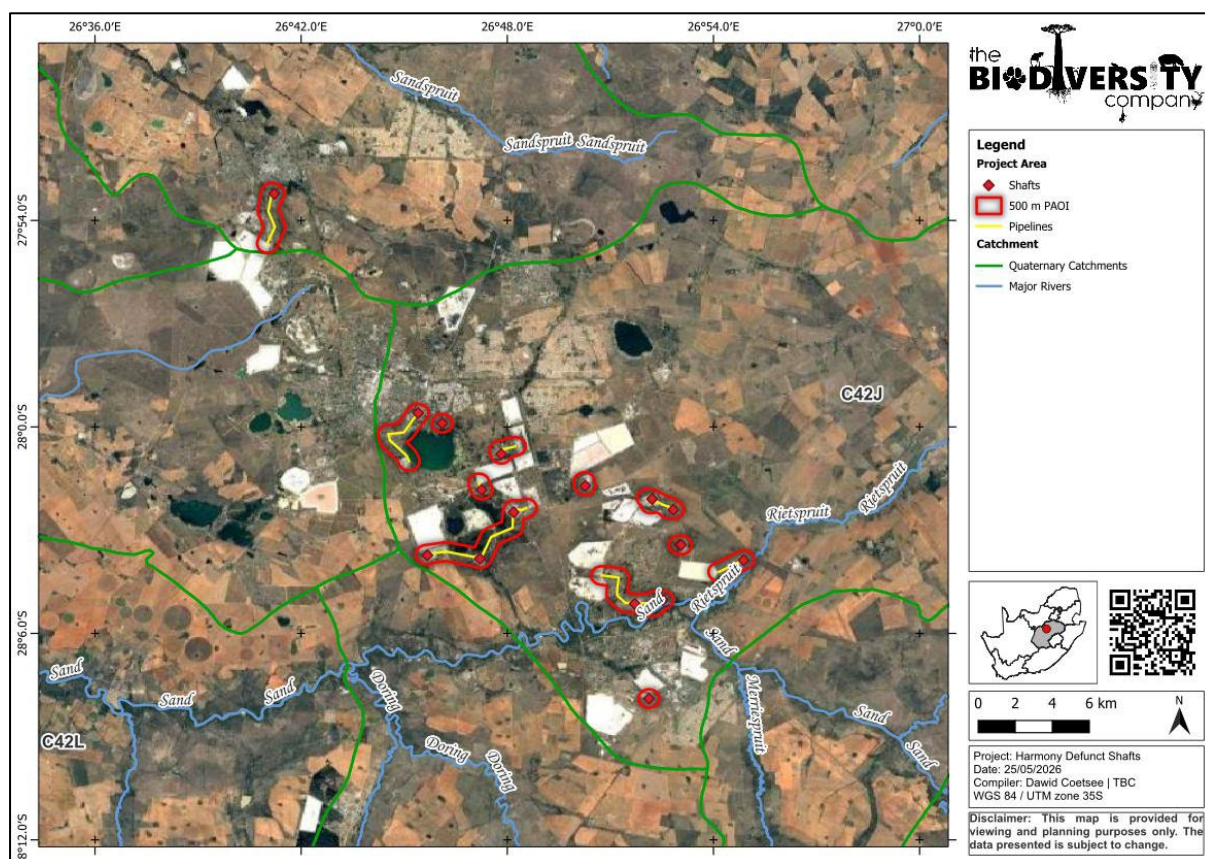


Figure 2-2 Catchment Details and Major Rivers for the PAOI

2.1.3.1 Topographical River Lines and Inland Water Areas

The topographical inland and river line data (based on the 1994 1:500 000 topographic maps as per the Chief Directorate of the National Geo-spatial Information) for the “2826” and “2726” quarter degree squares indicated several inland water features as shown in Figure 2-3. In the north-western portion of

the site, within the Freddie's 6 Shaft PAOI, one marsh/vlei and one non-perennial pan were identified. The Brand 5, Unisel and Bambanani East PAOIs contain two dams, one perennial pan, two non-perennial pans and one reservoir. A sewerage works occurs within the Brand 1A Vent PAOI. The Harmony 1 Vent area contains two dams, while Harmony Vent 5 contains one dam. One non-perennial pan occurs within the Saaiplaas 1 Vent PAOI. In addition, the perennial Sand River intersects the Harmony Vent 5 PAOI, and the perennial Rietspruit River intersects the Harmony 1 Vent PAOI. Four non-perennial rivers also flow into the project PAOI

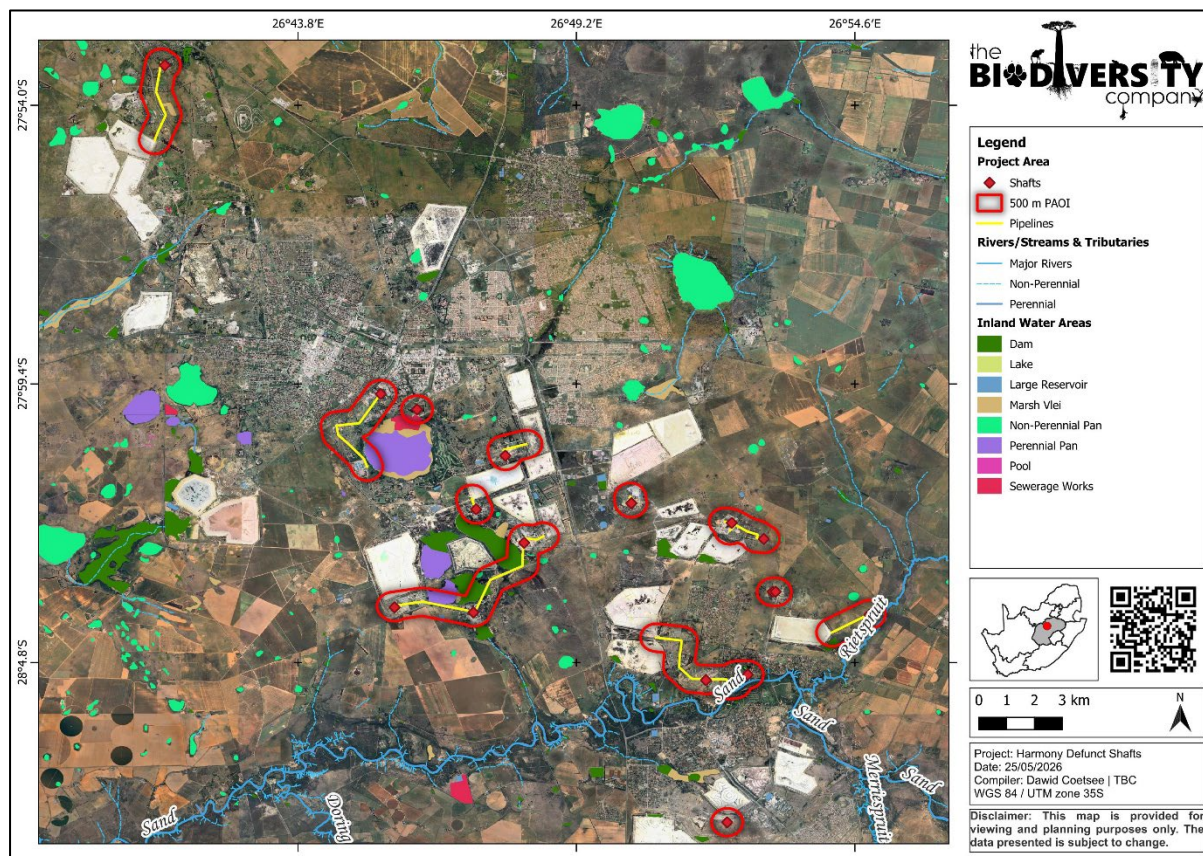


Figure 2-3 Topographical Inland Water Areas and River Lines that Intersect the PAOI

2.1.4 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 2-1. Only features that were identified to be relevant to the proposed project are further discussed.

Table 2-1 Summary of Relevance of the Proposed Project to Ecologically Important Landscape Features

Desktop Information Considered	Relevant/Irrelevant	Section
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Relevant – PAOI overlaps with SAIIAE wetlands and a river system.	2.1.4.1
National Freshwater Ecosystem Priority Area (NFEPA)	Relevant – PAOI overlaps with NFEPA wetlands and a river system.	2.1.4.2
Provincial Conservation Plan	Relevant – PAOI overlaps with Freshwater CBA's and ESA's.	2.1.4.3
Strategic Water Source Areas	Irrelevant – PAOI does not overlap with a Groundwater SWSA.	-

2.1.4.1 South African Inventory of Inland Aquatic Ecosystems

The SAIIE was established during the 2018 National Biodiversity Assessment (NBA), the SAIIE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

According to SAIIE, several depression wetlands were identified within the PAOIs (Figure 2-4). Of these, one occurs within the Freddie's 6 Shaft PAOI, one within the Saaiplaas Vent PAOI, and three within the Brand 5, Unisel, and Bambanani East PAOI. The wetlands conditions as per the dataset ranged from "C – Moderately Modified" to "D/E/F – Largely/Seriously/Critically Modified". The wetlands have been classified as "Least Concern" and "Poorly Protected" with regard to Ecosystem Threat Status and Ecosystem Protection Level, respectively.

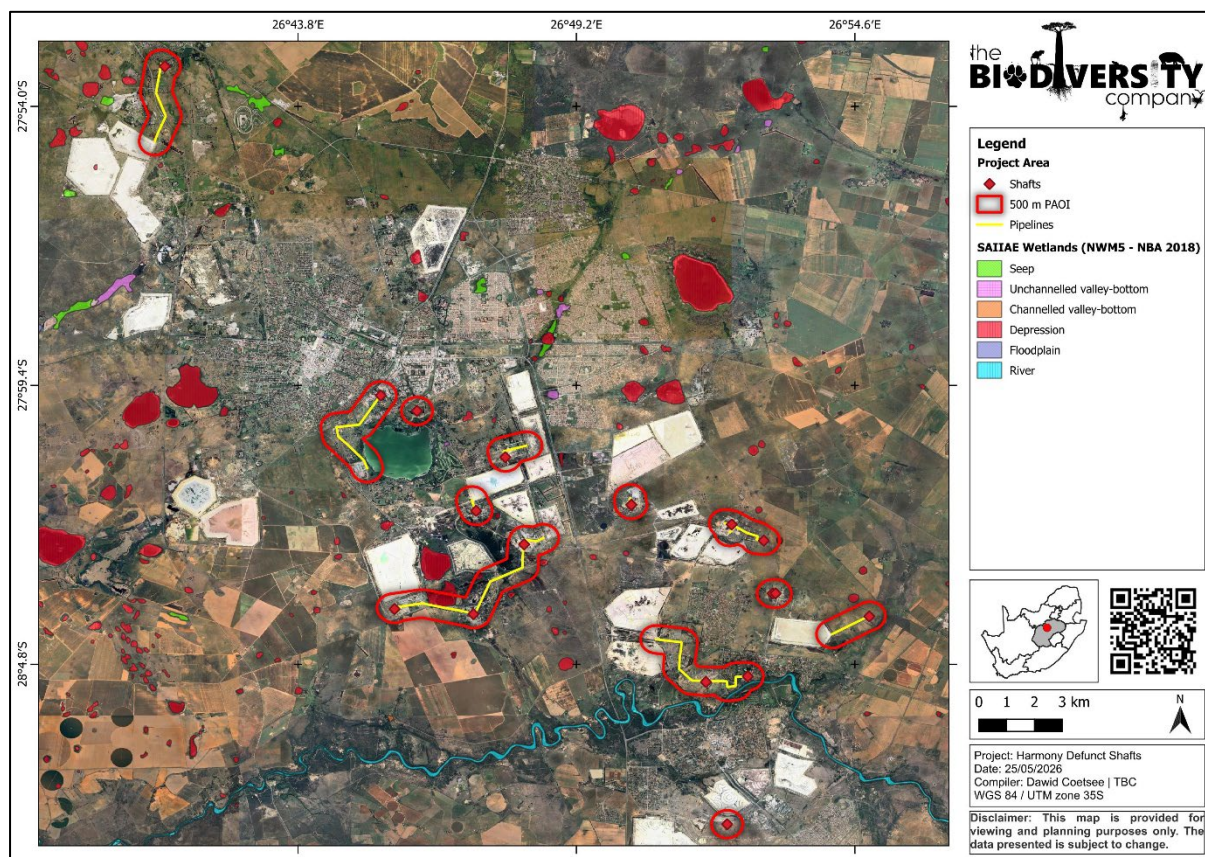


Figure 2-4 Wetland Features Identified Within the PAOI According to the South African Inventory of Aquatic Ecosystems Dataset

2.1.4.2 National Freshwater Ecosystem Priority Areas

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

Several wetlands were identified within the PAOI by means of the NFEPA dataset (Figure 2-5). According to the dataset, the mapped wetland types include Flat, Depression, Seep, and Unchannelled

Valley-Bottom Wetlands. Majority of the wetlands are classified as “C – Moderately Modified”. A summary of the location of the features identified according to the dataset in relation to the infrastructure sites is provided in Table 2-2.

Table 2-2 Wetland Types Identified According to the NFEPA Dataset at the Infrastructure Sites

Site	Wetland Types Present
Freddies 6 Shaft	Flat wetlands, Depression wetlands
Bambanani West	Unchannelled Valley-Bottom Wetland
Brand 5	Unchannelled Valley-Bottom Wetlands, Depression wetlands, Seeps
Unisel	Unchannelled Valley-Bottom Wetlands, Depression wetlands, Seeps
Bambanani East	Unchannelled Valley-Bottom Wetlands, Depression wetlands, Seeps
Harmony 4 Vent	Flat wetlands, Seeps
Harmony 1 Vent	Unchannelled Valley-Bottom Wetlands, Flat wetlands
Harmony Vent 5	Unchannelled Valley-Bottom Wetland
Brand 1A Vent	Unchannelled Valley-Bottom Wetlands

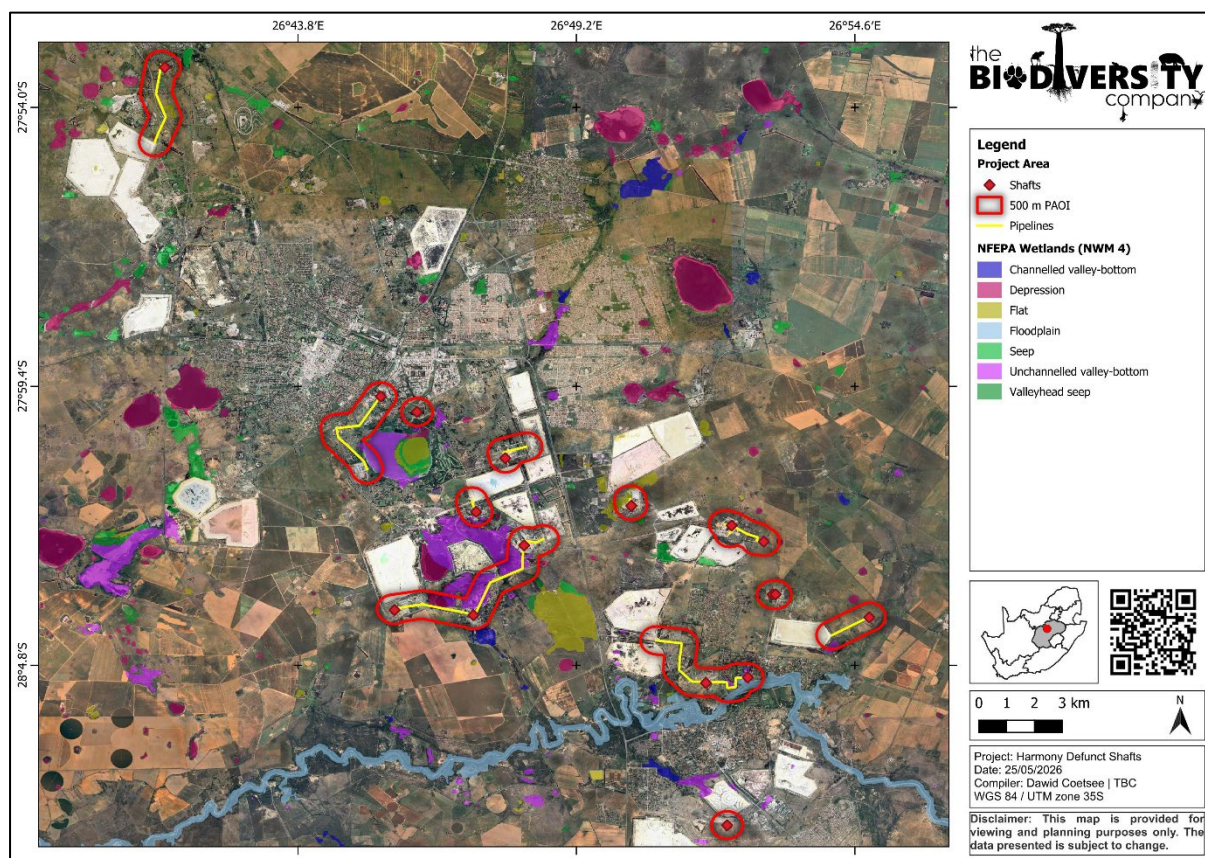


Figure 2-5 Wetland Features Identified Within the PAOI According to the NFEPA Dataset

2.1.4.3 Biodiversity Sector Plan

According to the Free State Terrestrial Critical Biodiversity Areas (Figure 2-6), the PAOI falls within areas characterised as:

- Critical Biodiversity Area 1;
- Critical Biodiversity Area 2;
- Ecological Support Area 1;
- Ecological Support Area 2;
- Other Natural Areas; and
- Degraded areas

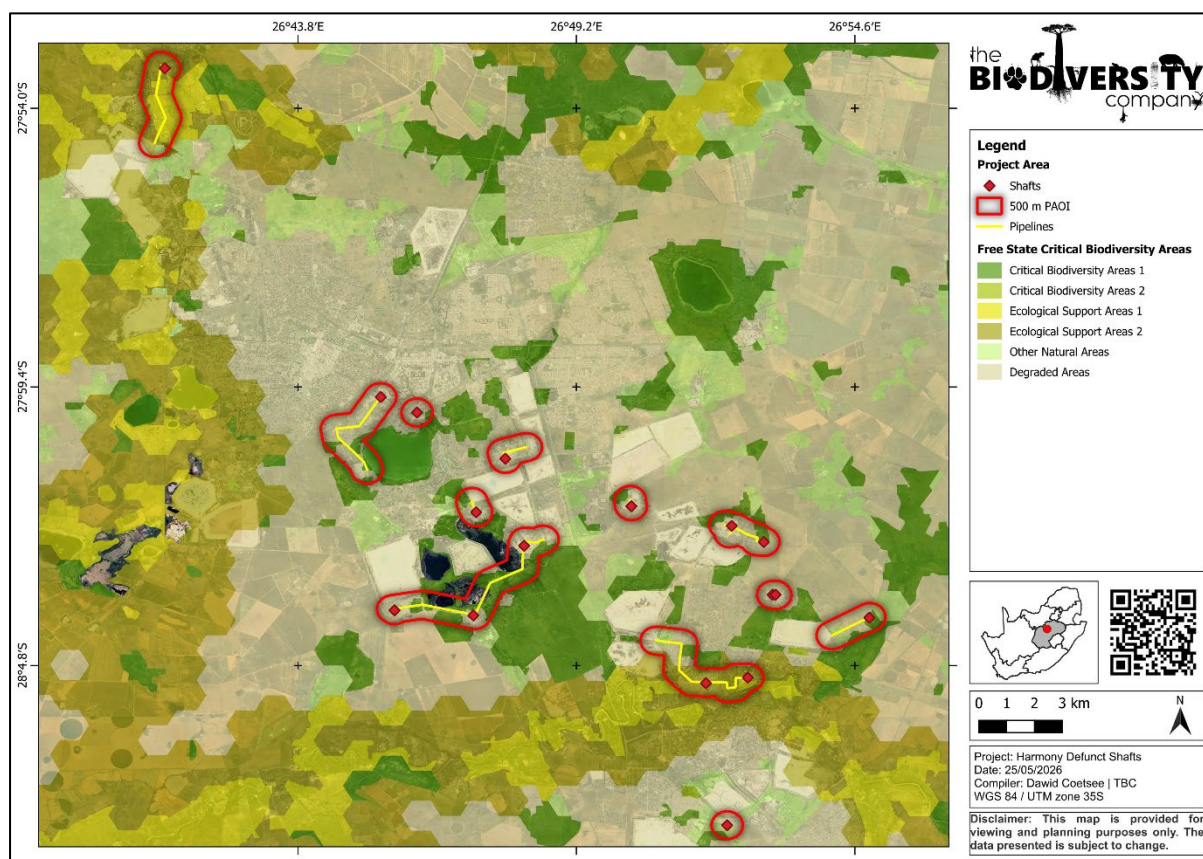


Figure 2-6 Biodiversity Sector Plan Overlay for the PAOI

2.2 Wetland Field Survey

A field survey for the area was undertaken on 28 and 29 April 2026, which is a late wet-season survey, to identify the presence of freshwater features (wetlands) and to delineate their spatial extents. Furthermore, to determine vegetation composition of the identified features and the likelihood of features to be used as habitat for fauna. The seasonality of the survey is not considered to be a limiting factor with regard to the identification and delineation of wetlands, the only limitation in this regard would be the identification of certain plant species. The results of the assessment are considered conclusive in the opinion of the specialist.

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 2-7. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

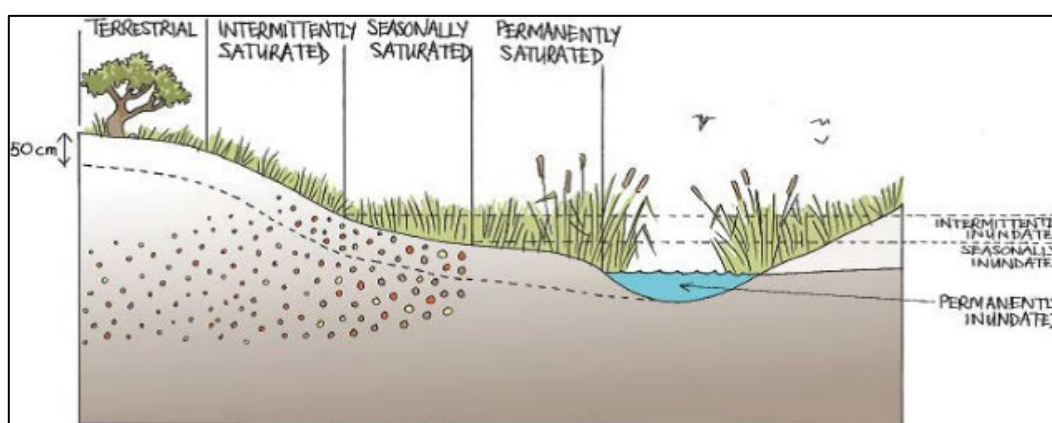


Figure 2-7 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

2.2.1 Delineation

For wetland delineation, a Hydrogeomorphic (HGM) approach was used to define and classify wetlands based on geomorphic setting (landform), water source, and hydrodynamics (water movement).

A total of 18 HGM units were identified within the PAOI, consisting of five Seep wetlands (HGM 1, HGM 2, HGM 4, HGM 15, HGM 17), 9 Depression (Dep) wetlands (HGM 3, HGM 5, HGM 9, HGM 11 – HGM 14, HGM 18 & HGM 19), three Unchannelled valley-bottom (UVB) wetlands (HGM 6, HGM 8, HGM 16) and one Channelled valley-bottom (CVB) wetland (HGM 7) (Figure 2-8 - Figure 2-11). Only "Natural" freshwater systems were delineated for the outcomes of this report.

A summary of the wetland area and percentage cover of wetlands within the PAOI is provided in Table 2-3.

Table 2-3 Summary of wetland area within the PAOI

HGM Unit	Area (ha)	Area of Total Wetlands (%)
HGM 1	7.84	3.62
HGM 2	25.06	11.57
HGM 3	5.06	2.34

Harmony Defunct Shafts Backfilling

HGM 4	15.38	7.10
HGM 5	24.50	11.31
HGM 6	4.06	1.87
HGM 7	37.29	17.21
HGM 8	3.32	1.53
HGM 9	0.6	0.28
HGM 11	70.71	32.64
HGM 12	3.05	1.41
HGM 13	1.71	0.79
HGM 14	2.80	1.29
HGM 15	4.97	2.3
HGM 16	7.22	3.33
HGM 17	2.63	1.21
HGM 18	0.3	0.14
HGM 19	0.12	0.05
Total	216.62	100

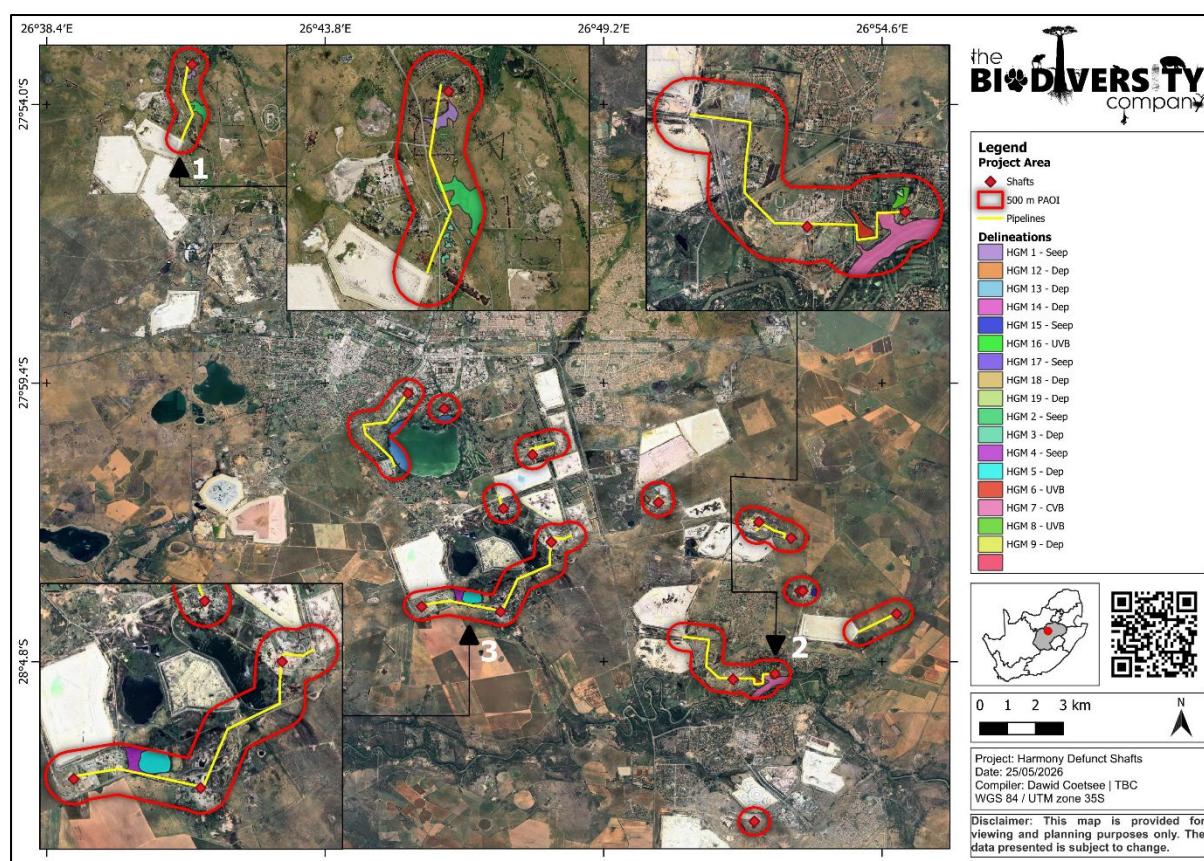


Figure 2-8 Delineation of the Watercourses within the PAOI

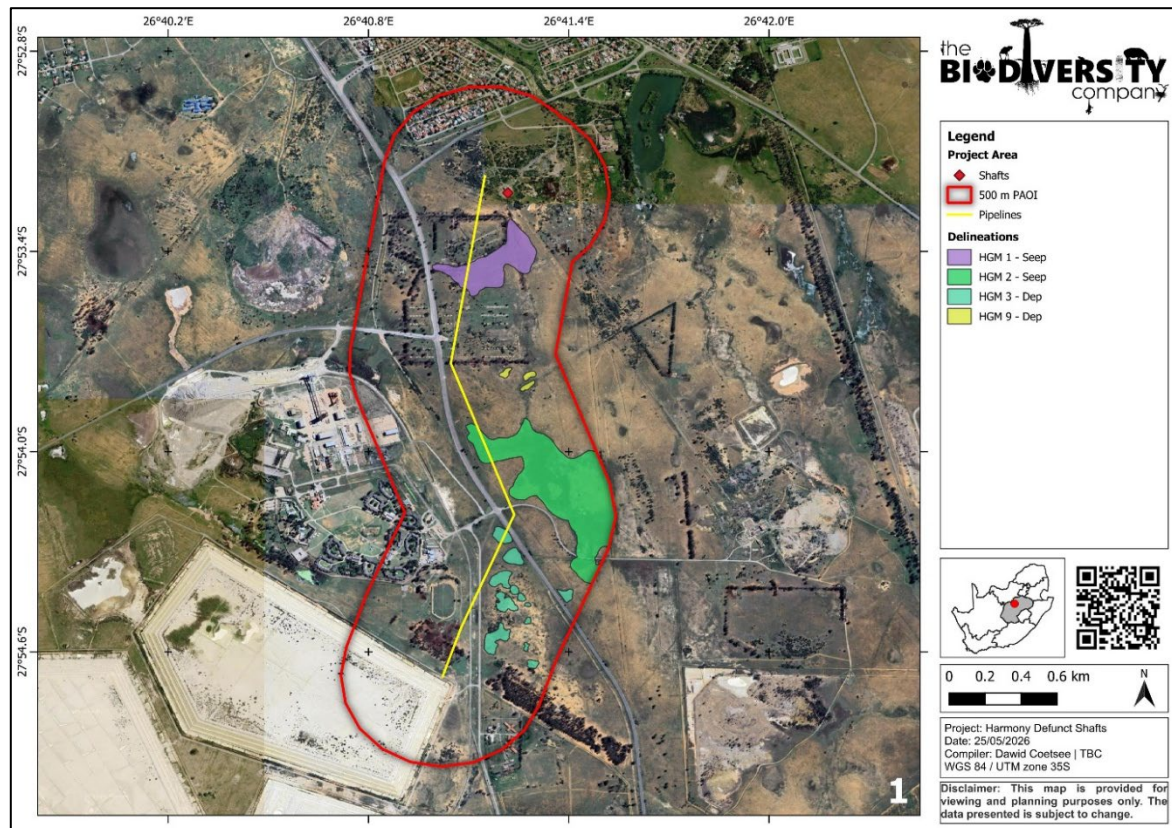


Figure 2-9 Delineations of the Watercourses within Cluster 1 within the PAOI

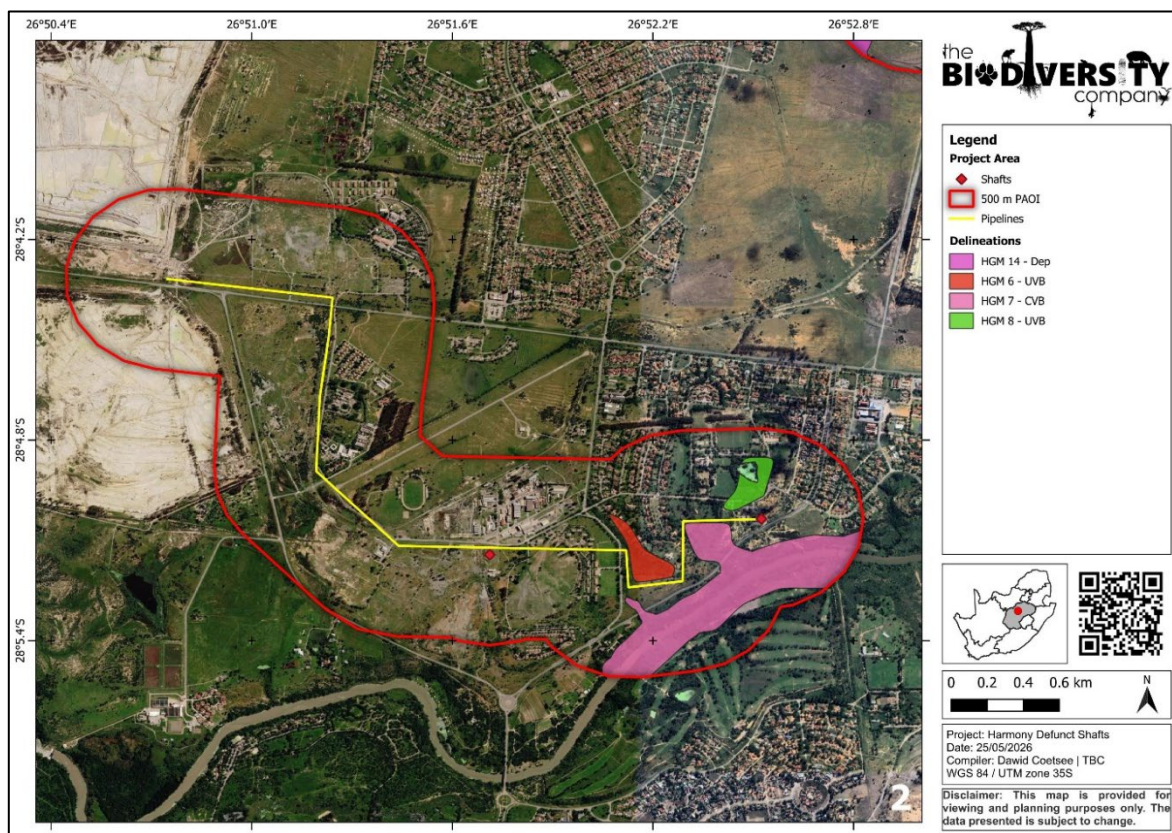


Figure 2-10 Delineations of the Watercourses within Cluster 2 within the PAOI

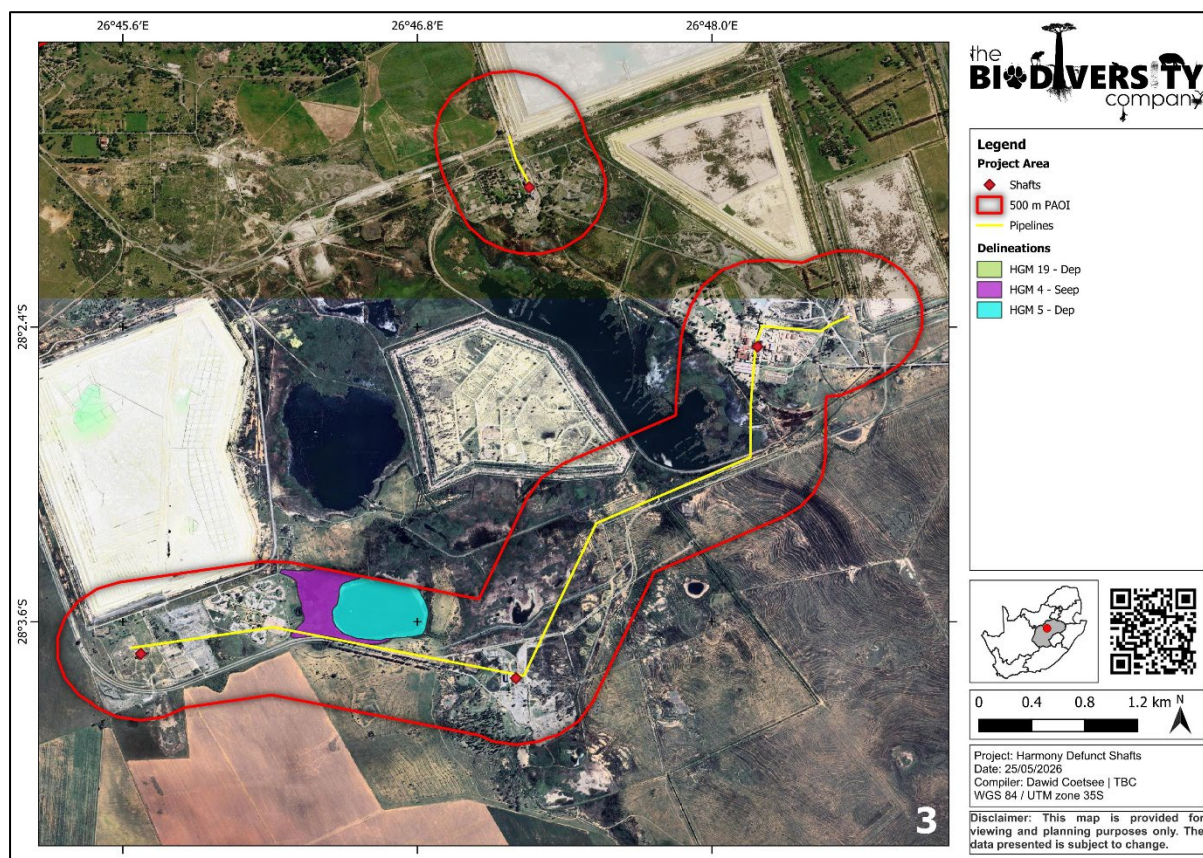


Figure 2-11 Delineations of the Watercourses within Cluster3 within the PAOI



Figure 2-12 Representative Photographs of the Different Identified Features within the PAOI. A) Seep; B) Depression; and C) Unchannelled valley-bottom

2.2.2 Risk Screening

Table 2-4 provides the results of risk screening for the delineated wetlands and provides motivation for each of the determined categories. Only HGMs 1 through to 8 were identified to be “At-Risk”. This is attributed to the proximity of the activities to the watercourses in conjunction with the interconnectivity of the watercourses.

Table 2-4 Risk Status of the Delineated Wetlands

HGM unit	Risk Status	Rationale
HGMs 1 to8	At Risk	These HGM units were overlapped by the proposed activities, located within proximity of the proposed activities or downslope of the activities and, have therefore been determined as “At Risk”. It is anticipated that direct and / or indirect impacts to the wetland systems are potential.

HGMs 9 to19	Not at Risk	These HGM units were situated outside the PAOI (Pipelines) and are not expected to be affected by any direct or indirect impacts associated with the development. As a result, these wetland systems are considered “Not at Risk,” and their functions and habitat integrity are expected to be maintained.
-------------	-------------	---

2.2.3 Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al.*, 2013).

The wetland classification as per SANBI guidelines (Ollis *et al.*, 2013) is presented in Table 2-5.

Table 2-5 Wetland Classification as per SANBI Guideline (Ollis *et al.*, 2013)

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1, HGM 2, HGM 4, HGM 15, HGM 17	Inland	Highveld Ecoregion	Dry Highveld Grassland Group 4	Slope	Seep	Without channelled outflow	N/A
HGM 3, HGM 5, HGM 9, HGM 11, HGM 12, HGM 13, HGM 14, HGM 18, HGM 19				Plain	Depression	Endorheic	N/A
HGM 6, HGM 8, HGM 16				Valley-Floor	Unchannelled valley-bottom	N/A	N/A
HGM 7				Valley-Floor	Channelled valley-bottom	N/A	N/A

A seep wetland is typically located on gently to steeply sloping land and is characterised by the colluvial, unidirectional movement of water and material down-slope (Ollis *et al.*, 2013). Seeps are often found on the side-slopes of a valley but do not usually extend onto the valley floor. The primary water inputs for seeps are subsurface flows from an up-slope direction, with water movement through the seep mainly occurring as interflow. During and after rainfall events, diffuse overland flow, known as sheetwash, can also be significant. Seeps are associated with geological formations and topographic positions that either cause groundwater to discharge to the land surface or rain-derived water to seep down-slope as subsurface interflow. This unique hydrological setting allows seeps to support specific vegetation adapted to these conditions, contributing to their ecological significance in the landscape. Figure 2-13 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

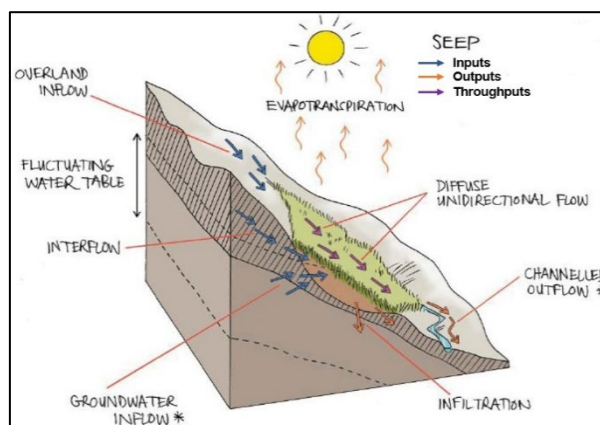


Figure 2-13 Amalgamated Diagram of a Typical Hillslope Seep, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)

A depression wetland is characterised by its distinct geomorphological features (Ollis et al., 2013). These wetlands are defined by closed or near-closed elevation contours, which increase in depth from the perimeter to a central area of greatest depth, where water typically accumulates. Depressions may be flat-bottomed, often referred to as pans, or round-bottomed, and can have various combinations of inlets and outlets or lack them entirely. The hydrodynamics of a depression are typically dominated by vertical water level fluctuations, with water inputs primarily from precipitation, groundwater discharge, interflow, and diffuse or concentrated overland flow. The classification system further categorizes depressions based on their outflow drainage characteristics as exorheic (outward-draining), endorheic (inward-draining), or dammed, and by their inflow drainage characteristics as with or without channelled inflow. This detailed classification helps in understanding the ecological functions and management needs of depression wetlands in South Africa. Figure 2-14 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

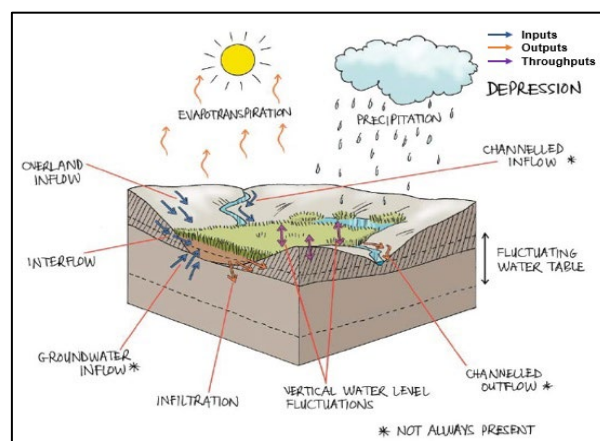


Figure 2-14 Amalgamated Diagram of a Typical Depression Wetland, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)

An unchannelled valley-bottom wetland is a wetland located on a valley floor, characterised by the absence of a distinct river channel (Ollis et al., 2013). These wetlands are defined by their diffuse water flows, which are not confined within channel banks, allowing water to spread across the valley floor. The primary water inputs for unchannelled valley-bottom wetlands include diffuse surface and subsurface flows from upstream channels that lose confinement, as well as seepage from adjacent valley side-slopes. The hydrodynamics of these wetlands are dominated by horizontal, unidirectional, diffuse surface flow, although infiltration and evapotranspiration can also be significant. This setting allows unchannelled valley-bottom wetlands to function as important sites for sediment deposition,

water filtration, and habitat provision, supporting a diverse range of plant and animal species. Their unique hydrological and geomorphological characteristics make them vital components of the landscape, contributing to the overall ecological health of the valley systems in which they occur. Figure 2-15 presents a diagram of a typical unchannelled valley-bottom wetland, showing the dominant movement of water into, through and out of the system.

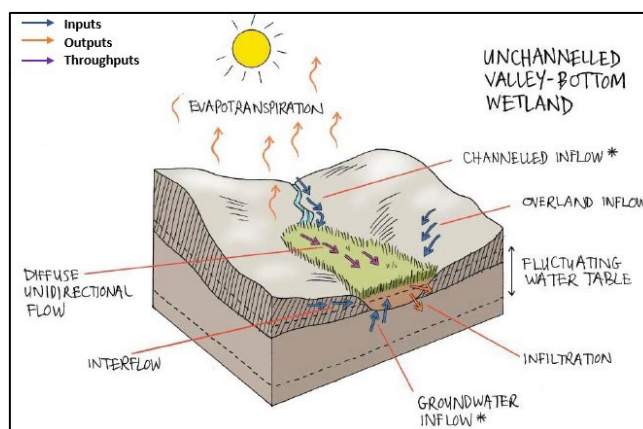


Figure 2-15 Amalgamated Diagram of a Typical Unchannelled Valley Bottom, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)

A channelled valley-bottom wetland is a wetland ecosystem located along a valley floor, characterised by the presence of a river channel running through it (Ollis et al., 2013). These wetlands are distinct from floodplain wetlands due to the absence of characteristic floodplain features and the presence of a defined river channel. The landscape setting of a channelled valley-bottom wetland typically involves a valley floor where the wetland receives water inputs from the river channel, either as surface flow during flooding or as subsurface flow, and from adjacent valley side-slopes through overland flow or interflow. The hydrodynamics of these wetlands are influenced by the river channel, which provides a concentrated flow of water, contributing to the wetland's ecological functions such as sediment trapping, nutrient cycling, and habitat provision. This setting makes channelled valley-bottom wetlands crucial for maintaining the ecological integrity of riverine systems and supporting biodiversity. Figure 2-16 presents a diagram of a typical channelled valley bottom, showing the dominant movement of water into, through and out of the system.

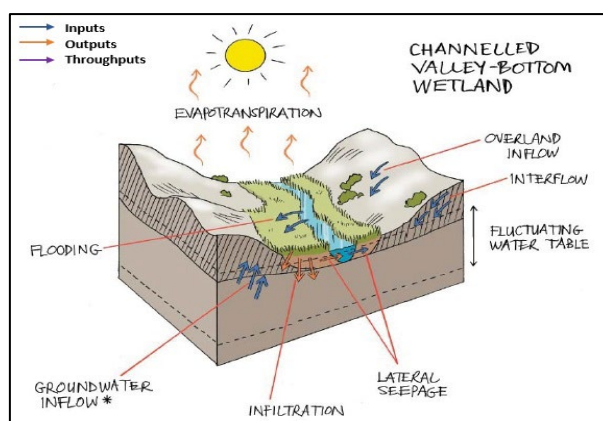


Figure 2-16 Amalgamated Diagram of a Typical Channelled Valley-Bottom, Highlighting the Dominant Water Inputs, Throughputs and Outputs, SANBI Guidelines (Ollis et al. 2013)

2.3 Wetland Functional and Ecological Assessment

2.3.1 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Eco-Services serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al.*, 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 2-6).

Table 2-6 *Classes for Determining the Likely Extent to Which a Benefit is Being Supplied*

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

Only natural features perceived to be “At - Risk” from the proposed activities were assessed further in terms of their ecological features. Therefore, only HGMs 1 to 8 are discussed below.

2.3.1.1 General Functional Description

Hillslope seep wetlands are typically found on hillsides where water emerges from subsurface flows, creating a diffuse downslope movement. These wetlands are primarily fed by groundwater discharges, although surface water contributions can also supplement flows. Hillslope seeps are particularly effective in water quality enhancement, notably in the removal of excess nutrients and pollutants such as nitrates, through processes like denitrification. This is facilitated by the wetland's vegetation, which provides organic carbon necessary for microbial processes that assimilate these nutrients. The vegetation also plays a critical role in stabilising the soil, thereby reducing erosion risks, although the generally steep slopes of hillslope seeps can increase erosion susceptibility if vegetation cover is compromised. Additionally, these wetlands contribute to streamflow regulation by slowing down subsurface water movement, which prolongs water contribution to stream systems during low flow periods, although their flood attenuation capacity is limited once the soils are saturated (Kotze *et al.*, 2009).

Depression wetlands are characterised by their basin-shaped areas with closed elevation contours, allowing for the accumulation of surface water. These wetlands are typically isolated from stream channels, which limits their role in streamflow regulation. However, they play a crucial role in capturing runoff, thereby reducing the volume of surface water that would otherwise contribute to downstream flooding. The inward-draining nature of depressions, combined with their generally impermeable underlying layers, means they are not significant contributors to streamflow regulation. Instead, they are more effective in nutrient cycling, particularly nitrogen, through processes such as denitrification and volatilisation. The water quality in depression wetlands is influenced by local pedology, geology, and climate, which also affects their response to nutrient inputs. These wetlands can also serve as important sites for the precipitation of minerals, including phosphate minerals, due to the concentrating effects of evaporation (Kotze *et al.*, 2009).

Unchannelled valley-bottom wetlands are characterised by their location in valley bottoms without a distinct stream channel, resulting in diffuse water flow across the wetland. These wetlands are highly

effective in sediment trapping due to their gentle gradients and the extensive areas that remain permanently saturated, which promote the deposition of sediments carried by runoff waters. The high levels of soil organic matter in these wetlands enhance their capacity for nitrate and toxicant removal, as the prolonged contact with runoff waters facilitates these processes. However, phosphate retention may be lower compared to other wetland types due to potential remobilisation under prolonged anaerobic conditions. Unchannelled valley-bottom wetlands also contribute to streamflow regulation to some extent, although this is influenced by factors such as vegetation transpiration and soil characteristics. These wetlands play a crucial role in maintaining water quality and providing habitat for diverse species, making them vital components of the landscape (Kotze *et al.*, 2009).

Channelled valley-bottom wetlands are characterised by their location in valley bottoms with a well-defined stream channel. These wetlands play a crucial role in hydrological processes, particularly in flood attenuation and sediment trapping. The presence of a channel allows for the movement of water, which can contribute to the regulation of streamflow, especially during periods of low flow. The vegetation in these wetlands provides resistance to water flow, thereby slowing down the movement of water and allowing for the deposition of sediments. This process not only helps in maintaining water quality by trapping sediments and associated nutrients but also supports the wetland's role in flood attenuation by spreading out and slowing down floodwaters. Additionally, channelled valley-bottom wetlands can contribute to the removal of nitrates and toxicants from the water, enhancing the overall water quality in the catchment area. These wetlands are integral to maintaining the ecological balance and providing essential ecosystem services, such as water purification and habitat provision for various species (Kotze *et al.*, 2009).

