Goldplat Recovery (Pty) Ltd

# Goldplat Reclamation Project

# DRAFT INTEGRATED WATER AND WASTE MANAGEMENT PLAN IN SUPPORT OF THE INTEGRATED WATER USE LICENCE APPLICATION

**October 2026**

**DWS Ref No.: WU48373**

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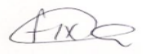
| **By Author** | Environmental Consultant | Anela Fixi |  | 27 September 2026 |
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# Executive Summary

**Kongiwe Environmental (Pty) Ltd** ('Kongiwe') has been appointed by Goldplat Recovery (Pty) Ltd ('Goldplat') 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 **Goldplat Reclamation Project** (hereafter the Proposed Project)

As part of the Water Use Licence Application (WULA) process, a proponent is required to compile an IWWMP for mining-related activities. The draft version of the IWWMP will be made available to Interested and Affected Parties (I&APs) for a 60-day public commenting period from Tuesday, 6 October 2026 – Friday, 4 December 2026. Following this commenting period, this report will be updated to include all comments received and submitted to the Vaal-Orange Catchment Management Agency (VOCMA) for consideration.

Goldplat proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Mining (Pty) Ltd gold plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

The removal of stock dams will allow repurposing of the land in a more sustainable manner and ultimate offsetting of environmental impacts. The reclamation projects are in line with the objectives of the Gauteng Mine Residue Area Strategy (2012), which are to reclaim and/or rehabilitate stock dams to the point where they become safe for adjacent communities and land can be made available for other purposes.

The purpose of this document is to provide sufficient information that will enable informed decision making through a detailed description of the proposed water use scenario and shortcomings in respect to the relevant water management measures. A list of the general and specific management commitments pertaining to this IWWMP is also included to show Goldplat's commitment towards continuous improvement in water management and to reduce the impacts on water resources to as low as reasonably practicable. This IWWMP is also the technical information document in support of the WULA for the relevant water uses under Section 21 of the National Water Act, 1998 ("NWA"). This document is based on the following technical guidelines:

- Regulations regarding the procedural requirements for water use licence applications and appeals, Government Notice 267, dated 24 March 2017;
- Best Practice Guideline (BPG) 1.1: Integrated Mine Water and Waste Management developed by the Department of Water Affairs (DWAF, 2008);
- Operational Guideline to assist in the compilation of an Integrated Water and Waste Management Plan, First Edition: February 2010;
- External Guideline: Generic Water Use Authorisation Application Process, as compiled by the DWA, dated November 2007.

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, surface water, groundwater and socio-economic environment);


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- Analysis and characterisation of activities (organisational structure, training, awareness, monitoring and control);
- Risk assessment in relation to process water, stormwater, groundwater and waste (methodology, potential impacts and significance of risks to the environment);
- Water and waste management strategies, specifically focussing on process water, stormwater, groundwater and waste; and
- The regulatory status of water use activities accompanied by the section 27 motivation.

A detailed list of water use activities and description of these activities is included in Chapter 3 below. 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, surface 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.


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### Abbreviations and Units

| Abbreviation/Symbol | Description |
|---|---|
| **AMD** | Acid Mine Drainage |
| **AIP** | Alien Invasive Plants |
| **ASG** | Advanced Strike Gully |
| **BID** | Background Information Document |
| **BPG G4** | Best Practice Guideline G4: Impact Prediction |
| **CA** | Competent Authority / Competent Authorities |
| **CBA** | Critical Biodiversity Area |
| **CoE** | City of Ekurhuleni Metropolitan Municipality |
| **CRR** | Comments and Response Report |
| **DALRRD** | Department of Agriculture, Land Reform and Rural Development |
| **DEFF** | Department of Forestry, Fisheries and the Environment |
| **DMPR** | Department of Mineral and Petroleum Resources |
| **DPWI** | Department of Public Works and Infrastructure |
| **DSR** | Draft Scoping Report |


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| | |
|---|---|
| **DTM** | Digital Terrain Model |
| **EA** | Environmental Authorisation |
| **ECO** | Environmental Control Officer |
| **EIA** | Environmental Impact Assessment |
| **EIS** | Ecological Importance and Sensitivity |
| **EMP** | Environmental Management Plan |
| **EMPr** | Environmental Management Programme |
| **EMS** | Environmental Management Systems |
| **ESA** | Ecologically Sensitive Areas |
| **GA** | General Authorisation |
| **GDP** | Gross Domestic Product |
| **GM** | Gold Mine |
| **Ha / ha** | Hectare |
| **HDPE** | High-density polyethylene |
| **HGM** | Hydrogeomorphic |
| **HSE** | Health, Safety and Environmental |
| **IDP** | Integrated Development Plan |
| **IWULA** | Integrated Water Use Licence Application |
| **IWUL** | Integrated Water Use Licence |
| **Km / km** | Kilometre |
| **L** | Low |
| **M** | Medium |
| **MAP** | Mean Annual Precipitation |
| **m** | Metre |
| **mamsl** | Metres above mean sea level |
| **mbs** | Metres below surface |
| **MPRDA** | Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) |


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| | |
|---|---|
| **MR** | Mining Right |
| **MUN** | Municipal |
| **NBA** | National Biodiversity Assessment |
| **NBSAP** | National Biodiversity Strategy and Action Plan |
| **NDP** | National Development Plan |
| **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:PAA** | National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) |
| **NEM:WA** | National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) |
| **NFEPA** | National Freshwater Ecosystem Priority Area |
| **NNR** | National Nuclear Regulator |
| **NS** | Not specified |
| **NA** | Not available |
| **OHSMS** | Occupational Health and Safety Management Systems |
| **PA** | Protected Area |
| **PAIA** | Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) |
| **PAOI** | Project Area of Influence |
| **PES** | Present Ecological State |
| **PP** | Public Participation |
| **PPP** | Public Participation Process |
| **PR** | Prospecting Right |
| **REC** | Recommended Ecological Category |
| **RMO** | Recommended Management Objective |
| **RoD** | Record of Decision |
| **RWB** | Rainfall station code for Springs; confirm the exact station name |
| **SACS** | South African Committee for Stratigraphy |
| **SCS** | Soil Conservation Service |


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|---|---|
| **SDF** | Spatial Development Framework |
| **SLP** | Social and Labour Plan |
| **SPLUMA** | Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) |
| **SRP** | Surface Right Permit |
| **SWSA** | Strategic Water Source Areas |
| **SWMP** | Stormwater Management Plan |
| **T.Alk** | Total Alkalinity |
| **TSF** | Tailings Storage Facility |
| **VOCMA** | Vaal-Orange Catchment Management Agency |
| **WMA** | Water Management Area |
| **WML** | Waste Management Licence |
| **WQO** | Water Quality Objective |
| **WRE** | White Rivers Exploration |
| **WUL** | Water Use Licence |
| **WULA** | Water Use Licence Application |


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# 1. INTRODUCTION

**Kongiwe Environmental (Pty) Ltd** ('Kongiwe') has been appointed by **Goldplat Recovery (Pty) Ltd** ('Goldplat') as the Environmental Service Provider tasked with facilitating the Integrated Water Use Licence Application (IWULA) process for the proposed **Goldplat Reclamation Project** (hereafter the Proposed Project).

## 1.1 Project Background

Goldplat proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

Hydraulic reclamation is a water-based process with a lower risk profile than that of conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Mining (Pty) Ltd (Ergo) Plant (Ergo Plant) is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

The removal of stock dams will allow repurposing of the land in a more sustainable manner and ultimate offsetting of environmental impacts. This reclamation project is in line with the objectives of the Gauteng Mine Residue Area Strategy (2012), which are to reclaim and/or rehabilitate stock dams to the point where the stock dam areas become safe for adjacent communities and the resultant rehabilitated land can be made available for other purposes.

A Water Use Licence (WUL) in terms of section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) will be required before the Proposed Project can commence. It is certain that the Proposed Project activities trigger the requirement for a WUL, due to the section 21 water use requirements. 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 and will be supported by a Technical Report and Integrated Water and Waste Management Plan (IWWMP).

### 1.1.1 Project Rehabilitation

Once reclamation of the stock dams is completed, the areas will be assessed for contamination (particularly in terms of radiation). Contaminated soils will be removed, and the land levelled to its original functioning topography levels. The resultant stock dam footprints may then be reused as a future site for [1]tailings deposition.

[1] The deposition of tailings does not form part of this application. The proposed project is limited to the reclamation of existing tailings material.


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## 1.2 Applicant Details

The contact details of the responsible personnel are provided in Table 1-1 below.

***Table 1-1: Contact Details of Applicant***

| | |
|---|---|
| **Applicant** | Goldplat Recovery (Pty) Ltd |
| **Registration No:** | 1979/007102/07 |
| **Primary Contact:** | Werner Klingenberg |
| **Head Office Address:** | Daveyton Road Benoni, Gauteng, South Africa. |
| **Postal Address** [2] | P.O. Box 40, Benoni, 1500 |
| **Telephone:** | 011 749 6300 |
| **E-mail:** | wklingenberg@goldplat.com |

## 1.3 Regional Setting and Location of Activity

The proposed Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni Metropolitan Municipality (CoE), Gauteng Province. The Modder Bee Road is situated to the west to northwest of the Proposed Project, while the R51 is to the east, and the N12 to the north of the Prosed Project.

The residential suburb of New Modder is situated to the west of the Proposed Project and the residential suburb of Rynsoord is situated to the southwest of the project.

The process water and slurry pipelines run from Goldplat and extend all the way to the Ergo Plant. They run past residential areas, open areas, wetlands and industrial areas. Figure 1-1 presents the local context of the Proposed Project area.