It should be noted that these characteristics are representative of ideal river or wetland features and may not necessarily represent the characteristics of all rivers or wetlands. The functionality of the features and the provision of benefits is largely dependent on the river or wetland size and influence from abiotic drivers.

2.3.1.2 Ecosystem Services

The ecosystem services provided by the relevant HGM units on site were assessed and rated using the WET-EcoServices method (Kotze *et al.*, 2009). The results of the assessment are presented in Table 2-7. The ecosystem services scores of the assessed wetlands ranges from “Moderately Low” to “Moderately High”.

The delineated wetlands within the project area provide a range of regulating and supporting ecosystem services despite varying levels of modification. These include attenuation of surface runoff, temporary water storage, maintenance of local hydrological connectivity, sediment trapping, erosion reduction, and enhancement of water quality through the retention and filtration of suspended material and contaminants. Seepage wetlands additionally reflect groundwater-driven processes and contribute to the maintenance of local soil moisture regimes. Collectively, the wetland systems also provide habitat and movement corridors for wetland-associated flora and fauna, thereby supporting ecological functioning within the surrounding landscape.

Table 2-7 Summary of the Average Ecosystem Scores of the Assessed Wetland Units

Moderately Low	Intermediate	Moderately High
HGM 3	HGM 1	HGM 7
HGM 5	HGM 2	-
-	HGM 4	-
-	HGM 6	-
-	HGM 8	-

2.3.2 Present Ecological State

The overall approach as described by Macfarlane *et al.*, 2020 is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological State (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 2-8.

Table 2-8 The Present Ecological State Categories (Macfarlane *et al.*, 2020)

Impact Category	Description	Impact Score Range	PES Score (%)	PES
None	Unmodified, natural	0 to 0.9	90-100	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	80-89	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	60-79	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	40-59	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	20-39	E
Critical	Critically Modified. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	0-19	F

The wetlands identified within the project area have exhibited some degree of modification resulting from natural physical changes as well as anthropogenically induced impacts at both the local and catchment level. Resultingly, the wetlands scored average PES scores within the “D – Largely Modified” PES class. The results of the wetland health and integrity assessment is provided in Table 2-9.

Table 2-9 Average Present Ecological State Scores for the Assessed Wetland

D - Largely Modified
HGM 1
HGM 2
HGM 3
HGM 4
HGM 5
HGM 6
HGM 7
HGM 8

The list below refers to the present-day local impacts observed within the assessed wetland areas:

- Alterations to hydrology and geomorphology through the presence and operation of existing roads and crossings within the wetland catchment;
- Loss of vegetation through mining activities and urban encroachment;

Harmony Defunct Shafts Backfilling

- Water quality impairments from runoff from impermeable surfaces and contaminated runoff from within the catchment;
- Proliferation of alien invasive vegetation;
- Channel straightening;
- Induced wetness from impoundments, mining activities, and urban encroachment; and
- Erosion of watercourses from altered hydrology and geomorphology.

2.3.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants as described by Rountree *et al.*, 2013, is used to assign the Ecological Importance and Sensitivity (EIS) category as listed in Table 2-10.

Table 2-10 Description of Ecological Importance and Sensitivity Categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	A
High	2.1 to 3.0	B
Moderate	1.1 to 2.0	C
Low Marginal	< 1.0	D

The EIS assessment was applied to the HGM units in conjunction with the ecosystem service scores in the preceding sections, to assess the levels of sensitivity and ecological importance of the wetland. Various components pertaining to the protection status of a wetland is considered for the EIS, including Strategic Water Source Areas (SWSA), the NFEPA Wetveg protection status and the protection status of the wetland itself considering the NBA wetland dataset. The results of the assessment are shown in Table 2-11. The wetlands average EIS scores present within the “A – Very High” and “C – Moderate” class.

Table 2-11 Aspects Considered in the Ecological Importance and Sensitivity Assessment

HGM No.	NFEPA Wet Veg			Wetland Condition (Field Survey)	NBA Wetlands		SWSA (Yes/No)	CBA / ESA (Yes/No)	EIS Class
	Type	Ecosystem Threat Status	Ecosystem Protection Level		Ecosystem Threat Status 2018	Ecosystem Protection Level			
HGM 1, 2, 4 Seep	Dry Highveld Grassland Group 3	Endangered	Not Protected	D Largely Modified	Critically Endangered	Not Protected	No	Yes (CBA, ESA)	A – Very High
HGM 3, 5 Depression		Least Threatened		D Largely Modified	Least Threatened	Poorly Protected		Yes (ESA)	C – Moderate
HGM 6, 8 UVB		Least Threatened		D Largely Modified	Critically Endangered	Not Protected		Yes (ESA)	B – High
HGM 7 CVB		Least Threatened		D Largely Modified	Critically Endangered	Not Protected		Yes (ESA)	B – High

2.3.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 2-12) was determined based on the results obtained from the PES and EIS of the assessed wetlands, with the objective of recommending how a water resource should be managed. This is achieved by either maintaining or improving the ecological integrity of the wetland in order to ensure continued ecological functionality (DWA, 1999).

Table 2-12 Recommended Ecological Category and Recommended Management Objectives for Water Resources based on Present Ecological State and Ecological Importance and Sensitivity Scores

		Ecological Importance and Sensitivity			
		Very High	High	Moderate	Low
PES	A (Pristine)	A Maintain	A Maintain	A Maintain	A Maintain
	B (Natural)	A Improve	A/B Improve	B Maintain	B Maintain
	C (Good)	A Improve	B/C Improve	C Maintain	C Maintain
	D (Fair)	C Improve	C/D Improve	D Maintain	D Maintain
	E/F (Poor)	D Improve	E/F Improve	E/F Maintain	E/F Maintain

These PES and EIS assessments indicated that all wetland features within the site had, to an extent, undergone transformation as a result of historical and current impacts. Nevertheless, despite the altered ecological integrity of these systems, they are considered to provide ecological services. The appropriate REC and RMO estimated for the wetland areas is presented in Table 2-13 below.

Table 2-13 Summary of the REC and RMO Categories Assigned to the Relevant Wetlands

C – Improve	C/D – Improve	D – Maintain
HGM 1	HGM 6	HGM 3
HGM 2	HGM 7	HGM 5
HGM 4	HGM 8	-

2.4 Buffer Requirements

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane *et al.*, 2014). The recommended buffer zones are presented in Figure 2-17 - Figure 2-20. The post-mitigation buffers for the wetlands in relation to the proposed assessment area were calculated to be 50 m.

In the context of the proposed slurry pipeline activities, the buffer serves several critical functions: it provides a protective zone to intercept and filter potential pollutants (such as sediment, hydrocarbons, and heavy metals) before they reach the wetland, helps to maintain the natural hydrological regime by reducing surface runoff velocity and promoting infiltration, and safeguards the integrity of wetland habitat for biodiversity. The 50 m buffer is therefore justified as a precautionary measure to minimise these risks, maintain ecosystem services, and comply with the precautionary principle embedded in South African environmental legislation. This width is consistent the minimum necessary to provide effective mitigation for the anticipated impacts of prospecting and potential future mining activities. It should, however, be noted that certain sections of the proposed pipeline are located within wetlands and therefore within the recommended buffer.

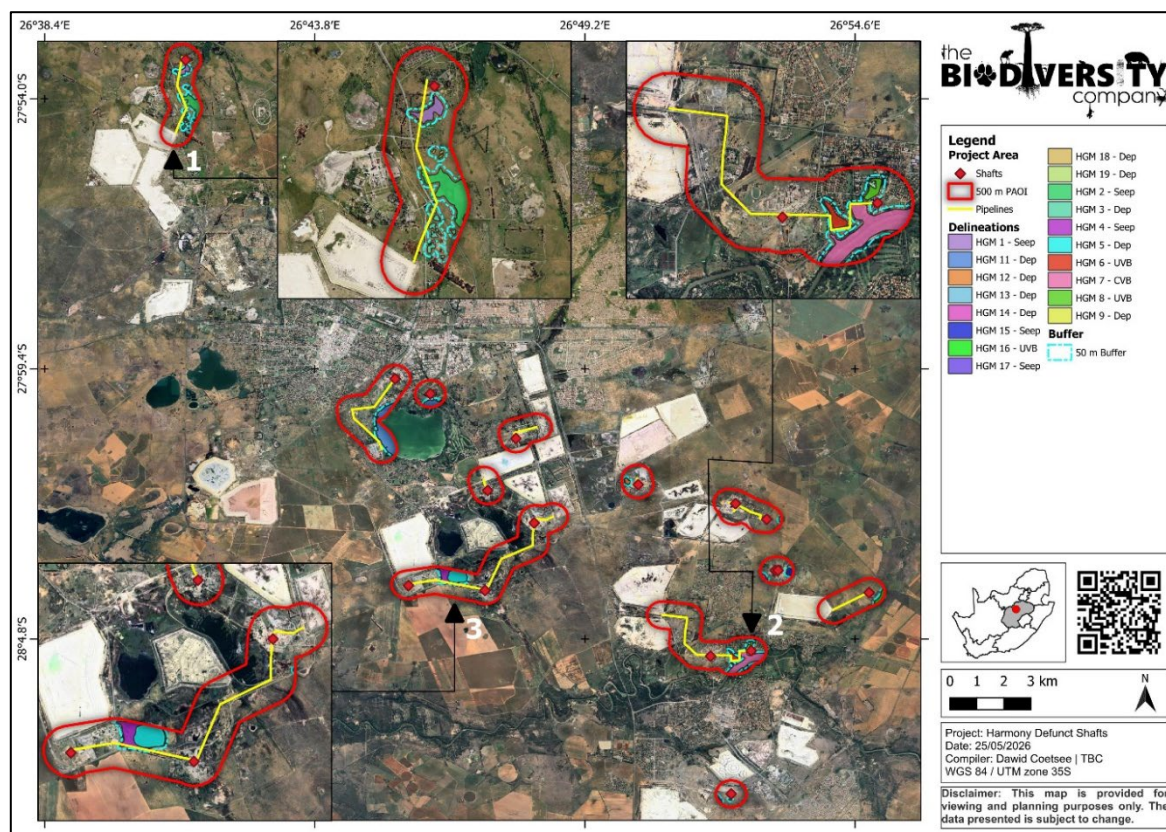


Figure 2-17 Recommended Buffers for the Identified Wetlands in relation to the Proposed Development

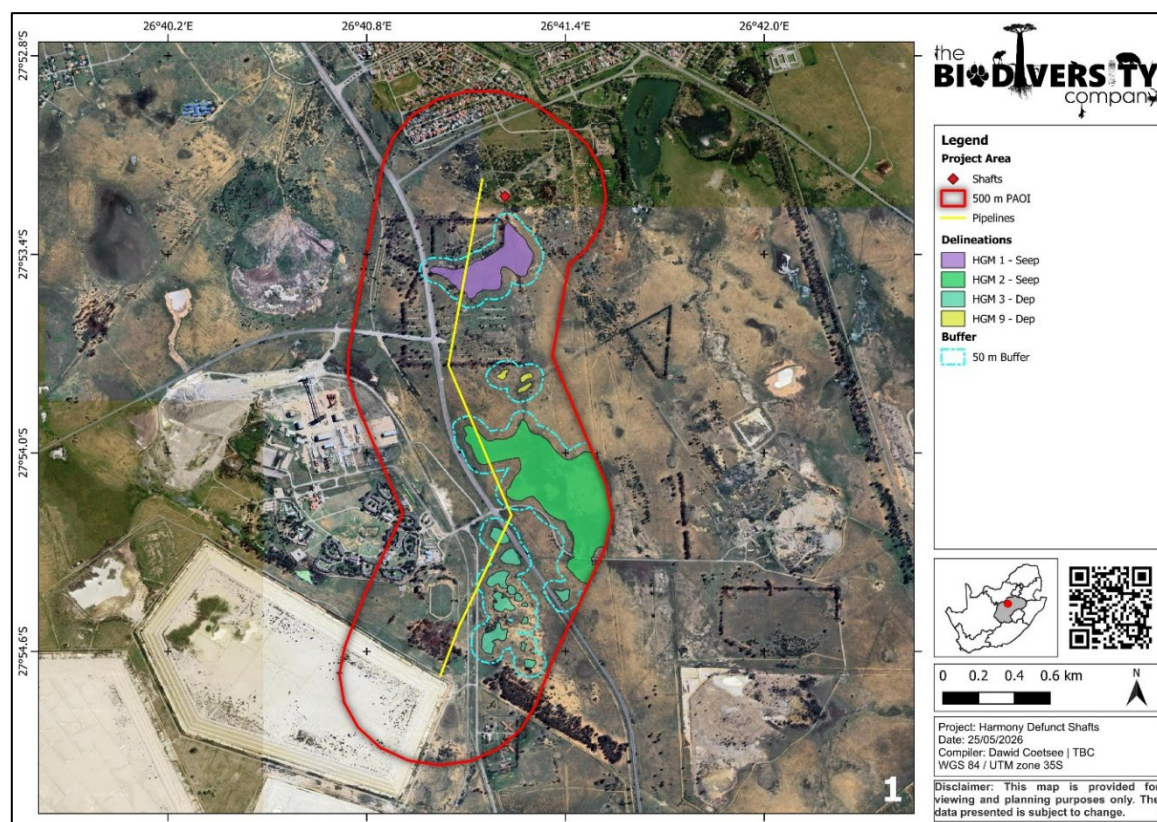


Figure 2-18 Recommended Buffers for the Identified Wetlands within Cluster 1 in relation to the Proposed Development

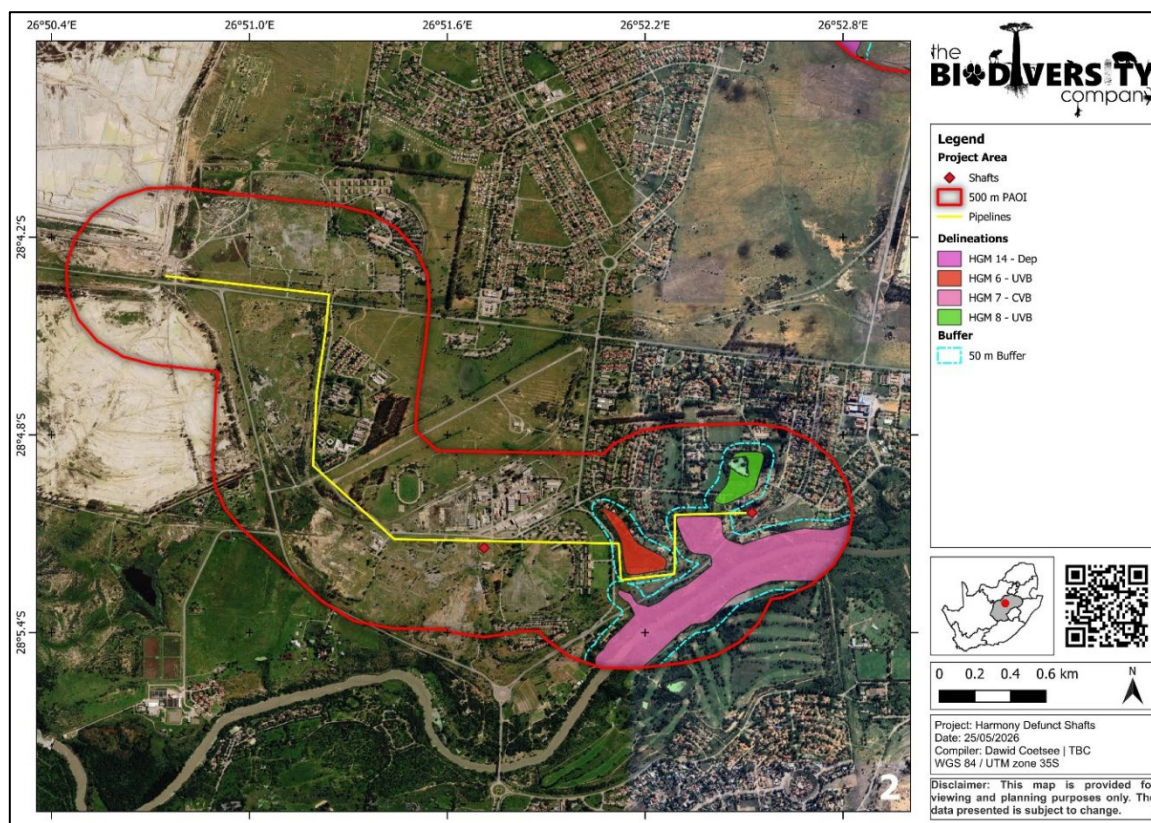


Figure 2-19 Recommended Buffers for the Identified Wetlands within Cluster 2 in relation to the Proposed Development

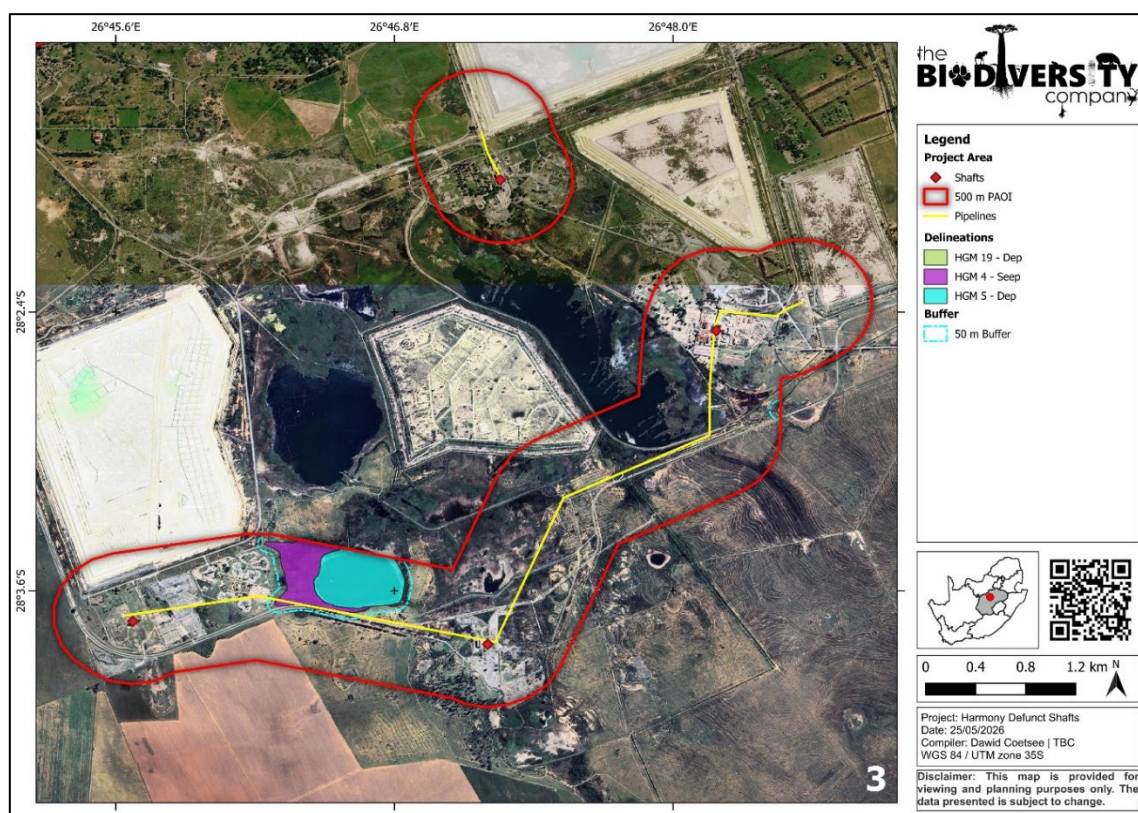


Figure 2-20 Recommended Buffers for the Identified Wetlands within Cluster 3 in relation to the Proposed Development

2.4.1 Regulation Zones

Table 2-14 presents the legislated zones of regulation that would be applicable to the wetland areas.

In accordance with Government Notice (GN) 4167 of 2023 and GN 509 of 2016, as it relates to the NWA (1998), water uses as defined in Section 21 (c) and 21 (i) of the NWA must be considered if the proposed activities fall within the regulated zones of a watercourse as defined in the Act.

Listed activities, in terms of the NEMA (1998) and the EIA Regulations (as amended in April 2017) that require authorization before initiating any development or infrastructure, must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation.

Both types of authorisations (NEMA and NWA) are applicable given that the proposed development occurs within the relevant regulated zones (Figure 2-21 - Figure 2-24).

Table 2-14 **Legislated Zones of Regulation**

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). GN 4167 as published in the Government Gazette 49833 of 2023. GN 509 as published in the Government Gazette 40229 of 2016.	In accordance with GN 4167 of 2023 and GN 509 of 2016, as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: - the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; - in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or - a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
Environmental Authorisation in terms of the Listed activities of the National Environmental Management Act, 1998 (Act No. 107 of 1998). EIA Regulations (2014), as amended.	Activity 12 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: The development of: (xii) Infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs— (a) Within a watercourse; (b) In front of a development setback; or (c) If no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. excluding – (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves. Activity 19 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states that: “The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.”

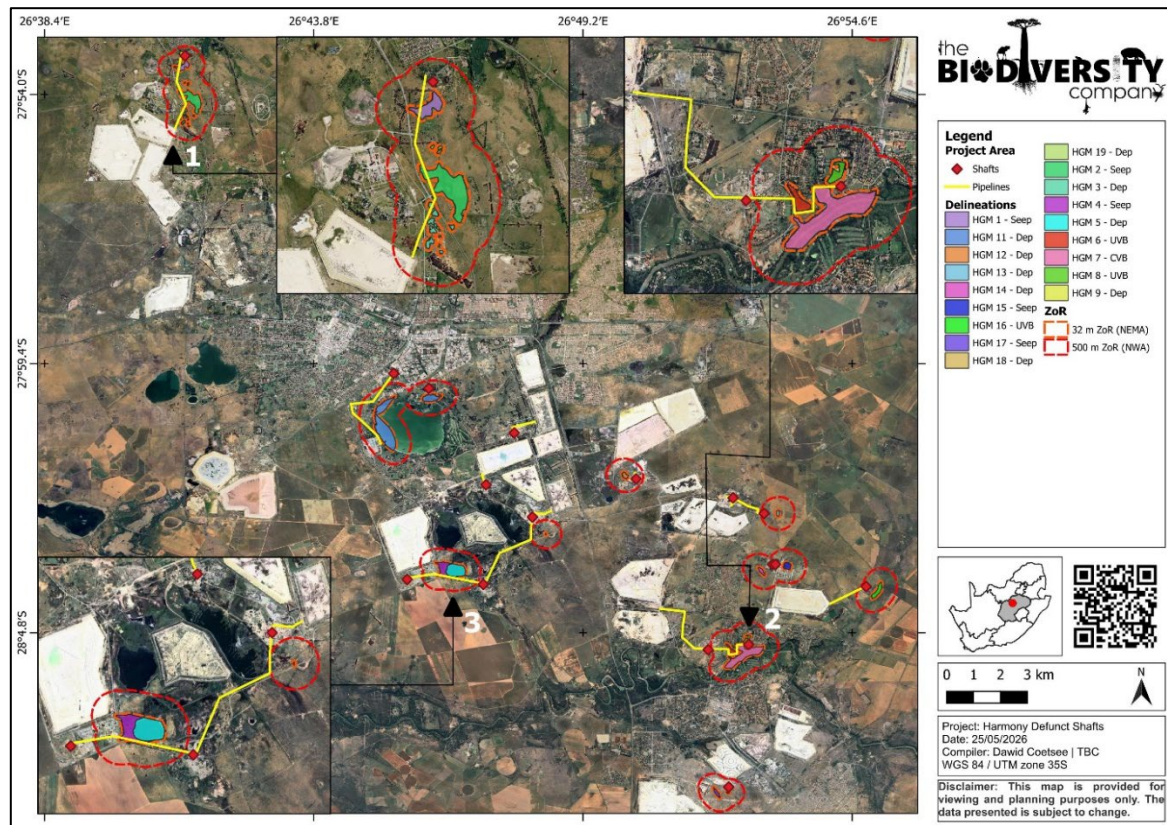


Figure 2-21 Zones of Regulation in relation to the Identified Watercourses Within the PAOI

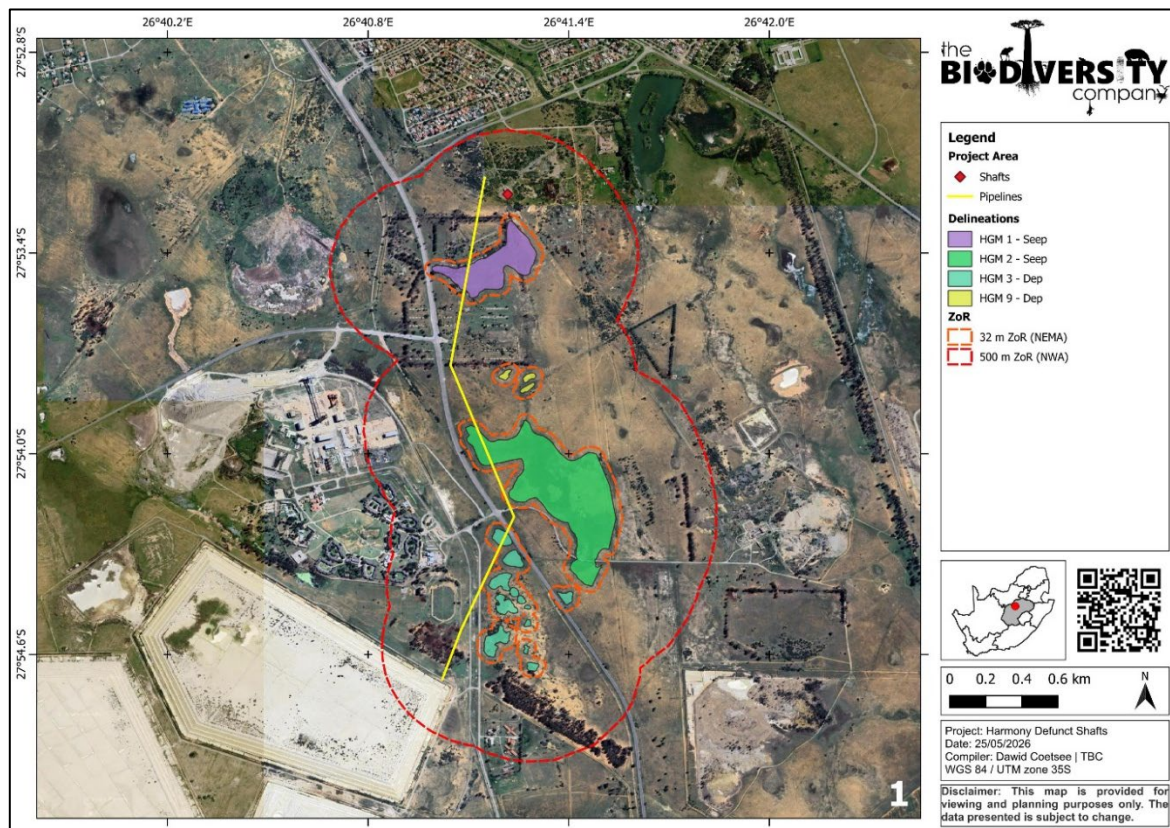


Figure 2-22 Zones of Regulation in relation to the identified Watercourses Within Cluster 1 Within the PAOI

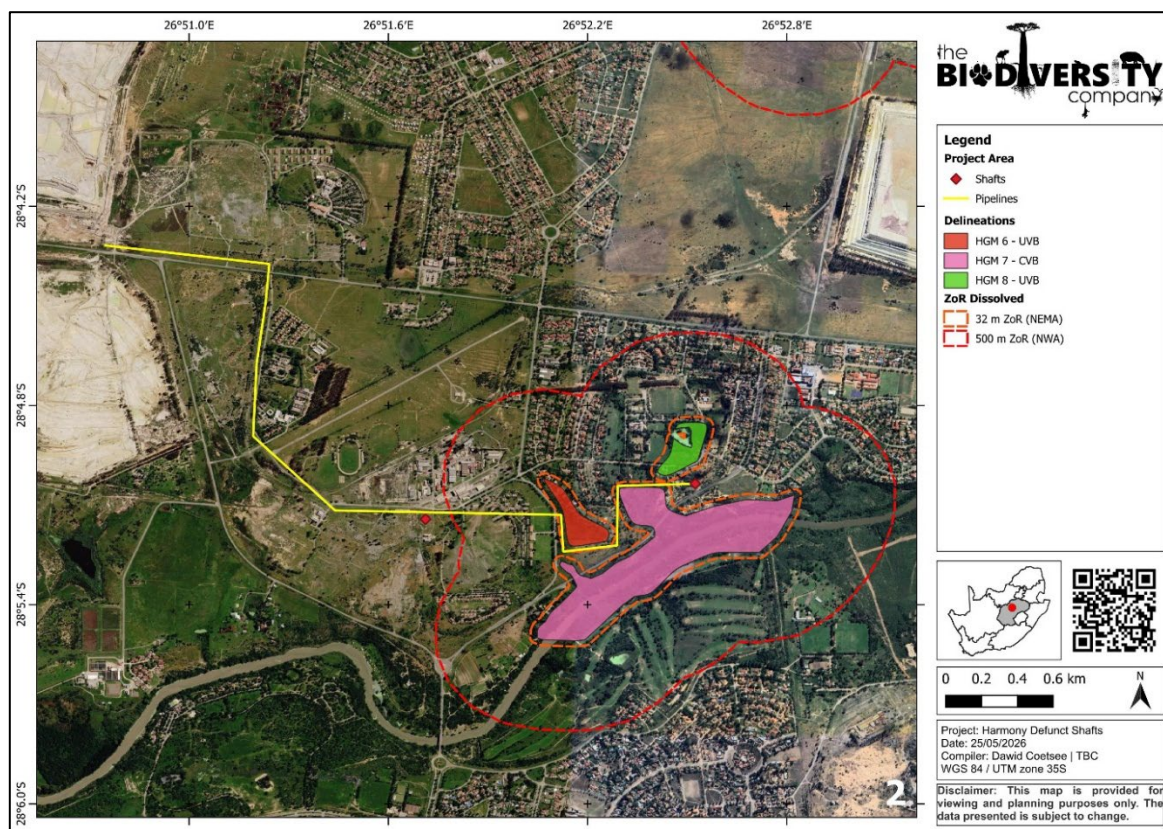


Figure 2-23 Zones of Regulation in relation to the identified Watercourses Within Cluster 2 Within the PAOI

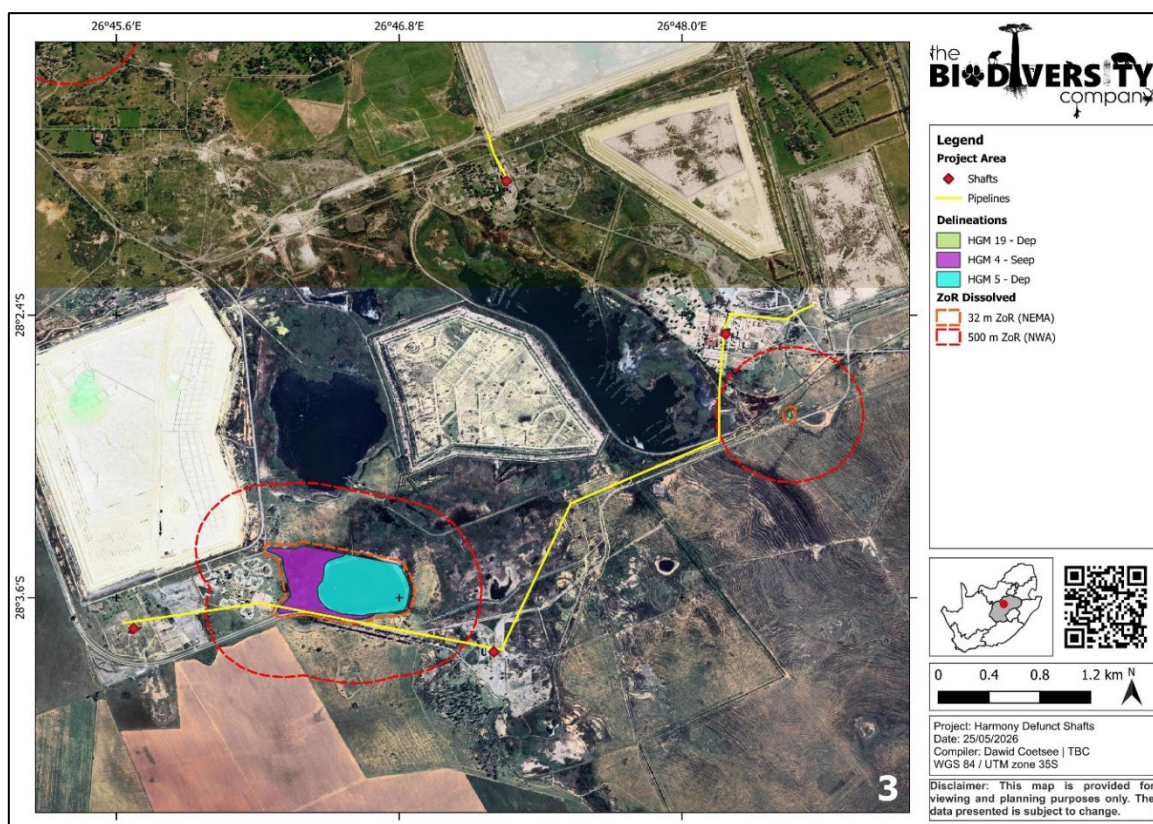


Figure 2-24 Zones of Regulation in relation to the identified Watercourses Within Cluster 3 Within the PAOI

2.5 Site Sensitivity Verification

2.5.1 Desktop Ecological Sensitivity

The following is deduced from the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Aquatic Biodiversity Theme sensitivity as “Low” for the project footprint (Figure 2-25).



Harmony Defunct Shafts Backfilling



Figure 2-25 Aquatic Biodiversity Theme Sensitivity for the Proposed Sites

2.5.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 2-15 below. A summative explanation for each result is provided as relevant. It should be noted that the National Web-based Environmental Screening Tool allocates sensitivities to freshwater resources identified through the available national freshwater datasets based on their presence (very high) or absence (low). The specialist-assigned sensitivity ratings presented herein for the natural and assessed wetlands have considered the ecological characteristics of the delineated features.

The specialist-assigned sensitivity ratings are informed by desktop screening and field verification, including observed wetland indicators and habitat characteristics, and consideration is given to any observed or likely presence of sensitive fauna and flora. The sensitivities are displayed in Figure 2-26.

Table 2-15 Summary of the Screening Tool Versus Specialist Assigned Sensitivities

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
HGM 1 – HGM 6, HGM 8	Aquatic Biodiversity Theme	Low	Medium	Disputed – Wetland systems were identified in these areas, contrastingly to the screening tool results. Although, these wetlands are the smaller systems with reduced connectivity and have reduced ecological function and service provision resulting from modification in comparison the larger valley-bottom systems identified within the PAOI.
HGM 7		Low	Very High	Disputed – This is a larger intact valley-bottom system which retains good residual function and sensitivity by providing important ecological services. This wetland also has direct hydrological and ecological connectivity within the valley-floor network and downstream perennial systems.
50 m Buffer		Low	Medium	Disputed – Buffers play a role in protecting adjacent wetlands from edge effects and supporting ecological connectivity and their sensitivity is therefore determined by the features they encompass.
Remaining Area		Low	Low	Validated – No natural wetland or freshwater ecosystem identified within this area.

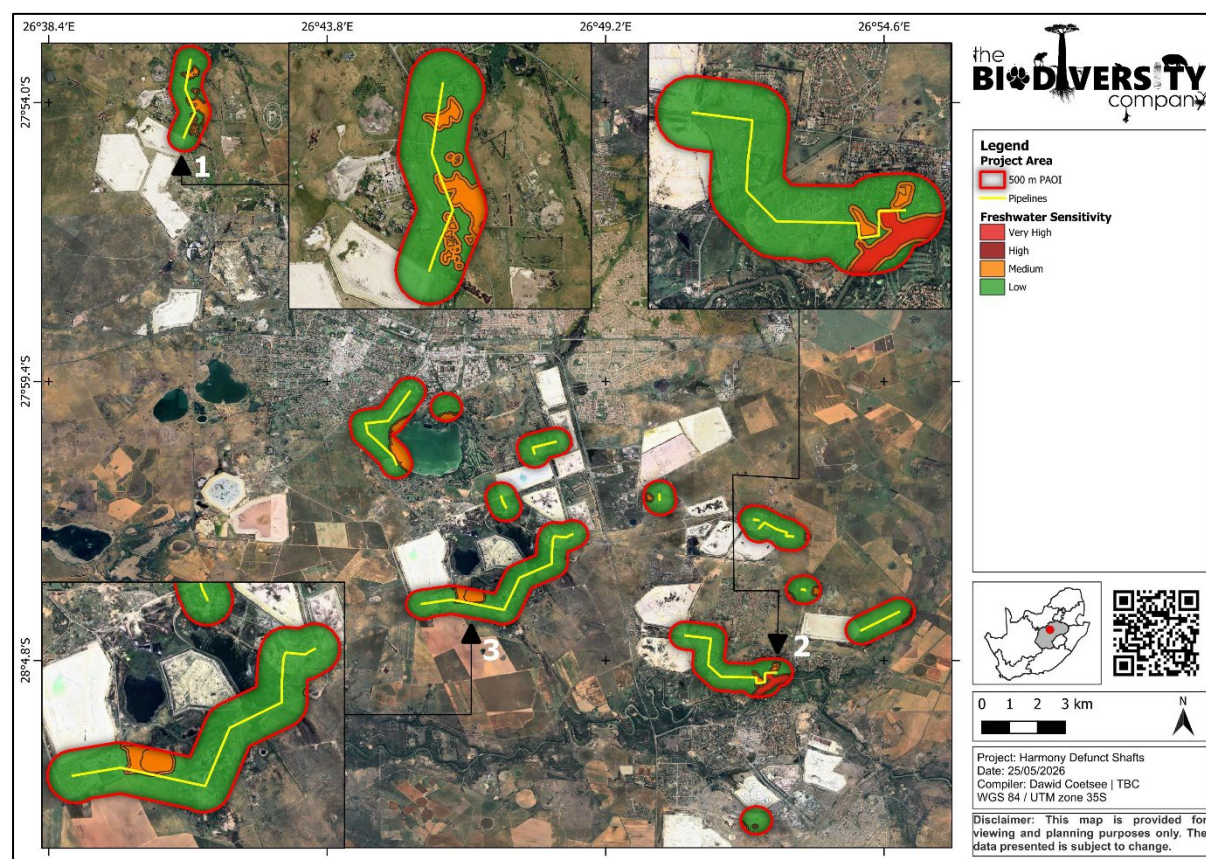


Figure 2-26 Freshwater Sensitivity for the PAOI

3 Risk Assessment

The Risk Assessment considered the direct and indirect impacts, to the wetland systems. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 3-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, siting, scale, layout, technology and phasing to avoid impacts.

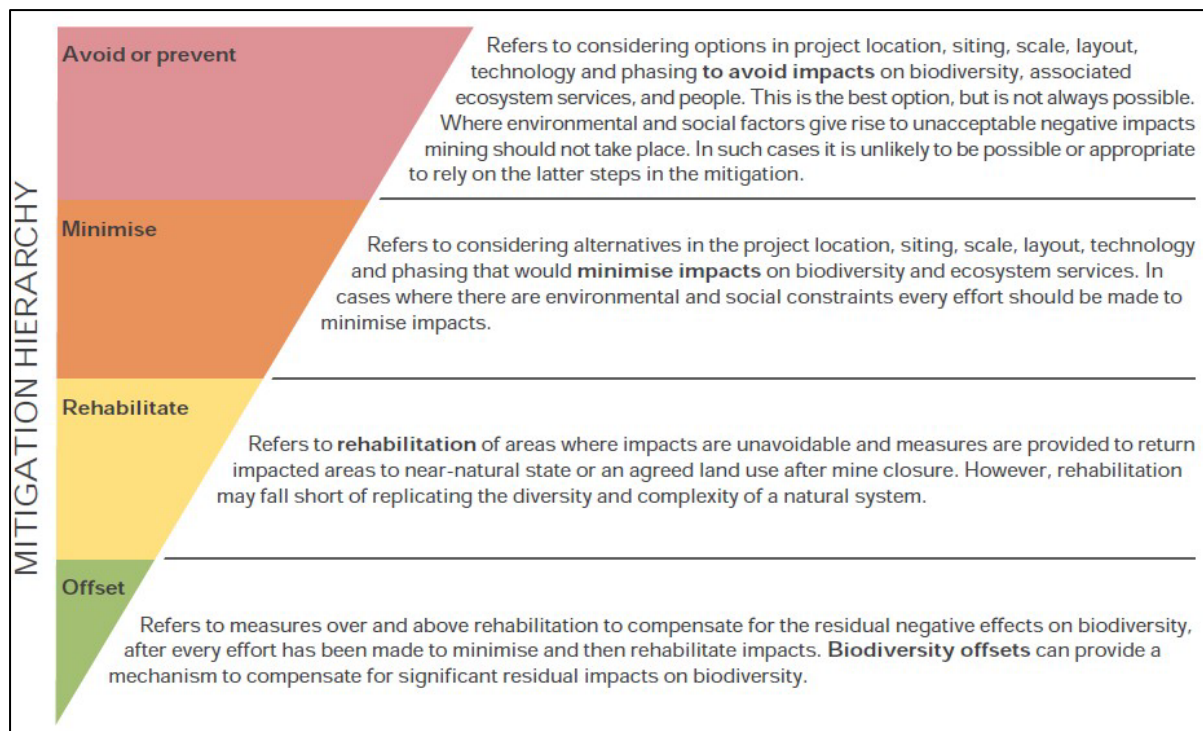


Figure 3-1 The Mitigation Hierarchy as Described by the DEA (2013)

The DWS risk matrix was used to assess impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 3-1.

Table 3-1 Significance Ratings Matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

The risk assessment was conducted (Table 3-2) under the assumption that the selected wetlands and/or their buffers will be impacted by the proposed development. Wetlands were identified within the assessment area and within the 500 m PAOI therefore, direct and indirect impacts to the watercourse systems are potential. The focus for mitigation was thus placed on minimising potential impacts.

It is anticipated that the Project will pose “Moderate” and “Low” post-mitigation risks, provided that the suggested mitigations are implemented, given that some activities currently overlap with wetland areas. It is recommended that the pipeline be re-routed to avoid the wetlands and their associated buffers to minimise wetland disturbance in line with the mitigation hierarchy. Should this not be feasible, a wetland compensation plan (rehabilitation) must be developed and implemented and all other mitigation measures suggested to alleviate impacts must be implemented.

In summary, HGM 1, HGM 2 and HGM 4 will have Moderate post-mitigation risk rating due the following:

- Construction of temporary slurry pipelines and associated shaft work areas (intersecting wetlands), specifically in relation to:
 - Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance;
 - Altered Hydrology and induced erosion and sedimentation from soil compaction;
 - Storage of chemicals, mixes, and fuels with associated accident spills;
 - Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles; and
 - Hydrocarbon leaks/ spills from operation of vehicles, equipment, and machinery.
- Construction of temporary pipeline crossings, specifically in relation to:
 - Erosion and Sedimentation of the freshwater resource; and
 - Impeding flow of water.
- Operation of infrastructure (intersecting wetlands), specifically in relation to:
 - Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses;
 - Loss of native vegetation and habitat fragmentation with proliferation of alien species from vegetation clearance for maintenance of infrastructure; and
 - Water quality impairment from contaminated runoff/ leakage,

All other post-mitigation impact ratings were assessed as low.

Table 3-2 Summative Results of the Risk Assessment Conducted for the Proposed Development

Phase	Activity	Impact	Potentially affected watercourses	Significance (max = 100)	Risk Rating
			Name/s		
CONSTRUCTION	Construction of temporary slurry pipelines and associated shaft backfilling procedures (intersecting wetlands) Site clearing and preparation. Earthworks including the excavation, reshaping and compacting of project area for pipeline installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Storage and use of hazardous substances associated with accidental spills. Final reshaping, retaining, and landscaping.	Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Altered Hydrology and induced erosion and sedimentation from soil compaction	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
		Water quality impairment from contaminated runoff	HGM 1, HGM 2, HGM 4	16	L
			HGM 3	9.6	L
		Storage of chemicals, mixes, and fuels with associated accident spills	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Indiscriminate dumping of waste products or construction materials	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	14.4	L
		Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
		Hydrocarbon leaks / spills from operation of vehicles, equipment, and machinery	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
	Construction of temporary slurry pipeline (within 500 m of wetlands) Site clearing and preparation. Earthworks including the excavation, reshaping and compacting of project area for pipeline installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Storage and use of hazardous substances associated with accidental spills. Final reshaping, retaining, and landscaping.	Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	12	L
		Altered Hydrology and induced erosion and sedimentation from soil compaction	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	16.8	L
		Water quality impairment from contaminated runoff	HGM 6, HGM 7, HGM 8	11.2	L
			HGM 5	8.4	L
		Storage of chemicals, mixes, and fuels with associated accident spills	HGM 6, HGM 7, HGM 8	21.6	L
			HGM 5	12.6	L
		Indiscriminate dumping of waste products or construction materials	HGM 6, HGM 7, HGM 8	16.8	L
			HGM 5	12.6	L
		Altering surface hydrology due to soil stripping, soil stockpiling and building material stockpiles	HGM 6, HGM 7, HGM 8	28.8	L
			HGM 5	16.8	L
		Hydrocarbon leaks / spills from operation of vehicles, equipment, and machinery	HGM 6, HGM 7, HGM 8	22.4	L
			HGM 5	16.8	L
	Construction of temporary pipeline crossings (intersecting wetlands) Site clearing and	Erosion and Sedimentation of the freshwater resource	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	19.2	L
		Loss of aquatic habitat	HGM 1, HGM 2, HGM 4	24	L

Harmony Defunct Shafts Backfilling

	preparation Earthworks including the excavation, reshaping and compacting of project area for infrastructure installation. Operation of machinery and equipment and vehicle movement. Stripping, soil stockpiling and building material stockpiles. Concrete works Temporary flow diversion Final reshaping, retaining, and landscaping.		HGM 3	10.8	L
		Impeding flow of water	HGM 1, HGM 2, HGM 4	32	M
			HGM 3	14.4	L
OPERATIONAL	Operation of pipelines (intersecting wetlands) Pumping and transport of tailings slurry via existing and temporary overland pipelines. Routine access and maintenance of temporary slurry pipelines and associated infrastructure. Leak detection, inspection and repair of pipeline sections, joints and supports. Management of dirty water, return water and slurry-affected water where required. Emergency isolation and spill response.	Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses	HGM 1, HGM 2, HGM 4	40	M
			HGM 3	24	L
		Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance for maintenance of infrastructure.	HGM 1, HGM 2, HGM 4	30	M
			HGM 3	14.4	L
		Water quality impairment from contaminated runoff/leakage	HGM 1, HGM 2, HGM 4	36	M
			HGM 3	18	L
	Operation of pipelines (within 500 m of wetlands) Pumping and transport of tailings slurry via existing and temporary overland pipelines. Routine access and maintenance of temporary slurry pipelines and associated infrastructure. Leak detection, inspection and repair of pipeline sections, joints and supports. Management of dirty water, return water and slurry-affected water where required. Emergency isolation and spill response.	Altered overland flows from hardened surfaces (roads) adjacent to pipeline and stormwater management with induced erosion and sedimentation of watercourses	HGM 6, HGM 7, HGM 8	28.8	L
			HGM 5	21.6	L
		Loss of native vegetation and habitat fragmentation (direct and indirect loss of wetland) with proliferation of alien species from vegetation clearance for maintenance of infrastructure.	HGM 6, HGM 7, HGM 8	21.6	L
			HGM 5	12.6	L
		Water quality impairment from contaminated runoff/leakage	HGM 6, HGM 7, HGM 8	26.4	L
			HGM 5	16.2	L
	Backfilling of defunct shafts with tailings slurry (within 500 m of wetlands) Pumping of tailings slurry into defunct shafts. Management of filling rates, pressures and intake. Monitoring of seepage,	Seepage or migration of contaminated water/slurry through fractures, connected workings or preferential pathways	HGM 6, HGM 7, HGM 8	26.4	L
			HGM 5	16.2	L
		Water quality impairment due to mobilisation of	HGM 6, HGM 7, HGM 8	26.4	L

Harmony Defunct Shafts Backfilling

	overflow, return flows and shaft collar conditions. Management of displaced water, return water, decant and dirty stormwater associated with shaft backfilling operations.	historical underground contaminants during filling	HGM 5	16.2	L
		Daylighting, overflow or breakout of slurry at adjacent shafts, old workings, fractures or low-lying areas	HGM 6, HGM 7, HGM 8	17.6	L
			HGM 5	10.8	L
Decommissioning	Decommissioning of temporary slurry pipelines (Intersecting wetlands) Draining and flushing of temporary slurry pipelines where required. Stripping and removal of temporary pipes, fittings and supports for reuse. Vehicle and machinery access along temporary pipeline routes. Removal of temporary laydown areas and associated materials where required. Rehabilitation of disturbed areas, including reshaping, erosion control and revegetation.	Residual tailings slurry release during pipeline draining or removal causing soil and water contamination	HGM 1, HGM 2, HGM 4	20	L
			HGM 3	9.6	L
		Erosion and sedimentation from disturbance during pipeline removal and rehabilitation	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	14.4	L
		Loss of aquatic habitat	HGM 1, HGM 2, HGM 4	18	L
			HGM 3	10.8	L
		Water quality impairment from accidental discharge of slurry residues, hydrocarbon leaks or sediment-laden runoff	HGM 1, HGM 2, HGM 4	20	L
			HGM 3	9.6	L
		Disturbance to adjacent wetland buffer habitat during access and retrieval	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	10.8	L
		Failure of revegetation and continued proliferation of alien invasive species along disturbed corridors	HGM 1, HGM 2, HGM 4	16	L
			HGM 3	7.2	L
		Persistent altered drainage patterns due to incomplete reinstatement of disturbed surfaces	HGM 1, HGM 2, HGM 4	24	L
			HGM 3	10.8	L
	Decommissioning of temporary slurry pipelines (Within 500 m of Wetlands) Draining and flushing of temporary slurry pipelines where required. Stripping and removal of temporary pipes, fittings and supports for reuse. Vehicle and machinery access along temporary pipeline routes. Removal of temporary laydown areas and associated materials where required. Rehabilitation of disturbed areas, including reshaping, erosion control and revegetation.	Residual tailings slurry release during pipeline draining or removal causing soil and water contamination	HGM 6, HGM 7, HGM 8	16	L
			HGM 5	9.6	L
		Erosion and sedimentation of freshwater resources	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	14.4	L
		Impeding flow of water	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	10.8	L
		Hydrocarbon leaks/spills from removal equipment and vehicles	HGM 6, HGM 7, HGM 8	12.8	L
			HGM 5	9.6	L
		Failure of revegetation and continued proliferation of alien invasive species along disturbed corridors	HGM 6, HGM 7, HGM 8	12.8	L
			HGM 5	9.6	L
		Persistent altered drainage patterns due to incomplete reinstatement of disturbed surfaces	HGM 6, HGM 7, HGM 8	19.2	L
			HGM 5	10.8	L

3.1 Mitigation Measures

In light of the expected impacts from proposed activities the following mitigation measures have been proposed to lower the intensity of the impacts on the ecological integrity of the wetland catchment and its downslope wetland features.

The focus of mitigation measures should be to reduce the significance of potential environmental impacts associated with the mixed land use development and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community of the wetland areas; and
- Limit the construction area to the defined project areas and only impact those areas where it is unavoidable to do so otherwise.
- If avoidance is not possible, the project should implement site-specific mitigation measures to reduce the extent and severity of impacts; and
- In the event that residual impacts to the wetland cannot be fully avoided and mitigated, a detailed wetland rehabilitation plan must be developed and executed to compensate for any loss of wetland function.

3.1.1 Construction Phase

3.1.1.1 Loss and Disturbance of Wetland Habitat

- Construction activities must be restricted to the approved development footprint and all wetland and buffer no-go areas must be clearly demarcated prior to the commencement of works.
- The final pipeline alignment, temporary access routes, and associated work areas must be micro-sited to avoid delineated wetlands and their associated buffer areas as far as reasonably possible.
- Existing roads, tracks, servitudes, and previously disturbed areas must be used preferentially in order to minimise additional disturbance to wetland habitat.
- No construction camp, laydown area, stockpile area, batching area, workshop area, or storage area may be established within a wetland or its associated buffer area.
- No indiscriminate clearing of vegetation may take place within wetland areas or associated buffer zones.
- The construction footprint must be kept to the minimum area required for the safe execution of the works.
- Vehicles and machinery must remain within demarcated work areas and approved access routes at all times.
- Wetland areas and buffer vegetation may not be used for turning, parking, standing, or temporary storage of vehicles, machinery, pipe sections, rubble, or material.
- Construction personnel must be made aware of wetland no-go areas and the sensitivity of the delineated wetland systems during environmental induction.
- Disturbed wetland-adjacent habitat must be rehabilitated following completion of works.

3.1.1.2 Loss and Fragmentation of Habitat

- The width and extent of disturbance associated with pipeline installation and shaft-related activities must be minimised as far as practicably possible.
- Temporary access through natural or semi-natural wetland-adjacent vegetation must be avoided where existing disturbed routes can be used.

- Repeated unnecessary movement of vehicles and machinery through wetland margins and wetland buffer areas must be prohibited.
- Works within sensitive areas must be completed in the shortest practicable timeframe to reduce prolonged habitat disturbance.
- Open disturbed areas must not be left unnecessarily exposed or uncleared for extended periods where this may contribute to ongoing habitat fragmentation.
- All temporarily disturbed areas must be reinstated and rehabilitated after completion of construction activities.

3.1.1.3 Proliferation and Establishment of Alien Invasive Vegetation

- Disturbance to wetland and wetland buffer vegetation must be minimised to reduce the establishment of alien invasive species.
- Disturbed areas must be monitored for the emergence and spread of alien invasive vegetation during and after construction.
- Any alien invasive species establishing within disturbed areas must be removed using appropriate control methods.
- Vehicles and machinery must be restricted to approved routes to reduce the spread of alien invasive propagules.
- Topsoil, fill, and any imported material used on site must be free of alien invasive plant material as far as reasonably possible.
- Rehabilitated areas must be monitored to ensure that indigenous vegetation is re-establishing and that alien invasive species are not becoming dominant.
- Alien invasive plant control must continue until the disturbed area is considered stable and adequately rehabilitated.

3.1.1.4 Alteration of Hydrology / Surface Flow

- Natural surface flow paths into and through wetland systems must be maintained at all times.
- Construction activities may not obstruct, divert, canalise, concentrate, or impound diffuse flow into or out of wetland areas.
- Temporary access routes, stockpiles, pipe placement, berms, trenches, spoil ridges, and other temporary works may not be positioned so as to alter natural drainage patterns.
- Particular care must be taken in seep wetlands and valley-bottom systems where localised disturbance may alter diffuse or shallow subsurface flow.
- Temporary works must not create wheel ruts, channels, embankments, or impoundments that could redirect runoff toward or away from wetlands.
- Where disturbance to the soil profile occurs, affected areas must be reinstated to approximate pre-construction contours as soon as practicable.
- Any construction-related ponding, diversion of flow, localised flooding, or abnormal drying of wetland areas must be rectified immediately.
- Where crossings are required, the chosen method must minimise interruption of wetland hydrology and allow continued movement of water across the wetland system.

3.1.1.5 Induced Erosion and Sedimentation

- No stockpiling of soil, rubble, spoil, trench material, or pipe material may take place within wetlands or associated buffer areas.
- All excavated or excess material must be placed in approved areas outside wetlands and their associated buffers.
- Topsoil and subsoil must be stockpiled separately where stripping is required, and stockpiles must be protected from erosion.
- Stockpiles may not be placed in positions where runoff could transport material into wetlands or where they may impede drainage.
- Appropriate erosion and sediment control measures must be installed prior to and during construction where there is a risk of sediment entering wetland areas.
- Such controls may include silt fences, sediment traps, berms, sandbags, brush packing, contouring, or similar appropriate measures.
- Exposed soils must be stabilised as soon as practicable after completion of works in each section.
- Particular attention must be given to disturbed areas on slopes draining toward wetlands and to wetland crossing points.
- All disturbed areas must be protected against erosion until vegetation cover has been re-established.
- Should erosion, gullyng, scouring, or sediment deposition occur, remedial action must be implemented immediately.
- No stormwater runoff from disturbed work areas may be discharged directly into wetlands in a manner that causes erosion or sedimentation.

3.1.1.6 Soil Compaction and Disturbance of Hydromorphic Soils

- Disturbance of hydromorphic, saturated, or poorly drained soils must be avoided as far as reasonably possible.
- Machinery access through soft seepage and valley-bottom wetland areas must be avoided unless specifically authorised as part of an approved crossing or access arrangement.
- Where temporary disturbance of such soils is unavoidable, the affected area must be kept to the minimum practicable extent and duration.
- Rutting, churning, and unnecessary trafficking within wetland margins and buffers must be prevented.
- Where compaction has occurred within disturbed wetland-adjacent areas, soils must be loosened during rehabilitation where required to restore infiltration and promote vegetation establishment.

3.1.1.7 Water Quality Impairment / Pollution of Wetlands

- No fuel, oil, grease, chemicals, cement, wash water, wastewater, slurry, or other hazardous or contaminated substances may be allowed to enter any wetland or associated buffer area.

- All fuels, oils, chemicals, and hazardous substances must be stored in secure bunded areas located outside wetlands and associated buffer zones.
- Bunded areas must be of sufficient capacity to contain spills and leaks.
- Refuelling and servicing of vehicles and machinery must only take place within designated areas outside wetlands and their associated buffers.
- Drip trays must be used during refuelling, servicing, and maintenance activities.
- Spill kits must be available at all active construction fronts, refuelling points, maintenance areas, and wetland-adjacent work areas.
- All site personnel must be inducted and trained in spill prevention, spill response, and pollution control procedures.
- Potable sanitation facilities must be placed outside wetlands and their associated buffers and must be serviced regularly to prevent leakage or overflow.
- All waste must be collected and disposed of at a registered/licensed waste disposal facility.
- No waste, litter, rubble, wash water, surplus material, or contaminated material may be dumped, buried, or burned within wetland areas or associated buffers.
- No concrete mixing, batching, or washout may take place within wetlands or where runoff could enter wetlands unless undertaken on an appropriately contained surface in an approved area.
- Dirty water generated at work areas may not be allowed to drain uncontrolled toward wetlands and must be managed within designated controlled areas.
- In the event of a spill or leak, the source must be stopped immediately, the affected area contained, contaminated material removed where required, and the incident reported immediately to the ECO and site management.

3.1.1.8 Slurry-specific Contamination risk

- Given that the project involves the transfer of tailings slurry, strict slurry containment and emergency response measures must be implemented throughout construction.
- Temporary slurry pipelines must be installed, supported, and maintained in a manner that minimises the risk of rupture, leakage, joint failure, overflow, or uncontrolled discharge.
- Particular attention must be given to pipeline sections located upslope of wetlands, near seepage areas, at low points, at bends, and at joints where leakage risk may be elevated.
- Pipeline sections in proximity to wetlands must be inspected regularly during installation and prior to commissioning.
- A slurry leak response procedure must be in place prior to the commencement of transfer activities.
- If slurry is released, pumping must be stopped immediately and containment measures must be implemented before the material reaches any wetland area.
- Slurry-contaminated soil or sediment must be removed where necessary and disposed of appropriately.
- Clean-up and remediation measures must be implemented in a manner that does not cause unnecessary secondary disturbance to wetland soils or vegetation.

- Any area affected by slurry contamination must be reinstated and stabilised following remediation.

3.1.1.9 Wetland Crossing Controls

- Wetland crossings must be avoided wherever feasible through route refinement and micro-siting.
- Where avoidance is not possible, crossings must be located at the least sensitive practicable point.
- All wetland crossings must be approved prior to construction and must be clearly shown on the final construction layout.
- A site-specific method statement must be prepared for each unavoidable wetland crossing before construction commences.
- The method statement must include the approved crossing location, access method, construction sequence, plant and equipment requirements, footprint extent, spoil handling, stormwater controls, erosion and sediment controls, pollution prevention measures, spill response actions, rehabilitation measures, and rainfall/flood contingency procedures.
- The wetland crossing footprint must be restricted to the minimum practicable width and duration.
- No unnecessary widening of access or work areas may take place at wetland crossings.
- Construction materials, spoil, equipment, and waste may not be stored within wetland crossing areas unless specifically required for the immediate works and approved as such.
- Natural flow paths through the wetland must be maintained throughout the crossing construction period.
- Following completion of the crossing, the affected area must be reinstated to approximate pre-disturbance contours and stabilised against erosion.
- Disturbed wetland vegetation at crossing points must be rehabilitated as soon as practicable following completion of the works.
- Where scour or bank instability is likely, suitable stabilisation measures must be installed.

3.1.2 Operational Phase

3.1.2.1 Loss and Continued Disturbance of Wetland Habitat

- Operational access to the temporary slurry pipeline must be restricted to approved routes and authorised personnel only.
- No routine operational access through wetlands or wetland buffers may occur unless required for inspection, emergency response, or authorised maintenance.
- Disturbance associated with maintenance activities must be limited to the minimum area and duration required to safely undertake the work.
- No parking, laydown, or storage of material may occur within wetlands or associated buffers during operational activities.
- Any areas disturbed during maintenance or repair must be reinstated and rehabilitated following completion of the works.

3.1.2.2 Alteration of Hydrology / Erosion / Sedimentation

- The pipeline route and associated disturbed areas must be inspected regularly for evidence of ponding, altered flow, erosion, sediment deposition, rutting, or scouring.
- Any evidence of altered hydrology or runoff concentration associated with the pipeline route must be corrected as soon as practicable.
- Erosion and sediment control measures installed during construction must be maintained for as long as required.
- Maintenance access may not create new erosion channels or flow diversion into wetland systems.
- Disturbed areas resulting from repair or maintenance works must be stabilised immediately after the completion of works.

3.1.2.3 Water Quality Impairment and Contamination Risk

- All slurry transfer infrastructure must be routinely inspected for leaks, corrosion, weakened joints, damaged sections, or any other sign of failure.
- Inspection frequency must be increased in high-risk areas, including sections adjacent to wetlands and wetland buffers.
- A leak detection and response procedure must be implemented and maintained for the duration of slurry transfer operations.
- Spill response materials suitable for slurry and hydrocarbon containment must be available at all high-risk operational areas.
- In the event of a leak or spill, pumping must be stopped immediately and containment measures implemented without delay.
- Any contaminated soil or sediment must be removed and disposed of appropriately where necessary.
- Clean-up activities must be undertaken in a manner that prevents secondary erosion, sedimentation, or unnecessary disturbance of wetland areas.
- No uncontrolled discharge of dirty water, slurry, wastewater, or contaminated runoff may occur toward wetlands during operation.
- No refuelling, vehicle servicing, waste storage, or uncontrolled maintenance activities may occur within wetlands or associated buffer areas.

3.1.2.4 Alien Invasive Vegetation and Rehabilitation Maintenance

- Disturbed wetland-adjacent areas must be monitored during operation for alien invasive vegetation establishment.
- Any alien invasive species recorded within disturbed or rehabilitated areas must be controlled or removed.
- Previously rehabilitated areas must be inspected to assess vegetation establishment, stability, and recurrence of erosion.
- Additional rehabilitation or stabilisation measures must be implemented where vegetation establishment is poor or where erosion reoccurs.

3.1.3 Decommissioning Phase

3.1.3.1 Disturbance Associated with Pipeline Removal

- Prior to removal, all temporary slurry pipelines must be drained and, where necessary, flushed in a controlled manner.
- No slurry, flushing effluent, contaminated water, or residual material may be discharged into wetlands or their associated buffers.
- Pipeline removal must be undertaken within the minimum footprint necessary to complete the work safely.
- Unnecessary access through wetlands and buffer areas during removal activities must be prohibited.
- All pipeline sections, supports, anchors, markers, waste, and associated infrastructure must be removed from wetland and buffer areas following decommissioning.
- Wetland and buffer no-go areas must remain demarcated during decommissioning activities.

3.1.3.2 Residual Contamination and Pollution Risk

- Any residual slurry contamination encountered during decommissioning must be contained and cleaned up immediately.
- Contaminated soil or sediment must be removed where necessary and disposed of at an appropriate facility.
- Spill kits and pollution response materials must remain available until all slurry infrastructure has been removed and rehabilitation completed.
- Decommissioning activities must be supervised to ensure that no secondary contamination of wetlands occurs during dismantling and removal.

3.1.3.3 Rehabilitation and Reinstatement

- All disturbed areas must be rehabilitated following the removal of temporary infrastructure.
- Reinstatement must restore, as far as reasonably possible, pre-disturbance contours, drainage characteristics, and vegetation cover.
- Compacted soils within disturbed wetland-adjacent areas must be loosened where required before topsoil replacement.
- Stored topsoil must be replaced over disturbed areas where applicable.
- Re-vegetation must make use of locally appropriate indigenous species or an approved indigenous seed mix suited to the affected habitat.
- Disturbed areas must be stabilised against erosion until vegetation cover is re-established.
- Rehabilitated areas must be monitored for erosion, subsidence, poor vegetation establishment, alien invasive plant establishment, and persistent hydrological disturbance.
- Corrective action must be implemented where rehabilitation failure is identified.

3.1.4 General Monitoring and Compliance Measures

- A suitably qualified Environmental Control Officer must monitor wetland-related activities prior to disturbance, during construction, during operations where necessary, and during rehabilitation.
- Particular attention must be given to wetland crossings, wetland-adjacent pipeline sections, and areas where spills, erosion, or hydrological disturbance have occurred.
- Environmental induction must be undertaken for all personnel working in or near wetland-sensitive areas.
- A record of all wetland-related incidents, spills, leaks, erosion problems, rehabilitation actions, and corrective measures must be maintained on site.
- Contractor method statements must include all relevant wetland protection, pollution control, crossing, and rehabilitation measures.
- Any deviation from approved wetland mitigation measures must be authorised by the ECO where feasible, or reported immediately thereafter in the case of emergency actions.
- Compliance with wetland mitigation measures must form part of routine environmental inspections and auditing.

4 Conclusion

A total of 19 HGM units were identified within the PAOI, comprising one channelled valley-bottom wetland, three unchannelled valley-bottom wetlands, five seeps, and 10 depressions. In addition to these wetlands, several artificial wet areas and drainage features associated with historical anthropogenic disturbance were also identified.

Of these, only HGMs 1 to 8 were identified as “At-Risk”, as these units are overlapped by the proposed activities, located in proximity to the proposed activities, or occur downslope thereof, and are therefore considered susceptible to direct and/or indirect impacts due to the proximity and interconnectivity of the watercourses. The remaining wetland units, HGMs 9 to 19, are situated outside the pipeline assessment area and are not anticipated to be affected by the proposed development. The assessed wetlands were found to be generally within the D – Largely Modified Present Ecological State (PES) category, while the Ecological Importance and Sensitivity (EIS) ranges from A – Very High to C – Moderate, including wetlands within the B – High sensitivity class. The ecosystem service assessment further indicates that, despite existing disturbance, these wetlands continue to perform important ecological and hydrological functions.

HGM 1, HGM 2 and HGM 4 will have Moderate post-mitigation risk rating due aspects of the following:

- Construction of temporary slurry pipelines and associated shaft work areas (intersecting wetlands);
- Construction of temporary pipeline crossings; and
- Operation of infrastructure (intersecting wetlands):

All other post-mitigation risk ratings were assessed as low.

A 50 m post-mitigation buffer is therefore recommended around delineated wetlands in relation to the proposed project activities.

4.1 Risk and Impact Statement

The proposed project involves the temporary transfer of tailings slurry to defunct shafts via pipelines and therefore presents risks associated with wetland habitat disturbance, hydrological alteration, erosion and sedimentation, alien invasive plant establishment, and water quality impairment through hydrocarbon or slurry spills. Based on the findings of the wetland impact and risk assessment, it is anticipated that the proposed project will pose low to moderate post-mitigation risks, provided that the recommended mitigation measures are fully implemented, with particular emphasis on wetland avoidance, minimisation of the disturbance footprint, strict pollution prevention, wetland crossing controls, and the rehabilitation of all disturbed areas.

4.2 Specialist Opinion

Considering the findings of the assessment, and on condition that the recommended mitigation measures, monitoring requirements, and rehabilitation measures are implemented in full, no fatal flaws are evident from a wetland perspective at this stage. It is therefore the opinion of the specialists that the proposed project may be considered for authorisation, subject to strict adherence to the wetland mitigation and management measures set out in this report.

5 References

Department of Water Affairs and Forestry (DWAF). 2005a. A Practical Field Procedure for Identification and Delineation of Wetlands and Riparian Areas.

Department of Water and Sanitation (DWS). 2016. General Authorisation in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Government Gazette Notice: 509 in Government Gazette 40229 of 26 August 2016.

Department of Water and Sanitation (DWS). 2023. General Authorisation in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Government Gazette Notice: 4167 in Government Gazette 49833 of 08 December 2023.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.C., and Collins, N.B. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands, Mondi Wetland Project.

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

Lotter, M.C., Le Maitre, D. 2021. Fine-scale delineation of Strategic Water Source Areas for surface water in South Africa using Empirical Bayesian Kriging Regression Prediction: Technical report. Prepared for the South African National Biodiversity Institute (SANBI), Pretoria. 33p.

Macfarlane, D.M., Bredin, I.P., Adams, J.B., Zungu, M.M., Bate, G.C. and Dickens, C.W.S. 2014. Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. WRC Report No TT 610/14, Water Research Commission, Pretoria.

Macfarlane, D.M., Ollis, D.J. & Kotze, D.C. 2020. WET-Health Version 2: A refined suite of tools for assessing the present ecological state of wetland ecosystems. WRC Report No. TT 820/20, Water Research Commission, Pretoria.

Mucina, L., and Rutherford, M.C., 2010. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Nel, J. L., Driver, A., Strydom, W. F., Maherry, A. M., Petersen, C. P., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. R. & Smith-Adao, L. B. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources, WRC Report No. TT 500/11. Water Research Commission, Pretoria.

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

Rountree, M. & Kotze, D. 2013. Ecological Importance and Sensitivity Assessment. In: Rountree, M., Malan, H. & Weston. ed., Manual for the Rapid Ecological Reserve Determination of Inland Wetlands. Report to the Water Research Commission and Department of Water Affairs. WRC Report No. 1788/1/12. Pretoria. p. 42-46.

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

Van Deventer, H.; Smith-Adao, L.; Mbona, N.; Petersen, C.; Skowno, A.; Collins, N.B.; Grenfell, M.; Job, N.; Lötter, M.; Ollis, D.; Scherman, P.; Sieben, E.; Snaddon, K. 2018. South African Inventory of Inland Aquatic Ecosystems. South African National Biodiversity Institute, Pretoria. Report Number:

CSIR report number CSIR/NRE/ECOS/IR/2018/0001/A; SANBI report number
<http://hdl.handle.net/20.500.12143/5847>.

6 Appendix C – Specialist Declaration of Independence

Declaration

I, Rian Pienaar, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



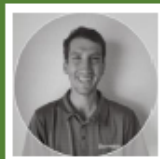
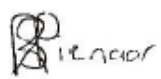
Rian Pienaar

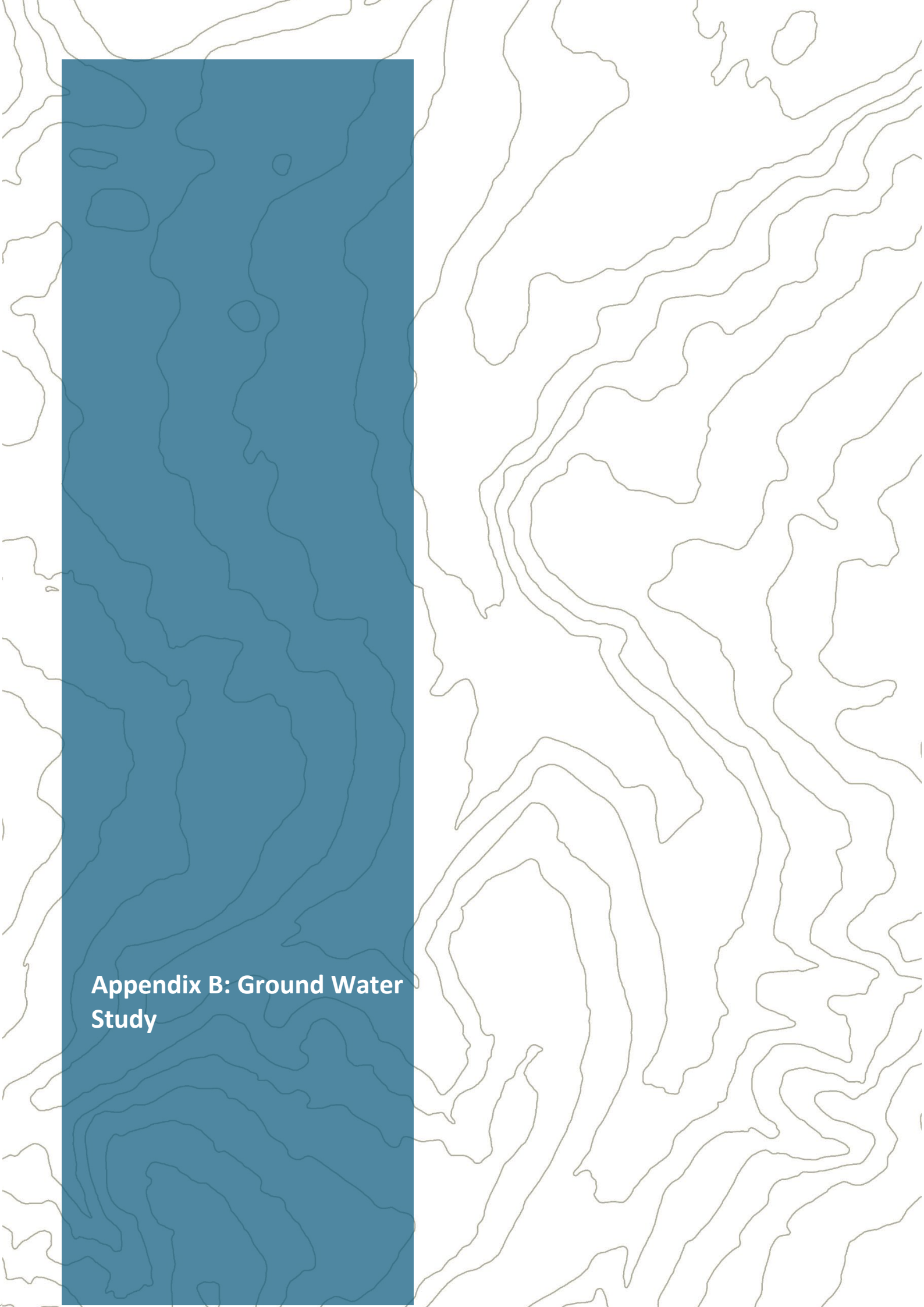
Ecologist

The Biodiversity Company

May 2026

7 Appendix D – Specialist CVs

Rian Pienaar Pr Sci Nat 135544 +27 78 505 0201 rian@thebiodiversitycompany.com 	
PROFILE SUMMARY Environmental scientist and Pri Sci Nat (SACNASP 135544) with ~5+ years' specialist consulting experience across Southern Africa. Specialist expertise in wetland delineation and ecological assessments, wetland offset strategy design, rehabilitation and monitoring plans, as well as soil classification and agricultural potential assessments. Experienced in delivering high-quality field surveys and technical reporting aligned with in-country legislative requirements and international lender standards, and currently manages the operations at TBC.	
PERSONAL INFO Nationality: South African Date of birth: 23 May 1994	ACADEMIC QUALIFICATIONS North-West University (2020): MASTER OF SCIENCE (MSc) – Environmental Sciences (Cum Lauda): Title: The use <i>Clarias gariepinus</i> and associated helminthic parasites as bio-indicators of metal pollution in a subtropical ecosystem. North-West University (2018): BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCE – Aquatic Ecosystem Health North-West University (2018): BACHELOR OF SCIENCE IN ENVIRONMENTAL AND BIOLOGICAL SCIENCES – Zoology and Microbiology
EXPERIENCE Environmental Impact Assessments (EIA) Environmental Management Programmes (EMP) Project Management Logistics	PROFESSIONAL EXPERIENCE Sept 2020 – Present The Biodiversity Company Wetland Ecology Jan 2018 – Dec 2018 National Aquatic Bioassay Facility (NABF) Intern
SKILLS ✓ Wetland functional assessments ✓ Ecology ✓ Rehabilitation ✓ Monitoring & Management Plans	INTERNATIONAL EXPERIENCE South Africa, Mozambique, Botswana, Eswatini
LANGUAGES English – Proficient Afrikaans – Proficient  Signed: Rian Pienaar	

The background of the page is a topographic map with thin, light brown contour lines. A solid blue vertical band runs down the left side of the page, starting from the top and extending to the bottom. The text 'Appendix B: Ground Water Study' is located within this blue band, positioned in the lower half of the page.

Appendix B: Ground Water Study

HARMONY GOLD MINING COMPANY LIMITED

ASSESSMENT OF THE POTENTIAL GROUNDWATER IMPACTS ASSOCIATED
WITH THE BACKFILL OF SHAFTS WITH GOLD TAILINGS

FINAL REPORT

Report No.: Mv8112/23/B002



APRIL 2023

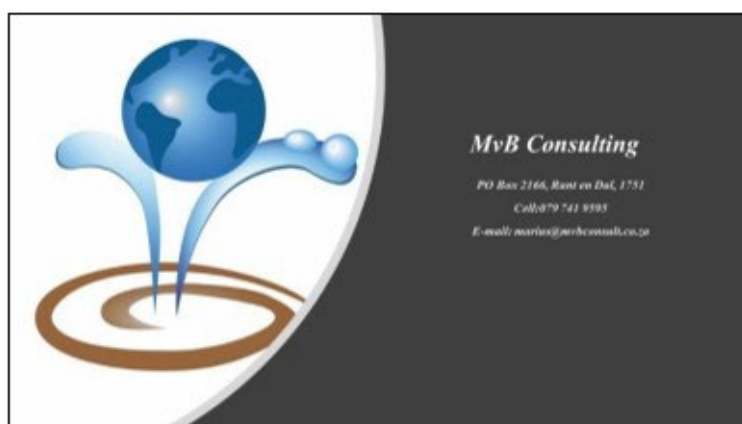


DOCUMENT APPROVAL RECORDReport No.: MvB112/23/B002

ACTION	FUNCTION	NAME	DATE	SIGNATURE
Prepared	Geohydrologist	Dr M van Biljon (PhD, Pr. Sci.Nat.)	24/03/2023	

RECORD OF REVISIONS AND ISSUES REGISTER

Date	Description	Issued to	Issue Format	No. Copies
24/03/2023	Report - Revision 1	Hlayiseko Mashaba Harmony Gold	Electronic	1
28/04/2023	Final Report	Hlayiseko Mashaba Harmony Gold	Electronic	1




Marius van Biljon
(PhD, Pr. Sci. Nat.)
Geohydrologist

HARMONY GOLD MINING COMPANY LIMITED

ASSESSMENT OF THE POTENTIAL GROUNDWATER IMPACTS ASSOCIATED WITH THE
BACKFILL OF SHAFTS WITH GOLD TAILINGS

FINAL REPORT

REPORT NO: MvB112/23/B002

<u>CONTENTS</u>	<u>PAGE</u>
1. INTRODUCTION	1
2. STUDY PURPOSE AND TERMS OF REFERENCE	1
3. PROJECT DESCRIPTION	1
3.1 Mine Boundaries	1
4. GEOHYDROLOGICAL SETTING	3
4.1 Regional Geology	3
4.2 Geohydrological Setting	5
4.3 Regional Groundwater Levels	7
5. GEOCHEMICAL ASSESSMENT	10
5.1 Introduction	10
5.2 Project Objectives	10
5.3 Methodology	10
5.4 Laboratory Tailings Material and Water Quality Data	12
5.5 Conceptual Geochemical Framework	18
5.6 Geochemical Modelling and Environmental Risk	22
6. CONCLUSIONS AND RECOMMENDATIONS	25
7. REFERENCES	28

Table of Figures

Figure 3.1:	Mine locality	2
Figure 4.1:	Free State Goldfields Stratigraphy	4
Figure 4.2:	Graphical illustration of the aquifers in the region	6
Figure 4.3:	Correlation between topography and groundwater level	7
Figure 4.4:	Regional interpolated groundwater level.....	9
Figure 5.1:	Localities of the sampled tailings facilities.....	11
Figure 5.2:	Conceptual model showing an operational phase in which tailings is being disposed in the underground mine voids	18
Figure 5.3:	Schematic of a conceptual model comparing the earth surface geochemical system with that of the underground mine voids in an operational and post-operational phase. Operational and post-operational refer to disposal of the tailings into the mine voids and after it has been disposed of respectively	20
Figure 5.4:	Conceptual model of the underground mine voids tailings disposal geochemical system.....	21
Figure 5.5:	Flow diagram showing the coupling of individual numeric models into a combined model for the tailings deep mine void disposal.....	22
Figure 5.6:	Timeseries results of the geochemical model for the tailings operational phase, decommissioning and/or re-processing phase and the post-operational phase in which the tailings are disposed of in the underground mine voids	23
Figure 5.7:	Conceptual model showing the change in redox state and thus mobility of iron (Fe) and manganese (Mn) in the mine void water and at the Earth's surface.....	24
Figure 6.1:	Bacfilling scenarios	26

List of Tables

Table 5.1:	Mineralogical composition of the Saaiplaas tailings material.....	12
Table 5.2:	Chemical composition of the Saaiplaas tailings material.....	13
Table 5.3:	Distilled water leach results including the SANS 241:2015 drinking water quality guideline values for comparison	14
Table 5.4:	Water quality of the deep mine void water	16
Table 5.5:	Leachability of potential contaminants in the tailings material	17
Table 5.6:	Final water quality results for the underground mine voids and seepage from the tailings as predicted by the geochemical model	23



MvB Co11s11/ti11g

PO B"x 2166, RC111te11 DC1!, 1751

Cell:079 7419595

E-mail: marius@mvbconsult.co.za

HARMONY GOLD MINING COMPANY LIMITED

ASSESSMENT OF THE POTENTIAL GROUNDWATER IMPACTS ASSOCIATED WITH THE
BACKFILL OF SHAFTS WITH GOLD TAILINGS

FINAL REPORT

REPORT NO: MvB112/23/B002

1. INTRODUCTION

Harmony Gold Mining Company Limited (Harmony) is investigating the possibility of closing some of their gold mines in the Free State region. Part of this closure investigation is to assess the possibility of backfilling the shafts with gold tailings. The purpose of the study was to determine and quantify the potential geochemical environmental risks associated with the proposed disposal.

A total of 15 tailings samples were collected from Merrie Spruit 32, Saaiplaas 6 and Harmony Dam 23 Tailings Facilities (TSF) on the FS30/5/1/2/2/82 Mining Right. These samples were composited into three samples for analysis, one for each of the tailings facilities, at the accredited laboratory Waterlab (Pty) Ltd. Leach tests as well as mineralogical and total chemical composition analyses were conducted on the tailings samples. Surface water, groundwater and tailings return water dam monitoring data were made available for the study. Underground mine water quality samples were collected from the deep Witwatersrand aquifer. A geochemical model was developed using the USGS software package PHREEQC. The purpose of the model was to quantify the long-term (100 years) behaviour of the tailings material in the deep mine voids.

Although the FS30/5/1/2/2/82 Mining Right was selected for this study it is expected that the tailings material from any of the Free State mines will be similar and the findings of this report can be implemented at the other operations in the region. MVB Consulting (MvB) sub-contracted Dr. Robert Hansen from Geochemical Dynamic Systems (GeoDyn) to undertake the geochemical assessment.

2. STUDY PURPOSE AND TERMS OF REFERENCE

The primary objective of this study was to understand the following:

- Description of the geohydrological environment.
- Assessment of the likelihood of the development of AMO (Acid Mine Drainage) conditions from the tailings material in the backfilled shaft.
- Assessment of potential long-term i.e., 100 years, pollution from the tailings material in the backfilled shaft.

3. PROJECT DESCRIPTION

3.1 Mine Boundaries

The study area is located just north of the town of Virginia, Free State Province (**Figure 3.1**).



Figure 3.1: Mine locality

4. **GEOHYDROLOGICAL SETTING**

4.1 **Regional Geology**

The Free State Goldfield which forms a triangle between Allanridge, Welkom and Virginia, produces gold from auriferous bearing reefs situated within sediments of the Central Rand Group of the Witwatersrand Supergroup. A detailed description of the geology of the Welkom Goldfields is provided by Minter et. al; (1986). In: Anhaeusser, C.R. and Maske, S., Eds., Mineral Deposits of Southern Africa, I. Geol. Soc. S. Afr.

The mine geology, from shallow to deep, consist of the following (**Figure 4.1**):

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

4.1.1 Karoo Supergroup

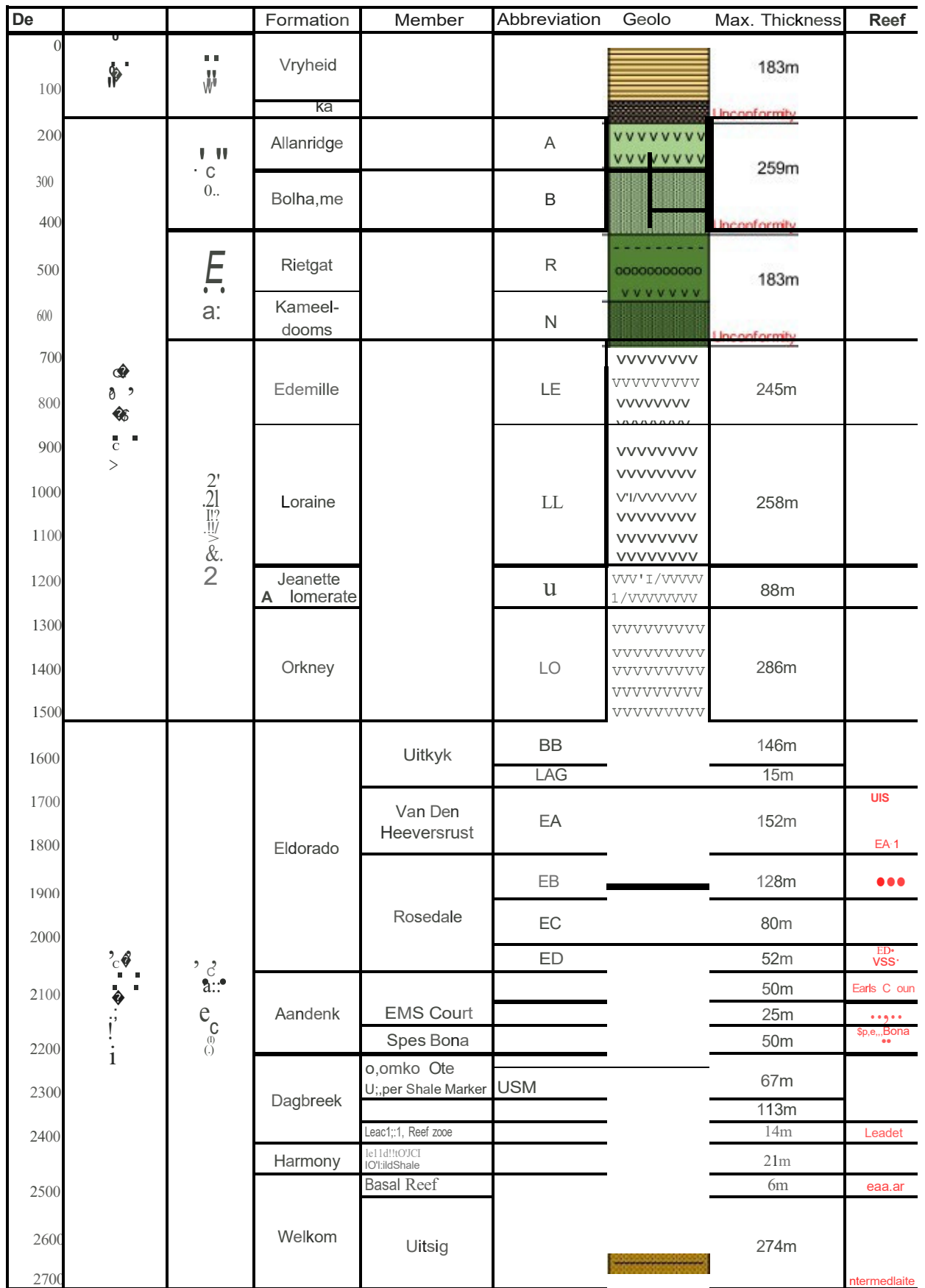
Sediments of the Vryheid Formation of the Eccca Group underlie the study area. The Vryheid Formation (Eccca Group) mainly comprises mudstone, siltstone and fine- to coarse grained sandstone (pebbly in places).

According to Tankard et. al. (1982) the Eccca Group (Vryheid Formation) overlies the Dwyka Formation gradationally and comprises predominantly elastic sediments deposited in an extensive landlocked basin experiencing only rare marine incursion. Steyn and Beukes (1977) described the lower Vryheid Formation as upwards-coarsening shale and sandstone cycles, which represent prograding deltaic environments. This in turn is overlain by upwards-fining sandstone and shale cycles, which are of a fluvial origin. The coal beds, which were deposited in the back swamps of meandering river systems, cap the Lower Vryheid lithologies. The depositional environment is believed to be a dendritic channel system that resulted in the deposition of more arenaceous material in the active channels and mud and coal deposited on their floodplains.

Channel closure led to the filling of channels by mud, the establishment of swamps and the deposition of coal beds within them. Similar deltaic and fluvial processes characterise the sediments overlying the coal seams, consisting mainly of alternating sequences of shale and sandstone. The more competent sandstone formations can result in localised hilly terrains. The surface and near surface lithologies comprise topsoil, weathered sandstone and dolerite. The latter is important as it generally forms an impermeable layer, affecting groundwater flow.

Although not exposed on surface the Dwyka Formation underlies the Eccca Group. The Dwyka sediments were deposited during late Carboniferous to early Permian times by glacial processes. The group consists mainly of diamictite (tillite), which is generally massive with little jointing, but it may be stratified in places. The Dwyka diamictite consists of angular to rounded clasts of basement rock embedded in a clay and siltmatrix. Individual clasts measure up to 3m in diameter. Subordinate rock types are conglomerate, sandstone, rhythmite and mudstone (both with and without dropstones).

From a groundwater perspective the Dwyka is considered a very low permeable horizon and classified as an aquiclude. This unit forms a barrier between the upper Karoo aquifer and the lower Witwatersrand aquifer.



flbte: • Reefs that are rined

Figure 4.1: Free State Goldfields Stratigraphy

Dolerite intrusions are common in this type of geological terrain and represent the roots of the volcanic system and are presumed to be of the same age as the extrusive lavas (Fitch and Miller, 1984). The level of erosion that affected the Main Karoo basin has revealed the deep portions of the intrusive system, which displays a high degree of tectonic complexity. The Karoo dolerite, which includes a wide range of petrological facies, consists of an interconnected network of dykes and sills and it is nearly impossible to single out any particular intrusive or tectonic event. It would, however, appear that a very large number of fractures were intruded simultaneously by magma and that the dolerite intrusive network acted as a shallow stockwork-like reservoir.

Based on the exploration drilling the Karoo Supergroup has an average thickness of approximately 200m.

4.1.2 Ventersdorp Supergroup

The Witwatersrand Supergroup is unconformably overlain by the volcanic and sedimentary rock of the Ventersdorp Supergroup.

Within the Free State Goldfield, the Ventersdorp Supergroup can be divided into the Pniel sequence, the Platberg Group and the basal Kliprivierberg Group consisting of alternating sediments, amygdaloidal and non-amygdaloidal andesitic lavas, luffs and agglomerates (Minter et.al; 1986).

Based on the exploration drilling the Ventersdorp Supergroup has an average thickness of 1 300m.

4.1.3 Witwatersrand Supergroup

Within the Free State Goldfield, the Witwatersrand Supergroup, comprising a thick succession of elastic sediments with minor intercalated lava flows, rests on the granites and schist of the Archean Basement. The Central Rand Group of the Witwatersrand Supergroup contains the economic reef horizons mined throughout the basin. The Central Rand Group is dominated by quartzite with minor shale and conglomerate. Several unconformities in the succession are overlain by the economic auriferous paleoplacers (reefs).

The Central Rand Group has been divided into an upper Turffontein Subgroup comprising the Eldorado and Aandenk Formation and a lower Johannesburg Subgroup comprising the Dagbreek, Harmony, Welkom, St Helena and Virginia Formations (see **Figure 4.1**).

4.2 Geohydrological Setting

To understand the geohydrological setting a description of the groundwater occurrence in the region is summarised below.

The Free State mining operations are characterised by two aquifers:

- **A Shallow Weathered and Fractured Karoo Aquifer (Karoo Formations):** A shallow, weathered aquifer exists in the weathered shale and sandstone at an average depth of 10m - 20m below ground level. The most consistent water strike is located at the fresh bedrock / weathering interface.
 - The primary porosity of the Vryheid Formation is very low. Any water bearing capacity is therefore associated with secondary joints, bedding planes and faults. The contact zones of dolerite intrusions are considered the primary source of groundwater flow within the deeper formations.
 - The two aquifers may or maynot be hydraulically connected, dependent on the local geology.
- **A Deep Witwatersrand / Ventersdorp Aquifer:** The deep brine Witwatersrand aquifer is situated approximately 300m below surface. This aquifer is thought to be connate (i.e.

original formation water) or extremely old (fossil) water and is usually concentrated on geological structures such as fault zones or igneous intrusions (e.g. dykes).

The time gap between the end of the Central Rand Group and the start of the Karoo deposition was in the order of 2.3Ga. There is also a significant time gap between the Central Rand Group and the Ventersdorp Supergroup. During these intervening periods, the older rocks were uplifted and exposed to erosion and the near surface rocks to pressure release. This resulted in the forming of fractures in approximately the upper 150m of the rock succession. Subsequent land surface changes and inundation by a shallow sea allowed marine water to percolate into the network of fractures in the Witwatersrand and Ventersdorp rocks (Young, 1990).

The major fractures that formed during the Ventersdorp tectonic events were filled with water to a depth of several kilometres. The impermeable nature of the overlying Karoo sediments, particularly the Dwyka Formation at the base of the Karoo, effectively sealed off the aquifer (Van Biljon, 1995). Post-Karoo movement and intrusions provided conduits for leakage from the Karoo aquifers to the deep Witwatersrand aquifer. However, the deep aquifer recharge from surface is regarded as negligible and at best localised (Van Biljon, 1995).

This is concluded based on the dewatering of this aquifer over the past 40 years during which the water levels in the Witwatersrand aquifer dropped significantly. Underground dewatering boreholes have dried up in some instances (Van Biljon, 1995).

Previous studies concluded the following:

- There is no or very limited hydraulic connectivity between the Karoo aquifers and the deeper Witwatersrand aquifer.
- Recharge to the Witwatersrand aquifer is negligible.
- Once the Witwatersrand aquifer is dewatered (or the water level lowered) it will not recover. The estimated post-mining water level in the Witwatersrand aquifer will therefore be deeper than the pre-mining water level of ~200m below surface.

A graphical illustration of the aquifers is presented in **Figure 4.2**.

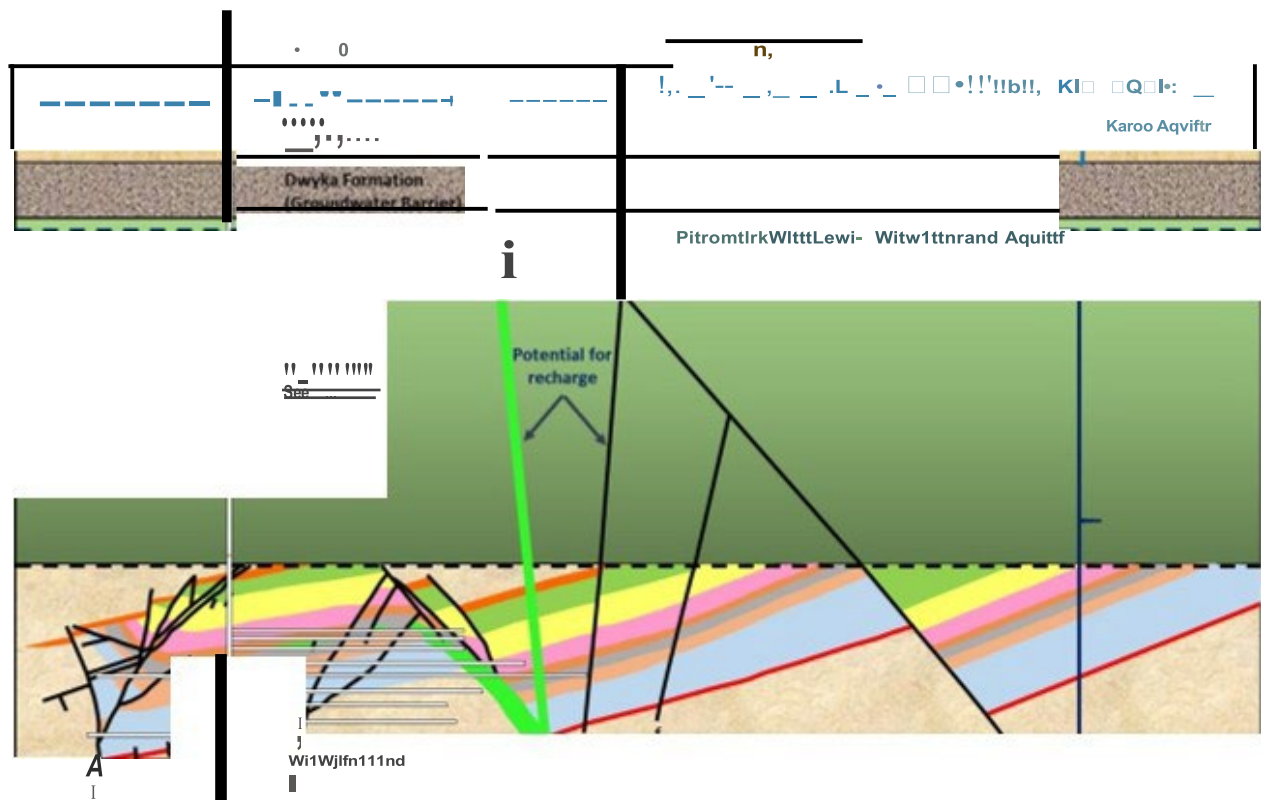


Figure 4.2: Graphical illustration of the aquifers in the region

4.3 Regional Groundwater Levels

4.3.1 Karoo Aquifer

The connectivity between the Witwatersrand and Karoo aquifers can best be investigated through an assessment of the regional groundwater levels. Connections between the Karoo aquifer and the underlying mine workings will manifest in zones of dewatering. The regional groundwater levels will indicate areas where dewatering occurred.

Harmony has an extensive groundwater monitoring network, and this information was made available. Groundwater levels from the monitoring data, as well as from a regional hydro census that was done by Aquisim Consulting (*"2018 Free State Radiological Public Safety Assessment: Groundwater Flow and Mass Transport Model Update"*) was incorporated into a groundwater level database.

The groundwater levels in this geological environment typically mimics the topography. To test this phenomenon the borehole collar elevations (representing the topography) were plotted against the measured groundwater levels. The result of this exercise is shown in **Figure 4.3**.