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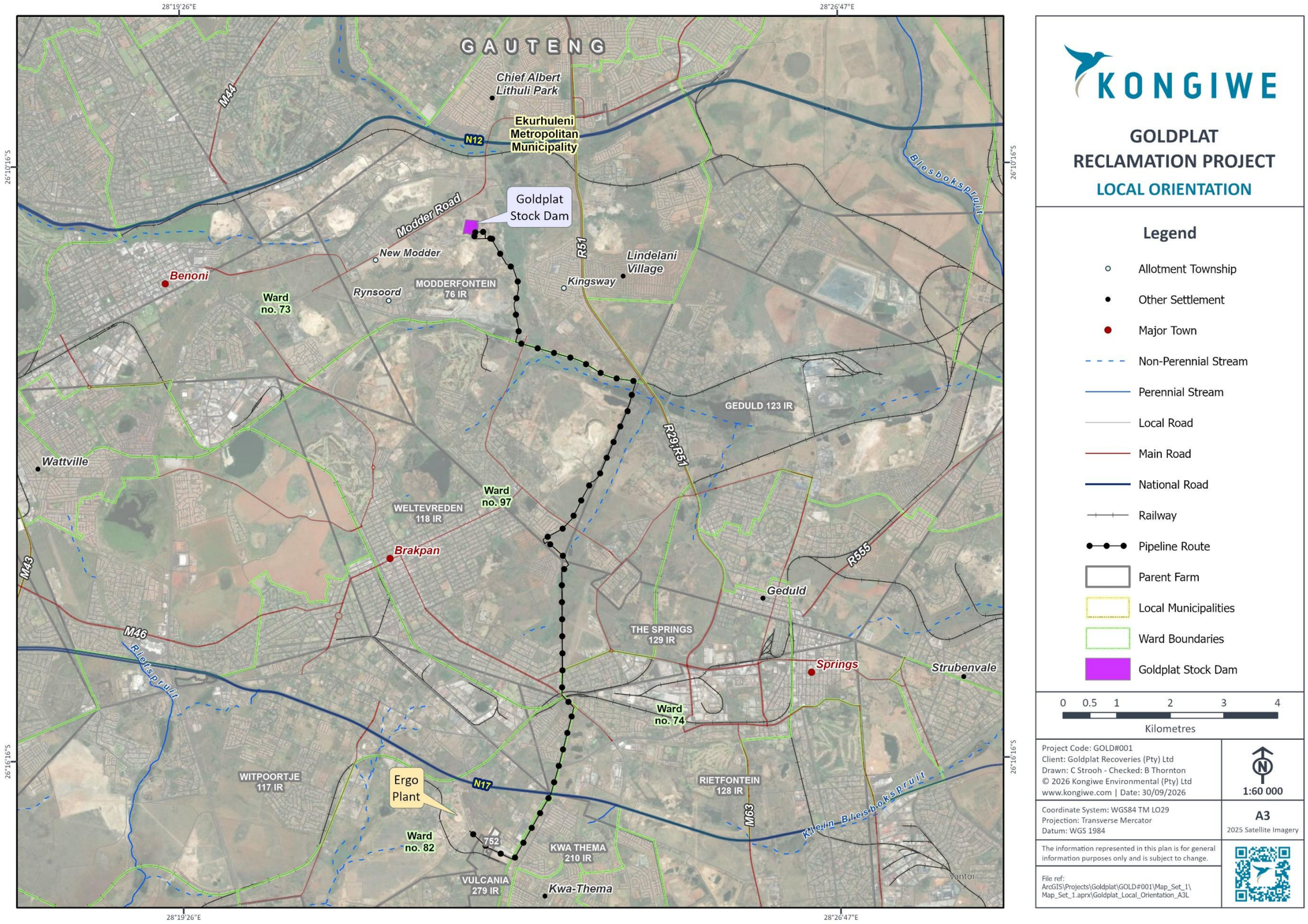


KONGIWE

**GOLDPLAT RECLAMATION PROJECT**

**LOCAL ORIENTATION**

**Legend**

- Allotment Township
- Other Settlement
- Major Town
- Non-Perennial Stream
- Perennial Stream
- Local Road
- Main Road
- National Road
- Railway
- Pipeline Route
- Parent Farm
- Local Municipalities
- Ward Boundaries
- Goldplat Stock Dam

0 0.5 1 2 3 4
Kilometres

Project Code: GOLD#001
Client: Goldplat Recoveries (Pty) Ltd
Drawn: C Strooh - Checked: B Thornton
© 2026 Kongiwe Environmental (Pty) Ltd
www.kongiwe.com | Date: 30/09/2026

1:60 000

Coordinate System: WGS84 TM LO29
Projection: Transverse Mercator
Datum: WGS 1984

A3
2025 Satellite Imagery

The information represented in this plan is for general information purposes only and is subject to change.

File ref:
ArcGIS\Projects\Goldplat\GOLD#001\Map_Set_1\Map_Set_1.aprx\Goldplat_Local_Orientation_A3L

*Figure 1-1: Proposed Project Local Orientation*


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## 1.4 Property Description

Table 1-2 refers to the properties that are directly affected by the Proposed Project. Figure 1-2 shows the directly affected properties in relation to the Project infrastructure.