This graph indicates a very good correlation (98%) between the topography and the groundwater level, which suggests that groundwater flow will follow the topographical gradient. If a dewatering cone has developed over the years this correlation will no longer exist. This graph is therefore an indication that groundwater from the Karoo aquifer is not seeping into the underlying mine workings.

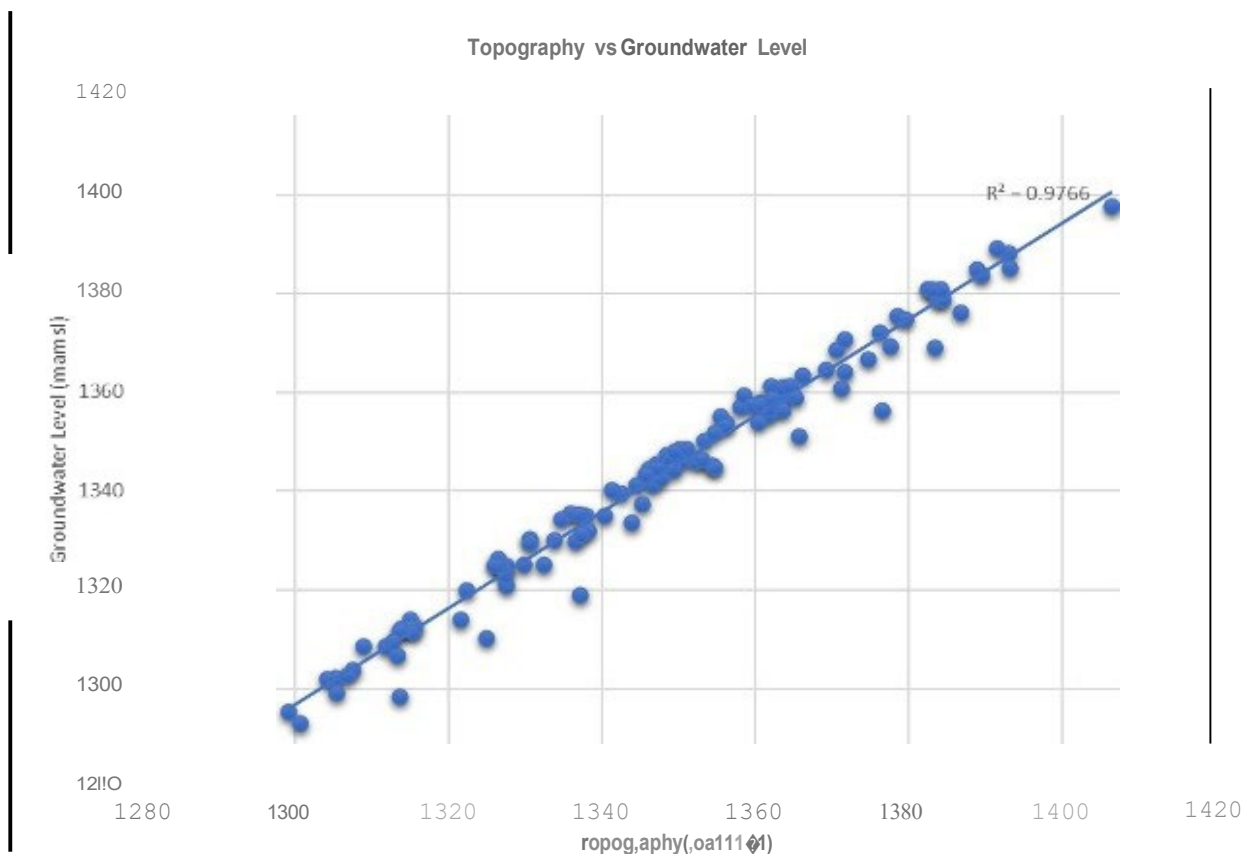


Figure 4.3: Correlation between topography and groundwater level

The relationship between the topography and the groundwater level is known as the Bayesian relationship. Where this correlation exists, the regional topography can be used to interpolate (Bayesian interpolation) a regional groundwater gradient map. **Figure 4.4** depicts the groundwater level elevations, which as expected mimic the surface contours. As expected, there is no clear evidence of dewatering cones, which confirms that the Karoo aquifer is a perched aquifer, unaffected by the underlying mine workings.

4.3.2 Witwatersrand Aquifer

Groundwater level records in the Witwatersrand aquifer are scarce. Some data is available for Joel mine (Van Biljon, 1995) and although it is some distance from the current study area it provides some information that is applicable throughout the basin.

Joel mine is located in the southern extremity of the Witwatersrand basin and started operating in 1986. At the time when mining started the water level was at 775 mamsl, some 600m below surface.

The Witwatersrand aquifer is a confined aquifer, and the water level is represented by a piezometric or pressure level, which is expected to be consistent throughout the basin. This piezometric level of 775 mamsl that was measured at Joel prior to any dewatering from the mine is thought to represent the original water level in the entire Witwatersrand aquifer.

What was also noticeable at Joel was that between January 1986 and December 1992 the water level in the aquifer dropped 198m due to dewatering from Joel mine. Many of the dewatering boreholes that was drilled at Joel dried up during this time as sections of the mine became dewatered. This shows that abstracting from the Witwatersrand aquifer dewateres the aquifer and that there is very little or no recharge to this aquifer.

It is therefore concluded that:

- There is no connectivity between the Karoo aquifer and the Witwatersrand aquifer.
- Water inflow into the mine workings is derived from the Witwatersrand aquifer and not the Karoo aquifer.
- Once the mine workings re-water the water level will stabilise at the current piezometric level. This level is currently unknown, but it can be measured by converting the water pressure, as measured in underground water intersections, to a water level (1 Bar= 10 metres).
- In any event this water level is not expected to exceed 775 mamsl, which is at least 400 - 500m below the Karoo aquifer.
- Decant of poor quality mine water into the Karoo aquifer or onto surface through the shafts is not expected to occur.

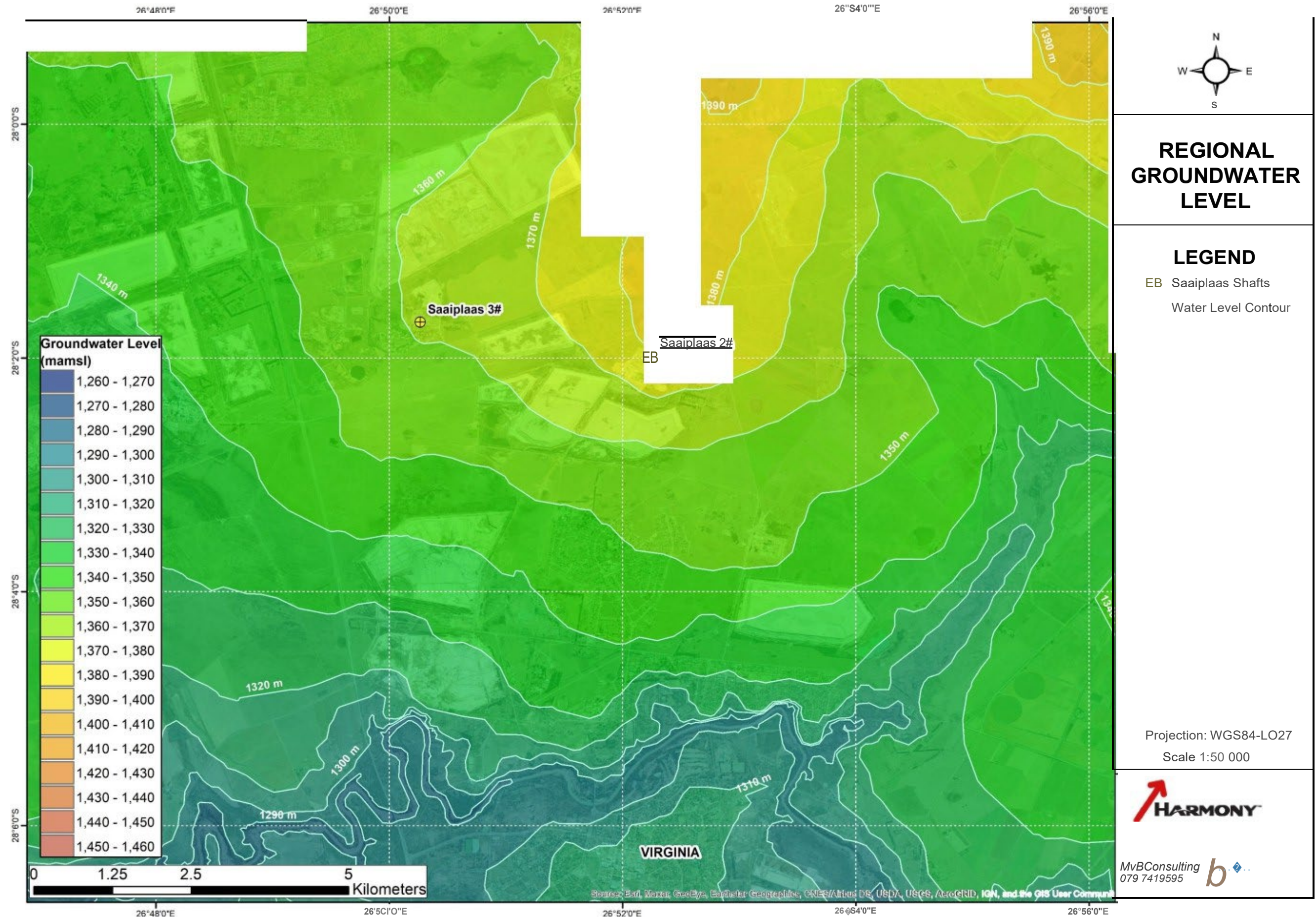


Figure 4.4: Regional interpolated groundwater level

5. **GEOCHEMICAL ASSESSMENT**

5.1 Introduction

Geochemical Dynamic Systems (GeoDyn) was sub-contracted to conduct a geochemical environmental risk assessment for the disposal of tailings material from the FS30/5/1/2/2/82 Mining Right in the Saaiplaas and Merriespruit shafts.

A geochemical model was developed using the USGS software package PHREEQC. The purpose of the model was to quantify the long-term (100 years) behaviour of the tailings material in the underground mining environment.

5.2 Project Objectives

The project has the following main objectives:

1. Assessment of the likelihood of the development of AMD (Acid Mine Drainage) conditions from the tailings material in the backfilled shaft.
2. Assessment of potential long-term i.e., 100 years, pollution, and pollution sources from the tailings material in the backfilled shaft.

5.3 Methodology

The focus of the project is to determine the differential impact of disposing of gold tailings from the Saaiplaas gold mining operations into the shafts. Fifteen samples were collected from the three tailings facilities i.e., Merrie Spruit 32, Saaiplaas 6 and Harmony Dam 23 (see **Figure 5.1** for the localities of these facilities). These were composited into three samples for analysis, one sample representing material from each of the tailings facilities. The following were analyses for on the samples at the accredited laboratory Watertab (Pty) Ltd.:

- Mineralogical composition.
- Total chemical composition using a total acid digest and analysis.
- Leach test using distilled water.

The laboratory certificates are attached as **Appendix B**.

Surface water, groundwater and tailings return water dam monitoring data were made available for the study. Underground mine water quality could not be sourced from Saaiplaas mine itself, however, mine water data from another mine in the region was used.

Geochemical modelling is a powerful tool in assessing the geochemical reactions associated with water-rock related problems and concerns like the interaction with tailings material and mine void water, taking time into account. The internationally validated USGS geochemical modelling software package, PHREEQC, was used to develop the numeric geochemical models for this project.

The SANS 241:2016 water quality guideline values were used as a standard to compare water quality and geochemical model results to aid in data assessment.



Figure 5.1: Localities of the sampled tailings facilities

5.4 Laboratory Tailings Material and Water Quality Data

5.4.1 Mineral Composition: Tailings Material

The tailings material (**Table 5.1**) consists predominantly of quartz [SiO₂], pyrophyllite [Al₂Si₄O₁₀(OH)₂], and muscovite [KAl₃(Si₃Al)O₁₀(OH)₂]. Jarosite [KFe₃(SO₄)₂(OH)] and gypsum [CaSO₄•2H₂O] occur in the tailings material as secondary minerals i.e., minerals formed through the breakdown of primary minerals deposited on the tailings facility directly from the processing plant. The mineralogical analysis indicated the absence of pyrite [FeS₂], however, this is because the samples were collected from the tailings zone in which oxidation has already occurred. Historical data of fresh Saaiplaas tailings material indicated a pyrite content of 2.58 wt%, which was used to develop the model in this study to take account of the disposal of unoxidized tailings material into the shafts.

Table 5.1: Mineralogical composition of the Saaiplaas tailings material

Mineral	Ideal formula	Amount wt%
Quartz	SiO ₂	90
Pyrophyllite	Al ₂ Si ₄ O ₁₀ (OH) ₂	4
Muscovite	KAl ₃ (Si ₃ Al)O ₁₀ (OH) ₂	3
Jarosite	KFe ₃ (SO ₄) ₂ (OH)	1
Gypsum	CaSO ₄ •2H ₂ O	2
Pyrite	FeS ₂	(2.58)

5.4.2 Chemical Composition: Tailings Material

The major element composition of the tailings material reflects its mineral composition (**Table 5.2**). The most important trace elements in terms of environmental risk are aluminium, arsenic, chromium, iron, manganese, nickel, uranium, and cyanide.

Table 5.2: Chemical composition of the Saaiplaas tailings material

Parameter	Abbreviation	Merrie Spruit 32 TSF	Saaiplaas 6 TSF	Hannony Dam32 TSF
		mg/kg		
Aluminium	Al	17200	22800	15600
Antimony	Sb	2.38	1.29	1.09
Arsenic	As	263	64	103
Cadmium	Cd	0.2	0.2	0.2
Calcium	Ca	3 200	4800	1 600
Chromium (Hexavalent)	Cr(VI)	1	1	1
Chromium (Total)	Cr(total)	165	209	201
Cobalt	Co	9.7	10.2	5.2
Copper	Cu	10.4	19.5	17.5
Iron	Fe	16800	9200	14000
Magnesium	Mg	400	800	400
Manganese	Mn	37.3	83.9	45.4
Mercury	Hg	0.2	0.2	0.2
Molybdenum	Mo	8	7	8
Nickel	Ni	16	26	39
Potassium	K	5 752	7249	5 598
Selenium	Se	0.2	0.2	0.2
Sodium	Na	800	1 200	800
Uranium	U	14	25	24
Vanadium	V	22	33	25
Zinc	Zn	4.1	23.9	7.2
Fluoride	Fe	0.25	5.67	0.25
Cyanide (Total)	CN(Total)	2.61	0.78	0.78

Note: Values in orange are half the detection limit. For example the detection limit for Cadmium is 0.4 mg/k.g. The exact value for Camium is therefore unknown, but to allow for statistical analysis and modelling the Cadmium value is taken as 0.2 mg/kg. This practise is in accordance with International Best Practise Guidelines.

5.4.3 Distilled water leach results

The distilled water leach results (**Table 5.3**) indicate that the concentrations of arsenic, manganese, nickel, and uranium exceed the SANS 241:2015 water quality guideline values for material from all three tailings facilities. The concentrations of total chromium and iron in the leachate exceed the SANS 241:2015 guideline values in the Merrie Spruit tailings material.

5.4.4 Water quality: Deep mine void water

The deep mine void water has a moderately acidic pH of 5.8 and contains, relative to the SANS 241:2015 guideline values, elevated concentrations of dissolved solids, iron, manganese, sodium, sulphate, uranium, nickel, aluminium, calcium, magnesium, and arsenic (**Table 5.4**).

Table 5.3: Distilled water leach results including the SANS 241:2015 drinking water quality guideline values for comparison

Parameter	Abbreviation	Units	SANS 241 (2015) Guideline Values	Merriespruit 32 TSF	Saaipiaas 6 TSF	Harmony Oam 23 TSF
Total Alkalinity	TAik	mgCaCO ₃ /L		2.5	2.5	2.5
Chloride	Cl	mg/l.	300	1	18	7
Nitrate	N03-N	mg/l.	11	0.2	0.2	0.2
Total Nitrogen	N03-N	mg/l.		1.1	0.8	22
Sulphate	SO ₄	mg/l.	500	285	444	201
Phosphate	PO ₄	mg/l.		0.05	0.05	0.05
Cyanide (Total)	CN	mg/l.	0.2	0.035	0.035	0.035
Fluoride	F	mg/l.	1.5	0.1	0.1	0.1
Aluminium	Al	mg/l.		14	4.128	7.162
Antimony	Sb	mg/l.	0.02	0.001	0.001	0.001
Arsenic	As	mg/l.	0.01	0.034	0.019	0.006
Cadmium	Cd	mg/l.	0.003	0.001	0.002	0.001
Calcium	Ca	mg/l.		119	203	79
Chromium (Hexavalent)	Cr(VI)	mg/l.	0.05	0.005	0.005	0.005
Chromium(Total)	Cr(Total)	mg/l.	0.05	0.054	0.004	0.026
Cobalt	Co	mg/l.	0.5	0.169	0.223	0.143
Copper	Cu	mg/l.	2	0.119	0.093	0.133
Iron	Fe	mg/l.	2	6.468	0.327	0.636

Parameter	Abbreviation	Units	SANS 241 (2015) Guideline Values	Merriespruit 32 TSF	Saaiplaas 6 TSF	Harmony Dam 23 TSF
Magnesium	Mg	mg/l.		8	9	5
Manganese	Mn	mg/l.	0.4	0.421	1.493	0.573
Mercury	Hg	µg/L	0.006	0.001	0.001	0.001
Molybdenum	Mo	mg/l.	0.07	0.001	0.001	0.001
Nickel	Ni	mg/l.	0.07	0.267	0.456	0.254
Potassium	K	mg/l.		0.25	0.25	0.25
Selenium	Se	mg/l.	0.04	0.001	0.006	0.001
Sodium	Na	mg/l.	0.2	0.5	13	3
Uranium	U	mg/l.	0.03	0.431	0.86	0.369
Vanadium	V	mg/l.	0.2	0.001	0.001	0.001
Zinc	Zn	mg/l.	5	0.1	0.651	0.19

*Note: Values in orange are half the detection limit.
Values in red exceed the SANS limits.*

Table 5.4: Water quality of the deep mine void water

Parameter	unit	SANS	Risk	Mine Water
pH	<i>n.a.</i>	5.0-9.7	operational	5.8
EC	mS/m	170	aesthetic	478
TDS	mg/l	1 200	aesthetic	5 578
TAik	<i>mgCaCO₃/l.</i>	<i>n.g.v.</i>	n.a.	224
Al	mg/l	0.3	operational	0.457
As	mg/l	0.01	chronichealth	0.065
B	mg/l	<i>n.g.v.</i>	n.a.	0.161
Ba	mg/l	0.7	Chronichealth	<0.010
Ca	mg/l	150	aesthetic/operational	490
Cd	mg/l	0.003	chronichealth	<0.010
Co	mg/l	0.5	chronichealth	0.067
Cl	mg/l	300	aesthetic	76.00
Cr	mg/l	0.05	chronichealth	<0.010
Fe	mg/l	2	chronichealth	875
Hg	mg/l	0.006	chronichealth	<0.010
K	mg/l	50	operational/health	10.7
Mg	mg/l	70	aesthetic/health	162
Mn	mg/l	0.4	chromic health	12
Na	mg/l	200	aesthetic	280
NH ₃ -N	mg/l	1.5	aesthetic	0.70
Ni	mg/l	0.07	chronichealth	0.081
NO ₃ -N	mg/l	12	acutehealthchemical	< 0.1
Pb	mg/l	0.01	chronichealth	<0.010
PO ₄ -P	mg/l	<i>n.g.v.</i>	n.a.	0.04
SO ₄	mg/l	500	acutehealthchemical	2897
U	mg/l	0.03	acutehealth chemical	0.035
V	mg/l	0.2	chronichealth	<0.010
Zn	mg/l	5	aesthetic	0.012

Note : Values in red exceed the SANS limits.

The SANS 241:2015 drinking water standards are shown for comparison purposes only.

5.4.5 Mass Balance Calculations

The leach test, total analysis and mineralogical data was used to determine the leachability of compounds of concern from the tailings material (**Table 5.5**). The data indicates that aluminium, arsenic, chromium, cyanide and iron are almost exclusively associated with the non-leachable fraction in the tailings material. The elements manganese, nickel, sulphur and uranium are partly associated with the leachable fraction.

The leachable fraction e.g., sulphur and uranium, are associated with gypsum, which is partially soluble. A portion of these elements are also likely loosely sorbed to clay minerals and hydrous oxides of iron and manganese.

Table 5.5: Leachability of potential contaminants in the tailings material

Parameter	Abbreviation	Tailings facility	Total	Leachable		Comment
			maJka	maJka	%	
Aluminium	Al	Merrie Sprutt	17200	280	1.6	Most aluminium is in the non-leachable fraction which is pyrophyllite and muscovite
		Saaiplaas	22800	83	0.4	
		Harmony Dam	15600	143	0.9	
Arsenic	As	Merrie Spruit	263	0.7	0.3	Almost all arsenic in the non-extractable fraction, likely iron sulphides and/or iron oxides not detected by the XRD method
		Saaiplaas	64	0.38	0.6	
		Harmony Dam	103	0.12	0.1	
Chromium	Cr	Merrie Sprutt	165	1.08	0.7	Almost all chromium in non-extractable fraction, likely muscovite and/or jarosite
		Saaiplaas	209	0.08	0.0	
		Harmony Dam	201	0.52	0.3	
Cyanide	CN	Merrie Sprutt	2.61	0	0	Only Merrie Spruit contains cyanide which only occurs in the non-extractable fraction most likely insoluble ferri-cyanide minerals e.g., Prussian Blue or Turnbull's Blue.
		Saaiplaas	0	0	0	
		Harmony Dam	0	0	0	
Iron	Fe	Merrie Spruit	16800	129	0.8	Almost all iron in non-exchangeable fraction i.e. jarosite and/or also likely iron sulphides and iron oxides not detected by the XRD method
		Saaiplaas	9 200	6.54	0.1	
		Harmony Dam	14000	12.72	0.1	
Manganese	Mn	Merrie Spruit	400	8.42	2.1	Most manganese in non-extractable fraction likely manganese oxide minerals. The soluble fraction is likely associated with gypsum and/or loosely sorbed to clay minerals
		Saaiplaas	83.9	29.86	35.6	
		Harmony Dam	45.4	11.46	25.2	
Nickel	Ni	Merrie Sprutt	16	5.34	33.4	Most Ni is associated with the non-extractable fraction, likely metal sulphides and/or jarosite. The soluble fraction is likely associated with gypsum and/or loosely sorbed to clay mineral and hydrous oxides of iron and manganese
		Saaiplaas	26	9.12	35.1	
		Harmony Dam	39	5.08	13.0	

5.5 Conceptual Geochemical Framework

The conceptual framework forms the basis of the geochemical modelling and is therefore discussed in this section for the Saaiplaas gold mine tailings material (**Figure 5.2**).

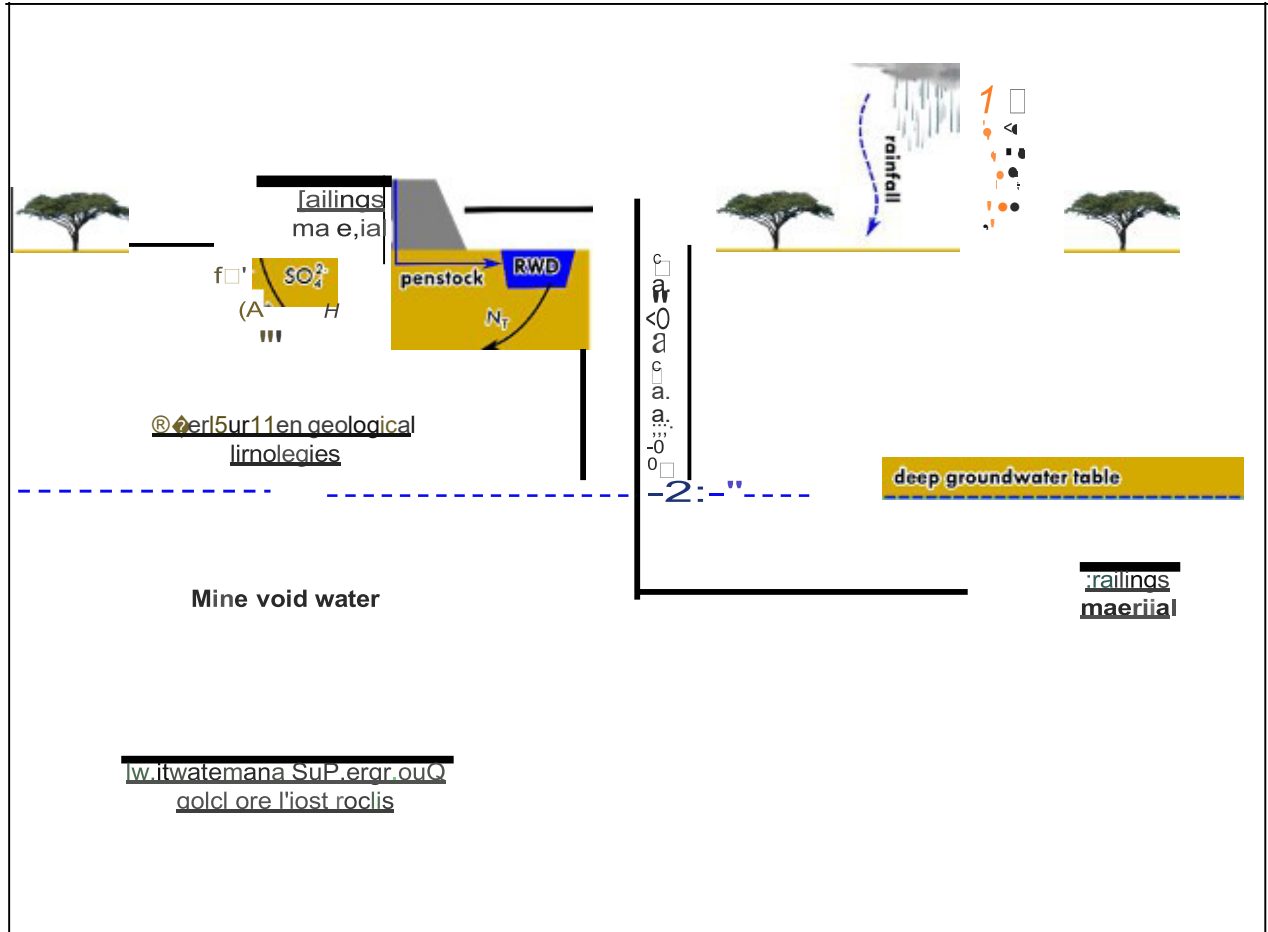
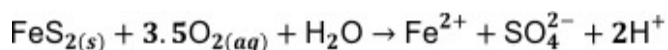


Figure 5.2: Conceptual model showing an operational phase in which tailings is being disposed in the underground mine voids

5.5.1 Operational Tailings Facility

Although the aim of the project was to assess the viability of disposal of gold mine tailings in the underground mine voids, it is important to understand the geochemical processes changing the tailings material over time, as these changes have implications for the mobility of potential pollutants in the underground mine voids. Therefore, the conceptual framework for the operational tailings is outlined in this section.

The Saaiplaas gold mining tailings material contains the iron sulphide mineral pyrite [FeS₂], which is thermodynamically unstable in the presence of oxygen in the Earth's atmosphere. As soon as pyrite is exposed to the Earth's atmosphere, it starts to oxidise and break down. When pyrite is oxidised by oxygen in the presence of water, ferrous iron, sulphate, and acidity, in the form of *W*, is produced.



Equation 1

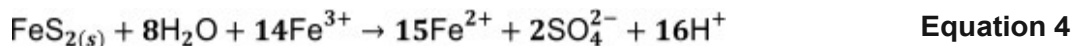
Natural minerals are not pure, and pyrite can contain trace metal(loid)s e.g., arsenic and nickel, which have the potential to leach from the tailings. Ferrous iron is released to the tailings pore water and can further be oxidised to ferric iron.



At pH greater than about 3, ferric iron will hydrolyse and precipitate in a range of secondary (oxy)hydroxide phases.



The hydrolysis of ferric iron and the subsequent formation of hydrous iron oxide minerals adds additional acidity to the tailings pore water. At pH values less than 3, ferric iron is soluble and the ferric iron ions remain in the pore water rather than precipitating as secondary minerals. Under these conditions ferric iron can act as an oxidant for pyrite and produce eight times more acidity per mass unit of pyrite, than when only oxidized by oxygen.



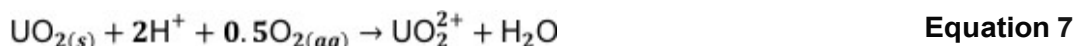
The pyrite oxidation process can also be facilitated by a variety of microbes, such as Acidithiobacillus Ferrooxidans, which use the oxidation of ferrous to ferric iron as an energy source.

In addition to metal sulphides, the tailings material also contains silicate minerals, the gangue to the gold ore, such as the mineral muscovite $[\text{KAl}_2(\text{SbAl})\text{O}_6(\text{OH})_2]$. These minerals, and release ions e.g., potassium (K^+), to the tailings pore water. These ions can combine with other dissolved ions generated by the breakdown of sulphides and other minerals to form secondary minerals e.g., jarosite $[\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6]$ and gypsum $[\text{CaSO}_4 \cdot 2\text{H}_2\text{O}]$.



The geochemical processes described above, the hydrological regime of the tailings facility, and the limitations regarding the depth oxygen can diffuse in the facility, cause the tailings facility to be stratified into two main geochemical zones. These zones from the tailings surface to the base are the oxidation zone, where active oxidation of sulphide minerals occur and the transition zone where unoxidized sulphide mineral occur, which have not yet been exposed to oxygen in the Earth's atmosphere. The boundary between these two zones is the oxidation front.

The Saaiplaas tailings contains uranium from the primary mineral uraninite $[\text{UO}_2]$, which occurs in the Witwatersrand gold-containing lithologies. Uraninite, like pyrite, is unstable in the presence of oxygen in the Earth's atmosphere and breaks down upon exposure.



The resulting soluble uranium can then migrate through the pore water and beyond, but it can also precipitate as secondary minerals.

The formation of secondary iron and manganese oxide and hydroxide minerals e.g., goethite $[\text{FeOOH}]$ and pyrolusite $[\text{MnO}_2]$ are critical to the tailings-mine void water geochemical system. These minerals have the capacity to sorb and/or co-precipitate dissolved metal(loid)s thereby removing them from the water and immobilizing them in solid mineral phases. These processes are dependent on the pH and redox conditions i.e., whether the system is in contact with free oxygen or not, of the geochemical system.

5.5.2 Underground Mine Voids

The underground mine void geochemical environment is different from the earth surface, which is in contact with an oxygen rich atmosphere. The deep mine voids are far less oxygen rich and even this phase changes when mining operations cease, and the deep voids are allowed to flood with water. These phases are shown schematically in **Figure 5.3** and **Figure 5.4**. The figures compare the earth surface geochemical environment with the geochemical environment of the deep mine voids, using iron, manganese, and sulphur ions to illustrate the effects of the differences on the mobility of ions.

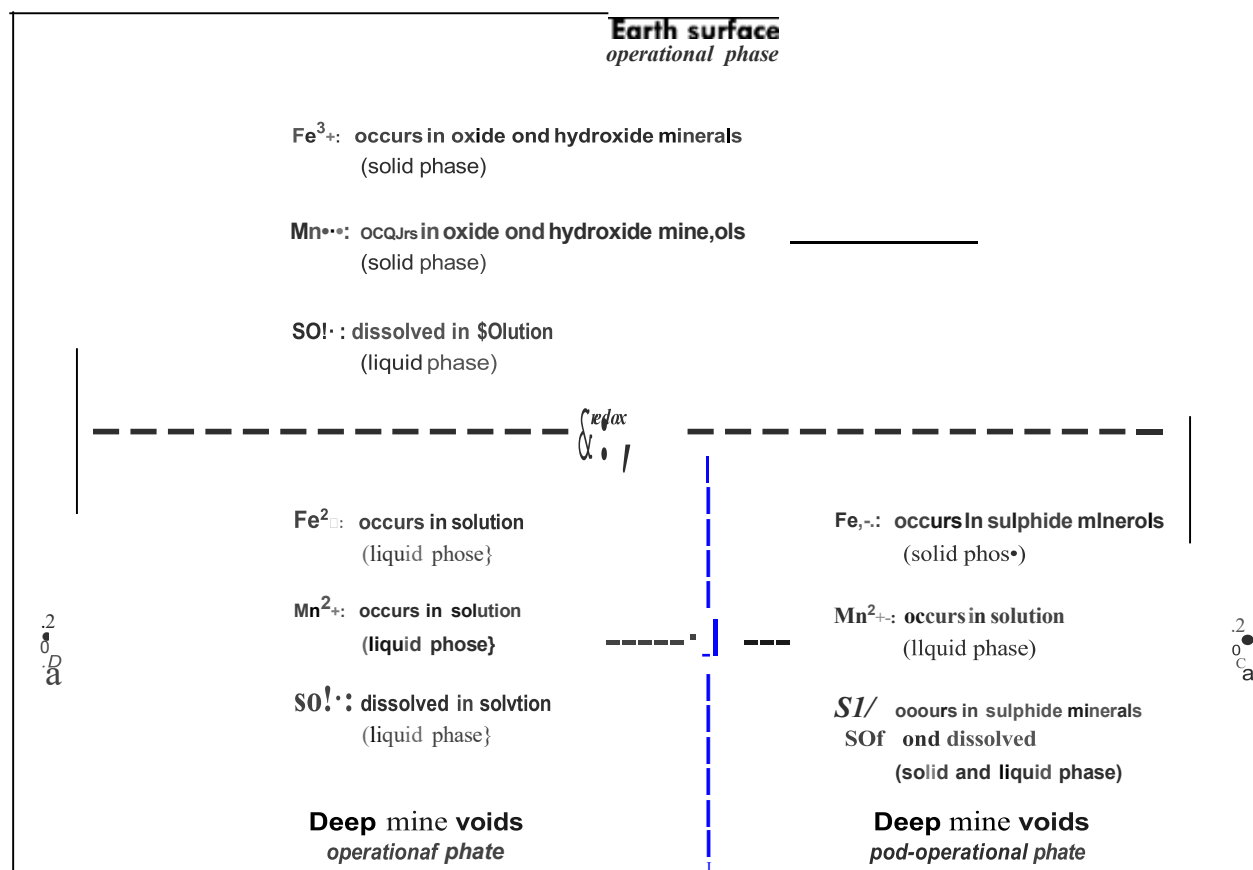


Figure 5.3: Schematic of a conceptual model comparing the earth surface geochemical system with that of the underground mine voids in an operational and post-operational phase. Operational and post-operational refer to disposal of the tailings into the mine voids and after it has been disposed of respectively.

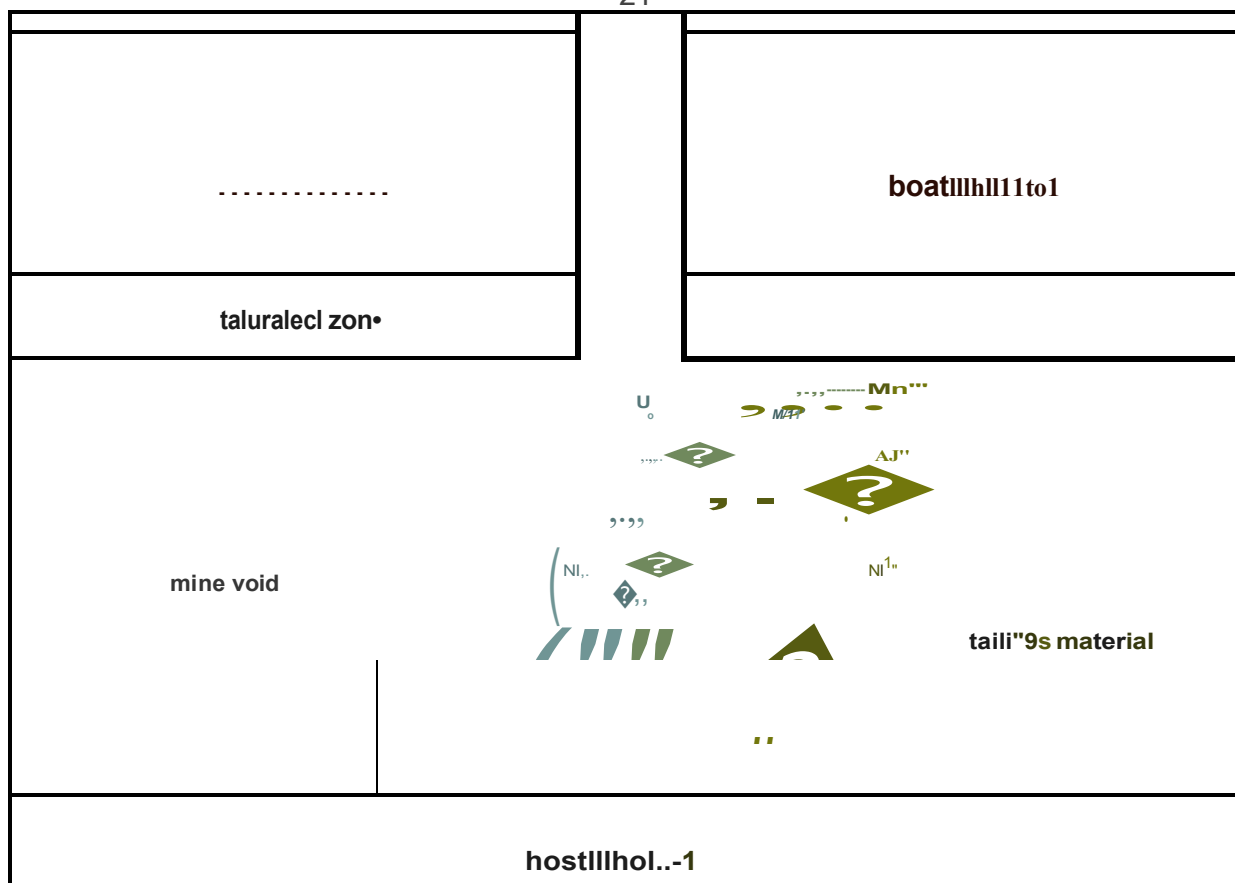


Figure 5.4: Conceptual model of the underground mine voids tailings disposal geochemical system

When in contact with oxygen in the Earth's atmosphere, iron, manganese, and sulphur are in their most oxidised state, meaning iron occurs as ferric iron (Fe^{3+}), manganese occurs as Mn^{2+} and sulphur occurs as S^{6+} state. The significance of this is that ferric iron and Mn^{2+} occurs in oxide and hydroxide minerals i.e., in the solid phase, while sulphur occurs mostly dissolved in water as sulphate.

The mine voids in the mine operational phase have less oxygen compared to the Earth's surface environment. However, during the operational phase, the deep mine voids are mostly dewatered to be able to gain access to the rock face. The mine dewatering exposes unoxidized sulphide minerals, which are in contact with oxygen pumped into the void either through ingress of treated mine water or from ventilation to the various shafts. This causes the deep mine voids to be suboxic meaning that there is enough oxygen for sulphur to remain as S^{6+} and thus as the dissolved sulphate ion. but there is not enough oxygen to keep iron and manganese in their most oxidised states. Manganese reduces to Mn^{2+} and iron reduces to Fe^{2+} . Both cations are more soluble than their more oxidised counterparts and thus tend to remain dissolved in the deep mine void water, rather than precipitate as minerals in the solid phase.

Upon cessation of mining operations, the deep mine voids gradually start to flood as mine dewatering has also ceased. The flooding effectively isolates the unmined ore and wall-rock from oxygen and the geochemical system moves from suboxic to anoxic. Under these conditions, oxygen is purged from the system through geochemical reactions. Some sulphur is reduced from its S^{6+} state to S^{2-} and can then react with iron in its $2+$ state to form pyrite and other iron sulphide mineral, thereby reducing the concentration of iron and sulphur in the deep mine void water. The reduced sulphur also reacts with metalloids e.g., arsenic and nickel. to form metal(loid) sulphide minerals.

Manganese is reduced from Mn^{++} to Mn^{2+} and tends to partition between being dissolved and forming manganese minerals. However, the formation of manganese, and other, minerals will depend on the solubility of these minerals, which are dependent on the concentration of the ions making up these minerals in the deep mine void water.

5.6 Geochemical Modelling and Environmental Risk

A geochemical model was developed with the purpose of tracking changes in the tailings geochemical system from its operational phase in contact with the Earth's atmosphere till where it is disposed of in the deep mine voids and remains in the voids over the long term (more than 100 years).

The model was developed by coupling four individual models into one to assess the geochemical processes and environmental risk due to the disposal of the tailings material into the underground mine voids. The process is schematically shown in **Figure 5.5**.

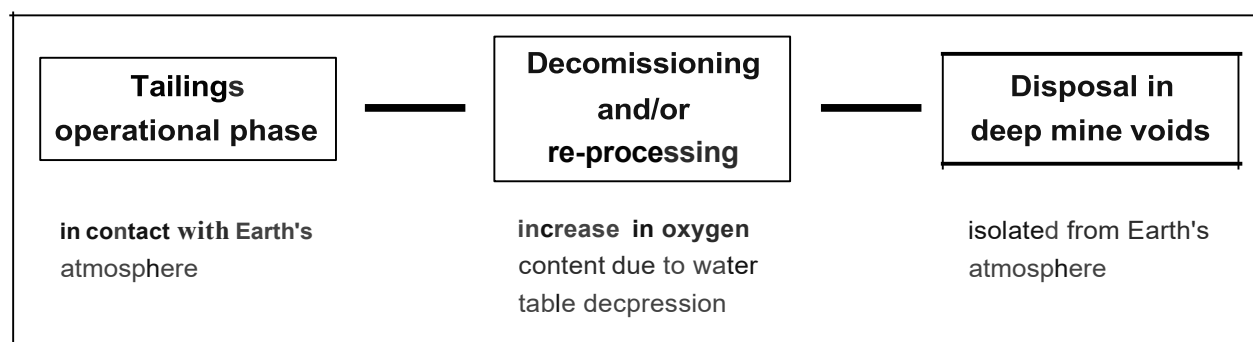


Figure 5.5: **Flow diagram showing the coupling of individual numeric models into a combined model for the tailings deep mine void disposal**

The model parameterisation and uncertainties are discussed in **Appendix A**.

5.6.1 Model Results

The final mine void geochemical model results are shown in **Table 5.6**. The model indicates that the mine void water is likely to be slightly acidic with a pH of 5.6. The sulphate concentrations are elevated at 3 122 mg/L. The model mine void water is anoxic, implying that the sulphide minerals in the tailings material are not likely to oxidise and that the sulphate in the mine void water is most likely due to dissolution of sulphate containing minerals and release of sulphate in the tailings pore water to the mine void water system. Over time the model indicates that the sulphate concentration remains constant (**Figure 5.6**). The constant sulphate concentration over the long-term indicates that no additional sulphate is being introduced to the mine void water through the oxidation of sulphide minerals.

The model concentrations of arsenic, nickel and uranium are shown to be low. This is due to the precipitation of these elements in metal sulphides, which are stable at under the anoxic mine void water conditions. The presence of these sulphides indicates that a small amount of sulphur is reduced to sulphide and immobilised as secondary minerals, but not enough is reduced to significantly reduce the dissolved sulphate in the mine void water. This process could likely be facilitated by introducing sulphur reducing microbes into the mine voids, however, this concept will need to be proven prior to initiation.

The concentrations of iron and manganese in the mine void water is likely to remain elevated. This is due to the subtoxic to anoxic conditions in the mine voids, which favour the soluble species of iron and manganese.

Table 5.6: Final water quality results for the underground mine voids and seepage from the tailings as predicted by the geochemical model

Parameter	Abbreviation	Unit	Mine Water	Seepage Water Quality IDecantl
pH	pH		5.6	6.2
Total dissolved solids	TDS	mg/l.	4 694	4142
Aluminium	Al	mg/l.	<0.001	<0.001
Arsenic	As	mg/l.	<0.001	<0.001
Bicarbonate	HCO ₃	mg/l.	242	811
Calcium	Ca	mg/l.	<0.001	1 306
Iron	Fe	mg/l.	854	<0.001
Magnesium	Mg	mg/l.	163	163
Manganese	Mn	mg/l.	12	<0.001
Nickel	Ni	mg/l.	0.018	<0.001
Potassium	K	mg/l.	21	21
Sodium	Na	mg/l.	280	280
Sulphate	SO ₄	mg/l.	3122	1561
Uranium	U	mg/l.	<0.001	<0.001

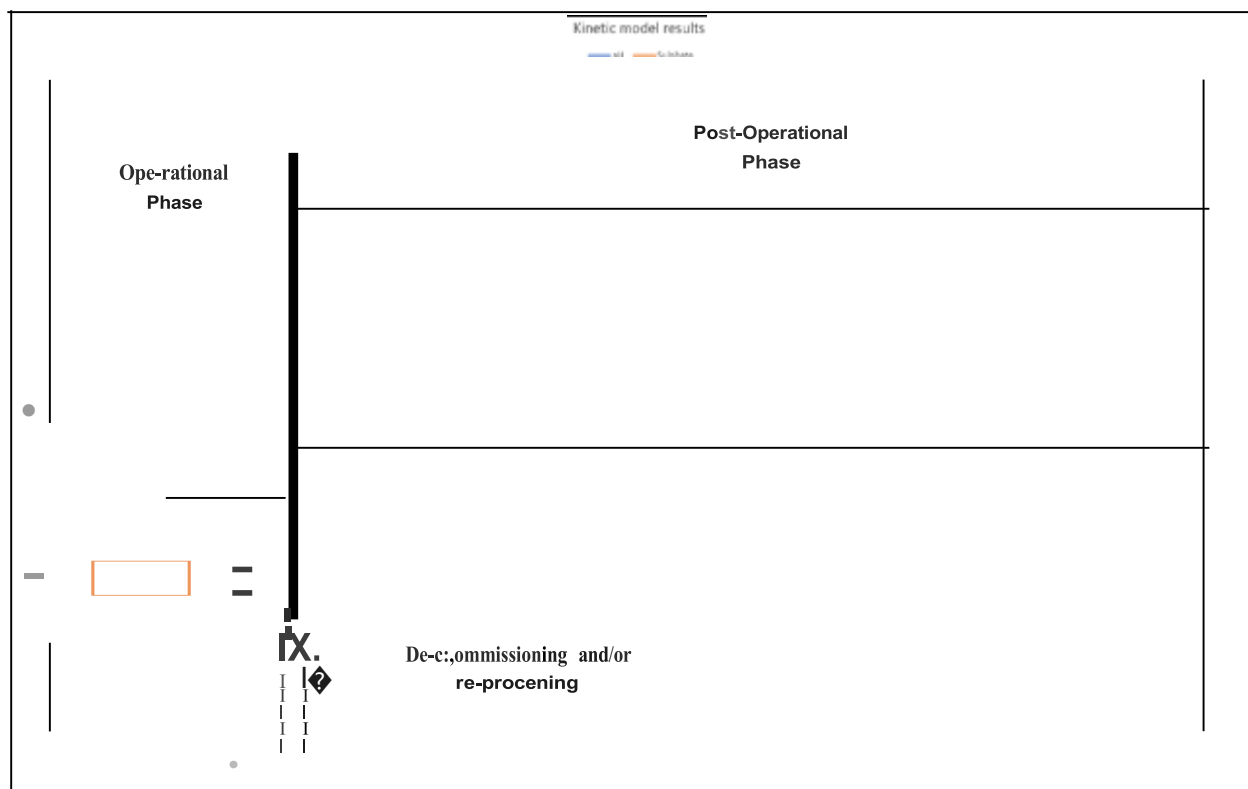


Figure 5.6: Timeseries results of the geochemical model for the tailings operational phase, decommissioning and/or re-processing phase and the post-operational phase in which the tailings are disposed of in the underground mine voids

However, as soon as deep mine void water with elevated concentrations of iron and manganese reaches the Earth's surface and is brought into contact with oxygen, they will rapidly precipitate in iron and manganese oxide and hydroxide mineral phases e.g., goethite and pyrolusite, thereby immobilising them and removing them from the water column (Table 5.6, Figure 5.7). Hydrous oxides of iron and manganese typically have large surface areas and can remove metals and metalloids from the water column, thereby further reducing the risk of contamination by these compounds in a decanting scenario.

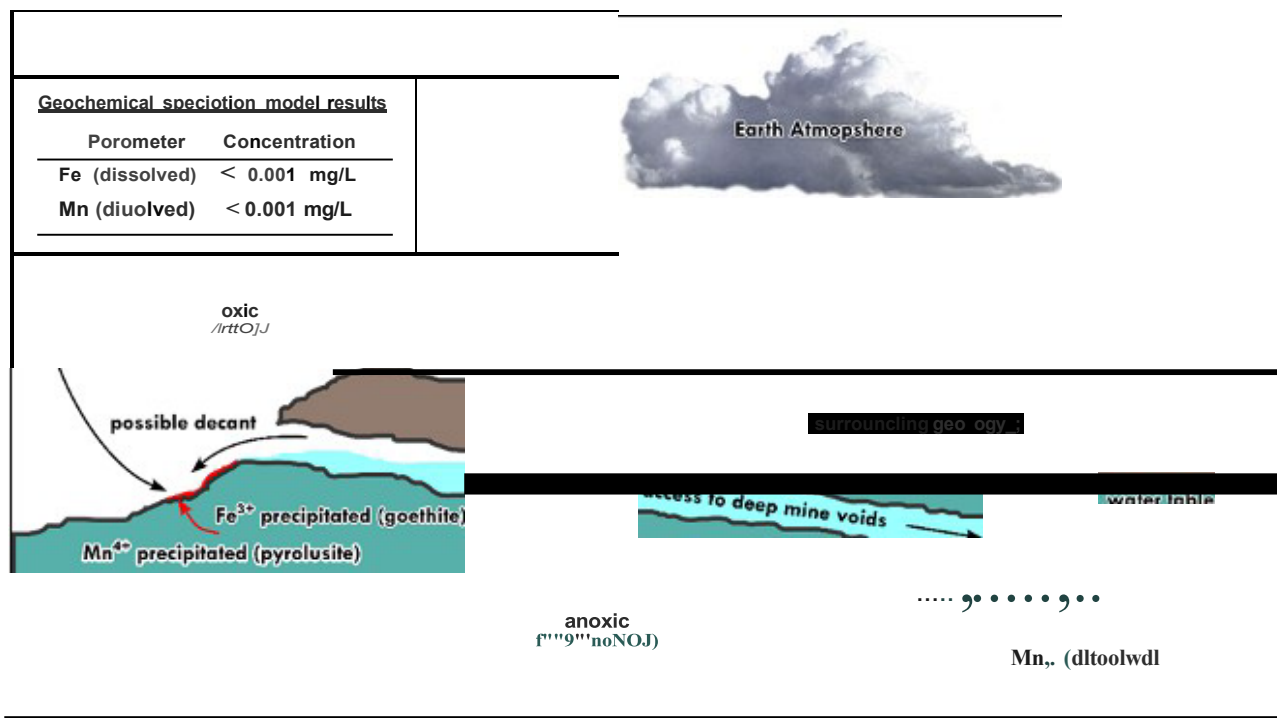


Figure 5.7: Conceptual model showing the change in redox state and thus mobility of iron (Fe) and manganese (Mn) in the mine void water and at the Earth's surface

5.6.2 Acid Mine Drainage

The numeric geochemical model results (Table 5.6) indicate that the pH of the mine void water into which the tailings has been disposed is unlikely to drop below 5.6 over the long term (100 years), implying that the development of AMO is unlikely.

Several studies have indicated that mine water will not decant to surface, but theoretically if the mine void water decants onto the surface, the pH is not likely to drop below 6.2 due to the presence of carbonate minerals in the matrix of the surface geology. Therefore, decanting is also not likely to produce AMO.

6. **CONCLUSIONS AND RECOMMENDATIONS**

MVB Consulting was appointed to conduct a geohydrological study to assess the potential groundwater impacts if the Saaiplaas Shafts are filled with gold tailings. This study was conducted in consultation with Dr. Robert Hansen from Geochemical Dynamic Systems (GeoDyn), who undertook the geochemical assessment.

Although the Saaiplaas Mine was selected for this study it is expected that the tailings material from any of the Free State mines will be similar and the findings of this report can be implemented at the other mines in the region.

The primary objective of this study was to understand the following:

- Description of the geohydrological environment.
- Assessment of the likelihood of the development of AMO (Acid Mine Drainage) conditions from the tailings material in the backfilled shaft.
- Assessment of potential long-term i.e., 100 years, pollution from the tailings material in the backfilled shaft.

The Free State mining operations are characterised by two aquifers:

- ***A Shallow Weathered and Fractured Karoo Aquifer (Karoo Formations):*** A shallow, weathered aquifer exists in the weathered shale and sandstone at an average depth of 10m - 20m below ground level. The most consistent water strike is located at the fresh bedrock / weathering interface.
 - The primary porosity of the Vryheid Formation is very low. Any water bearing capacity is therefore associated with secondary joints, bedding planes and faults. The contact zones of dolerite intrusions are considered the primary source of groundwater flow within the deeper formations.
 - The two aquifers may or may not be hydraulically connected, dependent on the local geology.
- ***A Deep Witwatersrand / Ventersdorp Aquifer:*** The deep brine Witwatersrand aquifer is situated approximately 300m below surface. This aquifer is thought to be connate (i.e. original formation water) or extremely old (fossil) water and is usually concentrated on geological structures such as fault zones or igneous intrusions (e.g. dykes).

In terms of the regional geohydrology the following points are important:

- There is no connectivity between the Karoo aquifer and the Witwatersrand aquifer.
- Water inflow into the mine workings is derived from the Witwatersrand aquifer and not the Karoo aquifer.
- Once the mine workings re-water the water level will stabilise at the current piezometric level. This level is currently unknown, but it can be measured by converting the water pressure, as measured in underground water intersections, to a water level (1 Bar= 10 metres).
- In any event this water level is not expected to exceed 775 mamsl, which is at least 400 - 500m below the Karoo aquifer.
- Decant of poor quality mine water into the Karoo aquifer or onto surface through the shafts is not expected to occur.

There are two possible scenarios when backfilling the shaft with tailings:

- **Scenario A:** The shaft liner is intact and there is no interaction between the material in the shaft and the surrounding aquifer. Groundwater will flow around the backfilled shaft.
- **Scenario B:** The shaft liner has been compromised and groundwater can flow into and through the tailings material in the shaft.

In Scenario A there is no possible contaminant impact, but for Scenario B there is a slight chance for impact to the groundwater regime.

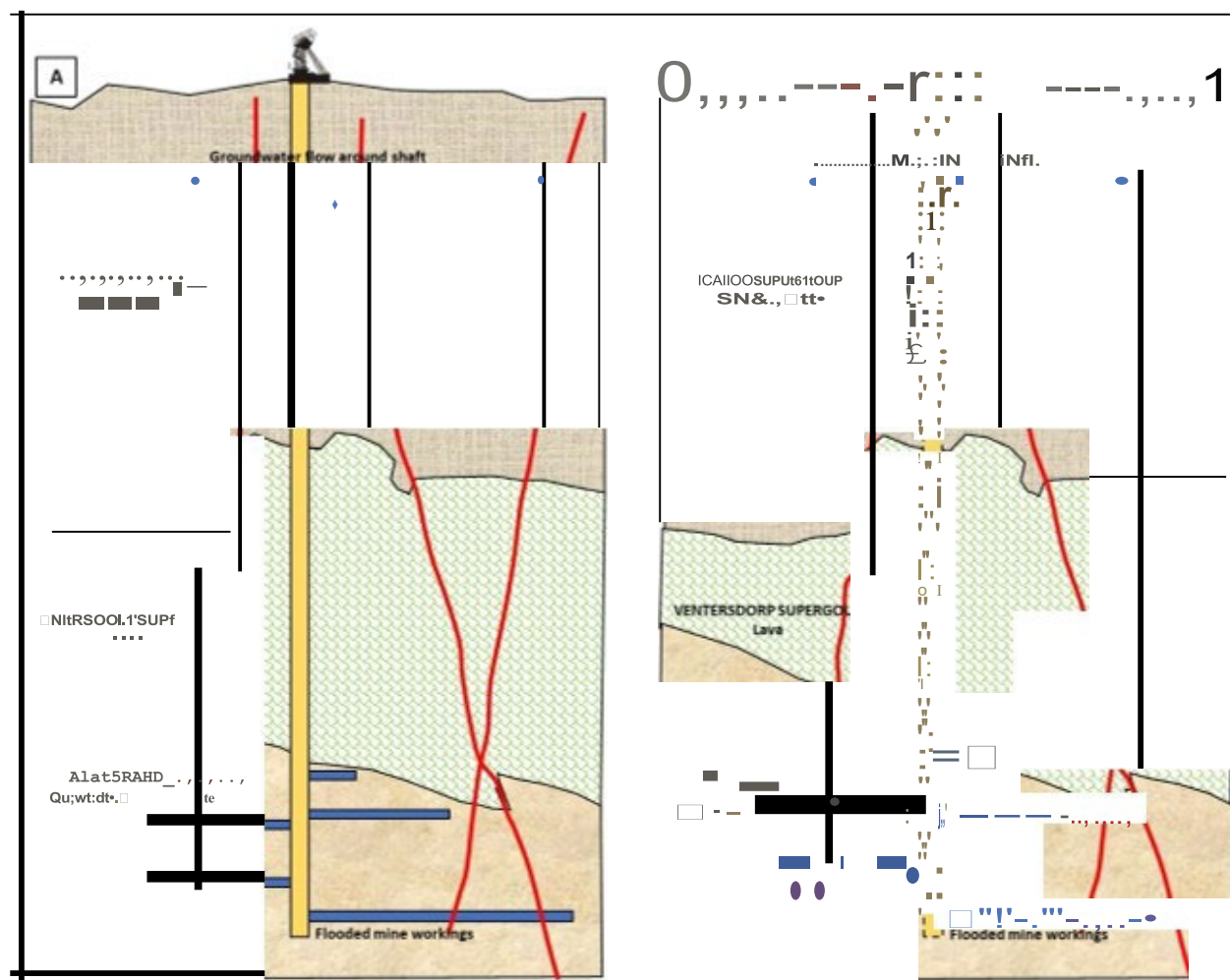


Figure 6.1: Bacfilling scenarios

The geochemical assessment concluded the following:

- **Acid mine drainage.** The risk of development of AMD (acid mine drainage) conditions from the tailings material in the deep mine voids is negligible. This is due to the low concentration of free oxygen in the deep mine void geochemical system. The risk of development of AMD in a scenario in which the mine void water decants onto Earth's surface is also unlikely.
- **Contaminant leaching.** The concentration of sulphate is likely to remain elevated in the deep mine voids. Some of the sulphate is likely to be reduced to sulphide and combine with metal(loid)s to precipitate sulphide minerals, however, the geochemical model indicates that a limited amount of sulphur is reduced to sulphide. However, the amount of sulphide reduced will, in addition to the inorganic processes, be dependent on microbial processes. If sulphur reducing microbes are present in the mine voids, or if they can be introduced, they will facilitate the reduction of more sulphate than currently shown in the geochemical model. For more certainty regarding the sulphur reduction question, research into the presence or potential presence of sulphur reducing microbes in the deep mine voids should be considered. Enough sulphur is reduced to sulphide to remove the potential contaminants arsenic and nickel from the mine void water as solid sulphide mineral phases. However, due to the anoxic state of the deep mine void geochemical system iron and manganese are in their reduced forms, which favours solubilisation of these elements. The concentrations of iron and manganese is likely to remain elevated in the mine void water in the long term. However, in a scenario in which the mine void water would reach the Earth's surface and be exposed to the atmosphere, the iron and manganese will rapidly oxidise and be removed from the water column by the precipitation of hydrous iron and manganese oxide minerals. The risk of elevated uranium concentrations in the deep mine void water tailings geochemical system is negligible. This is due to the anoxic conditions of the mine void system, which favours uranium in the solid state i.e., in mineral phases.
- **Tailings deep mine void disposal.** The disposal of Saaiplaas tailings material in the deep underground mine voids is, from an environmental geochemical perspective, a viable and even desirable management option.

The study concluded that the potential risk to the groundwater environment is minimal for the following key reasons:

1. The condition of the shaft, assuming that the liner is intact, will prevent any interaction between the tailings and the adjacent aquifer.
2. The risk of mine water decant from the shafts post-mining is very small. The plugging of the shafts with tailings will further diminish this risk and will keep the poor quality mine water in the mine workings.
3. The risk of development of AMD conditions from the tailings material in the deep mine voids is negligible. This is due to the low concentration of free oxygen in the deep mine void geochemical system. The risk of development of AMD in a scenario in which the mine void water decants onto Earth's surface is also unlikely.
4. In the absence of oxygen and an acid solution the leaching of metals from the tailings will be negligible.
5. If the tailings are deposited below the groundwater level the risk of contaminant seepage will be further reduced. Based on the mine monitoring data the groundwater level in the Karoo aquifer is <10m below surface. It is recommended that tailings deposition only takes place below the groundwater level. Where the existing monitoring networks are lacking, additional boreholes may be required to monitor if any contaminant migration is taking place from the shafts during and after tailings deposition.

7. **REFERENCES**

Brantley, S.I., Kubicki, J.D., White, A.F., 2008, Kinetics of water-rock interaction. <https://doi.org/10.1007/978-0-387-73563-4>.

SANS 241-2. (2015). South African National Standard. Drinking Water - Part 2: Application of SANS 241-1.

Torrero, M.E., Baraj, E., De Pablo, J., Casas, J.G.I., 1996, Kinetics of corrosion and dissolution of uranium dioxide as a function of pH. International Journal of Chemical Kinetics, [https://doi.org/10.1002/\(SICI\)1097-4601\(1997\)29:4%3C261::AID-KIN4%3E3.0.CO;2-S](https://doi.org/10.1002/(SICI)1097-4601(1997)29:4%3C261::AID-KIN4%3E3.0.CO;2-S).

Williamson, M.A., Rimstidt, J.D., 1994, The kinetics and electrochemical rate-limiting step of aqueous pyrite oxidation. Geochimica et Cosmochimica Acta, [https://doi.org/10.1016/0016-7037\(94\)90241-0](https://doi.org/10.1016/0016-7037(94)90241-0).

HARMONY GOLD MINING COMPANY LIMITED

ASSESSMENT OF THE POTENTIAL GROUNDWATER IMPACTS ASSOCIATED WITH THE
BACKFILL OF SHAFTS WITH GOLD TAILINGS

FINAL REPORT

REPORT NO: MvB112/23/B002

APPENDIX A

GEOCHEMISTRY MODEL SETUP AND UNCERTAINTY

Model Setup

The geochemical model was developed by coupling four individual models into one overall model. The parameterisation of the models is discussed in the sections below.

Tailings Operational Phase

This model represents a scenario in which the tailings material is exposed to the Earth's atmosphere and allowed to oxidise. This represents the oxidation zone of the operational phase of the tailings. The gas phase represents the Earth's atmosphere and was parameterised to contain 21% oxygen 400 ppm carbon dioxide.

The purpose of the model was to determine the incremental impact of geochemical processes in the tailings facility. Therefore, the initial water solution was defined as deionised water with a pH of 7.

The solid phase of the model are the minerals that make up the tailings material. The minerals were divided into two groups. The first are minerals which react rapidly enough that over the model simulation period they do not have to be defined by kinetic rate equations. These minerals are termed equilibrium reactants. The second group react relatively slowly, thereby requiring a kinetic description of their breakdown into dissolved ions.

Minerals added to the model as equilibrium reactants are gypsum [$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$] and jarosite [$\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6$], both of which occur in the tailings material and were measured by the XRD analysis method.

Pyrite was added as a kinetic phase. The rate law of Williamson and Rimstidt (1994) was used to define the pyrite dissolution rate:

$$r = 10^{-8.19} \frac{[\text{O}_{2(\text{aq})}]^{0.5}}{[\text{H}^+]^{0.11}} \quad \text{Equation 8}$$

In equation 8, "r" is the reaction rate in mol/m²/s and square brackets indicate molar concentration.

A generic rate law is used to kinetically describe the silicate minerals.

$$r = k[\text{H}^+]^n \quad \text{Equation 9}$$

In equation 9 "k" is the kinetic rate constant and "n" is an empirically determined exponent which is a measure of the sensitivity of the breakdown of a specific mineral to changes in pH. The rate constants and exponents were sourced from literature (Brantley et al., 2008). The silicate minerals added as kinetic reactants are muscovite, quartz and, pyrophyllite, as determined by mineralogical analysis.

Witwatersrand tailings material generally contain the mineral uraninite, the main host mineral to uranium. The mineral generally occurs in concentrations too low to be detected by the XRD analysis method. Therefore, the whole-rock uranium concentration was used to calculate a maximum uraninite concentration and added to the model as a kinetic reactant. The rate law of Torrero et al. (1996) was used to describe the breakdown of uraninite.

$$r = 10^{-8.19} \frac{[\text{O}_{2(\text{aq})}]^{0.31}}{[\text{H}^+]^{0.37}} \quad \text{Equation 10}$$

The simulation time for the model was set to 25 years.

Tailings Decommissioning and/or Reprocessing Phase

Between the cessation of operations at the tailings and pumping the tailings material into the underground mine voids, there is a short intermediate period in which more tailings material is exposed to the Earth's atmosphere as the material is transferred not the underground mine voids. To simulate this period, the gas phase oxygen content was increased to 42% oxygen. This value is to account for the larger surface area exposed to the Earth's atmosphere. The solid phases are setup and parameterised as for the tailings operational phase model described above. The liquid phase output is used as input to the tailings decommissioning and/or reprocessing model. The simulation time is 2 years.

Deep Mine Void

The underground mine voids are isolated from the Earth's atmosphere. The only oxygen that enters the system is contained in water and tailings material as it is pumped to the voids. As soon as the tailings pumping ceases, no more oxygen can enter the mine void system. In addition, the diffusion of oxygen through liquid water is 10^4 to 10^6 times slower than in air, thus further limiting the access to oxygen in the mine void system. Therefore, the amount of gas phase in the deep mine void model was reduced and oxygen was not included in the gas phase. The output solution from the tailings decommissioning model was used as the input solution to the deep mine void water model. The mineral solid phases were defined as in the tailings operational phase model.

Mine Void Water Decanting

To model a scenario in which the deep mine void water reaches the surface and reacts with gasses in the Earth's atmosphere, the deep mine water model output solution was used as input to the decanting model. The gasphase represents the Earth's atmosphere and thus has the same composition as the gas in the tailings operational phase model.

The solid phases added to the model are those minerals shown to be supersaturated and likely to form. These are the hydrous oxide minerals, goethite [FeOOH] and pyrolusite [MnO₂]. Calcite [CaCO₃] was also added to the model. This represents the calcite cement in the rocks and soil of the surrounding geology. Hydrous oxide minerals of iron and manganese have the capacity to remove ions from the water into the solid phase, thus immobilising them. This was modelled by adding a diffuse double layer (DDL) adsorption surface to the model with a surface sorption site density of 3 mol/nm² and a concentration of 0.1 g/L. This value is 10 times lower than the amount predicted by the model to form and is hence represents a conservative scenario.

Calibration

Surface water monitoring from the tailings return water dams were used to calibrate the geochemical model. Specific parameters that were used were pH and the concentration of sulphate, iron, total nitrogen and uranium. These were the system-specific parameters that were included in the monitoring reports provided by Saaiplaas mine.

Uncertainties and Sensitivities

The geochemical model is sensitive to the reaction rate constants and reaction rate law parameters used. However, this uncertainty was approached from a conservative perspective in that values were used from literature, which result in maximum reaction rates. In addition, water quality monitoring data were used to further calibrate the reaction rates.

The main uncertainty is the limited parameters in the groundwater and surface water monitoring data. Focus was thus placed on the most important parameters. Sulphate and pH were used to calibrate the model for sulphide mineral reaction rates, as these two parameters are indicative of

the products forming during the oxidation process (Equation 2). Uranium concentrations were used to calibrate the uraninite dissolution process, as soluble uranium is a product of the overall process (Equation 7).

Other important parameters were arsenic, manganese, iron, and nickel. These parameters are not included in the monitoring database but are directly related to the rate of oxidation of metal sulphides.

The calibrated reaction rates were thus used to determine the influx rate of these constituents to the tailings and underground mine void geochemical systems.

The water:rock ratio in the tailings as well as in the underground mine voids is a major uncertainty.

However, the model is relatively insensitive to the ratio, partly because contaminants are allowed to build up over time, where, in the real system, they slowly migrate out of the system through water flow.

A ratio of 1:1 was used, which has been found to provide realistic model results in general.

Limitations

The geochemical models have been developed for the Saaiplaas tailings material specifically. The results of the model can thus not be directly applied to other mineral waste facilities on Saaiplaas or on other mine sites. The geochemical models were developed for specific scenarios i.e., tailings material exposed to the Earth's atmosphere and tailing being disposed of in the underground mine voids. The model results cannot be extrapolated to other scenarios without updating the existing geochemical models for the newly envisaged scenarios.

HARMONY GOLD MINING COMPANY LIMITED

ASSESSMENT OF THE POTENTIAL GROUNDWATER IMPACTS ASSOCIATED WITH THE
BACKFILL OF SHAFTS WITH GOLD TAILINGS

FINAL REPORT

REPORT NO: MvB112/23/B002

APPENDIX B

LABORATORY CERTIFICATES



WATERLAB (PTY) LTD

Reg. No.: 1983/009165/07

VA T.N0.:*130107\$91

23B De Hill/illand Crescent
Perseuor Techno Parlt,
Me-iring Naude Road, Pretoria
P.O. 8ox 283, 0020

Telephone: •2712 - 349- 1066
Fae-simile: •2712 - 349 - 2064
Email: accCulls@watertab.oo.z-a

CERTIFICATE OF ANALYSES

Index

Date received:	2022/11/30	Date completed:	2023/01/11
Project number:	1000	Report number:	115922
Order number:			
Client name:	MvB Consulting	Contact person:	Marius van Biljon
Address:	P.O. Box 2166, Rant en Dal, 1751	Email:	marius@mvbconsult.co.za
Telephone:		Email:	annike@mvbconsult.co.za
		Cell:	079 7419595

Leachable
pistilled Wate1
Total
Acid Digestion
Outsourced analysis
X-ray_ Diffraction

S. Laubscher
Assistant Geochemistry Project Manager



WATERLAB (PTY) LTD

Reg. No.: 983100916&07 V.A.T. No.: 4130107891

238 Oe Havtland Orescen1
Perseuor Tecmo Park.
Mciring Naud6 ROOd, PretOria
P.O. Box283, 0020

Teteph()ne: +2712 - 149 - 1066
Facsffile: +2712 - 349- 2064
Email: acoounts@waterlab.co.za

CERTIFICATE OF ANALYSES DISTILLED WATER EXTRACTION

Date received:	2022111/30	Date completed:	2023101111
Project number:	1000	Report number:	115922
Order number:			
Client name:	MvB Consulting	Contact person:	Marius van Blijon
Address:	P.O. Box 2166, Rant en Dal, 1751	Email:	marius@mvbconsult.co..za
Telephone:		Email:	annike@mvbconsult.co.za
		Cell:	0797419595

Analyou	Sample __, __. on					
	1. -Spruit		2.		3. HarmonyDm	
Sampl■Number	1198118		1198118		17NH	
TCLP I AcidRain / Distilled - / IlzO,	DI--		DIlllecl-		DI--	
DryM- Uod III)	lIO		lIO		lIO	
Valum■UND (mt)	1-		1-		1000	
Inorganic Anions	malt	mg/kg	malt	mg/kg	molt	mo/kg
Total Alkalinity as CaCO:l	<S	<100	<5	<100	<5	<100
Chloride as Cl	<2	<40	18	360	7	140
Sulphate asSO,	285	5700	444	8880	201	4020
Nitrate as N	<0,1	<2,0	<0,1	<2,0	<0,1	<2,0
Nitrite as N	<0.05	<1.0	<0.05	<1.0	<0.05	<1.0
Fluoride as F	<0.2	<4,0	<0.2	<4,0	<0.2	<4,0
Ortho Phosphate asP	<0.1	<2.0	<0.1	<2.0	<0.1	<2.0
Hexavalent Chromium as Cr6+	<0,010	<0.200	<0,010	<0.200	<0,010	<0.200
Total Kjeldahl Nitrogen	1.1	22	0.8	16	2.2	44
Total Nitrogen (calc)	1.1	22	0.8	16	2.2	44
Total Cyanide as CN (o)	<0.07	<1.40	<0.07	<1.40	<0.07	<1.40
ICP-OES Quant	See ICP OW tab					
ICP-MS Quant						

(o] • Outsourced

S. Laubscher
Assistant Geochemistry Project Manager

WATERLAB (PTY) LTD
CERTIFICATE OF ANALYSES
ICP-MS QUANTITATIVE ANALYSIS

Date received: 2022/11/30
Project number: 1000

Date Completed: 2023/01/11
Report number: 115922

Client name: MvB Consulting
Address: P.O. Box 2166, Rant en Dal, 1751
Telephone:

Contact person: Marius van Biljon
Email: marius@mvbconsult.co.za
Email: annike@mvbconsult.co.za
Cell: 079 741 9595

Extract	Sample ID	Mass	Volume	Mass	Factor
Distilled Water	50	1000	50	20	

Sample ID	Sample number	Al	Al	M	As	Se	Co
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.100	<2.00	<0.001	<0.020	<0.025	<0.500
1. Merrie Spruit	179688	14	280	0.034	0.680	<0.025	<0.500
2. Saaiplaas	179689	4.13	83	0.019	0.380	0.100	2.00
3. Harmony Dam	179690	7.16	143	0.006	0.120	<0.025	<0.500

Sample ID	Sample number	Ca	Ca	Cd	Cd	Co	Co
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<1	<20	<0.001	<0.020	<0.001	<0.020
1. Merrie Spruit	179688	119	2380	<0.001	<0.020	0.169	3.38
2. Saaiplaas	179689	203	4060	0.002	0.040	0.223	4.46
3. Harmony Dam	179690	79	1580	0.001	0.020	0.143	2.86

Sample ID	Sample number	Cr	Cr	Cu	Cu	Fe	Fe
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.025	<0.500
1. Merrie Spruit	179688	0.054	1.08	0.119	2.38	6.47	129
2. Saaiplaas	179689	0.004	0.080	0.093	1.86	0.327	6.54
3. Harmony Dam	179690	0.026	0.520	0.133	2.66	0.636	13

Sample ID	Sample number	Hg	Hg	K	K	Mg	Mg
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.5	<10.0	<1	<20
1. Merrie Spruit	179688	<0.001	<0.020	<0.5	<10.0	8	160
2. Saaiplaas	179689	<0.001	<0.020	<0.5	<10.0	9	180
3. Harmony Dam	179690	<0.001	<0.020	<0.5	<10.0	5	100

Sample ID	Sample number	Mn	Mn	Mo	Mo	Na	Na
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<0.500	<0.001	<0.020	<1	<20
1. Merrie Spruit	179688	0.421	8.42	<0.001	<0.020	<1	<20
2. Saaiplaas	179689	1.49	30	<0.001	<0.020	13	260
3. Harmony Dam	179690	0.573	11	<0.001	<0.020	3	60

Sample ID	Sample number	Ni	Ni	Sb	Sb	Se	Se
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
1. Merrie Spruit	179688	0.267	5.34	<0.001	<0.020	0.001	0.020
2. Saaiplaas	179689	0.456	9.12	<0.001	<0.020	0.006	0.120
3. Harmony Dam	179690	0.254	5.08	<0.001	<0.020	<0.001	<0.020

Sample ID	Sample number	U	U	V	V	Zn	Zn
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.001	<0.020	<0.001	<0.020	<0.001	<0.020
1. Merrie Spruit	179688	0.431	8.62	<0.001	<0.020	0.100	2.00
2. Saaiplaas	179689	0.860	17	<0.001	<0.020	0.651	13
3. Harmony Dam	179690	0.369	7.38	<0.001	<0.020	0.190	3.80

rJ=Element analysed on ICP-OES Instrument



WATERLAB (PTY) LTD

Run No: 1503/000165/17 V.o.f. No.: 01071W1

238DoHaWland Crosoon.
P81"\$81QUOr T«hnoParll..
Meiri"lg Naod8 Road, Pretoria

Telephone: +2712 - 349-1066
f8C61mkl: •2712-349-2064
Email: aiccounts@waterlab.oo.ui,

CERTIFICATE OF ANALYSES
TOTALS

Date received:	2022111/30	Date completed:	2023/01111
Project number:	1000	Report number:	115922
Order number:			
Client name:	MvS Consulting	Contact person:	Marius van Biljon
Address:	P.O. Box 2166, Rant en Dal, 1751	Email:	marius@mvbconsult.co.za
Telephone:		Email:	annike@mvbconsult.co.z.a
		Cell:	0797419595

An.ar-	1. -Sp,ul		Z. Bulpluo		S. Hamon,Dwn	
S-pl■N,,,bor	1-		171189		1-	
DteN'llols	HNCXI: HF		HN03: HP		HN03: HP	
Dry- UNCl (g)	0.ZS		US		US	
Youn• UNCl C'''l	100		100		100	
Units	mglt	mg/kg	mg/t	mg/kg	mglf	mg/kg
Total Cyanide as CN (o)	•-	2.61	-•	<1.55	...	<1.55
Total Fluoride [o]	•-	<0.5	-•	5.67	...	<0.5
Total Hexavalent Ctwornias Cr6+(o)	•-	<2	-•	<2	...	<2
tcP-OES Quant	See ICP Digestion tab					
ICP-MSQua,u						

(o) • 0\11.sourced

S. Laubscher
As.sistant Geochemistry Project Manager

WATERLAB (PTY) LTD
CERTIFICATE OF ANALYSES
ICP-MS QUANTITATIVE ANALYSIS

Date received:	2022111130	Dato completed:	2023/01111
Project number:	1000	Report number:	115922
Client name:	MvB Consulting	Contact person:	Marius van Biljon
Address:	P.O. Box 2166, Rant en Dal, 1751	Email:	marius@mvbconsult.co.za
Telephone:		Email:	annike@mvbconsult.co.za
		Cell:	079 741 9595

Extract	Sample Mass(g)	Volume(ml)	Factor
HNO3:HF	0.25	100	400

Sample Id	Samp" Number	Af•	Al'	◆	A•	a-	e•
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Det Limit		<0.100	<40	<0.001	<0.4-00	<0.025	<10
1.Merrie Spruit	179688	43	17200	0.658	263	<0.025	<10
2.Saaiplaas	179689	57	22800	0.16-0	64	<0.025	<10
3.Hannonv Dam	179690	39	15600	0.257	103	<0.025	<10

Sample Id	Sample Number	ca•	ca•	Cd	Cd	Co	Co
		mgn	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Dot Limit		<1	<400	<0,001	<0.400	<0,001	<0,400
1.Merrie Spruit	179688	8	3200	<0.001	<0.400	0.024	9.70
2.Saaiplaas	179689	12	4800	<0.001	<0.400	0.025	10
3.Harmony Dam	179690	4	1600	<0,001	<0.400	0.013	5,15

Sample Id	Sample Number	Cr	Cr	Cu	Cu	Fe•	Fe•
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Oct Limit		<0.001	<0,400	<0.001	<0.400	<0.025	<10
1.Merrie Spruit	179688	0.412	165	0.026	10	42	16800
2.Saa.iplaas	179689	0.522	209	0.049	20	23	9200
3.Harmony Dam	179690	0.504	201	0.044	17	35	14000

Sample Id	Sample Number	Hg	Hg	K	K	Mg	Mg
		mg/l	mg/kg	mg/l	mg/kg	mg/l	m9'kg
Det Limit		<0.001	<0.400	<0.5	<200	<1	<400
1.Merrie Spruit	179688	<0.001	<0,400	14.4	5752	1	400
2.Saaiptaas	179689	<0.001	<0.400	18.1	7249	2	800
3.Harmony Dam	179690	<0.001	<0.400	14.0	5598	1	400

Sample Id	Sample Number	Mn	Mn	Mo	Mo	Na	Na
		mg/l	mg/kg	mgn	mg/kg	mg/l	mg/kg
Det Limit		<0.025	<10	<0.001	<0.400	<1	<400
1.Merrie Spruit	179688	0.093	37	0.020	7.80	2	800
2.saalptaas	179689	0.210	84	0.019	7.40	3	1200
3.Harmony Dam	179690	0.113	45	0.020	7.83	2	800

Sample Id	Sample Number	NI	NI	Sb	Sb	S•	Se
		mg/l	mg/kg	mgn	mg/kg	mg/l	mg/kg
Oet Limit		<0.001	<0.400	<0.001	<0.400	<0.001	<0.400
1.Merrie Spruit	179688	0.039	16	0.006	2.38	<0.001	<0.400
2.S.talplaas	179689	0.064	26	0.003	1.29	<0.001	<0.400
3.Harmonv Dam	179690	0.097	39	0.003	1.09	<0.001	<0.400

Sample Id	Sample Number	U	U	V	V	Zn	Zn
		mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
Dot Limit		<0.001	<0.400	<0.00-1	<0.400	<0.001	<0.400
1.Merrie Spruit	179688	0.034	■ ■	0.054	22	0.010	4.10
2.Saaiplaas	179689	0.063	25	0.084	33	0.060	24
3.Harmonv Dam	179690	0.061	24	0.062	25	0.018	7.19

rJ=Element analysed on ICP-OESInstrument

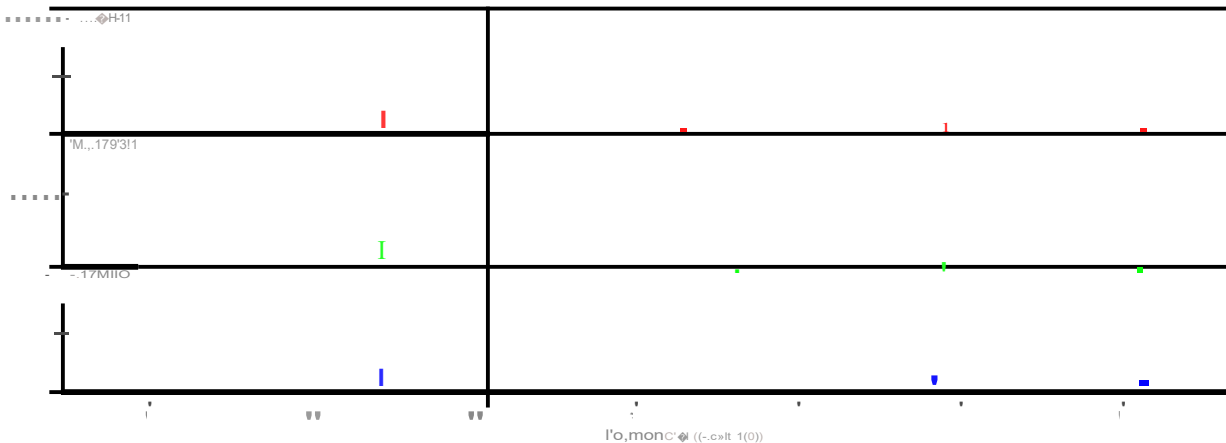
CERTIFICATE OF ANALYSES
X-RAY DIFFRACTKINOaitereceiwd: 2022/11/30
Project number: 1000

Report nvnumber: 115922

0-1te complet,d: 2023,01/11
Otder number;Client name: Mv8 Consulting
Addre&&: P.O. Box 2166,Rant en Dal, 1751
Telephone:Contact person: Marius van ~jon
Email: mu'iUS@mvbconsult.co.:ui
Email: annike@mvbconsult.co.za
Cell: 079 741 9595

Amount("019hl")	Composition(¾)(o)		
	90.22	88.03	91.17
J.arosite	1.4	0.31	1.7
Gvnsurn	2.16	1.97	1.34
Mu&eOY"1t~	207	3.68	2.59
ronhvllite	4.18	6.01	3.2

(o) • Outsou«:ed



0.~t~... 0.7s.1
[~(h~)~.HJdIII. 01.& SI
611num.1eC~06SI
..1..s(OY(t""II MI7~AA~ 'O !S(;(011(;01)7~S~
P>~Ofthjllll~i>f4~it 010 (0 M~ 1 III

Ilalo.

The material wasprepai-ed 10. XRD analysiSusing a bad~loBding preparatiOn melhOd.
Oiffrac10{J'am&wereoblanedusing a MatvernPan.a1)1ical Aerisdiffractome(ery,i(hPIX<:eldeteaor and fixedslits with Fe filtered Co-Koradiation.
~ ph.l\$es wereioontffiodusingX'Pert Histlsco10 plvs sonware.

The n:i&ati...ephaseamounts (we~it %)wereestimatedusingtheRietveldmethod.

Comment:

In case theresvltsdonot corresPondto resvltsof other-anal.,titaltechniQ,es,!)teasekit meknow forvrther finetuninQof XROresull5.
Mineml nJrnesm.rynot 1ofloct the octv{IloomPQI\$itions~1 minc1{111s(lon6'tied, but mlherlheminera gl oop.
Due toi.;refe«ed Otien1aliOn andcr~1am1e size effects, resvltls mayno1be as aoevra1e as Shown.
Tracesof additional phases maybe present Amountsbelow 0.5 wellflt % maybeunrella~
Amorphous phase,;ii pr8680t. were not taken intoconsideration durina ciuantification.

ID I MDP:SS:IIQIi:~I~..

CompoundName	CtwmkalF'ormu1.a
Gypsum	QIS04(H20)2
Jarosite	K(F-e3(S04)2(0H)6)
Mueeovfte	K>J3S13010I0H)2
Pyrophyllite	Al(\$120\$)(0H)
Cu~m	Si02

S. Laubscher
Assistant Geochemistry Project ManagerIII O
I P0mbl OQTJr.edh fJ ~e~rll,.....ft(#Jll:lho S1t~'Cb~
WATERLAB(Pl,tJ,d.M, lttNfuso O~ 111s~1h'olmcc:1OnIS'ChlbO~
""IT(IQ. ,dM10<L~... ~~,0.41OIWATERI.A&"riui

OfijjJLBOI WATLAB(Pl,tJ,d.EIOO«Il,Of~et,Aiwo.rLNIIS'~ N ~Mh~NO~tit

The background of the page is a light gray topographic map with thin, wavy contour lines. A solid blue vertical bar runs down the left side of the page, starting from the top and extending to the bottom. The text is located in the lower portion of this blue bar.

Appendix C: Public Participation Process Report



HARMONY GOLD MINING COMPANY LIMITED

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS Reference Number: WU44553

**Appendix C:
Public Participation Report**

Report Preparation By

Kongiwe Environmental (Pty) Ltd	
Registration Number	2016/135562/07
Telephone Number	+27 (10) 140 6508
Email	info@kongiwe.com
Registered Address	150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa
Mailing Address	PostNet Suite No 163, Private Bag X21, Bryanston, 2021, South Africa
Website	www.kongiwe.com

Report Information

Project	Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province
Report Title	Public Participation Process Report
DWS Reference Number	WU44553
Client	Harmony Gold Mining Company Limited
Project No.	HARM#019
Compilation Date	June 2026
Status of Report	Public Participation Report

Approval

Verification	Name	Capacity	Signature	Date
Compiled by	Vanessa Viljoen	Principal Stakeholder Consultant		25 May 2026
Reviewed by	Phumla Mngwengwe	Environmental Consultant		29 May 2026
Reviewed and Approved by	Grant Cornish-Bowden	Chief Operating Officer		27 May 2026

Please consider the Environment before you print this document.

Copyright © 2026 Kongiwe Environmental (Pty) Ltd

All rights reserved. No part of this report may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written consent of Kongiwe Environmental (Pty) Ltd. All content and methodologies remain intellectual property of Kongiwe Environmental (Pty) Ltd. Where applicable, the contents of this document are confidential and protected by legal privilege and must not be distributed to other parties without prior written permission.

This report is to be used for the sole purpose intended and should not be used for any other purpose without prior written permission.

Table of Content

1.	Introduction.....	1
2.	Public Participation Process	1
2.1	Applicable Legislation and International Standards.....	1
2.2	Objectives of the Public Participation Process.....	2
2.3	Summary of Issues Raised by Stakeholders	3
3.	Public Participation Approach.....	4
3.1	Submission of the Integrated Water Use Licence Application	4
3.2	Stakeholder Mapping and Identification	4
3.3	Land Claims Enquiry.....	5
4.	Communication and Engagement	5
4.1	Public Participation Materials	5
5.	Stakeholder Engagement Meetings	6
5.1	Consultation Approach	6
5.2	Stakeholder Meetings Held.....	7
5.3	Consultation to be Undertaken as Part of the Draft IWWMP	7
5.4	Availability of the Draft IWWMP Report for Public Review and Comment.....	8
5.5	Summary of Consultations.....	8
5.6	Consultation to be undertaken as part of the Final IWWMP	10
5.7	Consultation during the Decision-Making Phase	10
6.	Appendices	10

List of Tables

Table 2-1: Stakeholder Engagement Activities.....	3
Table 5-1: Proposed Dates and methods of Public Engagement	7
Table 5-2: Libraries where Hard Copies of the Draft IWWMP will be Placed	8
Table 5-3: Summary of PPP activities.....	8
Table 5-4: PPP Activities to be undertaken during the Final IWWMP	10

List of Appendices

Appendix C1: Stakeholder Database.....	11
Appendix C2: Land Claims.....	13
Appendix C3: Consultation Materials	15
Appendix C4: Newspaper Advertisement.....	17
Appendix C5: Site Notice	19
Appendix C6: Correspondence	21
Appendix C7: Authority Correspondence	23
Appendix C8: Meeting Minutes	25

Appendix C9: Written Comments	27
Appendix C10: Comment and Response Report.....	29

Reference Documents

Reference	Description
National Water Act, 1998 (Act No. 36 of 1998)	Governing legislation for water use licensing
Protection of Personal Information Act, 2013 (Act No. 4 of 2013)	Data privacy legislation
Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)	Transparency and access to information legislation

Abbreviations

Abbreviation	Description
BID	Background Information Document
CBO	Community-based Organisation
CRR	Comments and Response Report
DLRRD	Department of Land Reform and Rural Development
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
e-WULAAS	Water Use Licence Application and Authorisation System
IAP2	International Association for Public Participation
I&AP	Interested and Affected Party
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
LDM	Lejweleputswa District Municipality
MLM	Matjhabeng Local Municipality
NGO	Non-Governmental Organisation
NWA	National Water Act
PAIA	Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)
POPIA	Protection of Personal Protection Act, 2013 (Act No. 4 of 2013)
PPP	Public Participation Process
SMME	Small, Medium and Micro Enterprises
SMS	Short Message Services
WUL	Water Use Licence

1. Introduction

Harmony Gold Mining Company Limited ('Harmony') intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from processing plants and Tailings Storage Facilities (TSFs). The proposed Harmony Free State Defunct Shafts Backfilling Project ('Proposed Project') aims to address the safety risks associated with open defunct shafts. It is Harmony's intention to promptly rehabilitate these defunct shafts, including backfilling and sealing them.

The Proposed Project is located between Virginia and Welkom, within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM) of the Free State province.

The Proposed Project requires a Water Use Licence (WUL) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for Section 21 water uses before it can commence. Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Harmony to prepare the required documents to attain a WUL for the Project. An Integrated Water Use Licence Application (IWULA) is being prepared and will be submitted in accordance with the Water Use Licence Application and Appeals Regulations 2017, published in GNR 267 on 24 March 2017. The IWULA will be supported by an Integrated Water and Waste Management Plan (IWWMP).

This Public Participation Report outlines the public consultation activities that will be undertaken as part of the IWULA.

2. Public Participation Process

The Public Participation Process (PPP) offers stakeholders an opportunity to be informed about the Project, to raise issues and provide suggestions for mitigating potential negative impacts and enhancing positive ones. The PPP has been developed to ensure compliance with relevant legislation and facilitate meaningful stakeholder engagement, as required for the IWULA process.

2.1 Applicable Legislation and International Standards

The PPP will be undertaken in line with the statutory requirements for public participation. The following legislation is relevant to the PPP:

- NWA (Act No. 36 of 1998);
- Protection of Personal Information Act, 2013 (Act No. 4 of 2013) (POPIA); and
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) (PAIA).

The NWA is the primary law for the protection, management, and equitable use of the water resources. The NWA establishes the government's role in allocating water resources, promoting sustainable use of water resources, and preventing pollution.

The POPIA regulates the processing of personal information by both public and private bodies, aiming to protect individuals' constitutional right to privacy.

The PAIA gives effect to the constitutional right to access information held by both the state and private bodies. The Act establishes procedures for individuals to request information for the protection or exercise of their rights.

POPIA: Safeguarding Registered Person's Personal Information

In terms of Section 19 of the POPIA, a responsible party must, subject to Sections 9 and 11 of the Act, ensure the integrity and confidentiality of personal information in its possession or under its control by taking appropriate, reasonable technical and organisational measures to prevent loss of, damage to or unauthorised destruction of personal information, unlawful access to or processing of personal information. POPIA requires that personal information should be adequately protected to avoid unauthorised access. Therefore, Kongiwe continuously reviews security controls and procedures to ensure that personal information is secured. It should be noted that in terms of Section 11, personal information may be processed to the extent that this is necessary for pursuing the legitimate interests of the responsible party or parties to whom the information is supplied.

In addition to the above legislation, the PPP is to be aligned to international good-practice guidelines for public participation, particularly in regard to the following Core Values of the International Association for Public Participation (IAP2):

- To be based on the belief that those who are affected by a decision have a right to be involved in the decision-making process;
- To include the promise that the public's contribution will influence the decision;
- To promote sustainable decisions by recognising and communicating the needs and interests of all participants, including decision makers;
- To seek out and facilitate the involvement of those potentially affected by or interested in a decision;
- To seek input from participants in designing how they participate;
- To provide participants with the information they need to participate in a meaningful way; and
- To communicate to participants how their input affected the decision.

2.2 Objectives of the Public Participation Process

The PPP is designed to build and maintain constructive relationships. It is an ongoing process between the applicant and the project's stakeholders that extends throughout the life of a project. The PPP for the project ensures that adequate and timely information is provided to all potentially project-affected people and other stakeholders, that stakeholders are given sufficient opportunity to raise comments, and that these comments are taken into consideration during project decisions.

The PPP objectives for the Proposed Project are to:

- Ensure that stakeholders are informed about the Project;
- Provide stakeholders with the opportunity to participate in the IWULA process and provide comment;
- Encourage stakeholders to participate in identifying ways in which concerns can be mitigated;
- Work directly with stakeholders throughout the IWULA process to ensure that stakeholder comments are consistently understood and considered; and
- Verify that stakeholder comments are recorded and addressed.

The stakeholder engagement process will be undertaken as presented in Table 2-1 below:

Table 2-1: Stakeholder Engagement Activities

Project Phase	Activities to be Undertaken
Pre-Consultation Phase	• Pre-Consultation meeting with DWS, Free State (<i>this has been undertaken</i>). • Stakeholder identification (WinDeed searches, compilation of stakeholder database). • Consultation with directly affected landowners/ occupiers in the form of meetings (initiation of the landowner consent process where applicable) (Microsoft Teams/ one-on-one consultation meetings). • Consultation with relevant Authorities, including Ward councillors (Microsoft Teams/ one-on-one consultation meetings). • Compilation of announcement documents (Background Information Document (BID), registration and comment form, newspaper advertisement, site notice) and providing Project information to stakeholders. • Distribution and placement of announcement materials. • Obtaining initial comments and suggestions from stakeholders. • Development of Comments and Response Report (CRR), capturing all comments/questions and responses • Land Claims enquiry.
IWULA Consultation Phase	• Site visit with DWS (<i>this has been undertaken</i>). • Ongoing consultations with directly affected landowners (Microsoft Teams / one-on-one consultation meetings). • Update the stakeholder database. • Compile and make available the IWWMP for public review and comment. • Provide feedback about the specialist studies to be conducted and mitigation measures proposed, by means of consultation with stakeholders (Microsoft Teams and in-person consultation meetings). • Provide an opportunity for stakeholders to comment on specialist findings, impacts assessments and recommendations. • Verify that comments raised by stakeholders have been accurately recorded. • Inform specialists and the proponent of additional stakeholders' comments.
Decision Making Phase	• An IWULA will be submitted to the DWS in terms of the NWA. Once the DWS has come to a decision regarding the IWULA, the DWS will notify the applicant and any person who has objected to the application. Written reasons for the decision will be given.

2.3 Summary of Issues Raised by Stakeholders

Comments raised by stakeholders during the scoping phase will be included in the CRR (**Appendix C10**).

3. Public Participation Approach

3.1 Submission of the Integrated Water Use Licence Application

The IWULA process started when the Harmony Defunct Shafts Backfilling Project has been registered on the DWS' electronic Water Use Licence Application and Authorisation System (e-WULAAS) on **Thursday, 3 July 2025**.

A pre-application meeting was held on **Friday, 1 August 2025** with DWS. Phase 1 of the e-WULAAS application has been completed and submitted. Currently, the application is in Phase 3.

3.2 Stakeholder Mapping and Identification

Stakeholder Mapping is a process of identifying stakeholders before a project commences. Identified stakeholders are grouped according to their levels of participation, interest, and influence in a project. These groupings help determine the best way to involve and communicate with each group throughout the PPP. Project stakeholders are defined as individuals/ groups/ entities that have an interest in the Project. Such stakeholders are referred to as Interested & Affected Parties (I&APs).

To ensure sufficient representation of all stakeholders, the following identification methods have been used as part of the stakeholder identification and analysis process for the Proposed Project:

- Desktop and online research;
- WinDeed searches for the directly affected and adjacent farms;
- Identify and consult with the relevant local and district authorities in the Matjhabeng Local Municipality (MLM) and the Lejweleputswa District Municipality (LDM):
- Consult relevant ward councillors and ward committees from directly affected Wards, including:
 - Ward 8 (Ms Veronica Sotenjwa, Ward Councillor);
 - Ward 9 (Mr Johannes Marthinus Du Plessis, Ward Councillor);
 - Ward 24 (Mr Manene Mphikeleli, Ward Councillor);
 - Ward 32 (Ms Rene Steyne, Ward Councillor);
 - Ward 35 (Ms Estelle Dansey, Ward Councillor);
- Consult with relevant community leaders;
- Consult with directly affected landowners and inform indirectly affected and land occupiers;
- Consult with the Department of Land Reform and Rural Development (DLRRD), Office of the Regional Land Claims Commissioner (Free State);
- Consult other relevant government departments on a National, Provincial and Local level;
- Consult stakeholders responding to the publication of newspaper advertisements;
- Consult stakeholders responding to the distribution of Project documentation; and
- Update the stakeholder database from attendance registers from stakeholder meetings.

I&APs will be grouped into the following broad categories:

- **Government:** National, Provincial, and Local Authorities (including ward councillors and ward committee members);
- **Parastatals:** Various semi-government entities;
- **Landowners and Occupiers:** Landowners/ occupiers that are either:
 - **Directly Affected:** Landowners/ occupiers owning properties within an application boundary area or on a property(ies) where the Project infrastructure will/ might be located;

- **Adjacent (Indirectly Affected):** Landowners/ occupiers directly adjacent to the application boundary or property(ies) where the infrastructure will/ might be located;
- **Other Affected:** Landowners/ occupiers who register formally as stakeholders.
- **Communities:** Surrounding communities (community leaders);
- **Water:** Associations, entities responsible for water management and/ or regulation;
- Environmental Forums;
- Non-Government Organisations (NGOs);
- Community-based Organisations (CBOs); and
- **Business and Industry:** Small, Medium and Micro Enterprises (SMMEs), mines, industrial and large business organisations.

A stakeholder database has been compiled (**Appendix C1**) and will be updated throughout the regulatory process.