***Table 1-2: Description of the Directly Affected Properties***

| Farm Name | Portion | Landowner |
|---|---|---|
| Gelduld 123 IR | 189 | City of Ekurhuleni Metropolitan Municipality |
| Witpoortje 117 IR | 183 | Ergo Mining (Pty) Ltd |
| Modderfontein 76 IR | 24 | Transnet Ltd |
| Vulcania 279 | 0 (RE) | Industrial Zone (Pty) Ltd - iProp (Pty) |
| Modderfontein 76 IR | 3 (RE) | Choice Decisions 1260 cc |
| Modderfontein 76 IR | 1 (RE) | New Modder Township (Pty) Ltd |
| Kwa Thema 210 IR | 0 | City of Ekurhuleni Metropolitan Municipality |
| Saint - Gobain 752 IR | 0 | Saint - Gobain Construction Products SA Pty Ltd |
| Kwa Thema 210 IR | 37 | No Deeds information. Ownership to be confirmed (TBC) |
| Modderfontein 76 IR | 43 | Atoll Metal Recovery (Pty) Ltd |
| Modderfontein 76 IR | 51 | Department of Public Works and Infrastructure (DPWI) |
| Modderfontein 76 IR | 65 | City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 IR | 85 | Kingsway Township X1 - City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 IR | 88 | Kingsway Township X1 - City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 IR | 111 | City of Ekurhuleni Metropolitan Municipality |
| Witpoortje 117 IR | 1 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Witpoortje 117 IR | 155 | City of Ekurhuleni Metropolitan Municipality |
| Weltevreden 118 IR | 0 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Weltevreden 118 IR | 63 | No Deeds information. Ownership TBC |
| Weltevreden 118 IR | 15 | City of Ekurhuleni Metropolitan Municipality |
| Weltevreden 118 IR | 77 | City of Ekurhuleni Metropolitan Municipality |
| Gelduld 123 IR | 122 | City Deep X1 - City of Johannesburg |
| Gelduld 123 IR | 138 | Fullimput 1480 CC |
| Rietfontein 128 IR | 0 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 IR | 76 | No Deeds information. Ownership to be confirmed (TBC) |
| Rietfontein 128 IR | 96 | City of Ekurhuleni Metropolitan Municipality |


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| | | |
|---|---|---|
| Rietfontein 128 IR | 106 | Vereeniging Property & Investments |
| Rietfontein 128 IR | 139 | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 IR | 166 | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 IR | 215 | No Deeds information. Ownership to be confirmed |
| The Springs 129 IR | 0 | City of Ekurhuleni Metropolitan Municipality |
| The Springs 129 IR | 19 | City of Ekurhuleni Metropolitan Municipality |
| The Springs 129 IR | 38 | Transnet Ltd |
| The Springs 129 IR | 53 | City of Ekurhuleni Metropolitan Municipality |

The pipeline will follow existing servitudes / Surface Right Permits (SRPs) held by Ergo and in agreement with Ergo. Where required, Goldplat will acquire landowner consent.


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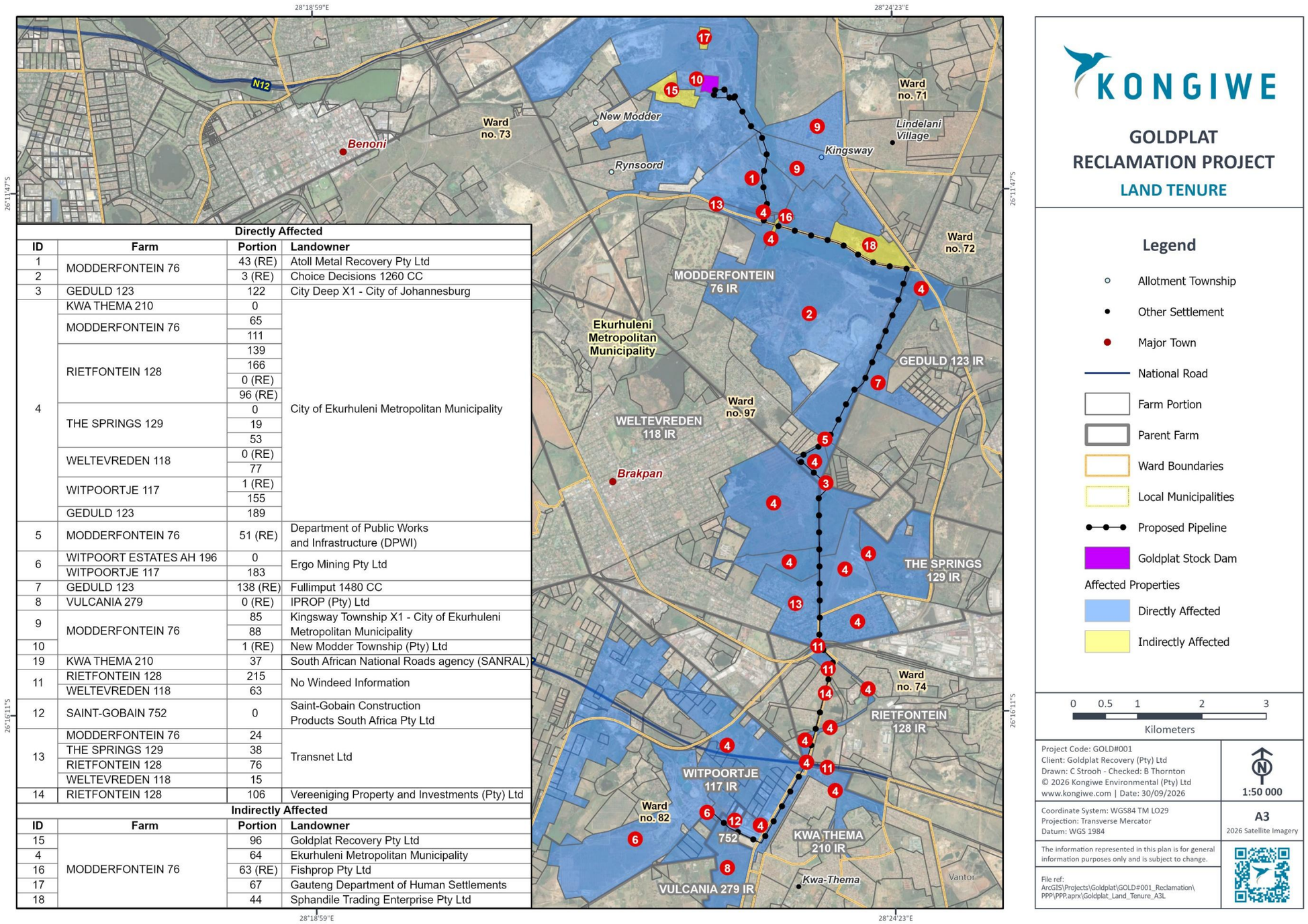


| Directly Affected | | | |
|---|---|---|---|
| **ID** | **Farm** | **Portion** | **Landowner** |
| 1 | MODDERFONTEIN 76 | 43 (RE) | Atoll Metal Recovery Pty Ltd |
| 2 | | 3 (RE) | Choice Decisions 1260 CC |
| 3 | GEDULD 123 | 122 | City Deep X1 - City of Johannesburg |
| 4 | KWA THEMA 210 | 0 | City of Ekurhuleni Metropolitan Municipality |
| | MODDERFONTEIN 76 | 65 | |
| | | 111 | |
| | RIETFONTEIN 128 | 139 | |
| | | 166 | |
| | | 0 (RE) | |
| | | 96 (RE) | |
| | THE SPRINGS 129 | 0 | |
| | | 19 | |
| | | 53 | |
| | WELTEVREDEN 118 | 0 (RE) | |
| | | 77 | |
| | WITPOORTJE 117 | 1 (RE) | |
| | | 155 | |
| | GEDULD 123 | 189 | |
| 5 | MODDERFONTEIN 76 | 51 (RE) | Department of Public Works and Infrastructure (DPWI) |
| 6 | WITPOORT ESTATES AH 196 | 0 | Ergo Mining Pty Ltd |
| | WITPOORTJE 117 | 183 | |
| 7 | GEDULD 123 | 138 (RE) | Fullimput 1480 CC |
| 8 | VULCANIA 279 | 0 (RE) | IPROP (Pty) Ltd |
| 9 | MODDERFONTEIN 76 | 85 | Kingsway Township X1 - City of Ekurhuleni Metropolitan Municipality |
| | | 88 | |
| 10 | | 1 (RE) | New Modder Township (Pty) Ltd |
| 19 | KWA THEMA 210 | 37 | South African National Roads agency (SANRAL) |
| 11 | RIETFONTEIN 128 | 215 | No Windeed Information |
| | WELTEVREDEN 118 | 63 | |
| 12 | SAINT-GOBAIN 752 | 0 | Saint-Gobain Construction Products South Africa Pty Ltd |
| 13 | MODDERFONTEIN 76 | 24 | Transnet Ltd |
| | THE SPRINGS 129 | 38 | |
| | RIETFONTEIN 128 | 76 | |
| | WELTEVREDEN 118 | 15 | |
| 14 | RIETFONTEIN 128 | 106 | Vereeniging Property and Investments (Pty) Ltd |
| **Indirectly Affected** | | | |
| **ID** | **Farm** | **Portion** | **Landowner** |
| 15 | MODDERFONTEIN 76 | 96 | Goldplat Recovery Pty Ltd |
| 4 | | 64 | Ekurhuleni Metropolitan Municipality |
| 16 | | 63 (RE) | Fishprop Pty Ltd |
| 17 | | 67 | Gauteng Department of Human Settlements |
| 18 | | 44 | Sphandile Trading Enterprise Pty Ltd |

KONGIWE

**GOLDPLAT RECLAMATION PROJECT**

**LAND TENURE**

**Legend**

- Allotment Township
- Other Settlement
- Major Town
- National Road
- Farm Portion
- Parent Farm
- Ward Boundaries
- Local Municipalities
- Proposed Pipeline
- Goldplat Stock Dam

Affected Properties

- Directly Affected
- Indirectly Affected

0 0.5 1 2 3
Kilometers

Project Code: GOLD#001
Client: Goldplat Recovery (Pty) Ltd
Drawn: C Strooh - Checked: B Thornton
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www.kongiwe.com | Date: 30/09/2026

1:50 000

Coordinate System: WGS84 TM LO29
Projection: Transverse Mercator
Datum: WGS 1984

A3
2026 Satellite Imagery

The information represented in this plan is for general information purposes only and is subject to change.