3.3 Land Claims Enquiry

A formal letter of enquiry has been compiled and sent to the Free State Department of Land Reform and Rural Development's (DLRRD) Office of the Regional Land Claims Commissioner on **Tuesday, 2 June 2026** for the attention of **Mr Khomotso Mahlatji**. The letter includes a list of all directly affected properties, which will be evaluated to determine if there are land claims. Should the DLRRD confirm that there are land claims within the Project footprint, Kongiwe will consult with the relevant parties. This will be documented in **Appendix C2**.

4. Communication and Engagement

4.1 Public Participation Materials

Considering the legislative requirements and good practice guidelines, the following documents have been developed and distributed to stakeholders. These documents will be used as part of the IWULA process' PPP.

Background Information Document (BID): The BID (**Appendix C3**) has been emailed on **Tuesday, 2 June 2026** to I&APs listed on the stakeholder database. The BID is also available on Kongiwe's website (<https://kongiwe.com/projects>). The BID provides the following details:

- An overview of the Proposed Project;
- The PPP to be undertaken in support of the IWULA, and contact details of the stakeholder engagement consultants;
- The public review and comment period for the IWWMP;
- Details of how stakeholders can register as I&APs and be kept informed about the Proposed Project developments;
- Invitation to attend an Online Meeting via Microsoft Teams; and
- Invitation to attend an Open Day.

Notification Letter with a Registration and Comment Form: An email has been sent to stakeholders to inform them about the Proposed Project. The email also shares details of the Online Meeting and Open Day and invites the broader public to formally register as I&APs. A Registration and Comment Form has also been provided to stakeholders to use for a formal registration as an I&AP and to submit their comments (**Appendix C3**).

A reminder notification will be emailed to remind stakeholders of the availability of the IWWMP for public review and comment. The reminder emails will also remind stakeholders to attend the Online Meeting and Open Day.

SMS: An SMS has been sent to stakeholders who have no access to the internet. Arrangements have been made to ensure that these stakeholders have full access to Project documentation.

Newspaper Advertisements: A newspaper advert (**Appendix C4**) has been placed in the Vista, a local newspaper within the Project area, on Thursday, 4 June 2026. The advert included the following details:

- An overview of the Proposed Project;
- Legal framework and details of the competent authority;
- How stakeholders can access the draft IWWMP for public review and comment;
- How to register as an I&AP;
- Invitation to attend the Online Meeting via Microsoft Teams;
- Invitation to attend the Open Day; and
- Contact details of the stakeholder engagement consultants.

Site Notice: The site notice (**Appendix C5**) will include the following:

- An overview of the Proposed Project, including a locality map;
- Legal framework and details of the competent authority;
- PPP to be followed and where relevant information could be obtained;
- Invitation to attend an Online Meeting via Microsoft Teams; and
- Invitation to attend an Open Day and where stakeholders can register to attend.

Pictures and co-ordinates of where the site notices have been placed and has been recorded in the site notice report, and a site notice map will be developed (**Appendix C5**).

Telephonic Discussions: Stakeholders will also be consulted by means of telephonic discussions, where required. These discussions facilitate the process of inviting stakeholders to stakeholder meetings and provide stakeholders with a platform to raise comments and suggestions regarding the Project. Comments raised through telephonic discussions will be recorded and considered by the Project team.

5. Stakeholder Engagement Meetings

This Section outlines the consultation approach as well as details of consultations in relation to the draft and final IWWMP.

5.1 Consultation Approach

Consultation will be aimed at providing stakeholders with an overview of the Proposed Project and to obtain comments which informed specialist studies and project planning. Stakeholders will be invited to participate through online and in-person engagements depending on preference. The purpose of these meetings will be to discuss the Proposed Project and the contents of the IWWMP – and to provide stakeholders with an opportunity to raise their comments and to interact with the Project team. Locality, infrastructure and land tenure maps will be displayed as part of these meetings.

The following meetings will be held:

- **Authority Meetings:** Meetings will be held with relevant Authorities.
- **Landowner Meetings:** Consultation meetings will be held with directly affected landowners.
- **Online Meetings:** will be held with stakeholders who prefer online engagements.
- **Broader Public Consultation Meetings:** An Open Day will be held with the broader public during the public review period.

Focused efforts will be made to engage with directly impacted stakeholders (those residents in the Project area), including vulnerable groups at local level. These individuals will be consulted directly and via their representatives and other influential people within communities. Meetings will be held in a culturally appropriate manner, allowing stakeholders to voice their opinions openly. Stakeholders will be given the option to raise issues in the language of their choice. Translations will be provided, where required.

Authorities, NGOs, landowners / land occupiers and community members will be engaged to promote attendance, by means of telephonic consultation and distribution of emails and SMS.

Refer to **(Appendix C8)** for a list of meetings and consultations that have been undertaken.

Minutes of the meetings and the presentations **(Appendix C8)** will be compiled and distributed to all stakeholders who attend. All comments raised by stakeholders during these meetings will be captured in the CRR **(Appendix C10)**.

5.2 Stakeholder Meetings Held

Pre-Application Meeting with Department of Water and Sanitation (DWS)

An Online pre-application meeting was arranged with Mr Mzukisi Maneli the Case Officer and other DWS officials, and has been undertaken on **Friday, 1 August 2025 from 10:00 AM – 11:30**. Proposed Project information has been presented by means of a PowerPoint presentation.

The purpose of this meeting was to:

- Present and discuss the Proposed Project's Integrated Water Use Licence Application (IWULA) ;
- Provide an overview of the IWULA Process;
- Provide the DWS officials with an opportunity to raise comments / seek clarity and provide input; and
- Record comments raised and included them in the CRR;

5.3 Consultation to be Undertaken as Part of the Draft IWWMP

As stated above, consultation meetings will be held using platforms like Microsoft Teams (Online Meeting) and an Open Day. The purpose of these meetings is to discuss the Proposed Project and the contents of the draft IWWMP, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise comments and interact with the Project team.

Refer to Table 5-1 for the proposed stakeholders' meeting schedule. Please confirm your attendance for the meeting.

Table 5-1: Proposed Dates and methods of Public Engagement

Proposed Dates	Available Time Slots	Method of Engagement
Online Meeting		
Wednesday, 1 July 2026	10H00 – 11H00	Microsoft Teams
In-Person Meeting: Open Day		
Saturday, 4 July 2026	11H00 – 13H00	In person at Ferdi Meyer Hall Stateway & Tulbagh St, Welkom Central, Welkom

5.4 Availability of the Draft IWWMP Report for Public Review and Comment

The **draft IWWMP** will be made available for public review and comment for 60 days, from **Wednesday, 10 June 2026 to Tuesday, 11 August 2026**.

A notification of the availability of the draft IWWMP for public review and comment has been distributed on **Tuesday, 2 June 2026** to all stakeholders on the database.

The draft IWWMP will be made available as follows:

- An electronic copy on Kongiwe's website: <https://kongiwe.com/projects/>
- A hard copy at the Welkom Library Welkom and Virginia Library. Contact details are shown in Table 5-2.

Table 5-2: Libraries where Hard Copies of the Draft IWWMP will be Placed

Location	Physical Address	Contact Person
Welkom Library	Cnr Tulbagh and Graaf Str, Welkom	Mr Isaac Mokati, Librarian (071) 841 9758 Open: 09:00 Close: 17:00
Virginia Library	47 Virginia Gardens, Virginia	Ms Lungile Maphanga, Librarian (072) 265 3786 Open: 09:00 Close: 16:30

5.5 Summary of Consultations

Table 5-3 below provides a summary of PPP activities relating to the draft IWWMP.

Table 5-3: Summary of PPP activities

Activity	Details	Reference in Draft Scoping Report
Identification of Stakeholders	• Stakeholders have been identified by means of WinDeed searches, stakeholder networking and research for the compilation of a stakeholder database. • The database will be updated with new I&APs who have formally registered and attended stakeholder meetings or submitted comments throughout the process.	Appendix C1 Stakeholder Database
Identification of Land Claims	• A formal letter of enquiry has been compiled and submitted to the Land Claims Commission, Department of Land Reform and Rural Development (DLRRD). The letter comprises of a list of directly affected properties for the Project.	Appendix C2 Land Claims Enquiry to (DLRRD)
Development of the BID	• The BID has been developed and distributed to stakeholders. The BID is available on Kongiwe's website.	Appendix C3 BID

Activity	Details	Reference in Draft Scoping Report
Placement of Newspaper Advertisements	An advert has been placed in the Vista local newspaper.	Appendix C4 Newspaper Advertisements
Placement of Site Notices	- Site notices have been placed at publicly accessible places within proximity of the Proposed Project area. Site notices have been placed at the Welkom Public Library and Virginia Public Library - A site notice report and a site notice map will be developed, indicating the exact locations of where the site notices have been placed, with photos and GPS coordinates.	Appendix C5 Site Notice Report and Placement Map
Announcement of the Project and the Availability of the Draft IWWMP Report	- The announcement email has been distributed to stakeholders to: - Announce availability of the draft IWWMP report. - Invite stakeholders to the Online Meeting and Open Day. - Indicate where the draft IWWMP report will be made available for public review and comment.	Appendix C6 Announcement Correspondence
Stakeholder Consultation Meetings Online Meetings	- The purpose of these meetings will be to discuss the Proposed Project and the contents of the IWWMP – and to provide stakeholders with an opportunity to raise their comments. - Minutes of the meetings and the presentations will be compiled and distributed to all stakeholders who attend. - All comments raised by stakeholders during these meetings will be captured into the CRR. Responses to comments will be provided in line with the overall Proposed Project scope and available information.	Appendix C8 List of Meetings and Meeting Minutes Appendix C10 CRR
Broader Public Consulting Meetings Open Day	- Consultation will be aimed at providing stakeholders with an overview of the Proposed Project and to obtain comments. - The purpose of the Open Day will be to discuss the Proposed Project and the contents of the IWWMP – and to provide stakeholders with an opportunity to raise their comments and to interact with the Project team.	Appendix C8 List of Meetings and Meeting Minutes Appendix C10 CRR

Activity	Details	Reference in Draft Scoping Report
	- Posters with information regarding the Proposed Project description, locality, infrastructure and the Land Tenure maps will be displayed. - Minutes of the Open Day will be compiled and distributed to all stakeholders who attend. All comments raised by stakeholders during the Open Day will be captured in the CRR.	

5.6 Consultation to be undertaken as part of the Final IWWMP

Once the final IWWMP has been submitted to the DWS, stakeholders will be notified. The final IWWMP report will be made available on Kongiwe's website. Table 5-4 below is a summary of the anticipated activities during the final IWWMP.

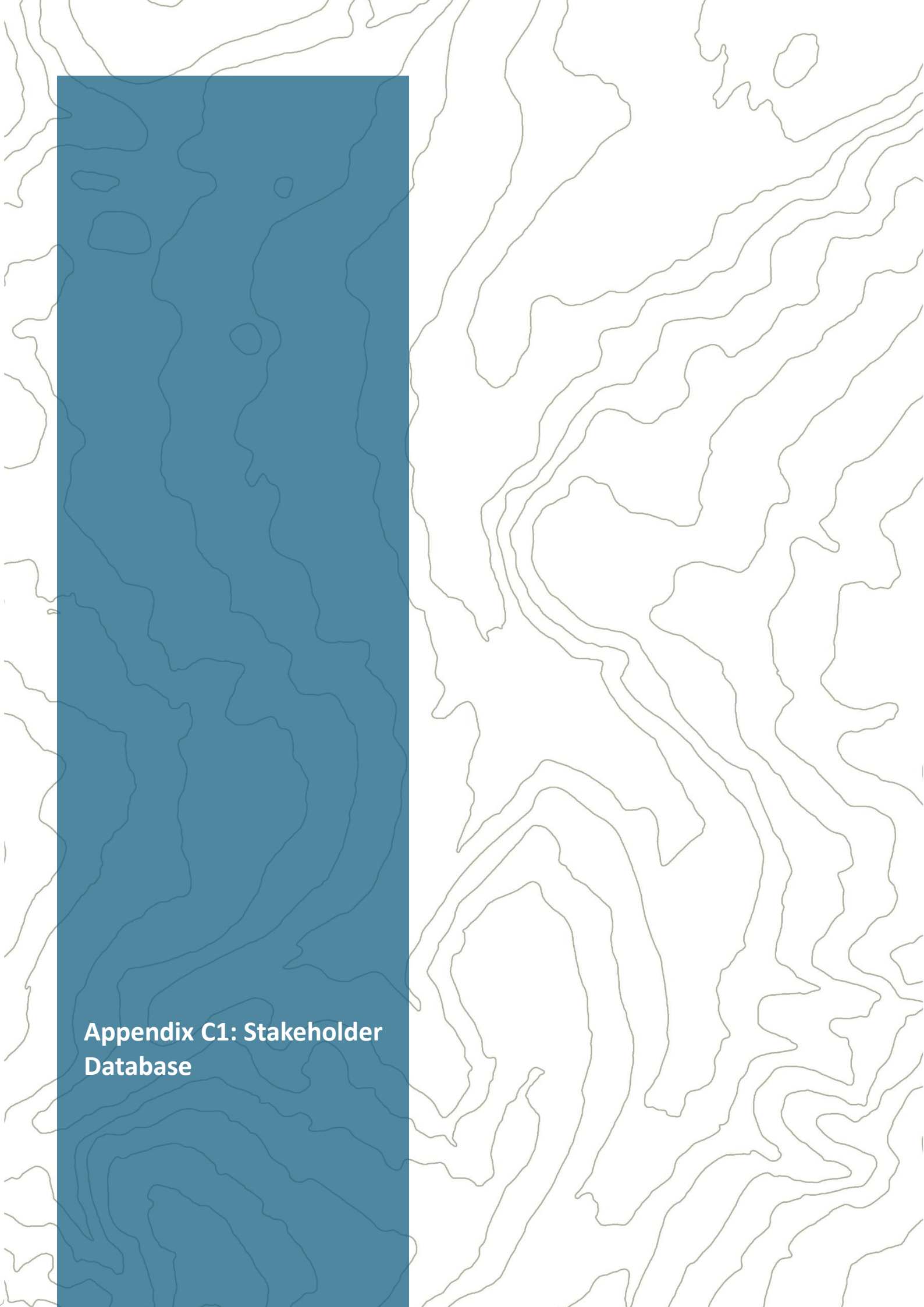
Table 5-4: PPP Activities to be undertaken during the Final IWWMP

Activity	Details
Update of stakeholder information	The stakeholder database will be updated with new stakeholders who formally registered, participated in stakeholder meetings or submitted comments.
Placement of the final IWWMP	The final IWWMP report will be made available on Kongiwe's website.
Submission to the Authorities	The final IWWMP will be uploaded on the electronic submission system (e-WULAAS), along with technical documents required for the IWULA.
Announcement of the submission of the final IWWMP to DWS	- A notification letter notifying stakeholders that the final IWWMP report has been submitted to DWS will be emailed to the full stakeholder database. - An SMS will be sent to stakeholders who have no access to the internet.

5.7 Consultation during the Decision-Making Phase

An Integrated Water Use Licence Application (IWULA) will be submitted to the Department of Water and Sanitation (DWS) in terms of the NWA. Once the DWS has come to a decision regarding the IWULA, the DWS will notify the applicant and any person who has objected to the application, providing written reasons for the decision.

6. Appendices



Appendix C1: Stakeholder Database

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project,

Free State Province

DWS reference numbers: WU44553

Stakeholder Database

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Agricultural Union	Free State Agriculture	Dr	Jack	Armour	Commercial Manager	Free State
Agricultural Union	Free State Agriculture	Dr	Jane	Buys	Safety and Risk Analyst	Free State
Agricultural Union	Free State Agriculture	Mr	Christo	Doman	Mangaung Representative	Free State
Agricultural Union	Free State Agriculture	Mr	Francois	Wilken	President	Free State
Agricultural Union	Free State Agriculture	Mr	Gernie	Botha	Chief Executive Officer	Free State
Agricultural Union	Free State Agriculture	Mr	Stefan	Hanekom	Region 10 - Matjhabeng	Free State
Agricultural Union	Grain SA	Mr	MJ	Swart	Regional Contact	Free State
Agricultural Union	Grain SA	Mr	Werner	Vos	Regional Contact	Free State
Agricultural Union	TLU SA Central Region	Mrs	Lynette	Du Plessis	Manager TAU SA Central Region	Free State
Agricultural Union	TLU SA Free State Region	Mr.	Jannie	Raath	Manager TAU SA Free State Region	Free State
Agricultural Union	Transvaal Agricultural Union of South Africa (TAUSA)	Mr	Henry	Geldenhuis	President	Free State
Directly Affected Landowner	City Thatch CC / Paint King	Mr	Riaan	Lombard	Landowner	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Directly Affected Landowner / Indirectly Affected Landowner	Department of Public Works and Infrastructure (DPWI)	Ms	Friedah	Khoza	Property Manager	Free State
Directly Affected Landowner / Indirectly Affected Landowner / Local Municipality	Matjhabeng Local Municipality	Mr	Eric Sello	Senoge	Property Department	Free State
District Municipality	Lejweleputswa District Municipality	Mr	Fannie	Zim	Environmental Management Practitioner	Free State
District Municipality	Lejweleputswa District Municipality (LDM)	Mr	Dewald	Kirsten	Manager Environmental Health Services	Free State
District Municipality	Lejweleputswa District Municipality (LDM)	Mr	Motlatsi	Makhetha	Municipal Manager	Free State
District Municipality	Lejweleputswa District Municipality (LDM)	Mr	Orapeleng	Manake	Environmental Manager	Free State
District Municipality	Lejweleputswa District Municipality (LDM)	Cllr	Veronica	Ntakumbana	Executive Mayor	Free State
District Municipality	Lejweleputswa District Municipality (LDM)	Ms	Michelle	Sello	Executive Manager of Environmental Health Services and Disaster Management	Free State
Environmental NGO's	Agricultural Research Council	Dr	Litha	Magingxa	President and CEO	Free State
Environmental NGO's	Birdlife South Africa (BLSA)	Dr	Kirsten	Day	Policy & Advocacy Manager	Free State
Environmental NGO's	Birdlife South Africa (BLSA)	Mr	Sam Ralston	Paton	Birds & Renewable Energy Project Manager.	Free State
Environmental NGO's	Endangered Wildlife Trust (EWT)	Mr	Bradley	Gibbons	Free State Representative	Free State
Environmental NGO's	Endangered Wildlife Trust (EWT)	Ms	Samista	Rooplal	Biodiversity and Business Officer	Free State
Environmental NGO's	Federation for Sustainable Environment (FSE)	Ms	Mariette	Liefferink	Chief Executive Officer	Free State
Environmental NGO's	South African National Biodiversity Institute (SANBI)	Ms	A	Mohai	Free State Representative	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Environmental NGO's	Wildlife & Environmental Society of South Africa (WESSA)	Mr	John	Wesson	Manager: Conservation Specialist	Free State
Environmental NGO's	Wildlife & Environmental Society of South Africa (WESSA)	Mr	Morgan	Griffiths	Senior Manager: Advocacy, Membership and Governance	Free State
Indirectly Affected Landowner	Moshage Adventures	Ms	Charmaine	Coetzee	Landowner	Free State
Indirectly Affected Landowner	Private Landowner	Mr	Sello	Chobokoane	Landowner	Free State
Indirectly Affected Landowner	Stille Trust	Mr	Jaco	Vosloo	Landowner	Free State
Libraries	Virginia Library	Ms	Lungile	Maphanga	Librarian	Free State
Libraries	Welkom Library SACR	Mr	Mohapi	Modupe	Librarian Assistant	Free State
Local Municipality	Matjhabeng Local Municipality	Adv	Lauretta	van Wyk-Williams	Municipal Manager	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Adam	Pobe	Acting Executive Director	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Boipelo	Molelekoa	Area Manager: City Planning - Welkom / Virginia / Odendaalsrus / Allanridge	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Johannes	Theunissen	Waste Manager	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Kabelo	Masekoa	Manager: Water	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Lennox	Rubulana	Speaker	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Lunga	Ncapai	Waste Officer	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Sello	Naniso	Manager at the Speakers Office	Free State
Local Municipality	Matjhabeng Local Municipality	Mr	Thanduxolo	Khalipha	Executive Mayor	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Local Municipality	Matjhabeng Local Municipality	Ms	Akhona	Noholoza	Secretary to Municipal Manager	Free State
Local Municipality	Matjhabeng Local Municipality	Ms	Mapitso	Mohapi	Office of the Speaker	Free State
Local Municipality	Matjhabeng Local Municipality	Ms	Mmase	January	Senior. Manager Planning	Free State
Local Municipality	Matjhabeng Local Municipality	Ms	Nelia	Rust	Manager Water and Effluent Water - West	Free State
Local Municipality	Matjhabeng Local Municipality	Ms	Mapuleng	Masilo	Environmental Manager	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)			DFFE - Biodiversity		Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Obed	Baloyi	Environmental Impact Evaluation	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Ronald	Nenungwi	Acting Chief Directorate	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Seoka	Lekota	Biodiversity Conservation	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Stanley	Tshitwamulomoni	Strategic Water Source Area	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Lydia	Kutu	Integrated Environmental Authorisations: Priority Infrastructure Developments	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Makhosi	Yeni	Environmental Officer	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Mashudu	Mudau	Protected Areas Planning and Management Effectiveness	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Mmatlala	Rabothata	Biodiversity Conservation	Free State
National Government	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Mulalo	Sundani	National Office: Directorate Forestry Regulation and Oversight: Environmental	Free State
National Government	Department of Health (DOH): National	Ms	Belinda	Makhafola	Directorate: Environmental Health Services	Free State
National Government	Department of Mineral and Petroleum Resources (DMPR)	Adv	Mmadikeledi	Moloto	DDG: Mineral Regulation	Free State
National Government	Department of Mineral and Petroleum Resources (DMPR)	Mr	David	Msiza	Mine Health and Safety Inspectorate	Free State
National Government	Department of Mineral and Petroleum Resources (DMPR)	Mr	Rudzani	Mabogo	Head of Environment: Director for Compliance and Enforcement	Free State
National Government	Department of Mineral and Petroleum Resources (DMPR)	Mr	Siyabonga	Vezi	Acting Gauteng Regional Director	Free State
National Government	Department of Public Works and Infrastructure (DPWI)	Mr	Thapelo	Duma	PA to Regional Manager	Free State
National Government	Department of Public Works and Infrastructure (DPWI)	Mr	Zakhele	Ndebele	Real Estate Management Services	Free State
National Government	Department of Public Works and Infrastructure (DPWI)	Ms	Jabulile	Mabaso	Acting Regional Manager	Free State
National Government	Department of Public Works and Infrastructure (DPWI)	Ms	Thobile	Zulu	Official	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Ayanda	Mtetwa	National	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Kama	Meso	Environmental Officer	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Londolani	Mutshekwa	National	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Luvuyo	Nqelenga	Compliance Monitoring & Enforcement (BloemWater)	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Pieter	Ackerman	Chief Landscape Architect	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
National Government	Department of Water and Sanitation (DWS)	Mr	Roets	Wietsche	Specialist Scientist	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	Victor	Nkuna	Environmental Officer	Free State
National Government	Department of Water and Sanitation (DWS)	Ms	Lumka	Kuse	Gauteng Wetland Forum (Downstream)	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	C	Schrader	Dam Safety: Free State Region Representative	Free State
National Government	Department of Water and Sanitation (DWS)	Mr	D	Truter	Control Engineering Technician	Free State
National Government	Minerals Council South Africa National	Mr	Babalwa	Matiwane	Environmental Department	Free State
National Government	Minerals Council South Africa National	Ms	Jeannette	Hofsajer	Environmental Department: National Administration	Free State
National Government (Provincial Office)	Department of Agriculture and Rural Development (DARD): Free State	Mr	Hennie	Grobler	Acting Director: Rural Infrastructure Development	Free State
National Government (Provincial Office)	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Qaphela	Ndabankulu	Forestry Regulation	Free State
National Government (Provincial Office)	Department of Forestry, Fisheries and the Environment (DFFE)	Mr	Shumani	Dzivhani	Deputy Director: Forestry Regulation	Free State
National Government (Provincial Office)	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Khuliso	Khomari	Environmental Officer	Free State
National Government (Provincial Office)	Department of Forestry, Fisheries and the Environment (DFFE)	Ms	Nompumelelo	Lekalakala	Biodiversity	Free State
National Government (Provincial Office)	Department of Mineral and Petroleum Resources (DMPR)	Mr	Cedrick	Fhedzisani	Regional Manager for Environment Dep.	Free State
National Government (Provincial Office)	Department of Minerals and Petroleum Resources (DMPR)	Ms	Kalipa	Kewuti	Free State Regional Manager	Free State
National Government (Provincial Office)	Department of Public Works and Infrastructure (DPWI)	Mr	SP	Menye	Acting Chief Director: Property Management	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
National Government (Provincial Office)	Department of Public Works and Infrastructure (DPWI)	Ms	Anneke	Barnard	Infrastructure Services	Free State
National Government (Provincial Office)	Department of Public Works and Infrastructure (DPWI)	Ms	Lebohang	Khumalo	Chief Director: Property Management	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Mr	Mzukisi	Maneli	Case Officer	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Mr	Phuti	Mabotja	Environmental Officer	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Dr	Tseliso	Ntili	Provincial Manager	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Mr	Kereemang	Maseloane	Director: Water Services Infrastructure, Development, and Refurbishment Program	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Mr	Mfundi	Biyela	Bloemfontein Representative	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Mr	Pule	Liatile	Assessor	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Ms	Barbara	Kalembo	(c) and (i) Water Use Specialist	Free State
National Government (Provincial Office)	Free State Province Department of Water and Sanitation (DWS)	Ms	Maureen	Letloenyane	Deputy Director and Office Manager for the Provincial Head	Free State
National Government (Provincial Office)	Department of Water and Sanitation (DWS)	Ms	Thembekile	Dlamini	Assessor	Free State
Parastatal	National Transmission Company South Africa (NTCSA)	Mr	Khululwa	Matshoba	Senior Environmental Advisor	Free State
Parastatal	Eskom Transmission Land and Rights: Free State	Mr	Gerrie	Van Schalkwyk	Senior Environmental Advisor	Free State
Parastatal	South African National Roads Agency Limited (SANRAL)	Ms	Ntsepo	Mkhize	Environmental Co-ordinator	Free State
Parastatal	South African National Roads Agency Limited (SANRAL)	Ms	Karabo	Mabyana	Statutory Control Officer	Free State
Parastatal	South African National Roads Agency Limited (SANRAL)	Ms	Khuliso	Nenguda	Statutory Control Officer	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Parastatal	Transnet Freight Rail Ltd	Mr	Samuel	Fiff	Free State Environmental Manager	Free State
Parastatal	Transnet Freight Rail Ltd	Ms	Zanele	Manyathi	Environmental Manager	Free State
Provincial Government	Free State Department of Economic (DESTE)	Dr	Sandile	Fuku	Environmental Affairs and Conservation	Free State
Provincial Government	Free State Department of Economic (DESTE)	Mr	Pule	Motsoetla	Biodiversity Manager	Free State
Provincial Government	Free State Department of Economic (DESTE)	Ms	BJ	Molefe	Environmental Officer	Free State
Provincial Government	Free State Department of Economic (DESTE)	Ms	Nozi	Nkwe	Environmental Manager	Free State
Provincial Government	Free State Department of Economic (DESTE)	Ms	RP	Likholele	Control Environmental	Free State
Provincial Government	Department of Health (HOD): Free State	Mr	Lucky	Leshabane	Assistant Director: Environmental Health	Free State
Ward Committee Member	Matjhabeng Local Municipality	Me	MA	Koto	Ward 32	Free State
Ward Committee Member	Matjhabeng Local Municipality	Mr	Everitt	Makape	Ward 8	Free State
Ward Committee Member	Matjhabeng Local Municipality	Mr	Mildred	Faro	Ward 35	Free State
Ward Committee Member	Matjhabeng Local Municipality	Ms	Anusa	Van Wyk	Ward 9	Free State
Ward Councillor	Matjhabeng Local Municipality	Mr	Johannes Marthinus	Du Plessis	Ward 9	Free State
Ward Councillor	Matjhabeng Local Municipality	Mr	Manene	Mphikeleli	Ward 24	Free State
Ward Councillor	Matjhabeng Local Municipality	Mr	Rene	Steyne	Ward 32	Free State
Ward Councillor	Matjhabeng Local Municipality	Ms	Estelle	Dansey	Ward 35	Free State
Ward Councillor	Matjhabeng Local Municipality	Ms	Veronica	Sotenjwa	Ward 8	Free State

I&AP Sector	Organisation	Mr/Ms	First Name	Last Name	Position	Province
Water Bodies -Institution	Sand-Vet Water Users Association	Mr	Andries	Labuscagne	CEO	Free State
Water Bodies -Institution	Sand-Vet Water Users Association	Ms	Moipone	Maoba	P.A to the CEO	Free State
Water Bodies -Institution	Vaal Central Water (formerly Bloem Water)	Mr	Aphumle	Mnyaka	Executive & Project	Free State
Water Bodies -Institution	Vaal Central Water (formerly Bloem Water)	Mr	Maruping	Rapudungoane	Operations and Maintenance	Free State
Water Bodies -Institution	Vaal Central Water (formerly Bloem Water)	Ms	Charmaine	Dladla	Project Coordinator	Free State
Water Bodies -Institution	Vaal Central Water (formerly Bloem Water)	Ms	NP	Silevu	Secretary	Free State
Water Bodies -Institution	Vaal-Orange Catchment Management Agency (VOCMA)	Mrs	Nametso	Sithole	Scientist Production	Free State
Water Bodies -Institution	Water Research Commission	Dr	Shafick	Adams	Senior Research Manager:	Free State
Water Bodies -Institution	Water Research Commission	Mr	Bennie	Mokgonyana	Water Use & Waste Management	Free State
Water Bodies -Institution	Water Research Commission	Mr	Jay	Bhagwan	Research Manager	Free State
Water Bodies -Institution	Water Research Commission	Ms	Penny	Jaca	Water Resource Management	Free State
Water Bodies -Institution	Water Research Commission	Ms	Shirley	Machelisi	Water Use & Waste Management	Free State

**Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project,
Free State Province**

DWS reference numbers: WU44553

Landowners Database

Directly Affected Landowners

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Fregul 443	RD	0 (RE)	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Harmony Farm 19	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	92	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	30	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	89	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	83	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Harmony Farm 222	RD	97	No Windeed	No Windeed	To be Confirmed
Hesters-Rust 224	RD	0 (RE)	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Jurgens Hof 490	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Kalkuil 153	RD	2	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Klippan 14	RD	1	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Klippan 14	RD	2	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
La Riviera 289	RD	RE	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Morijah 288	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Stuirmanship 92	RD	1	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Stuirmanship 92	RD	2	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Stuirmanship 92	RD	6 (An unregistered subdivision of Portion 1)	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
President Steyn 154	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Rietpan 17	RD	0 (RE)	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Rustgevonden 564	RD	1	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Saaiplaas 771	RD	0 (RE)	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Saaiplaas 771	RD	15	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Saaiplaas 771	RD	11	No Windeed	No Windeed	To be Confirmed
Vaalkranz 220	RD	2	National Government of Republic of South Africa	Department of Public Works and Infrastructure (DPWI)	Ms A Ntilane
Vaalkranz 220	RD	3	Van Den Berg Abraham Paulus	Mr Abraham Paulus Van Den Berg	To be Confirmed
Voorspoed 132	RD	0 (RE)	Individual 8151-8240 in Welkom Ext 14	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Voorspoed 132	RD	3	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Voorspoed 132	RD	4	No Windeed	No Windeed	To be Confirmed
Voorspoed 132	RD	1	City Thatch CC	City Thatch CC / Paint King	Mr Riaan Lombard
Welkom 80	RD	12	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Welkom 80	RD	11	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Welkom 80	RD	5	City Thatch CC	City Thatch CC / Paint King	Mr Riaan Lombard
Welkom 80	RD	0	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk

Indirectly Affected Landowners

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Klippan 14	RD	0	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Tarka 656	RD	0	Stille Trust	Stille Trust	Mr Jaco Vosloo
Ongegund 13	RD	0	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Voorspoed 139	RD	0	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Tarka 656	RD	1	Freegold Harmony Pty Ltd	Freegold Harmony Pty Ltd	Mr John Van Wyk
Saaiplaas 771	RD	4	Moshange Adventures	Moshange Adventures	Ms Charmine Coetzee
Saaiplaas 771	RD	5	Chobokoane Sello Meshack	Mr Chobokoane Sello Meshack	Mr Chobokoane Sello Meshack

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Saaiplaas 771	RD	7	Recme Trust	Recme Trust	To be Confirmed
Saaiplaas 771	RD	10	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Vaalkranz 220	RD	14	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	56	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Harmony Farm 222	RD	90	No Windeed	No Windeed	To be Confirmed
Harmony Farm 222	RD	91	No Windeed	No Windeed	To be Confirmed
Kallaagte 562	RD	0	Harmony Gold Mining Co Ltd	Harmony Gold Mining Co Ltd	Mr John Van Wyk
Welkom 41	RD	13	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Klippan 14	RD	10	No Windeed	No Windeed	To be Confirmed
Voorspoed 132	RD	5	No Windeed	No Windeed	To be Confirmed
Schoonheid 540	RD	0	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Witpan 62	RD	4	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge

Farm Name & Number	Farm ID	Farm Portion	Owner-Windeed	Farm owner	Contact Person
Harmony 19	RD	1	Matjhabeng Local Municipality	Matjhabeng Local Municipality	Mr Eric Sello Senoge
Onverwag 728	RD	0	National Government of Republic of South Africa	Department of Public Works and Infrastructure (DPWI)	Ms A Ntilane

The background of the page is a topographic map with thin, light brown contour lines. A solid blue vertical bar runs down the left side of the page, starting from the top and extending to the bottom. The text 'Appendix C2: Land Claims' is located in the lower-left portion of this blue bar.

Appendix C2: Land Claims

Vanessa Viljoen

From: Vanessa Viljoen
Sent: Tuesday, 02 June 2026 16:41
To: khomotso.mahlatji@dlrrd.gov.za; Nozipho Dlamini
Cc: Jean-Mari Williams
Subject: Land Claims Enquiry: Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province
Attachments: HARM_019_LC_2June26.pdf

Dear Mr Khomotso Mahlatji

Kongiwe Environmental (Pty) Ltd (hereafter Kongiwe) has been appointed by Harmony to undertake an Integrated Water Use Licence Application (IWULA) for the Proposed Harmony Free State Defunct Shafts Backfilling Project, Free State Province.

The Proposed Project is located between Virginia and Welkom, **within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM)** of the Free State province.

We would appreciate it, if you could assist us with the attached Land Claims enquiry.

Much appreciated.

Kind Regards,



Vanessa Viljoen | Principal Stakeholder Engagement Consultant | Kongiwe Environmental
Tel: +27 (10) 140 1725 | Cell: +27 (71) 485 5388 | Fax: +27 (86) 476 6438 | Email: vviljoen@kongiwe.com
150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa.
PostNet Suite no 163, Private Bag X21, Bryanston, 2021, South Africa.
www.kongiwe.com

Disclaimer: The provisions of Section 11 of the Electronic Communications and Transactions Act 25 of 2002 apply to this email notice and make it enforceable and binding on the recipient/addressee. This email message (including attachments) contains information which may be confidential and/or legally privileged. Unless you message or any information contained in the message or from any attachments thereto were sent with this email, and if you have received this email message in error, please advise the sender by email, and delete the message. Unauthorised disclosure and/or use of information contained in this email may result in civil and/or criminal liability of Kongiwe Environmental (Pty) Ltd to the company. Caution should be observed in placing any reliance upon any information contained in this e-mail, which is not intended to be a representation or inducement to make any decision in relation to Kongiwe Environmental (Pty) Ltd. Any decision taken in consultation with appropriate legal, regulatory, tax, technical, business, investment, financial, and/or accounting advisors. The e-mail address of the sender may not be used, copied, sold, disclosed or incorporated into any database or marketing material without the prior consent of Kongiwe Environmental. This message cannot be regarded as a solicitation to contract, nor be seen as an offer or acceptance of contractual agreement. Neither the sender of the e-mail, nor Kongiwe Environmental (Pty) Ltd shall be liable to any party for any direct, indirect or consequential damages, including, without limitation, loss of revenue. No warranties are created or implied that an employee of Kongiwe Environmental (Pty) Ltd and/or a contractor of Kongiwe Environmental (Pty) Ltd is authorised to create and send this e-mail.

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS Reference Number: WU44553

Land Claims Enquiry

Attention	Mr Khomotso Mahlatji
Government Body	Free State Department of Land Reform and Rural Development (DLRRD) Office of the Regional Land Claims Commissioner: Free State
Email	khomotso.mahlatji@dlrrd.gov.za , nozipo.dlamini@dlrrd.gov.za

Harmony Gold Mining Company Limited ('Harmony') intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from processing plants and Tailings Storage Facilities (TSFs). The proposed Harmony Free State Defunct Shafts Backfilling Project ('Proposed Project') aims to address the safety risks associated with open defunct shafts. It is Harmony's intention to rehabilitate these defunct shafts, including backfilling and sealing.

Kongiwe Environmental (Pty) Ltd (hereafter Kongiwe) has been appointed by Harmony to undertake an Integrated Water Use Licence Application (IWULA) for the Proposed Project. The Proposed Project requires a Water Use Licence (WUL) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for Section 21 water uses before it can commence.

The Proposed Project is located between Virginia and Welkom, **within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM)** of the Free State province.

The Project area impacts the farm portions listed in the table below:

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Fregul 443	RD	0 (RE)	Freddies 6 Shaft Pipeline	Freegold Harmony Pty Ltd
Klippan 14	RD	1	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Klippan 14	RD	2	Bambanani West, Bambanani East and Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	1	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	2	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	6	Brand 5 Main/Vent and Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd

Kongiwe Environmental (Pty) Ltd

Registration Number 2016/135562/07

Telephone: +27 (10) 140 6508, Email: info@kongiwe.com

Registered Address: 150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa

Mailing Address: PostNet Suite No 163, Private Bag X21, Bryanston, 2021, South Africa

www.kongiwe.com

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Rietpan 17	RD	0 (RE)	Freddies 6 Shaft Pipeline	Freegold Harmony Pty Ltd
Welkom 80	RD	0	Brand 3 and 1A Vent Pipeline	Freegold Harmony Pty Ltd
Harmony Farm 19	RD	0 (RE)	Harmony 5 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	92	Harmony 1 Vent and Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	30	Harmony 3 and 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	89	Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	83	Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	0 (RE)	Harmony 3 Shaft and Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Jurgens Hof 490	RD	0 (RE)	Unisel Shaft and Brand 5, Unisel, Bambanani East Connecting Pipeline	Harmony Gold Mining Co Ltd
La Riviera 289	RD	RE	Harmony 3 and 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Morijah 288	RD	0 (RE)	Merriespruit 2 Vent	Harmony Gold Mining Co Ltd
President Styen 154	RD	0 (RE)	Steyn 2 Vent and Steyn 2 Vent Pipeline	Harmony Gold Mining Co Ltd
Rustegevonden 564	RD	1	Harmony 4 Main, Harmony 4 Vent and Pipeline	Harmony Gold Mining Co Ltd
Saaiplaas 771	RD	0 (RE)	Saaiplaas 1 Vent and Saaiplaas 3 Shaft Pipeline	Harmony Gold Mining Co Ltd
Saaiplaas 771	RD	15	Saaiplaas 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Voorspoed 132	RD	3	Brand 3 Vent and Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd
Welkom 80	RD	11	Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd
Welkom 80	RD	12	Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd
Hesters-Rust 224	RD	0 (RE)	Freddies 6 Shaft Pipeline	Matjhabeng Local Municipality
Kalkuil 153	RD	2	Freddies 6 Shaft and Freddies 6 Shaft Pipeline	Matjhabeng Local Municipality
Vaalkranz 220	RD	3	Harmony 5 Vent and Harmony 5 Vent Pipeline	Mr Abraham Paulus Van Den Berg
Vaalkranz 220	RD	2	Harmony 5 Vent Pipeline	Department of Public Works and Infrastructure (DPWI)

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Voorspoed 132	RD	1	Brand 3 and 1A Vent Pipeline	City Thatch CC / Paint King
Welkom 80	RD	5	Brand 3 and 1A Vent Pipeline	City Thatch CC / Paint King
Saaipiaas 771	RD	11	Saaipiaas 1 Vent Pipeline	To be Confirmed
Harmony Farm 222	RD	97	Harmony 1 Vent Pipeline	To be Confirmed
Voorspoed 132	RD	0 (RE)	Brand 3 and 1A Vent Pipeline	To be Confirmed
Voorspoed 132	RD	4	Brand 3 and 1A Vent Pipeline	To be Confirmed

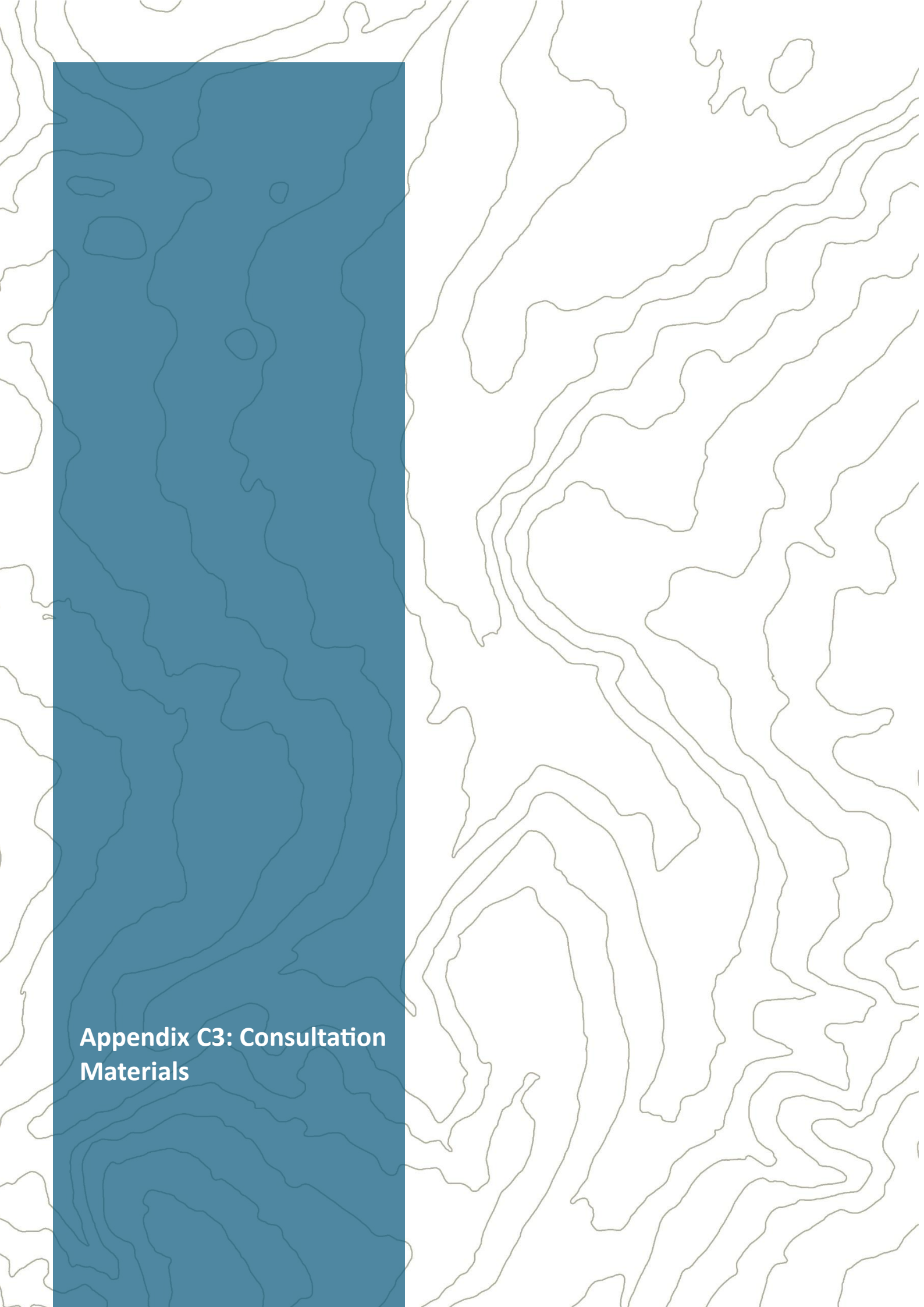
Konglwe wishes to enquire if there are any land claims on any of the farms listed above. Please could you revert to us as a matter of urgency.

Yours faithfully,



Vanessa Viljoen

Stakeholder Engagement Consultant

The background of the page is a topographic map with thin, light brown contour lines. A solid blue vertical bar runs down the left side of the page, starting from the top and extending to the bottom. The text 'Appendix C3: Consultation Materials' is located in the lower-left portion of this blue bar.

Appendix C3: Consultation Materials

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS Reference Number: WU44553

Background Information Document

Purpose of the Document

This Background Information Document (BID) aims to provide you with important information regarding:

- Project background of the proposed Harmony Gold Mining Company Limited (Harmony) Free State Defunct Shafts Backfilling Project (“the Project”);
- Water Use Licence (WUL) approval requirements;
- The Public Participation Process (PPP) that will be undertaken as part of the IWULA process.
- How you can register as an Interested and Affected Party (I&AP) and be kept informed about the Project’s developments; and
- The public review and comment period for the draft Integrated Water and Waste Management Plan Report (IWWMP).

Project Background

Harmony Gold Mining Company Limited (‘Harmony’) intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from plants and Tailings Storage Facilities (TSFs).

The proposed Harmony Free State Defunct Shafts Backfilling Project (‘Proposed Project’) aims to address the safety risks associated with open defunct shafts. It is Harmony’s intention to rehabilitate these defunct shafts, including backfilling and sealing. To achieve this, Harmony is proposing backfilling its defunct shafts, listed in **Table 1**.

Table 1: Shafts to be backfilled

Shaft	No.	Type
Harmony	1	Vent
Harmony	3	Main
Harmony	4	Main
Harmony	4	Vent
Harmony	5	Vent
Merriespruit	2	Vent
Saaiplaas	1	Vent

Shaft	No.	Type
Saaiplaas	2	Main
Saaiplaas	3	Main
Freddies	6	Main
President Steyn	2	Vent
Brand	1A	Vent
Brand	3	Vent
Brand	5	Main & Vent
Unisel		Main
Bambanani East		Main
Bambanani West		Main

Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Harmony to prepare the required documents to attain a WUL for the Project. The Harmony Defunct Shafts Backfilling Project requires an Integrated Water Use Licence (IWUL) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for Section 21 water uses before it can commence.

An Integrated Water Use Licence Application (IWULA) will be prepared and submitted in accordance with the Water Use Licence Application and Appeals Regulations 2017, published in GNR 267 on 24 March 2017. The **IWULA** will be supported by an **Integrated Water and Waste Management Plan (IWWMP)**.

Project Location

The Proposed Project is located between Virginia and Welkom, within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM) of the Free State province. Please refer to **Figure 1** for the Proposed Project local orientation.

Figure 1 shows the locations of shafts to be backfilled. The Project area extends across Wards 8, 9, 24, 32, 35 of the Matjhabeng Local Municipality. Properties in the Project area are listed in **Table 2**.