File ref: ArcGIS\Projects\Goldplat\GOLD#001_Reclamation\PPP\PPP.aprx\Goldplat_Land_Tenure_A3L

*Figure 1-2: Directly and Indirectly Affected Properties*


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## 1.5 Purpose of IWWMP

WULA and Appeals Regulations, 2017 (Government Notice R267) under the (NWA), regarding the procedural requirements for WULAs requires that an IWWMP must be submitted with the WULA if the purpose of a water use is for industry or mining.

The original intent of an IWWMP is aimed at collating and rationalising the information submitted for the 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.


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# 2. CONCEPTUALISATION OF ACTIVITY

This section describes a broad description of the activities, processes and products. It also provides the background information of the organisational structure of the water user i.e., Goldplat, and all the business and corporate policies related to the environment.

## 2.1 Description of Activity

Goldplat aims to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering gold using hydraulic reclamation. Hydraulic reclamation is a water-based process with a lower risk profile than that of conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

## 2.2 Extent of Activity

The total footprint of the Goldplat Stock Dams is approximately 8.47 ha.

## 2.3 Key Activity Related Processes and Products

The proposed reclamation method which will be used to reclaim the stock dam compartments is referred to as a top-down hydraulic reclamation process. It must be noted that only the Rooidam and Top stock dams are earmarked for reclamation as part of this project, and not all the Goldplat Tailing Storage Facility (TSF)s. This reclamation method uses high-pressure water monitors to erode unconsolidated tailings material within the stock dam compartments. The water from the water monitor mixes with the tailings and forms a slurry (see Figure 2-1). The slurry then flows under gravity feed to a collection sump which is positioned at the lowest elevation of the bench being reclaimed.

At the sump, finger screens remove any detritus that may impact pumping operations, and the screened slurry then flows into the sump and is subsequently conveyed to the pump station. The position of the collection sump will change as the reclamation progresses. To control the volume of slurry reporting to the reclamation station, valves are used to hold, and release slurry contained in the collection sump. From the pumpstation, located at the lowest point of a stock dams, slurry will then be pumped and conveyed, via a new pipeline, to the Ergo Plant for reprocessing. Approximately 50 000 tons per month of slurry will be pumped to the Ergo Plant. Process water used in the reclamation activities will be sourced from Ergo through the same pipeline route.

Ensuing tailings from the Ergo Plant will be deposited onto the Brakpan/Withok TSF.


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*Figure 2-1: Mobile Tracked Hydraulic Monitor on a Tailings Facility in South Africa (Kongiwe, 2025).*

## 2.4 Activity Life Description

The Proposed Project is divided into a number of stages, as shown in Figure 2-2 below.

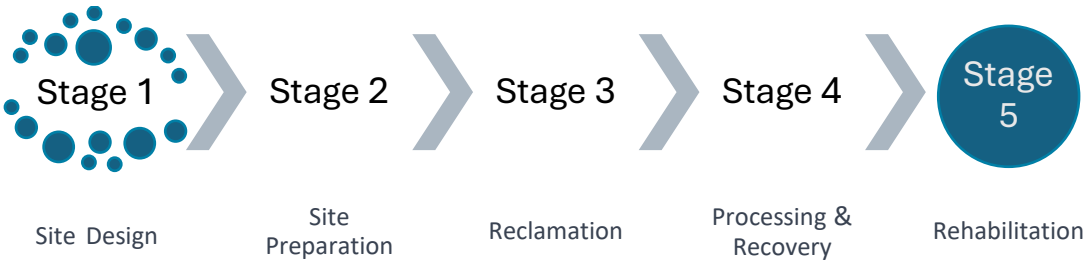


*Figure 2-2: Proposed Project Process*

### 2.4.1 Estimated Project Timeframes

The life of the Proposed Project is expected to be five years. An estimated maximum amount of 50 000 tons/month of slurry is expected to be pumped from the Goldplat stock dams via constructed pipelines to the Ergo Plant for beneficiation.

Table 2-1 gives an indication of the estimated timeframes in relation to the implementation of the actions, activities or processes of the Proposed Project phases (construction, operation and decommissioning) for the proposed project.


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*Table 2-1: Estimated Timeframes and Deadlines of the Different Phases Associated with the Goldplat Project*

| Phase | Timeframe | Year Start and End Date |
|---|---|---|
| Pre-Construction and construction Phase | 2 years | 2026 -2028 |
| Operations Phase | 5 years | 2028 - 2033 |
| Decommissioning and Post Closure Phase | 1 years | 2034 |

### 2.4.2 Life-Cycle Phases of the Proposed Project

Table 2-2 shows a summary of the activities that will occur at the different phases of this Project.

*Table 2-2: Summary of Activities Per Phase*

| Activity | Description |
|---|---|
| **Pre-Construction Phase** | |
| 1 | Conduct a pre-construction baseline Radiation walk-over survey |
| 2 | Removal of vegetation and site clearance |
| 3 | Preparation of access roads (should this be required) |
| 4 | Initiation of a community forum for engagement throughout the Project life cycle |
| 5 | Employment of workers should this be required |
| **Construction Phase** | |
| 6 | Operation of construction machinery and vehicles |
| 7 | Instatement of reclamation station and its associated infrastructure |
| 8 | Construction of pipelines and electricity reticulation and power line |
| 9 | Instatement of waste management and dust control measures on site |
| 10 | Desilting of existing facilities and construction of a lined paddock |
| 11 | Instatement of traffic signage, access, parking bays |
| 12 | Clearing of material on top of the TSF that cannot be reclaimed |
| **Operational Phase** | |
| 8 | Reclamation of the stock dams |
| 9 | Operation of pipelines |
| 10 | Operation of pumpstation and its associated infrastructure |
| 11 | Community Engagement |
| **Decommissioning Phase** | |
| 12 | Decommissioning and Rehabilitation activities: Demolition of temporary infrastructure such as screens, the pump station and pipelines, and rehabilitation of the Project area. |


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| Activity | Description |
|---|---|
| 13 | Closure forum to be established with key stakeholders. |
| **Post-Closure Phase** | |
| 14 | Post- Decommissioning Monitoring. |

#### 2.4.2.1 Pre-Construction Activities

Prior to the initiation of construction, vegetation will be cleared in strips as a walk over radiological survey and safety assessment is conducted, and access will be prepared for construction. Before reclamation can commence, the site will be prepared to prevent unwanted material from being screened and blended with slurry.

The Proposed Project will primarily make use of the existing road network; only limited road preparation works are anticipated during the pre-construction phase. Any upgrades to access roads, installation of traffic signage, or construction of turning areas and parking bays will be undertaken only where site assessments identify a need for such improvements. In addition to this, Goldplat will appoint security guards and fence off the reclamation pump station that will be used for the Proposed Project. During construction, temporary and mobile site infrastructure will be established. As part of construct guards and preparation activities, paddocks and stormwater systems will be constructed for capturing and managing dirty water around site.

A community forum will be established to facilitate ongoing stakeholder engagement and communication throughout the Project life cycle. Where required, workers will also be recruited and appointed to support the implementation of the Proposed Project.

#### 2.4.2.2 Operational Phase Activities

Once site preparation and construction are completed, hydraulic reclamation can begin. To excavate unconsolidated tailings material within the stock dam, a high-pressure water monitor (or cannon) will be directed onto the face of the stock dam. Water from the monitor mixes with the tailings and forms a slurry with a high solid content. The slurry then flows under gravity feed to a collection sump which is positioned at the lowest elevation of the bench being reclaimed. The collection sump is then able to filter and screen appropriately sized slurry, and direct this into pipelines which will pump the slurry to the existing Ergo Plant for gold recovery. Residual slurry will then be pumped to the licensed Brakpan/Withok TSF.

During the operational phase, it is advised that continual monitoring of both surface and ground water is conducted. This information needs to be collected and used to update specific water models and to monitor and evaluate the impact of the operation.

#### 2.4.2.3 Decommissioning Phase Activities

Once reclamation is completed down to a red earth footprint, the area will be shaped for correct storm water management. During this phase, all Project infrastructure will be removed, and a final radiological survey will be undertaken. Thereafter, the resultant stock dam footprints may then be reused as a future site for tailings deposition.

Thus, it is the primary aim of rehabilitation, in the context of this document, to:

- Reduce the actual or potential environmental threat;
- Reduce the potential risks so that unacceptable risks identified in this IWMMP are reduced to acceptable levels; and
- Protect the future liability of the land by re-establishing a sustainable land use.

#### 2.4.2.4 Post-Decommissioning Phase Activities


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Post-decommissioning activities will entail the assessment of rehabilitation and will address any further rehabilitation requirements. After the reclamation has occurred it is proposed that the following activities are undertaken as rehabilitation actions:

- All surface infrastructure, buildings and equipment need to be removed from site.
- Once all the infrastructure has been removed, the surface will need to be cleared to red earth and levelled, to match the local and functional topography.
- All access and other activity roads will need to be ripped and cleared to red earth.
- Paddocks and other stormwater infrastructure will need to be removed along with powerlines, pipelines and other electrical infrastructure.

Maintenance and Aftercare

The monitoring process will be used to assess whether the reclamation process has been successful or not and to indicate that no further deterioration on groundwater quality is foreseen.

### 2.4.3 Health and Safety

Regarding the safety of both the public and the employees, Goldplat will conduct a workers' safety assessment as well as a public safety assessment in relation to the requirements of the National Nuclear Regulator (NNR).