Table 2: Properties in the Project Area

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Fregul 443	RD	0 (RE)	Freddies 6 Shaft Pipeline	Freegold Harmony Pty Ltd
Klippan 14	RD	1	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Klippan 14	RD	2	Bambanani West, Bambanani East and Brand 5, Unisel, Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	1	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	2	Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Stuirmanship 92	RD	6	Brand 5 Main/Vent and Brand 5, Unisel, Bambanani East Connecting Pipeline	Freegold Harmony Pty Ltd
Rietpan 17	RD	0 (RE)	Freddies 6 Shaft Pipeline	Freegold Harmony Pty Ltd
Welkom 80	RD	0	Brand 3 and 1A Vent Pipeline	Freegold Harmony Pty Ltd
Harmony Farm 19	RD	0 (RE)	Harmony 5 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	92	Harmony 1 Vent and Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	30	Harmony 3 and 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	89	Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	83	Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Harmony Farm 222	RD	0 (RE)	Harmony 3 Shaft and Harmony 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Jurgens Hof 490	RD	0 (RE)	Unisel Shaft and Brand 5, Unisel, Bambanani East Connecting Pipeline	Harmony Gold Mining Co Ltd
La Riviera 289	RD	RE	Harmony 3 and 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Morijah 288	RD	0 (RE)	Merriespruit 2 Vent	Harmony Gold Mining Co Ltd
President Styen 154	RD	0 (RE)	Steyn 2 Vent and Steyn 2 Vent Pipeline	Harmony Gold Mining Co Ltd
Rustegevonden 564	RD	1	Harmony 4 Main, Harmony 4 Vent and Pipeline	Harmony Gold Mining Co Ltd
Saaiplaas 771	RD	0 (RE)	Saaiplaas 1 Vent and Saaiplaas 3 Shaft Pipeline	Harmony Gold Mining Co Ltd
Saaiplaas 771	RD	15	Saaiplaas 1 Vent Pipeline	Harmony Gold Mining Co Ltd
Voorspoed 132	RD	3	Brand 3 Vent and Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd
Welkom 80	RD	11	Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd

Farm Name & Number	Farm ID	Farm Portion	Infrastructure	Farm owner
Welkom 80	RD	12	Brand 3 and 1A Vent Pipeline	Harmony Gold Mining Co Ltd
Hesters-Rust 224	RD	0 (RE)	Freddies 6 Shaft Pipeline	Matjhabeng Local Municipality
Kalkuil 153	RD	2	Freddies 6 Shaft and Freddies 6 Shaft Pipeline	Matjhabeng Local Municipality
Vaalkranz 220	RD	3	Harmony 5 Vent and Harmony 5 Vent Pipeline	Mr Abraham Paulus Van Den Berg
Vaalkranz 220	RD	2	Harmony 5 Vent Pipeline	Department of Public Works and Infrastructure (DPWI)
Voorspoed 132	RD	1	Brand 3 and 1A Vent Pipeline	City Thatch CC / Paint King
Welkom 80	RD	5	Brand 3 and 1A Vent Pipeline	City Thatch CC / Paint King
Saaiplaas 771	RD	11	Saaiplaas 1 Vent Pipeline	To be Confirmed
Harmony Farm 222	RD	97	Harmony 1 Vent Pipeline	To be Confirmed
Voorspoed 132	RD	0 (RE)	Brand 3 and 1A Vent Pipeline	To be Confirmed
Voorspoed 132	RD	4	Brand 3 and 1A Vent Pipeline	To be Confirmed

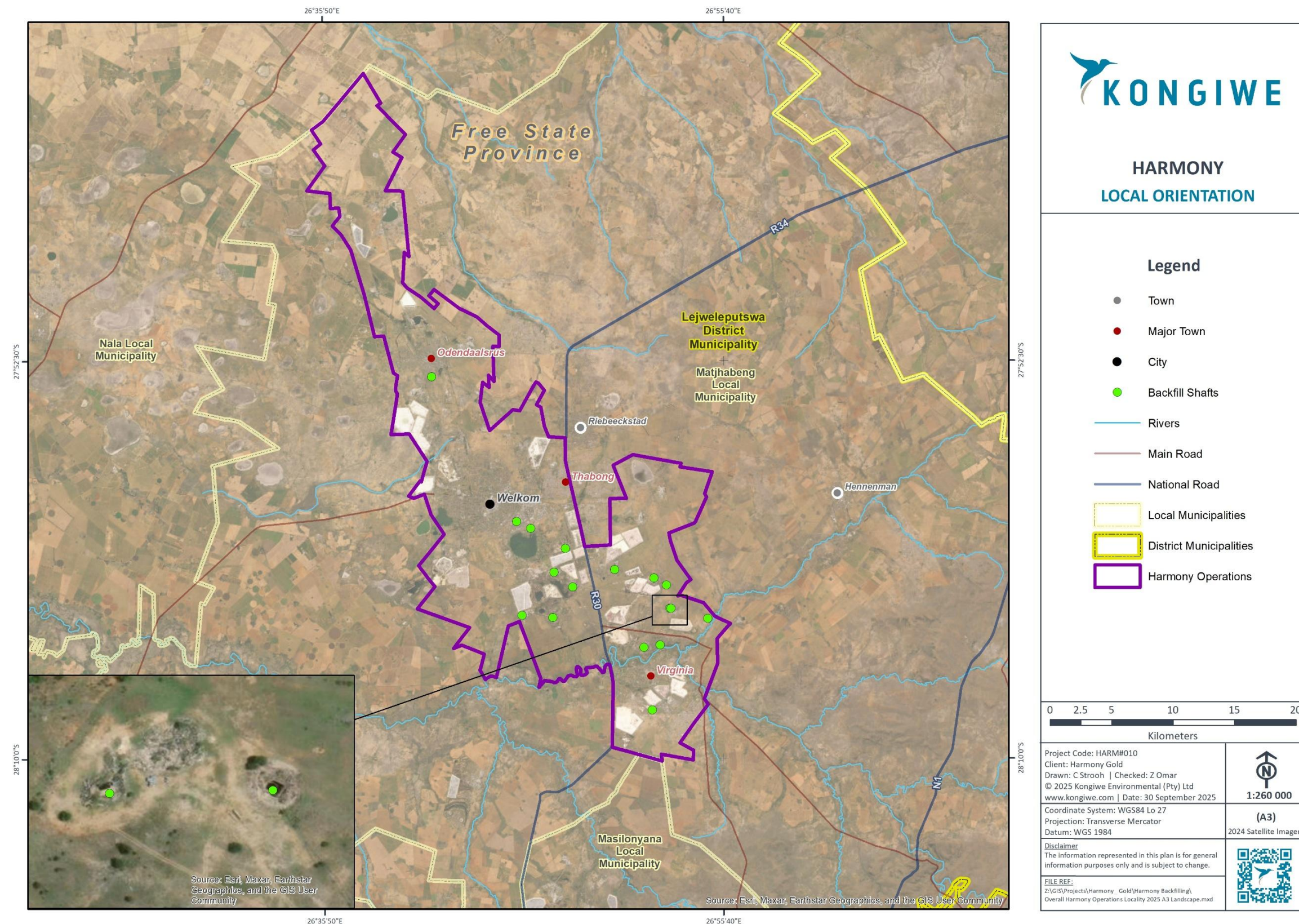


Figure 1: Locality Map

Backfilling Method

Backfilling is the proposed method for the rehabilitation of the defunct shafts for the Harmony Free State operations.

Harmony initially used rubble as their preferred backfill material. However, backfilling defunct shafts with rubble can create sparks which pose an explosion risk due to the methane concentration in the defunct operations. As a result, the shafts cannot be filled with rubble or waste rock. As an alternative backfilling measure, Harmony is now proposing the use of tailings material to backfill the defunct shafts. Tailings, in the form of slurry, will be pumped into the defunct shafts. The defunct shafts will be filled with tailings up to approximately 300m below surface, after which they will be topped off with rubble to minimise impacts on water resources. The slurry will be transported via existing overland pipelines, which will be connected to new overland pipelines, transporting slurry to each specific shaft area. Once complete, the pipelines will be stripped and reused. This process therefore removes tailings from surface and subsequently eliminates safety hazards associated with open shafts.

The proposed backfilling will be carried out using both existing pipelines and newly proposed temporary connection pipelines. The new pipelines are to be constructed using 300 mm diameter steel and no plinths will be required. The proposed pipelines will be connected to existing infrastructure in areas where disturbance has already occurred. Their alignment will run adjacent to existing pipelines and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

Proposed Pipeline Routes

The proposed pipelines will be connected to existing infrastructure in areas where disturbance has already occurred. Their alignment will run adjacent to existing pipelines, and access roads where possible, thereby utilising current routes and minimising additional environmental disturbance.

Refer to **Figure 2** below for the locations of the new pipeline routes and the associated shaft areas.

Life of Operation

The anticipated duration of the total Project is 5 years. Each shaft will be backfilled within approximately 4-6 weeks. Thereafter, the pipeline which was used to backfill will be removed and reinstalled at the next backfilling shaft.

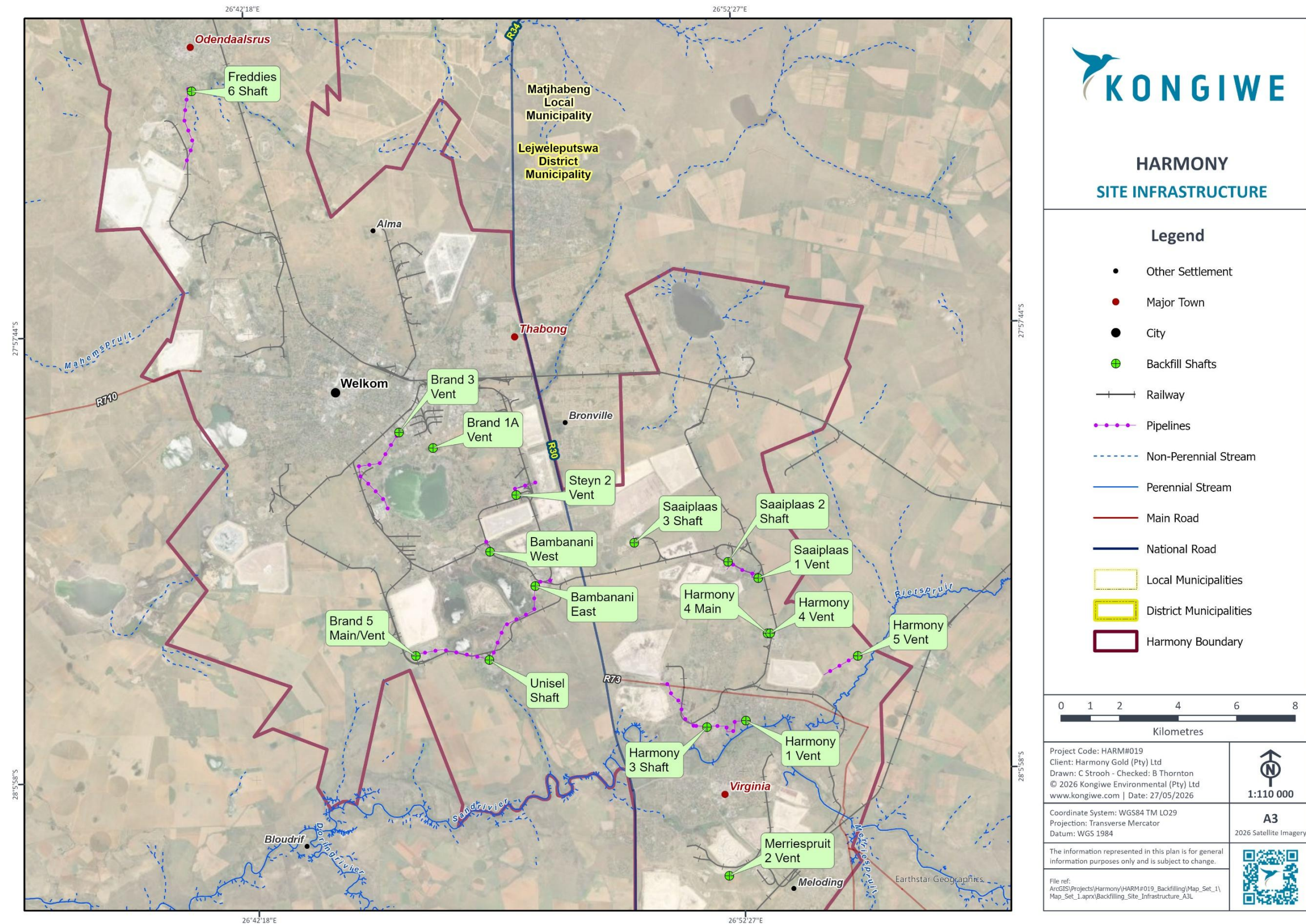


Figure 2: Location of Shafts and Pipelines

Legislative Requirements

An IWULA, in accordance with the Water Use Licence Application and Appeals Regulations 2017, must be submitted to the DWS to get a WUL for water use activities in terms of the National Water Act (NWA).

POPIA Disclaimer: Safeguarding Registered Person's Personal Information

In terms of Section 19 of the Protection of Personal Information Act (POPIA), a responsible party must, subject to Sections 9 and 11 of the Act, ensure the integrity and confidentiality of personal information in its possession or under its control by taking appropriate, reasonable technical and organisational measures to prevent loss of, damage to or unauthorised destruction of personal information, unlawful access to or processing of personal information. POPIA requires that personal information should be adequately protected to avoid unauthorised access. Therefore, Kongiwe continuously reviews security controls and procedures to ensure that personal information is secured. It should be noted that in terms of Section 11, personal information may be processed to the extent that this is necessary for pursuing the legitimate interests of the responsible party to whom the information is supplied.

IWULA Process

The steps involved in the IWULA process are outlined in **Figure 3**.

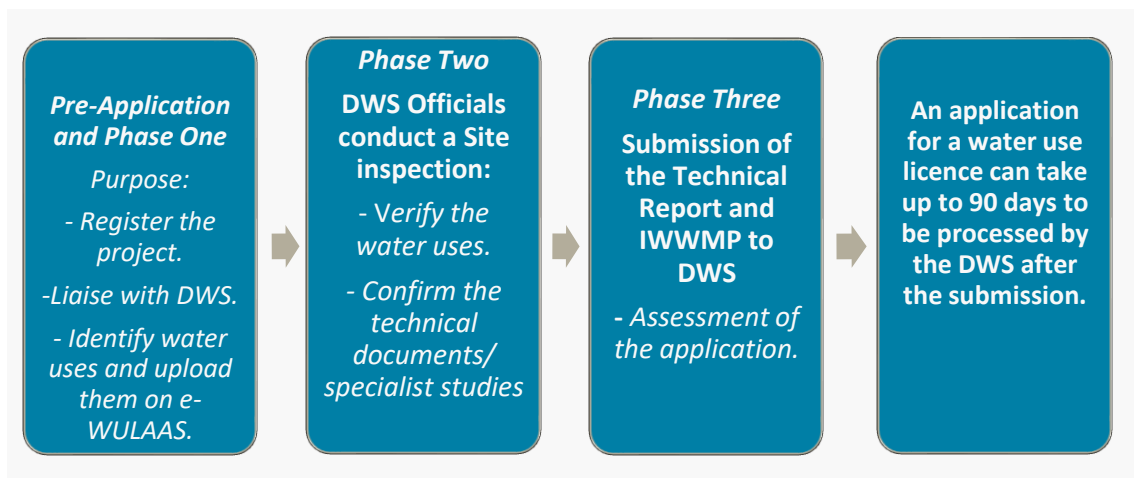


Figure 3: IWULA Process

Specialist Studies

Specialist studies that will be submitted to support the IWULA are listed below:

- Groundwater Impact Assessment.
- Wetland Impact Assessment

The findings of the specialist studies will be incorporated into the IWWMP.

Public Participation Process

The Public Participation Process (PPP) forms part of the IWULA process. The PPP offers stakeholders an opportunity to be informed about the proposed Project, to raise issues and to make suggestions for enhanced Project benefits. It also outlines the ways in which the Project team will communicate with stakeholders.

The PPP has been developed to ensure compliance with the relevant legislation and facilitate meaningful stakeholder engagement for the IWULA process. The Project team will consider relevant issues and suggestions during the IWULA Process. The issues will be addressed by the Project team, and all comments received and responses provided will be captured in the Comments and Responses Report (CRR) which will be submitted as part of the IWULA, for the DWS' consideration.

Availability of the Draft IWWMP for Public Review and Comment

The **draft IWWMP** will be made available for public review and comment for 60 days, from **Wednesday, 10 June 2026 to Tuesday, 11 August 2026**.

A notification of the availability of the **draft IWWMP** for public review and comment has been distributed on **Tuesday, 2 June 2026** to all stakeholders on the database.

The **draft IWWMP** will be made available as follows:

- An electronic copy on Kongiwe's website: <https://kongiwe.com/projects/>
- A hard copy at the Welkom Library and Virginia Library. Contact details are shown in **Table 3**.

Table 3: Libraries with Hard Copies of the Draft IWWMP

Location	Physical Address	Contact Person
Welkom Library	Cnr Tulbagh and Graaf Str, Welkom.	Mr Isaac Mokati, Librarian (071) 841 9758 Open: 09:00 Close: 17:00
Virginia Library	47 Virginia Gardens, Virginia.	Ms Lungile Maphanga, Librarian (072) 265 3786 Open: 09:00 Close: 16:30

Stakeholder Engagement Meetings

Consultation meetings will be held using platforms like Microsoft Teams (Online Meeting) and an Open Day. The purpose of these meetings is to discuss the Proposed Project and the contents of the **draft IWWMP**, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise comments and interact with the Project team.

Table 4 provides details of the proposed stakeholder meetings. Please confirm your attendance for the meeting.

Table 4 1: Schedule of Stakeholder Meetings

Proposed Dates	Available Time Slots	Method of Engagement
Online Meeting		
Wednesday, 1 July 2026	10H00 – 11H00	Microsoft Teams
In-Person Meeting: Open Day		
Saturday, 4 July 2026	11H00 – 13H00	Ferdi Meyer Hall Stateway & Tulbagh St, Welkom Central, Welkom

Invitation to be Involved as a Stakeholder

Kongiwe has put measures in place to ensure that all stakeholders are meaningfully consulted by using a wide range of media, documents and online tools. The proposed methods of engagement for the proposed Project are planned as follows:

- Telephonic consultations.
- Short Message Services (SMSs).
- Email correspondence:
 - Stakeholders with access to email are requested to send their comments/queries via email.
 - Stakeholders can email their Registration and Comment Form (included in this BID).
- Online engagements:
 - Project information will be timeously uploaded on Kongiwe's website.
 - Online Microsoft Teams meetings.
- In-person Engagements:
 - One-on-One consultation meetings.
 - Open Day.

The purpose of the above-mentioned methods of engagement is to encourage dialogue with stakeholders and provide stakeholders with opportunities to raise their comments. Minutes from all engagements with stakeholders will be compiled and recorded in the Comments and Responses Report (CRR). Stakeholders are encouraged to indicate their preferred method of engagement to the stakeholder engagement team. Please see the team's contact details below under **Comments and Queries**.

For consultation to be inclusive, it is the responsibility of stakeholders to:

- Register or ensure you are registered as an Interested and Affected Party (I&AP).
 - Inform others whom you think may be interested and/or affected by the Project.
 - Provide comments on the Project.
 - Ensure comments are submitted within the allowed timeframes received by the Stakeholder Engagement office.
 - Contribute information and/or knowledge of the environment.
- Attend meetings scheduled throughout the process to participate and access information.

Comments and Queries

Any person affected by or who may be interested in the proposed Project is asked to register as an I&AP. Should you have any comments/queries, please contact the stakeholder engagement team.

Contact Details

Ms Vanessa Viljoen	+27 (10) 140 1725	stakeholders@kongiwe.com
Jean-Mari Williams	+27 (10) 140 1726	stakeholders@kongiwe.com

**Our team welcomes your participation and looks forward
to your involvement throughout this process**

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS reference number: WU44553

Stakeholder Registration and Comment Form

Please return a completed registration form to the Stakeholder Engagement Team:

Ms Vanessa Viljoen - Phone: (010) 140 1725 / Ms Jean-Mari Williams - Phone (010) 140 1726
or E-mail: stakeholders@kongiwe.com

Postal Address: PostNet Suite No 163, Private Bag X21, Bryanston, 2021

I intend attending the stakeholders' meeting (Please indicate your preference)

Please provide your complete contact details:

Landowner	Property					
Land Occupier	Property			Property Owner		
Title	Mr	Mrs	Ms	Dr	Prof	Other
First Name						
Surname						
Organisation						
Position in Organisation						
Contact Details	Cell				Tel	
Email Address						
Postal Address						
Please indicate your preferred method of communication	Email	☐	SMS	☐	Post	☐

Meeting Dates	Available Time Slots	Method of Engagement	Yes	No
Virtual Meeting				
Wednesday, 1 July 2026	10H00 - 11H00	Microsoft Teams	Yes	No
Live Meeting: Open Day				
Please indicate which time slot you would like to participate in:				
Saturday, 4 July 2026	11H00 - 13H00	Ferdi Meyer Hall Stateway & Tulbagh St, Welkom Central, Welkom	Yes	No

Do you have any comments/suggestions regarding the proposed project? If so, please complete the section below/ send your comments to the stakeholder engagement team (please see details above).

Comments / Suggestions							
Please provide contact details of any other stakeholders we should consult:							
Title	Mr	Mrs	Ms	Dr	Prof	Other	
First Name							
Surname							
Organisation/ Property / Business							
Cell Phone							
Email							
Title	Mr	Mrs	Ms	Dr	Prof	Other	
First Name							
Surname							
Organisation/ Farm / Business							
Cell Phone							
Email							

Please note that the information supplied herein constitutes Personal Information as contemplated in Protection of Personal Information Act, 2013 (POPIA). All your rights as set out in the Act will continue to be protected and Kongiwe will be accountable to ensure that all conditions for lawful processing are met. Your signature will be regarded as granting consent for the processing of the information strictly in accordance with the provisions of the Act. It must be noted that POPIA does not prevent any private body from exercising or performing its powers, duties and functions in terms of the law and accordingly the EAP and any appellant may perform its duties under the National Appeal Regulations provided the processing is in accordance with POPIA and meets the requirements of the National Appeal Regulations.

Signature		Date	
-----------	--	------	--

The background of the page is a topographic map with thin, light brown contour lines. A solid blue vertical bar runs down the left side of the page, starting from the top and extending to the bottom. The text is located in the lower-left portion of this blue bar.

Appendix C4: Newspaper Advertisement



Take hands to spread warmth to those in need

The Riebeeckstad Methodist Church, under Reverend Sanda Ncama, in collaboration with Park Wholesalers in Welkom, has undertaken its annual winter initiative for those in need. The partnership, spanning 14 years, provides soup, bread, fruit and clothing every May. The event is held at the Riebeeckstad Police Station, where job seekers gather. The drive benefited 89 people. Methodist Church mission convener Ella Motseke expressed gratitude to all sponsors and church members, as well as to Brig. Disebo Cezula, the station commander of Welkom, for allowing the use of police premises. This year, Dirk Kotze (fourth from the right, back) of the Riebeeckstad Community Policing Forum (CPF) joined the initiative with a substantial contribution.

Change is called for

A provincial multi-party joint oversight committee has exposed serious governance and financial failures across several Free State municipalities.

This has prompted the DA to call for immediate administrative intervention and stronger accountability measures to address and alleviate the stresses the municipalities and residents are faced with.

The inquiry's findings focused primarily on the Matjhabeng and Nala local municipalities, both of which are under varying degrees of provincial oversight due to persistent failures in financial management and service delivery.

The Matjhabeng Local Municipality emerged as the most troubled of the two, with the committee finding that it had failed to comply with a mandatory financial recovery plan.

The municipality has reportedly adopted unfunded budgets, ignored legally binding directives, and provided incomplete reporting to council structures.

The financial position is severe. The amount of total debt has risen to R18.8 billion, whilst expenditure on infrastructure maintenance stands at just 1.2% of the budget - a figure the DA described as "catastrophic."

Water and electricity losses within the municipality are reported to be at critical levels, with residents bearing the consequences of prolonged service delivery failures.

The DA has called for the removal of the executive mayor for Matjhabeng and member of the ANC, Cllr Thanduxolo Khalipa, citing a pattern of non-compliance and inadequate leadership response to the municipality's deteriorating condition.

The party is also advocating for the appointment of an independent administrator to stabilise operations.

The Nala Local Municipality, also under provincial intervention, has shown some improvement but remains financially precarious.

The municipality's revenue collection rate sits at 40%, and creditor liabilities have grown to R1.6 billion.

The committee noted that consequence management efforts at Nala have been hampered by council disputes and legal challenges, while several critical posts remain vacant.

The municipality's continued reliance on external service providers has added further strain to an already constrained budget.

The DA, whose party members participated in the oversight committee, has urged the Free State Provincial Legislature to enforce stricter accountability measures across all underperforming municipalities.

"The people of the Free State deserve transparent, competent, and service-driven local government," the party said in a statement following the inquiry.

The committee's findings are expected to inform recommendations to the provincial executive regarding the future of both municipalities' oversight arrangements.

NOTICE OF APPLICATION FOR ENVIRONMENTAL AUTHORIZATION FOR A MINING PERMIT DMPR REFERENCE NO: FS 30/5/1/3/2/ 10470 MP.

Notice is hereby given in terms of Regulation 41 of Government Notice No. R326 under the National Environmental Management Act (Act 107 of 1998) as amended 7 April 2017, Mineral and Petroleum Development Act 28 Of 2002 as amended of intent to carry out the following listed activities:

NEMA: LISTING NOTICE 1 (NO. 327, 07 APRIL 2017)

GNR 327	21	Any activity including the operation of that activity which requires a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). The primary objective of the project is to mine aggregate, gravel and sand (gravel) activities. This application aligns with the regulatory requirements for mining permits as stipulated in the Act.
GNR 327	27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation. The proposed project will physically clear an approximately 1 ha of indigenous vegetation.
GNR 327	14	The development and related operation of facilities or infrastructure, for the storage or storage and handling, of a dangerous goods, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters. The proposed mining activities will entail the storage of diesel but not exceeding 80 cubic meters.

Applicant: Forum SA Trading 124 (Pty) Ltd
Location: Portion of portion 0 of the Farm Blomskraal No.:216 in the magisterial district of Lejweleputswa, Free State Province.
Consultant: Geodial Holdings (Pty) Ltd
Address: Regus Business Centre, Vodacom Lane, Nobel Street, Brandwag, 9301
Contact No: 074 441 8860 / 066 381 7215
Email Address: admin@geodial.co.za / geodialholdings@gmail.com

To be identified as the interested and affected parties (I&APs) you are hereby invited to submit your names, contact information, and interest in the matter to the consultant given above. The thirty days as stipulated by NEMA will be allowed to receive your comments/interest which will lapse on the 30th day of June 2026.

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS Reference Number: WU44553

Applicant: Harmony Gold Mining Company Limited
Project Name: Integrated Water Use Licence Application (IWULA) for the Harmony Free State Defunct Shafts Backfilling Project

Harmony Gold Mining Company Limited ('Harmony') intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from processing plants and Tailings Storage Facilities (TSFs). The proposed Harmony Free State Defunct Shafts Backfilling Project ('Proposed Project') aims to address the safety risks associated with open defunct shafts. It is Harmony's intention to rehabilitate these defunct shafts, including backfilling and sealing. The Proposed Project is located between Virginia and Welkom, within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM) of the Free State province.

Kongiwe Environmental (Pty) Ltd (hereafter Kongiwe) has been appointed by Harmony to undertake an Integrated Water Use Licence Application (IWULA) for the Proposed Project. The Proposed Project requires a Water Use Licence (WUL) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for Section 21 water uses before it can commence. An IWULA will be prepared and submitted in accordance with the Water Use Licence Application and Appeals Regulations 2017, published in GNR 267 on 24 March 2017. The IWULA will be supported by an Integrated Water and Waste Management Plan (IWWMP).

Availability of the Draft IWWMP Report for Public Review and Comment: The draft IWWMP for the Project will be made available for public review and comment for 60 days, from Wednesday, 10 June 2026 to Tuesday, 11 August 2026.

The draft IWWMP will be made available on Kongiwe's website <https://kongiwe.com/projects/>, and an electronic copy will be made available upon request.

Hard copies of the Draft IWWMP will be made available at the Welkom Library (Cnr Tulbagh and Graaf Str, Welkom – Contact: Mr Isaac Mokati, Librarian - (071) 841 9758) and Virginia Library (47 Virginia Gardens, Virginia – Contact: Ms Lungile Maphanga, Librarian - (072) 265 3786).

Stakeholder Meetings: Consultation meetings will be held using platforms like Microsoft Teams (Online Meeting) and an Open Day. The purpose of these meetings is to discuss the Proposed Project and the contents of the draft IWWMP, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise comments and interact with the project team.

Please see below the proposed stakeholder meeting details:

Proposed dates	Available time slots	Method of Engagement/Venue
Online Meeting		
Wednesday, 1 July 2026	10H00 – 11H00	Microsoft Teams
In-Person Meeting: Open Day		
Saturday, 4 July 2026	11H00 – 13H00	Ferdi Meyer Hall, Stateway & Tulbagh St, Welkom Central, Welkom

To register as an I&AP please contact: Kongiwe Environmental Stakeholder Engagement Team
Ms Vanessa Viljoen - Phone: (010) 140 1725 / Ms Jean-Mari Williams - Phone (010) 140 1726
or E-mail: stakeholders@kongiwe.com



Our team welcomes your participation and looks forward to your involvement throughout this process.

TAKE NOTE OF OFFICIALS

Legitimate environmental health practitioners employed by the Lejweleputswa District Municipality carry official municipal identification cards, wear official municipal identification where applicable, and properly introduce themselves upon arrival at premises.

They conduct inspections in accordance with applicable legislation and municipal procedures and will never demand bribes, cash payments, or personal favours in exchange for compliance approvals or inspection outcomes.

Food business operators and members of the public are advised to always request official municipal identification before allowing any inspection to proceed. For verification of officials or to report suspicious activities, contact the Lejweleputswa District Municipality Environmental Health Services Section during office hours on 057 391 8912.



VEILING

IN DIE HOËHOF VAN SUID AFRIKA VRYSTAAT AFDELING, BLOEMFONTEIN

SAAK NR: 6884/2024

In die saak tussen:

ABSA BANK BEPERK EISER
(REGISTRASIE NOMMER: 1986/004794/06)
en
HUNADI MARIA DE ANDRADE N.O.
1ST VERWEERDER
(IDENTITEITSNOMMER: 830504 0300 084)
(In sy hoedanigheid as Eksekuteur in die boedel van wyle **PEDRO RAFAEL DE ANDRADE** met Identiteitsnommer: 700612 6091 180 en Estate nommer: 005654/2023)
MANGAUJ METROPOLITAN MUNISIPALITEIT
2^{DE} VERWEERDER
DIE MEESTER VAN DIE HOËHOF,
POLOKWANE
3^{DE} VERWEERDER

KENNISGEWING VAN GEREGETELIKE VERKOPING
Ten uitvoering van 'n vonnis van die **HOËHOF BLOEMFONTEIN**, sal 'n verkoping van die volgende eiendom van bogenoemde Verweerder plaasvind deur die **BALJU VAN WELKOM**, te **DIE BALJU KANTORE, STATEWAY 366, DOORN, WELKOM** om **11H00** op **WOENSDAG DIE 17DE DAG VAN JUNIE 2026** naamlik:

EIENDOMSBEKRYWING:
SEKERE: ERF 2689 WELKOM, EXTENSION 3, DISTRICT WELKOM, PROVINSIE VRYSTAAT;
GROOT: 833 (AGT DRIE DRIE) VIERKANTE METER;
GEHOU: KRAGTENS AKTE VAN TRANSPORT NO T18281/2007;
ONDERWORPE AND DIE VOORWAARDES DAARIN BEVAT EN IN DIE BESONDERE MATE AAN DIE VOORBEHOUD VAN DIE REGTE VAN MINERALE;

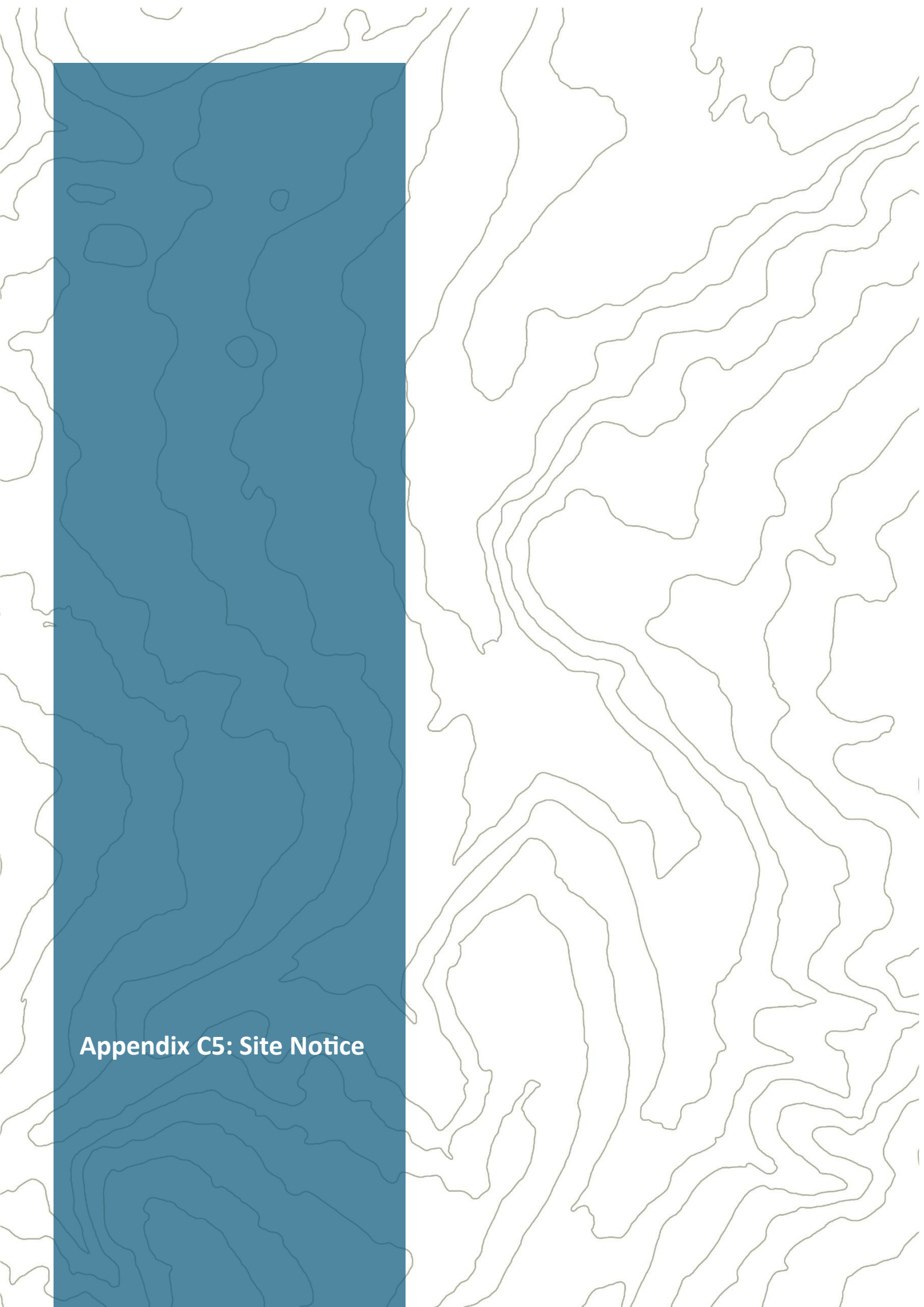
REG AFD: WELKOM RD;
GELEË TE: 113 LONG STRAAT, BEDELIA, WELKOM, PROVINSIE VRYSTAAT;
Die volgende inligting word verstrek maar in hierdie opsig word niks gewaarborg nie.
Sonering vir woon doeleindes en bestaan uit die volgende verbeterings:
1 SITKAMER; 1 BADKAMER; 3 SLAAPKAMERS; 1 KOMBUIS;
BUITEGEBOU: 1 MOTORHUIS; 1 APARTE TOILET;
TERME: Die koper sal 10% van die koopprijs in kontant aan die Balju betaal onmiddellik na die verkoping. Die balans moet verseker word deur 'n bank- of bougenootskapwaarborg wat binne EEN EN TWINTIG (21) dae na die datum van verkoping aan die Balju gelewer moet word. Indien die eiendom deur die eerste verbandhouer gekoop word, hoef die 10% kontantbetaling nie gemaak te word nie.

NEEM VERDER KENNIS:
1. Hierdie is 'n verkoping in eksekusie kragtens 'n Vonnis bekom in die Hoë Hof;
2. Registrasie as koper is 'n vereiste onderworpe aan bepaalde voorwaardes naamlik:
3. Voorskrifte van die **VERBRUIKERSBESKERMINGSWET 68 VAN 2008;**
([URLhttp://www.ikfn.gov.za/view/DownloadFileAction?id=99961](http://www.ikfn.gov.za/view/DownloadFileAction?id=99961))
3.1 Fica wetgewing met betrekking tot identiteit en adresbesonderhede;
3.2 Betaling van registrasiegede;
3.3 Registrasievoorwaardes;
3.4 Verkoping sal geskied deur die kantoor van die Balju, **WELKOM, MET AFSLAER CLAYTON PETER BROWN;**
3.5 Advertensiegeld teen heersende publikasietariewe en verkopingskoste volgens Hofreëls,geld.
4. Die volle en volledige verkoopsvoorwaardes sal net voor die verkoping deur die balju uitgelees word en lê ter insae by die kantoor van die **BALJU VAN WELKOM, TE DIE BALJU KANTORE, STATEWAY 366, DOORN WELKOM;** of by die eksekusie-skuldeiser se prokureurs en kan tydens kantoorure besigtig word.

GETEKEN te BLOEMFONTEIN op hierdie dag van APRIL 2026.

BALJU-VRYSTAAT HOË HOF WELKOM
TEL No 057 396 2881/2

M MYNHARDT PROKUREUR VIR EISER
EG COOPER MAJIEDT ING. DERDELAAN 17 WESTDENE BLOEMFONTEIN
VERW: MM/TVL/BK3358

The background of the page is a topographic map with thin, light brown contour lines. A solid blue vertical band runs down the left side of the page, starting from the top and extending to the bottom. The text 'Appendix C5: Site Notice' is located within this blue band, positioned in the lower half of the page.

Appendix C5: Site Notice

Integrated Water Use Licence Application for the Harmony Free State
Defunct Shafts Backfilling Project, Free State Province
DWS Reference Number: WU44553

Harmony Gold Mining Company Limited ('Harmony') intends to close its defunct mine shafts in the Free State region. The proposed method of closing these shafts is backfilling them with tailings material from processing plants and Tailings Storage Facilities (TSFs). The proposed Harmony Free State Defunct Shafts Backfilling Project ('Proposed Project') aims to address the safety risks associated with open defunct shafts. It is Harmony's intention to rehabilitate these defunct shafts, including backfilling and sealing them. The Proposed Project is located between Virginia and Welkom, within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM) of the Free State province, as shown in Figure 1.

Kongiwe Environmental (Pty) Ltd (Kongiwe') has been appointed by Harmony to undertake an Integrated Water Use Licence Application (IWULA) for the Proposed Project. The Proposed Project requires a Water Use Licence (WUL) in terms of the National Water Act (Act No. 36 of 1998) (NWA) for Section 21 water uses before it can commence. An IWULA is being prepared and will be submitted in accordance with the Water Use Licence Application and Appeals Regulations 2017, published in GNR 267 on 24 March 2017. The IWULA will be supported by an Integrated Water and Waste Management Plan (IWWMP).

Availability of the Draft IWWMP Report for Public Review and Comment:

The draft IWWMP for the Project will be made available for public review and comment for 60 days, from **Wednesday, 10 June 2026 to Tuesday, 11 August 2026**.

The draft IWWMP will be made available on Kongiwe's website <https://kongiwe.com/projects/>, and an electronic copy will be made available upon request.

Hard copies of the draft IWWMP will be made available at the **Welkom Library** (Cnr Tulbagh and Graaf Str, Welkom – Contact: Mr Isaac Mokati, Librarian - (071) 841 9758) and **Virginia Library** (47 Virginia Gardens, Virginia – Contact: Ms Lungile Maphanga, Librarian - (072) 265 3786).

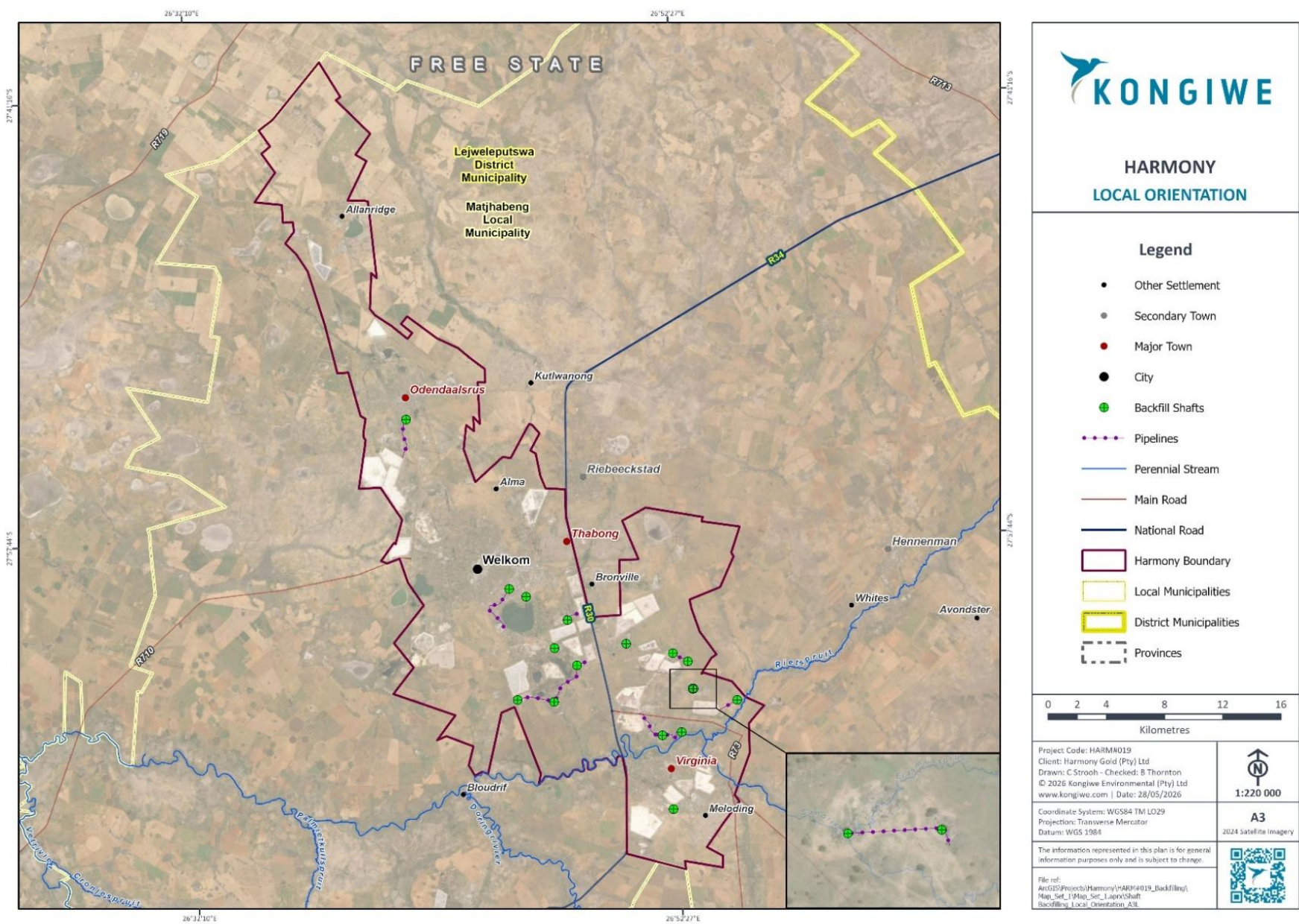
Stakeholder Meetings:

Consultation meetings will be held using platforms like Microsoft Teams (Online Meeting) and an in-person Open Day. The purpose of these meetings is to discuss the Proposed Project and the contents of the draft IWWMP, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise comments and interact with the project team. Please see below the proposed stakeholder meeting details:

Proposed Dates	Available Time Slots	Method of Engagement
Online Meeting		
Wednesday, 1 July 2026	10H00 – 11H00	Microsoft Teams
In-Person Meeting: Open Day		
Saturday, 4 July 2026	11H00 – 13H00	In-person, at Ferdi Meyer Hall, Stateway & Tulbagh St, Welkom Central, Welkom

To register as an I&AP please contact the Kongiwe Stakeholder Engagement Team:
Ms Vanessa Viljoen - Phone: (010) 140 1725 / Ms Jean-Mari Williams - Phone (010) 140 1726
E-mail: stakeholders@kongiwe.com

Our team welcomes your participation and looks forward to your involvement throughout this process.



The background of the page is a topographic map with thin, light gray contour lines. A solid blue vertical bar runs down the left side of the page, starting from the top and extending to the bottom. The text 'Appendix C6: Correspondence' is located in the lower-left corner, within the blue bar.

Appendix C6: Correspondence

Jean-Mari Williams

From: Kongiwe Stakeholder Engagement

Sent: 2026/06/02 12:09:43

To: Jean-Mari Williams; Phumla Mngwengwe

CC: Vanessa Viljoen

Subject: Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

Dear Stakeholder

Kongiwe Environmental (Pty) Ltd hereby gives notice that the **draft Integrated Water and Waste Management Plan (IWWMP)** for the proposed Harmony Gold Mining Company Limited (Harmony) Free State Defunct Shafts Backfilling Project (the 'Project'), will be made available for public review and comment.

Availability of the Draft IWWMP for Public Review and Comment:

The **draft IWWMP** will be made available for public review and comment for 60 days, from **Wednesday, 10 June 2026 to Tuesday, 11 August 2026**.

The Draft IWWMP will be Available as Follows:

- An electronic copy on Kongiwe's website: <https://kongiwe.com/projects/>.
- A hard copy at the Welkom Library and Virginia Library.

Invitation to Online Meeting:

Interested and Affected Parties (I&APS) are invited to attend an **Online Meeting and/or Open Day** as per the table below:

Proposed Dates	Available Time Slots	Method of Engagement
Online Meeting		
Wednesday, 1 July 2026	10H00 – 11H00	Microsoft Teams
In-Person Meeting: Open Day		
Saturday, 4 July 2026	11H00 – 13H00	In person, at Ferdi Meyer Hall Stateway & Tulbagh St, Welkom Central, Welkom

The purpose of the meeting is to discuss the Project and the contents of the **draft IWWMP**, and to provide I&APS with the opportunity to raise their comments and to interact with the Project Team.

Please do not hesitate to contact us if you have any queries.

Kind Regards,



Stakeholder Engagement Team | Kongiwe Environmental (Pty) Ltd.

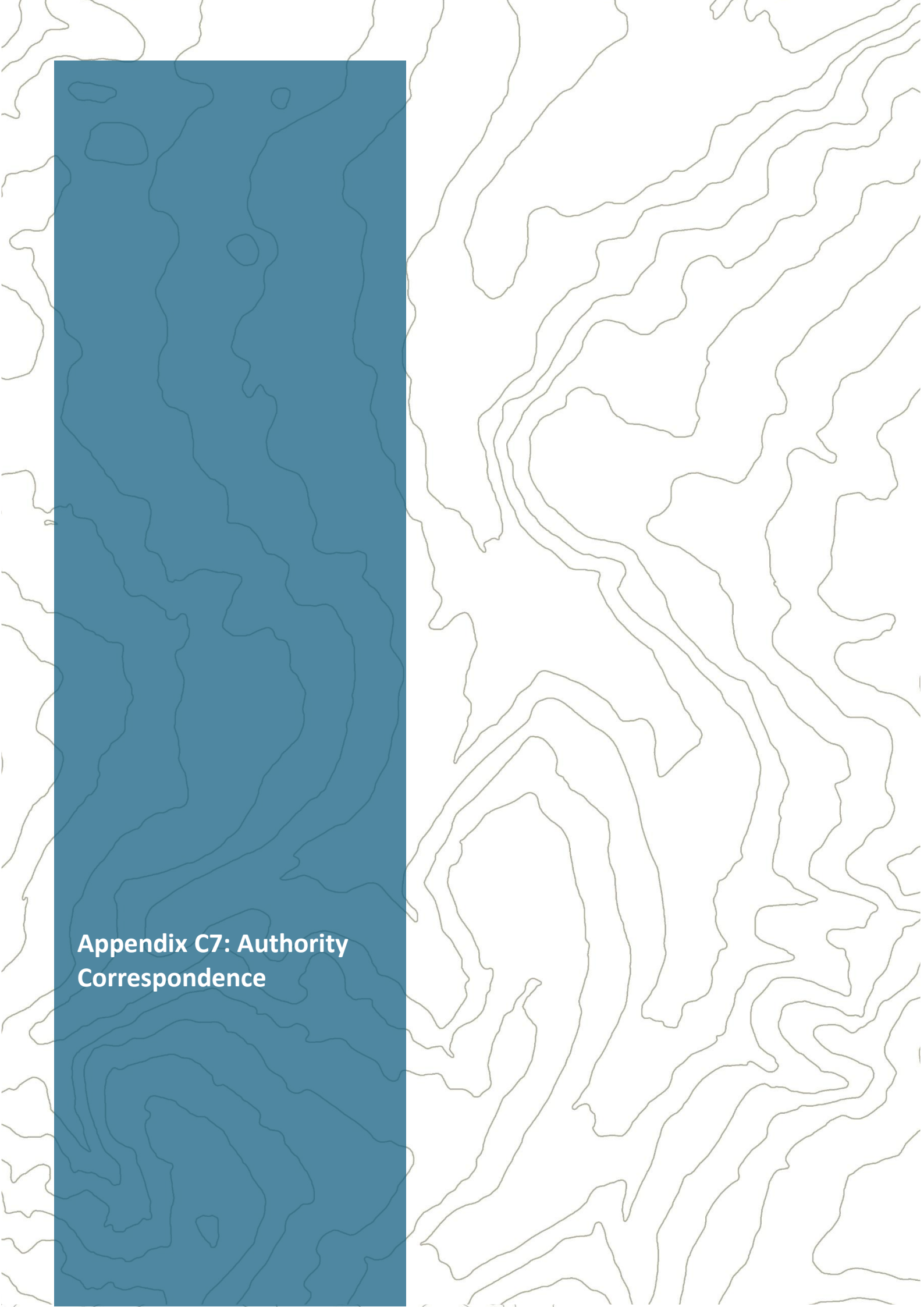
Tel: +27 (10) 140 1725 | Email: stakeholders@kongiwe.com

150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa.

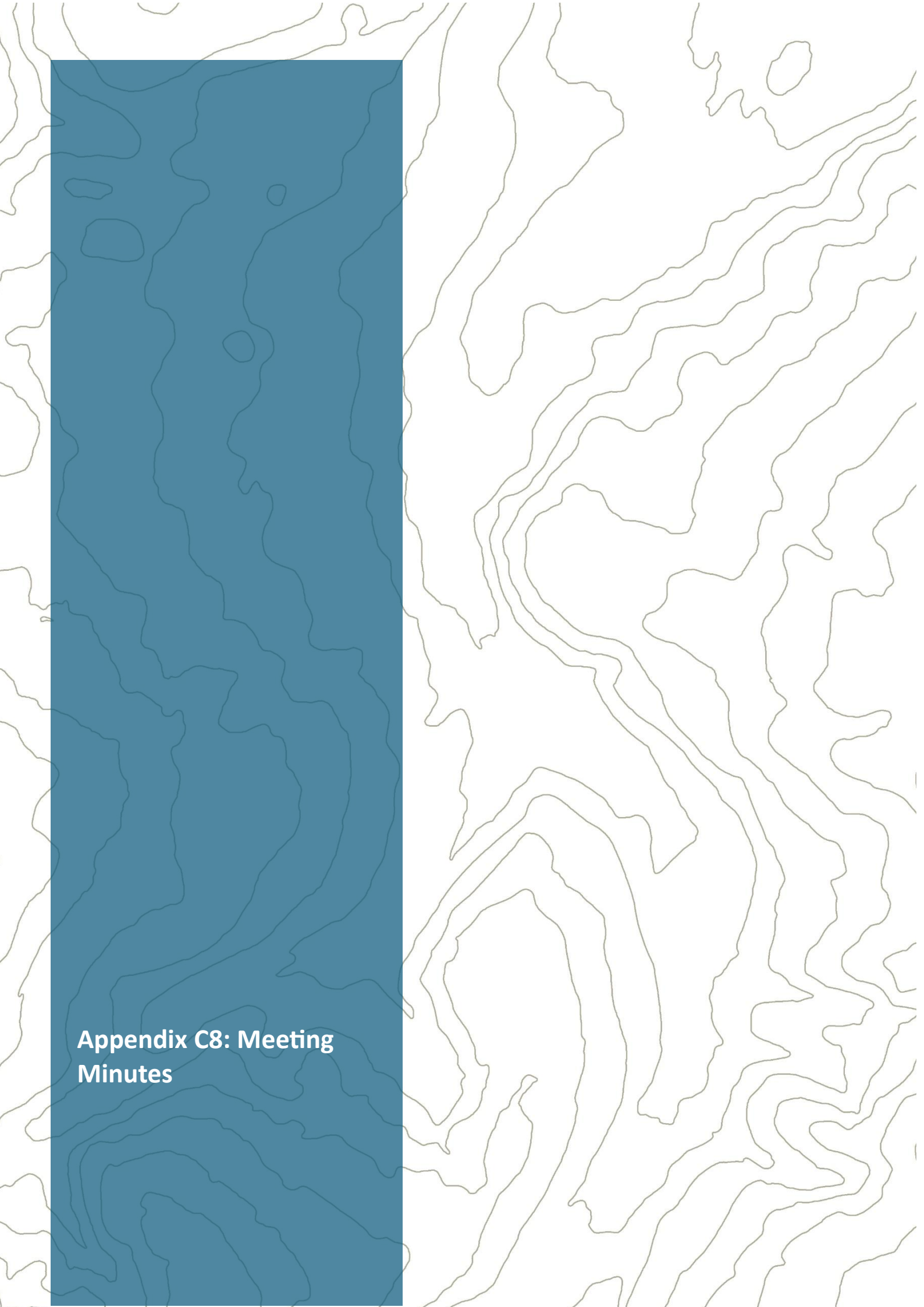
PostNet Suite no 163, Private Bag X21, Bryanston, 2021, South Africa.

www.kongiwe.com

Disclaimer: The provisions of Section 11 of the Electronic Communications and Transactions Act 25 of 2002 apply to this email notice and make it enforceable and binding on the recipient(s) to whom it is addressed. This email message (including attachments) contains information which may be confidential and/or legally privileged. Unless you are the intended recipient, you may not use, copy or disclose to anyone the message or any information contained in the message or from any attachments that were sent with this email, and if you have received this email message in error, please advise the sender by email, and delete the message. Unauthorised disclosure and/or use of information contained in this email may result in civil and criminal liability. Everything in this e-mail and attachments relating to the official business of Kongiwe Environmental (Pty) Ltd is proprietary to the company. Caution should be observed in placing any reliance upon any information contained in this e-mail, which is not intended to be a representation or inducement to make any decision in relation to Kongiwe Environmental (Pty) Ltd. Any decision taken based on the information provided in this e-mail, should only be made after consultation with appropriate legal, regulatory, tax, technical, business, investment, financial, and accounting advisors. The e-mail address of the sender may not be used, copied, sold, disclosed or incorporated into any database or mailing list for spamming and/or other marketing purposes without the prior consent of Kongiwe Environmental (Pty) Ltd. Unless the intention to contract has been expressed in this message, this message cannot be regarded as a solicitation to contract, nor be seen as an offer or acceptance of contractual agreement. Neither the sender of the e-mail, nor Kongiwe Environmental (Pty) Ltd shall be liable to any party for any direct, indirect or consequential damages, including, without limitation, loss of profit, interruption of business or loss of information, data or software or otherwise. No warranties are created or implied that an employee of Kongiwe Environmental (Pty) Ltd under a contract of Kongiwe Environmental (Pty) Ltd is authorised to create and send this e-mail.

The background of the page is a topographic map with thin, light gray contour lines. A solid blue vertical band runs along the left side of the page, starting from the top and extending to the bottom. The text 'Appendix C7: Authority Correspondence' is located within this blue band, positioned in the lower half of the page.

Appendix C7: Authority Correspondence



Appendix C8: Meeting Minutes

Integrated Water Use Licence Application for the Harmony Free State Defunct Shafts Backfilling Project, Free State Province

DWS Reference Number: WU44553

Stakeholder Meeting Schedule – Draft IWWMP

Date of the meeting	Time	Meeting Type / Format	Organisation / Address	Invited / Attended / Apologies	Resources Used	Who Presented (EAP / Harmony)	Project Team Attendance (Harmony and Kongiwe)
Friday, 1 August 2025	10H00 – 11H30	Pre-Application Online Meeting (Microsoft Teams)	Competent Authority Free State: ❖ <u>Department of Water and Sanitation (DWS)</u>	Invited: ❖ Mr Mzukisi Maneli, Environmental officer (DWS) ❖ Mr Pieter Ackerman, Chief Landscape Architect (DWS) ❖ Mr Nkhumbudzeni Mulaudzi, Specialist Scientist (DWS) ❖ Ms Lumka Nombewu, Specialist Scientist (DWS) ❖ Mr Clement Liatile Pule, Licensing Officer (DWS) ❖ Nobabalo Gaju, Production Scientist (DWS) ❖ Ms Dlamini Thembekile, Licensing Officer (DWS) ❖ Mr Terrence Ngilande, Case Officer (DWS) ❖ Mr Issac Thivhali Ramukhuba, Environmental Officer (DWS) ❖ Mr Rendani Ndou, Control Environmental Officer (DWS)	❖ Presentation ❖ Attendance Register	Ms Phumla Mngwengwe, Kongiwe	Mr John van Wyk, Environmental Manager, Harmony Ms Melani Nieuwoudt, Senior Environmental Officer, Harmony Mr Johan Le Roux, Surface Operations Manager, Harmony Mr Werner Grobbelaar, Surface Operations Manager, Harmony Mr Hilton Sparks, Project Manager, Kongiwe Ms Anela Fixi, Environmental Consultant, Kongiwe Ms Mutondwa Mushaathoni, Junior Engineer, Kongiwe

Date of the meeting	Time	Meeting Type / Format	Organisation / Address	Invited / Attended / Apologies	Resources Used	Who Presented (EAP / Harmony)	Project Team Attendance (Harmony and Kongiwe)
				Attended: ❖ Mr Mzukisi Maneli, Environmental officer (DWS) ❖ Mr Pieter Ackerman, Chief Landscape Architect (DWS) ❖ Mr Nkhumbudzeni Mulaudzi, Specialist Scientist (DWS) ❖ Ms Lumka Nombewu, Specialist Scientist (DWS) ❖ Mr Clement Liatile Pule, Licensing Officer (DWS) ❖ Nobabalo Gaju, Production Scientist (DWS) ❖ Ms Dlamini Thembekile, Licensing Officer (DWS) ❖ Mr Terrence Ngilande, Case Officer (DWS) ❖ Mr Rendani Ndou, Control Environmental Officer (DWS) ❖ Mr Issac Thivhali Ramukhuba, Environmental Officer (DWS) Apologies: None			

Integrated Water Use Licence Application for the Harmony Defunct Shafts Backfilling Project in the Lejweleputswa District Municipality, Free State Province

DWS reference number: WU44553

Meeting Minutes: Department of Water and Sanitation Pre-Application meeting

Date	Friday, 1 August 2025
Time:	10:00 AM – 11:30 AM
Meeting Platform :	Microsoft Teams Online Meeting

List of attendees:

Organisation	Name of attendee	Designation
Department of Water and Sanitation (DWS)	Mr Mzukisi Maneli	Case Officer
DWS	Ms Thembelihle Dlamini	Licensing Division
DWS	Ms Lumka Nombewu	Specialist
DWS	Mr Nkhumbudzeni Mulaudzi	Scientist
DWS	Mr Rendani Ndou	Control Environmental Officer
DWS	Mr Terrence Ngilande	Licensing Officer
DWS	Mr Pule Clement Liatile	Licensing Officer
DWS	Ms Nobabalo Gaju	Production Scientist
DWS	Mr Pieter Ackerman	Chief Landscape Architect
DWS	Mr Issac Thivhali Ramukhuba	Environmental Officer
Harmony Gold Mining Limited	Mr John van Wyk	Applicant Representative (Group Senior Environmental Manager)
Harmony Gold Mining Limited	Ms Melani Nieuwoudt	Applicant Representative (Senior Environmental Officer)
Harmony Gold Mining Limited	Mr Johan Le Roux	Applicant Representative (Surface Operations Manager)
Harmony Gold Mining Limited	Mr Werner Grobbelaar	Applicant Representative (Surface Operations Manager)
Kongiwe Environmental (Pty) Ltd	Mr Hilton Sparks	Project Manager
Kongiwe Environmental (Pty) Ltd	Ms Phumla Mngwengwe	Senior Environmental Consultant
Kongiwe Environmental (Pty) Ltd	Ms Anela Fixi	Environmental Consultant
Kongiwe Environmental (Pty) Ltd	Mutondwa Mushaathoni	Junior Engineer
Apologies		
None		

Note: *These minutes are not intended as a verbatim transcript of the meeting, but rather as a summary of the salient discussions which took place.*

1. Welcome and Introductions

- ❖ Mr Maneli greeted the attendees and provided an opportunity for all in attendance to introduce themselves.
- ❖ Ms Mngwengwe commenced with the presentation.

2. Meeting Purpose:

- ❖ Present and discuss the Proposed Harmony Backfilling Integrated Water Use Licence Application (IWULA) Project ("Proposed Project");
- ❖ Provide an overview of the IWULA Process;
- ❖ Provide the DWS officials with an opportunity to raise comments/seek clarity and provide input; and
- ❖ Record comments raised and include them in the Comments and Responses Report (CRR).

3. Meeting Agenda:

- ❖ Introductions
- ❖ Purpose of the Meeting
- ❖ Project Description
- ❖ Proposed Water Uses
- ❖ Specialist Studies
- ❖ Public Participation Process
- ❖ IWULA Process
- ❖ Comments and Discussion

4. Discussion

	COMMENT	RESPONSE
Mr Mzukisi Maneli	Mr Maneli expressed interest in the method statement of the Proposed Project, specifically seeking details on the types of structures to be implemented, and the construction approach for each. Mr Maneli requested a detailed explanation of the planned connectivity from the existing pipelines to the backfill areas. Additionally, Mr Maneli indicated that he does not yet have a clear understanding of the overall project methodology and would appreciate a more comprehensive overview.	Mr Van Wyk thanked Mr Maneli for the points raised and assured him that these matters will be addressed moving forward. He explained that a Section 55 instruction was issued to Harmony by the Department of Mineral Resources and Energy (DMRE) (now the Department of Mineral and Petroleum Resources (DMPR)), directing Harmony to close the shafts. Mr Van Wyk further explained that illegal miners have previously breached shaft caps and plugs, which is why backfilling of shafts has been identified as a necessary intervention. He emphasised that the long-term solution for ensuring safety and a sustainable mine closure is to fill the shaft collar from the bottom upwards, effectively preventing illegal access to the underground workings. He further mentioned that 80% of the material from the processing plant will be directed to the Tailings Storage Facility (TSF) itself, while the remaining 20% will be allocated for shaft backfilling purposes.
	Mr Maneli requested more information regarding long-term effects of the tailings, including any potential impacts that may arise as a result of the backfilling process. He expressed interest in understanding how the plume will be mitigated, the extent to which the material will actively seal the shafts, the total quantity of material to be used, and the specific sealing method that will be implemented.	Mr Van Wyk explained that tailing materials will be discharged into the shafts from the top and will flow downwards, filling the shaft collar and migrating into the haulages. It is estimated that the tailing materials will travel approximately 900 meters into the haulages, where it will be allowed to settle before the shaft is filled completely to the surface. Mr Van Wyk stated that the estimated volume of material required for backfilling is approximately 400,000 tons. However, this figure may vary depending on the depth of each individual shaft. He indicated that borehole monitoring points have been established and groundwater quality will be regularly monitored to assess both

	COMMENT	RESPONSE
		current baseline conditions and potential impacts. Mr Van Wyk emphasised that the backfilling material will not be sourced directly from the TSF, but rather from a processing plant. The material will be transported to the shaft areas via flange or victaulic pipelines laid on the ground surface. Mr Van Wyk added that safety protocols related to this operation will be detailed in the Integrated Water and Waste Management Plan (IWWMP). Once the backfilling process is complete, the pipelines will be removed, and continuous monitoring of groundwater levels will be carried out.
	Mr Maneli stated that he was unable to gain a clear understanding from the presentation and acknowledged that the project is still in its early stages. However, he indicated that the referenced 2023 Groundwater Report should have been incorporated into the presentation. He emphasised the importance of outlining what the report entails, particularly in relation to the material content and its quality.	Mr Van Wyk clarified that the 2023 Groundwater Report focused on the chemical composition of the material, and potential impacts on groundwater including plume modelling.
Mr Pieter Ackerman	Mr Ackerman enquired about the depth of the Shafts.	Mr Van Wyk explained that the shafts are situated below 1,000 metres within the Ventersdorp Supergroup. He stated that the intention is to backfill from the bottom and up to the Ventersdorp Supergroup, while remaining below the Karoo Supergroup aquifer. He stated that waste rock or suitable building material will then be used to backfill the remaining section up to the surface to protect the Karoo aquifer from potential contamination caused by the backfilling material from entering the groundwater table. Mr Van Wyk further stated that a few shafts will initially be backfilled as a precautionary phase, during which methane levels will be closely

	COMMENT	RESPONSE
		monitored. Once it is confirmed that no methane is venting to the surface, the remaining shafts will be backfilled using material that poses no risk to groundwater.
	Mr Ackerman stated that the General Authorisation (GA) excludes pipelines carrying hazardous material. He requested that the Regional Office review this matter to ensure that it does not contradict with Harmony's existing policies or laws.	Mr Van Wyk stated that Harmony requires guidance from the DWS on this matter. He acknowledged that a GA is not applicable for activities involving hazardous substances and confirmed that the tailings material has been classified as a hazardous substance.
Mr John van Wyk	Mr Van Wyk enquired whether the short, proposed pipelines should be licensed under Section 21 (c) and (i), given that it is a temporary installation. He explained that the pipelines will be connected from the plant to the shaft for the duration of approximately four to six weeks to facilitate backfilling. Upon completion of the backfilling process, the pipelines will be removed to prevent vandalism and theft.	Mr Maneli stated that a further motivation is required for the temporary pipelines. This should include details such as the type of structure that will be installed to support the pipeline, the existing infrastructure over which structures that the pipe will be laid, and whether the pipeline will traverse deep within the wetland buffers or be located closer to the edges. Mr Maneli further noted that the DWS will conduct a site visit, which a decision will be made on whether the temporary pipelines will require licensing or not.
Mr Rendani Ndou	Mr Ndou enquired about the expected timeframe for obtaining the required Water Use Licence (WUL). He also requested that the Section 21 (g) water use related to backfilling must be included in the GN 704 Exemption Motivation. In addition, he requested that the tailings material must be properly classified and that the backfilling methodology be clearly outlined. Mr Ndou further requested that the following be addressed: • An investigation into the appropriate settling time for the material (decant time); • The preparation process for the slurry; • The type of base that will be used within the shaft; and	Mr Van Wyk explained that the overall project is planned for a five-year period, during which fourteen shafts will be backfilled. He further explained that the backfilling of each individual shaft will take approximately four to six weeks. Following the completion of backfilling a shaft, monitoring will be conducted, and only once Harmony is satisfied with the results will it proceed to the next shaft. Mr Van Wyk added that the waste classification has already been completed, and that the GN 704 Exemption Motivation will be incorporated into the IWWMP. He also stated that Harmony previously undertook a GN 704 Exemption Motivation application for the Project which was rejected by the DWS. The DWS indicated that Harmony is required to submit a full IWULA. Additionally, Mr Van Wyk

	COMMENT	RESPONSE
	The submission of a closure report upon completion of the backfilling activities.	confirmed that there are approved closure plans in place with the DMPPR, which detail the material used and methodology for the backfilling process. Mr Van Wyk explained that in terms of the pipelines' placement on the surface, there is no risk of sinking or collapsing due to the relatively small size of the pipelines. He noted that further technical details will be provided in the project methodology. Mr Van Wyk also stated that Harmony operates under a broader WUL which includes groundwater monitoring across the entire operational area. However, a dedicated monitoring plan specific to this project will be developed to ensure alignment with project-specific groundwater monitoring requirements.
Mr Terrence Ngilande	Mr Ngilande enquired about the chemical composition of the material intended for backfilling the shafts. He specifically questioned whether the material could contribute to or increase the rate of Acid Mine Drainage (AMD).	Mr Van Wyk responded that the 2023 Groundwater Report addresses the potential for AMD generation. He explained that this is one of the key reasons why tailings backfilling will be stopped before reaching the Karoo Supergroup aquifer. This precaution ensures that should AMD be generated, it will remain contained underground and will not enter or impact the Karoo Supergroup aquifer.
	Mr Ngilande raised a concern regarding the methane gas, enquiring whether there is a risk that methane may eventually find alternative pathways to escape to the surface despite the backfilling measures in place.	Mr Van Wyk acknowledged that the Free State region does naturally produce methane as a form of natural gas. He stated that should any methane escape, it would contribute to the greenhouse gases emissions. However, such occurrences could potentially benefit companies involved in gas extracts within the region.
Mr Issac Thivhali Ramukhuba	Mr Ramukhuba enquired whether the material used for backfilling would permit the movement of plumes.	Mr Van Wyk explained that the backfilling material is intended to capture and curb the movement of any plume. As such, it is not expected to result in an increase in plume migration either at the surface or within the groundwater system.

	COMMENT	RESPONSE
Ms Phumla Mngwengwe	Ms Mngwengwe enquired about the case officer who will be responsible for this backfilling project.	Mr Maneli confirmed that he will be the case office responsible for overseeing the backfilling project.
	Ms Mngwengwe enquired whether a site visit will be conducted prior to moving the application to Phase 1, or if the application will be moved to Phase 1 after the meeting.	Mr Maneli confirmed that the application will move to Phase 1. He indicated that there will be internal discussions regarding scheduling of a site visit. He expressed the hope that the 2023 Groundwater Report will be submitted to him for review prior to site visit. He said that based on the findings in the report and outcomes of the internal discussions, a decision will then be made regarding licensing requirements for the pipeline.
	Ms Mngwengwe enquired about the expected timeframe for the DWS to give feedback/guidance relating to whether the pipelines will require licensing.	Mr Maneli responded that it is difficult to provide a definitive timeline at this stage, as the methodology for the pipeline implementation has not yet been clearly outlined. He indicated that the DWS can only provide feedback once detailed information has been submitted to the DWS, particularly regarding how the pipeline will cross the wetlands areas.
Mr John van Wyk	Mr Van Wyk stated that a letter will be submitted to the Department outlining the pipeline methodology in greater detail. The letter will also include information on specific locations where this methodology will be applied, to assist the DWS with making an informed decision.	The comment was noted by the DWS attendees.
Ms Lumka Nombewu	Ms Nombewu stated that, regardless of whether the pipeline is temporary or permanent, it must be authorised as it is transporting hazardous material. She further emphasised that even if the pipeline is later decommissioned and reinstalled at a different location, such activities should be included as part of the overall risk.	The project team noted the comment

5. Closing

Mr Maneli thanked everyone for their time and the meeting was adjourned at 11:30 AM.



HARMONY BACKFILLING

Integrated Water Use Licence Application (WU44553)

August 2025



Agenda

- Introductions
- Purpose of the Meeting
- Project Description
- Proposed Water Uses
- Specialist Studies
- Public Participation Process
- WULA Process
- Comments & Discussion

Introductions

- ❖ **Department of Water and Sanitation**
 - Mzukisi Maneli

- ❖ **Harmony Gold Limited (Applicant)**
 - John van Wyk
 - Melani Nieuwoudt

- ❖ **Kongiwe**
 - Hilton Sparks – Project Manager
 - Phumla Mngwengwe – WULA Consultant
 - Anela Fixi – Environmental Consultant

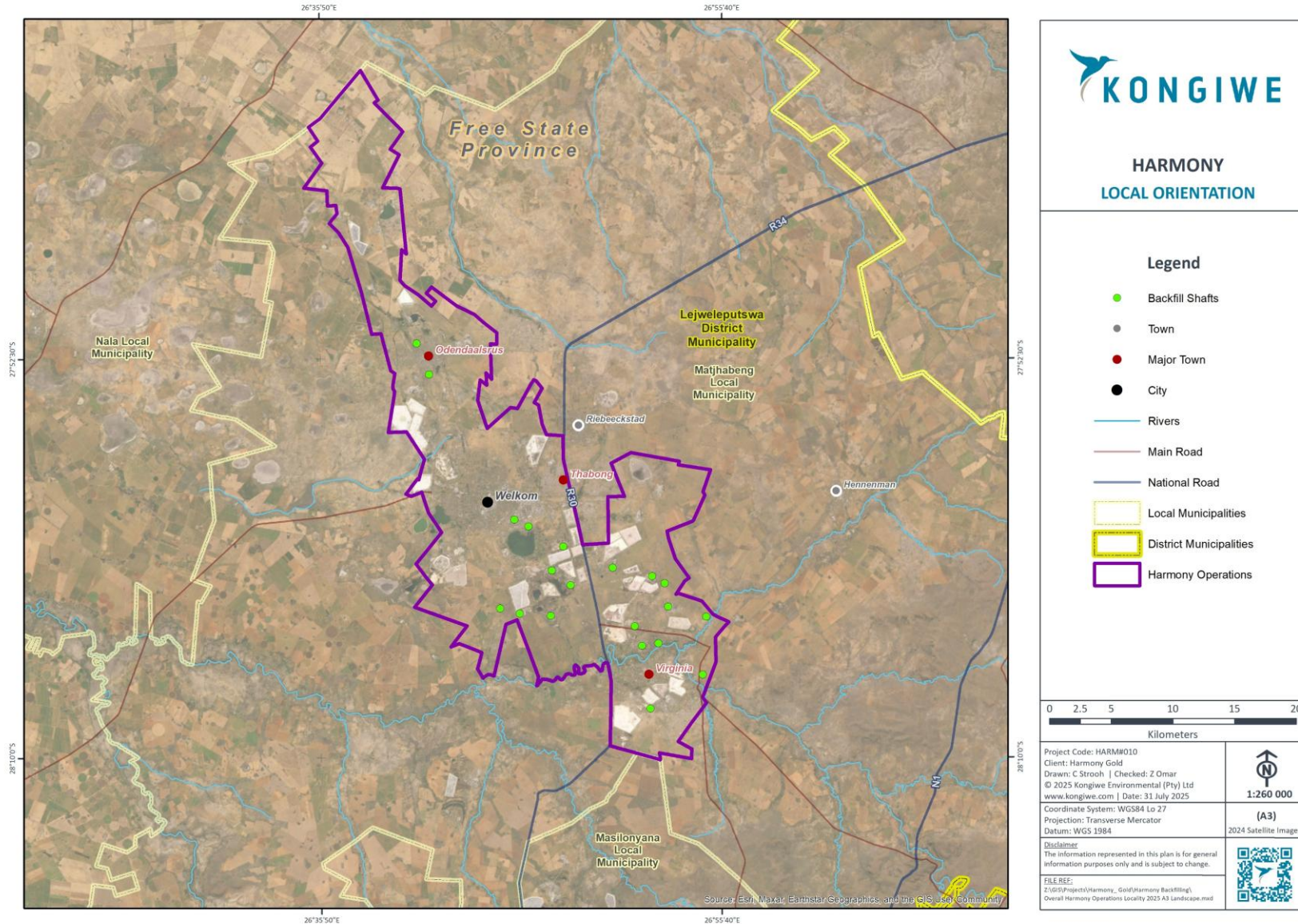
Purpose of the Meeting

- ❖ Present and discuss the Proposed Harmony Backfilling Water Use Licence Application Project.
- ❖ Provide an overview of the IWULA Process.
- ❖ Provide an opportunity to raise comments/seek clarity as well as provide input.
- ❖ Record comments raised and include them in the Comments and Responses Report (CRR).

Project Description

- ❖ **Applicant:** Harmony Gold Mining Company Limited
- ❖ **Life of Operation:** The approximate life of mine (LoM) for the Harmony backfilling is 5 years.
- ❖ Harmony intends to close its defunct mine shafts in the Free State region by backfilling them with tailings material
- ❖ Illegal mining in the Welkom area poses a major threat to the safety of Harmony's workforce, infrastructure, and surrounding communities.
- ❖ Open Shafts are the primary access points for illegal miners, who often bypass conventional plugs to gain entry.
- ❖ The rise in illegal mining is linked to shaft closures and declining economic conditions in the region.
- ❖ Harmony believes that accelerated backfilling and closure of these shafts is the most effective way to prevent illegal access and improve safety.
- ❖ Harmony is located between Virgina and Welkom, within the Matjhabeng Local Municipality (MLM) in the Lejweleputswa District Municipality (LDM) of the Free State province.

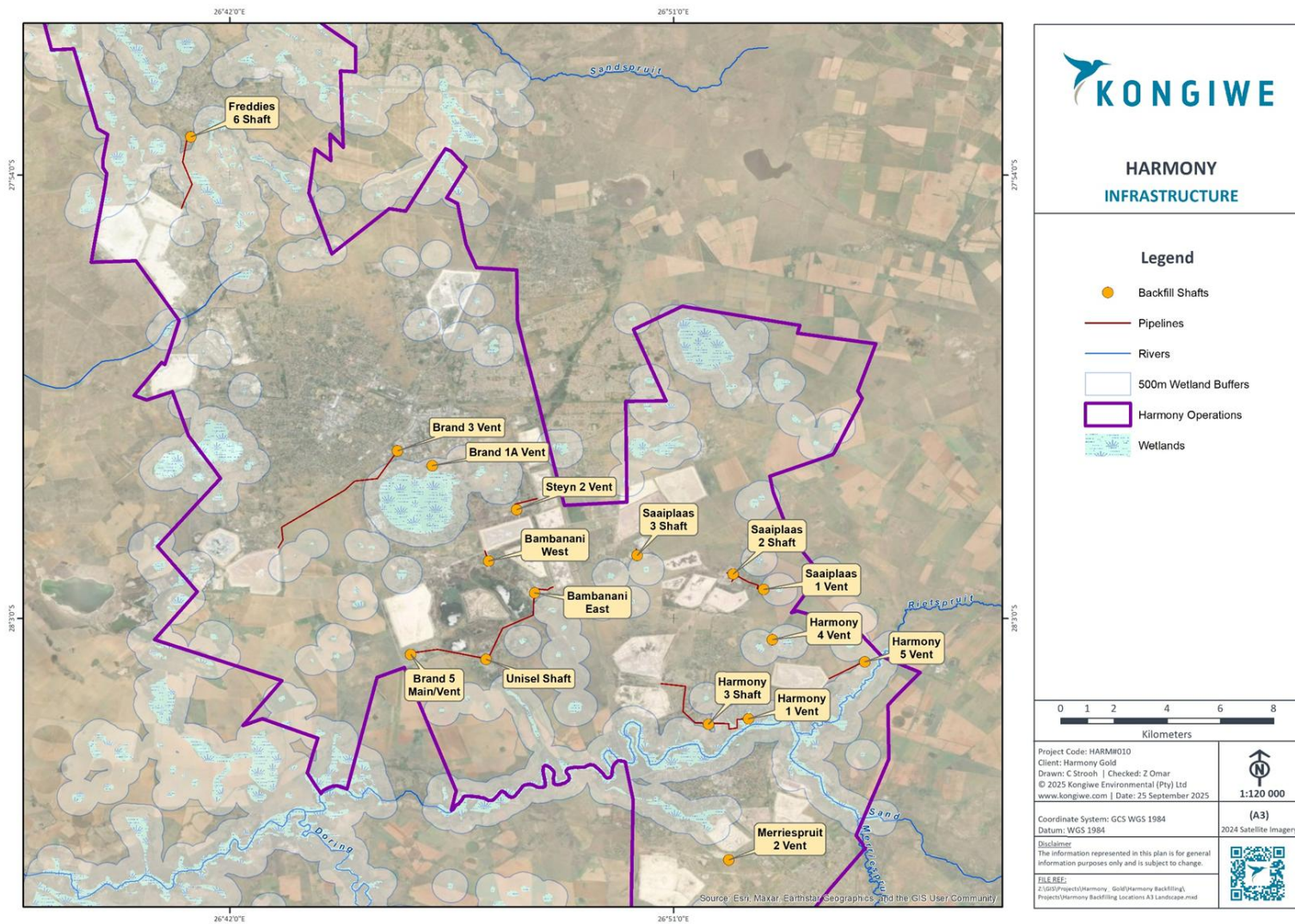
Project Description



Project Description: Shafts To Be Backfilled

Shaft	No	Type	Status	Plug	Filling		
					Filled	Not Filled	Partially Filled
Harmony	1	Vent	Capped	Concrete		x	
Harmony	3	Main	Capped	Slabs			X
Harmony	4	Vent	Capped	Slabs		x	
Harmony	4	Main	Open	Slabs			X
Harmony	5	Vent	Open	None		x	
Merriespruit	2	Vent	Open	None			X
Saaiplaas	1	Vent	Open	None		x	
Saaiplaas	2	Main	Capped	Concrete		x	
Saaiplaas	3	Main	Open	None		x	
Freddies	6	Main	Capped	Concrete		x	
President Steyn 2 vent	2	Vent	Not capped	None		x	
Brand	1A	Vent	Capped	Concrete			X
Brand	3	Vent	Capped	Concrete		x	
Brand	5	Main& Vent	Open	None			X
Unisel		Main	Open	None		x	
Bambanani East		Main	Open	None		x	
Bambanani West		Main	Open	None		x	
Not Filled						12	
Partially Filled							5

Project Description: Shafts To Be Backfilled



Project Description: Backfilling Method

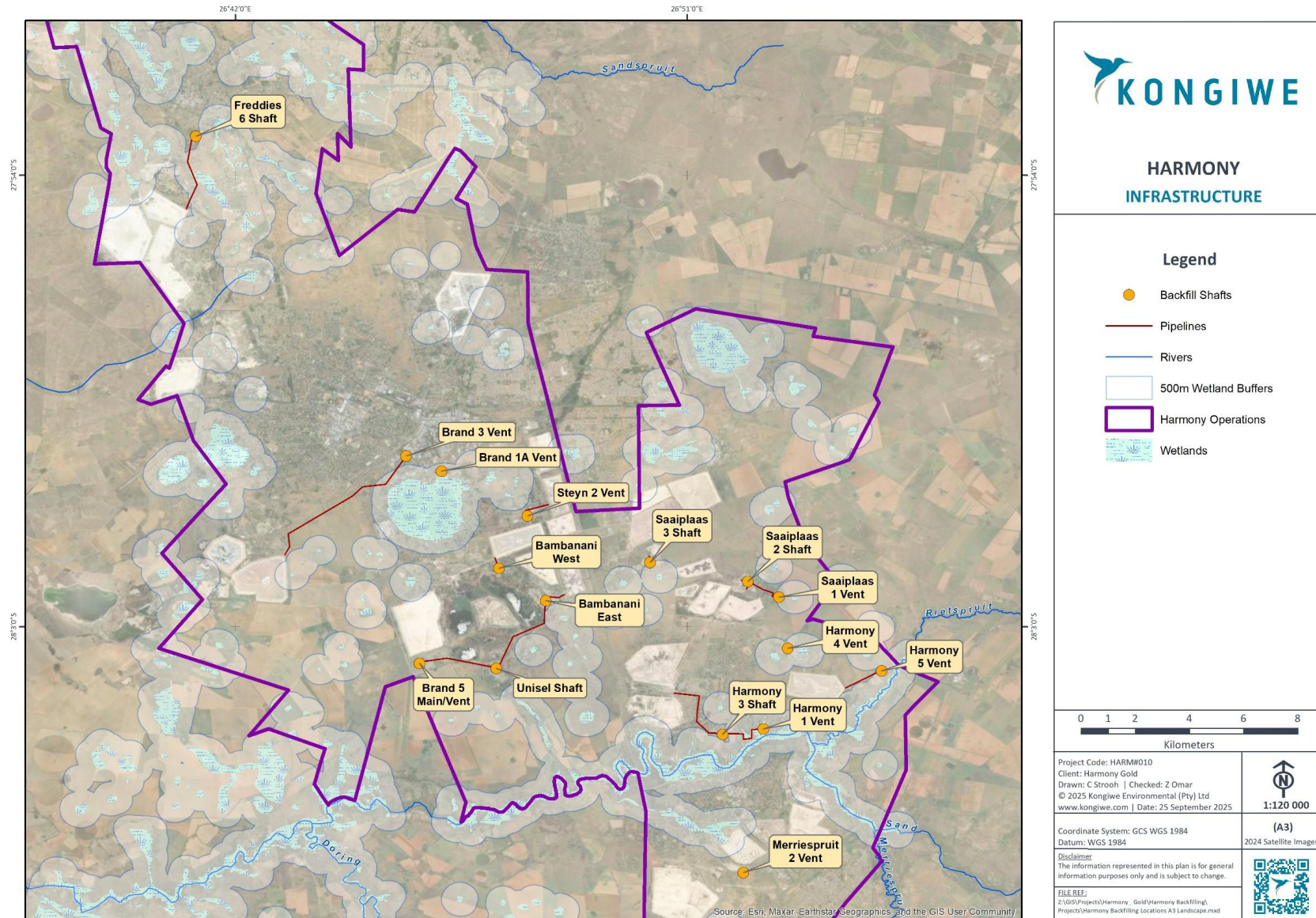
- ❖ Defunct shafts will be rehabilitated through backfilling method, using residual material from mineral processing.
- ❖ Harmony initially used rubble as backfill material, but methane concentrations in remaining shafts created explosion risks, making rubble and waste rock unsuitable.
- ❖ To address this, Harmony is now considering the use of tailings material as an alternative backfill.
- ❖ The tailings slurry will be transported via existing overland pipelines up to a designated shaft, after which new pipeline segments will be installed to reach the target shaft area.
- ❖ This method is cost-effective, repurposes waste, and supports environmentally responsible mine closure and land rehabilitation.

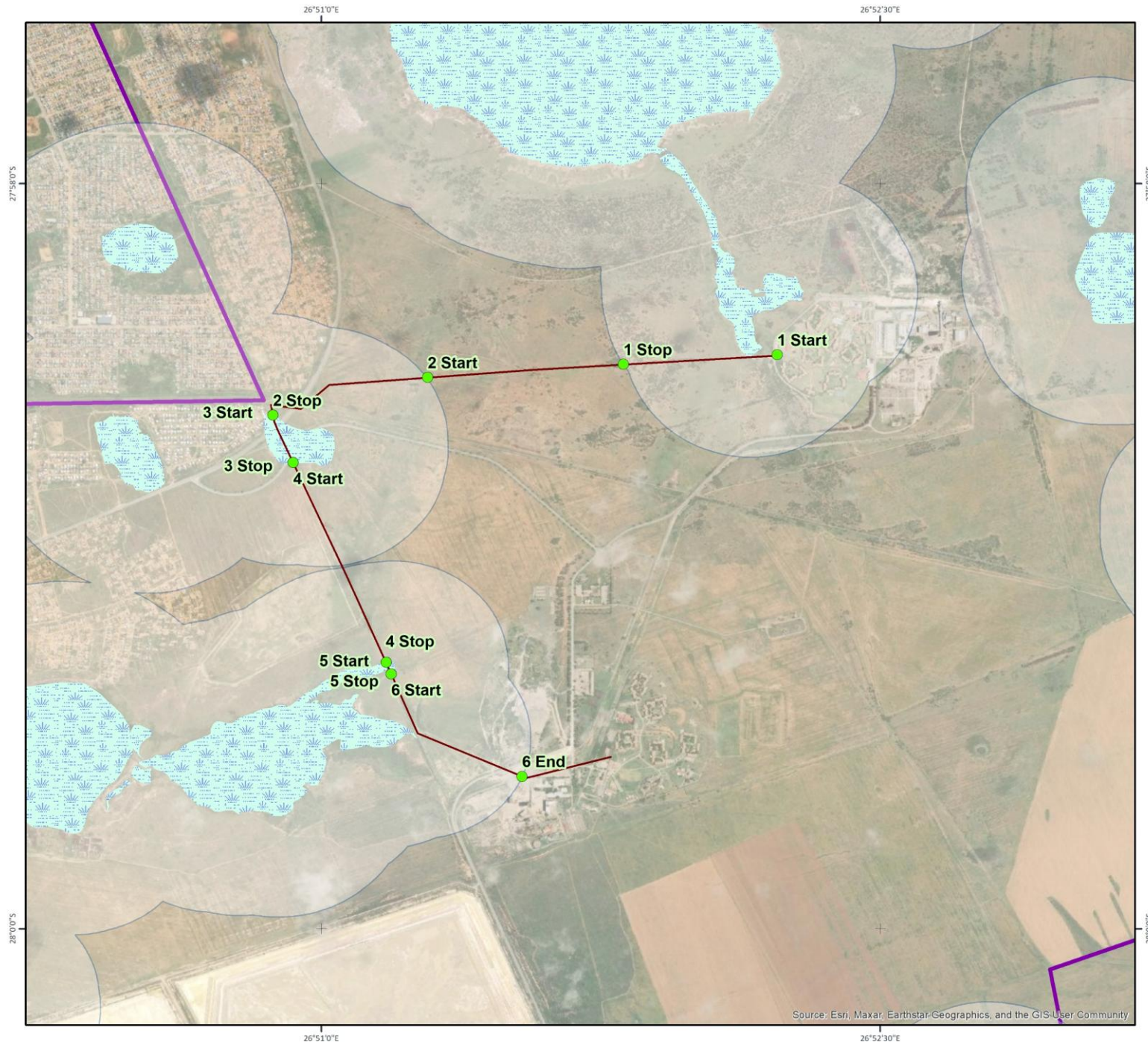
Proposed Water Uses

Water uses applicable to the Proposed Project are as follows:

- ❖ Section 21 (c) & (i) - Infrastructure proposed to be within 500m of a wetland and/or within 100 m of a river/stream (DWS to provide guidance).
- ❖ Section 21 (g) – Disposing of waste in a manner which may be detrimental to the environment
 - Backfilling of defunct shafts with tailings material.

Proposed Water Uses: Shafts Location



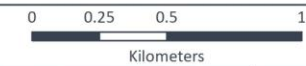


HARMONY WATER USES MAP A

Legend

Water Uses

- Section 21 (c) and (i)
- Pipelines
- 500m Wetland Buffers
- Harmony Operations
- Wetlands



Project Code: HARM#010
Client: Harmony Gold
Drawn: C Strooh | Checked: Z Omar
© 2025 Kongiwe Environmental (Pty) Ltd
www.kongiwe.com | Date: 01 August 2025



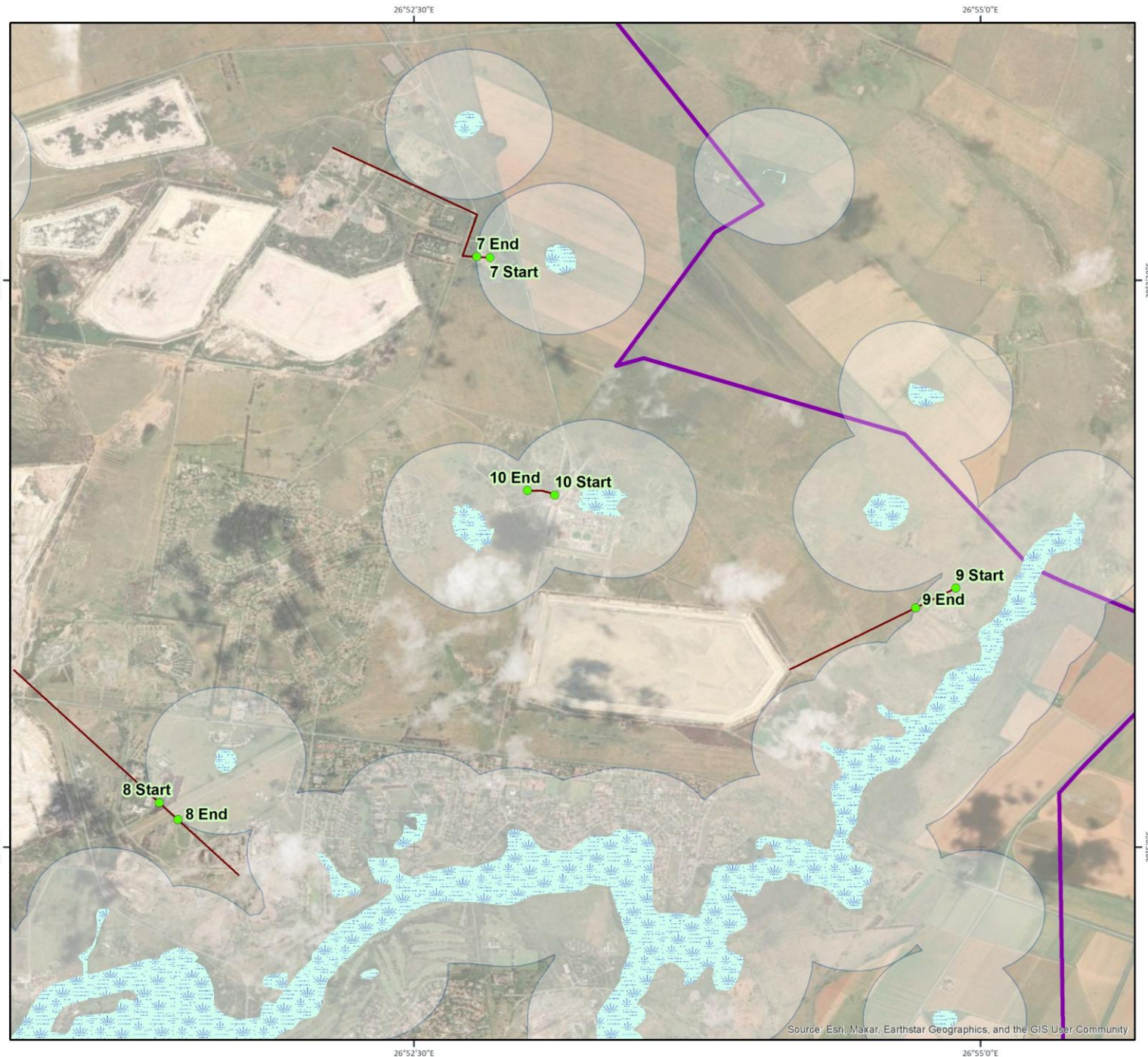
Coordinate System: GCS WGS 1984
Datum: WGS 1984

(A3)
2024 Satellite Imagery

Disclaimer
The information represented in this plan is for general information purposes only and is subject to change.

FILE REF:
Z:\GIS\Projects\Harmony_Gold\Harmony Backfilling\Projects\Harmony Backfilling Locations A3 Landscape.mxd



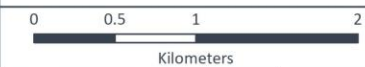


HARMONY WATER USES MAP B

Legend

Water Uses

- Section 21 (c) and (i)
- Pipelines
- 500m Wetland Buffers
- Harmony Operations
- Wetlands



Project Code: HARM#010
Client: Harmony Gold
Drawn: C Strooh | Checked: Z Omar
© 2025 Kongiwe Environmental (Pty) Ltd
www.kongiwe.com | Date: 01 August 2025



Coordinate System: GCS WGS 1984
Datum: WGS 1984

(A3)
2024 Satellite Imagery

Disclaimer:
The information represented in this plan is for general information purposes only and is subject to change.

FILE REF:
Z:\GIS\Projects\Harmony_Gold\Harmony Backfilling\Projects\Harmony Backfilling Locations A3 Landscape.mxd



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Specialist Studies

The following Specialist Studies have been undertaken for the purpose of this IWULA:

- ❖ Assessment of the Potential Groundwater Impact Associated with the backfill of shafts with gold tailings – April 2023

Public Participation Process

Interested & Affected Parties will be identified, and the database will be compiled.

Notification of Interested & Affected Parties (I&APs) by:

Site notices

Newspaper advert

Emails and sms

Consultations with directly affected landowners.

Public meeting with all I&APs to discuss the project will be undertaken.

60-Day public review period of the IWWMP will be undertaken.

- ❖ This Integrated Water Use Licence Application (IWULA) is being undertaken in accordance with the National Water Act, 1998 (Act No.36 of 1998) (NWA).
- ❖ The NWA stipulates that: “*A procedure for public participation must be conducted...*”

WULA Process: Where we are

Task	Procedural Steps for IWULA	Maximum Days	Cumulative timeframe	Responsibility
Project Registration				
1	Pre-application enquiry	Date determined by applicant		Kongiwe
2	Submit pre-application on e-WULAAS online system	1	1	Kongiwe
3	Response for acceptance of application from the Department of Water and Sanitation	10	10	Authority: DWS
Phase 1				
4	Submit application forms and supporting documents on e-WULAAS online & arrange for site inspection with DWS case officer	5	16	Kongiwe
Phase 2				
5	Site inspection with DWS case officer	20	36	Kongiwe and Authority: DWS
6	Confirm requirements for WUL and technical report based on site inspection	5	41	Authority: DWS
Phase 3				
7	Compilation, consultation and submission of WULA and technical reports to DWS	105	146	Kongiwe
8	DWS to accept/reject submission of technical reports	10	156	Authority: DWS
Application Assessment				
9	Assessment of application	90	246	Authority: DWS
10	Communicate decision to applicant	5	249	Authority: DWS



Comments & Discussion

- ❖ Discussion
- ❖ Way forward
- ❖ Closing





Contact

- Name: Phumla Mngwengwe
- Tel: 010 140 6508
- Email: PMngwengwe@kongiwe.com

Kongiwe Environmental

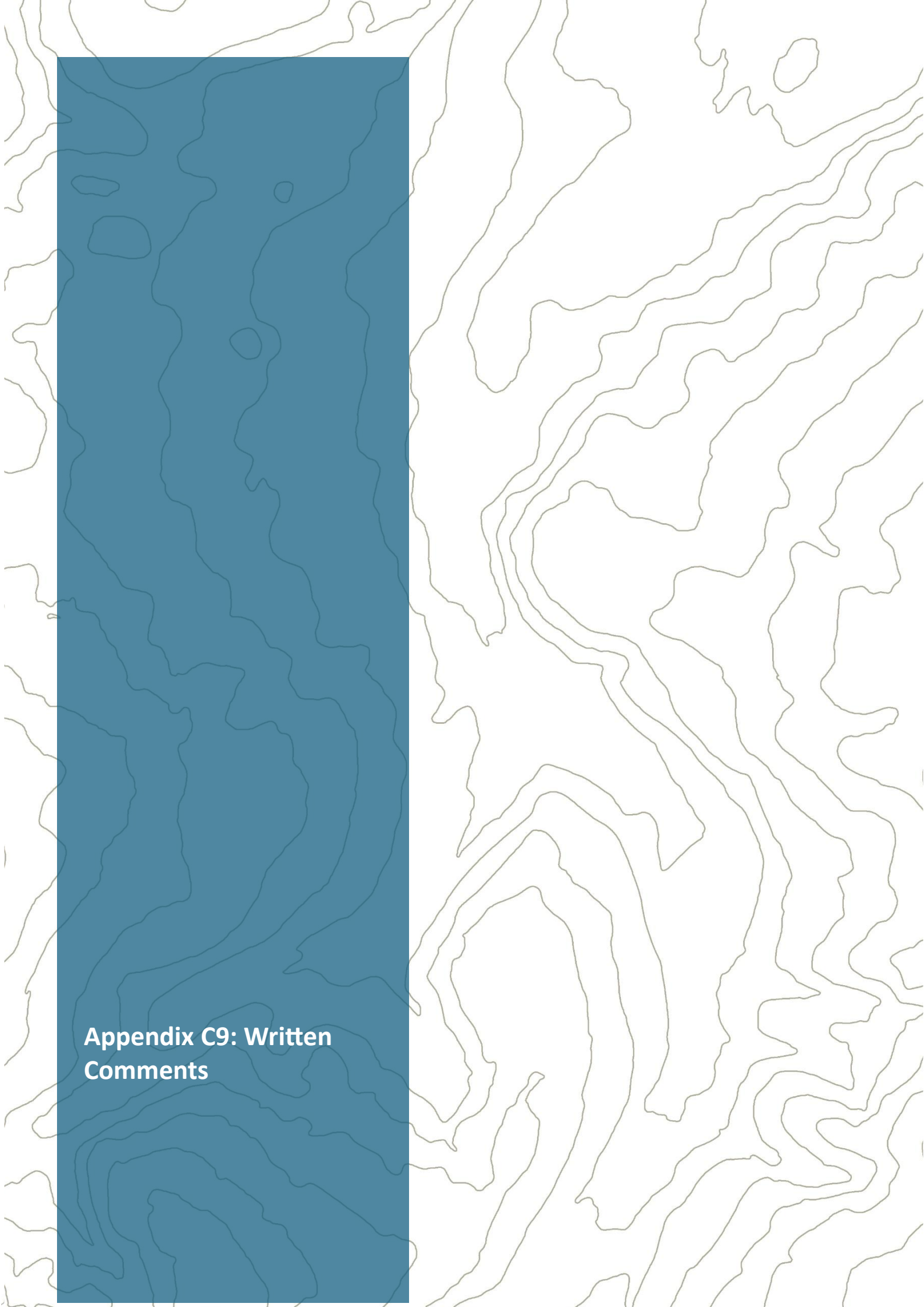
150 Bryanston Drive, Bryanston, Sandton, 2191, South Africa.

PostNet Suite no 163, Private Bag X21, Bryanston, 2021, South Africa.

info@kongiwe.com

www.kongiwe.com



The background of the page is a topographic map with brown contour lines. A solid blue vertical bar is positioned on the left side of the page.

Appendix C9: Written Comments



Appendix C10: Comment and Response Report