## 2.5 Activity Infrastructure Description

The following infrastructure will be utilised:

- Reclamation infrastructure at the Rooidam and Top stock dam area, consisting of a pump station which includes:
  - Slurry sump including a floating pontoon;
  - Vibrating Screen;
  - Water tank;
  - Motor control centre; and
  - Slurry and associated Pumps.
- Stormwater management infrastructure associated with the stock dams, including:
  - Lined catchment paddock;
  - Perimeter berm.
- 11 kV overhead powerlines capable of transmitting 3 kVA of electricity and electricity reticulation, sourced from the Goldplat plant or Eskom;
- Existing administration buildings, including change houses and ablution facilities at the Goldplat plant;
- Existing access roads;
- Construction contractors' yards (temporary facilities); and
- Slurry and process water pipelines running 15.6 km on the same route:
  - One slurry pipeline of 300 mm in diameter to Ergo Plant.
  - One process water pipeline of 250 mm in diameter from Ergo Plant.

### 2.5.1 Access

The major access routes in the vicinity of Goldplat include the R51, which provides connectivity to the Modder Bee Road, leading to access to the Goldplat area. Existing on-site access roads will be utilised.

### 2.5.2 Power and Water Supply

The proposed reclamation activity will require 11 kV overhead powerlines capable of transmitting 3 kVA of electricity. Power will be supplied by Eskom and connected at the existing Goldplat plant.


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Potable water will be sourced from the existing Goldplat plant.

Process water required for the reclamation activity will be sourced from the Ergo Plant and conveyed through a new process water pipeline to the project site for reuse in a closed-circuit system. The pipeline will follow existing servitudes / Surface Right Permits (SRPs) held by Ergo and in agreement with Ergo.

## 2.6 Key Water Uses and Waste Streams

### 2.6.1 Key Water Uses Associated with the Project

Water uses associated with the Proposed Project are Section 21 (c) and (i) and Section 21 (g) water uses.

The triggered **Section 21 (c) and (i)** water uses for activities within the regulated area of the watercourse are:

- Reclamation of the Goldplat stock dams, as well as the operation, decommissioning and rehabilitation of the associated reclamation and stormwater management infrastructure within 500 m of a CVB wetland and a depression wetland,
- The construction, operation, decommissioning and rehabilitation of the lined catchment paddock within 500 m of a CVB wetland; and
- The construction, operation decommissioning and rehabilitation of the pump station within 500 m of a CV wetland.
- The construction, operation, removal and rehabilitation of the proposed slurry pipeline within 500m of an CVB, hillslope seep and UVB wetalnd.

**Section 21 (g)** for the disposal of water containing waste into the waste facilities:

- Disposing of excess stormwater and slurry during a stormwater event

### 2.6.2 Waste Streams

The anticipated waste streams for the proposed Project are:

- **Domestic / general** waste from the offices and change houses which can include paper and cardboard, wood, plastic, metal, glass and organic articles such as food residue;
- **Construction and demolition** waste from activities such as construction of buildings, civil and reclamation infrastructure, road and maintenance. Construction waste includes materials such as concrete, bricks, wood, glass, metals, plastic and solvents; and
- **Hydrocarbons and waste oils** that display some hazardous properties.
- **Contaminated soils** generated during site preparation, infrastructure development, or spill remediation activities;
- **Screen rejects** resulting from the removal of oversized, unwanted, or non-processable materials during the reclamation process;
- **Sediment and slurry residues** generated through sediment management, stormwater control measures, and reclamation activities; and
- **Potentially radiologically impacted material** encountered during reclamation activities and managed in accordance with applicable radiological management requirements.

## 2.7 Organisational Structure of Activity

Goldplat is a wholly owned subsidiary of Goldplat plc and forms part of the Group's South African Recovery Operations. The operation is a leading gold recovery business based in South Africa, specializing in the recovery of gold and other precious metals from by-products and waste materials generated by mining and metallurgical processes.


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The roles, responsibilities and authority of personnel at Goldplat are assigned to facilitate effective environmental management.

## 2.8 Business and Corporate Policies

Business and corporate policies provide the framework for the effective management of water and waste throughout the project life cycle. These policies demonstrate an organisation's commitment to environmental stewardship, regulatory compliance, sustainable resource use, pollution prevention, risk management, and continual improvement.

Goldplat is a Gold Recovery Company based in Benoni, South Africa which processes gold and precious metals. Goldplat Recovery receives by-products from Blue-Chip Mining companies in South Africa and the SADC region such as Woodchips, Mill Liners, Mill Girth, Fine Carbon and Surface Materials to produce Bullion. Goldplat Recovery has an experienced board and management team with a proven track record of generating shareholder value through the development of resource assets into production. Goldplat is committed to conducting its operations in a manner that protects the health and safety of all employees, contractors, visitors and other interested parties, while preventing pollution and minimising adverse environmental impacts arising from its activities. This Health, Safety and Environmental (HSE) Policy is established in accordance with the requirements of ISO 45001:2018 (Occupational Health and Safety Management Systems) and ISO 14001:2015 (Environmental Management Systems) and provides the framework for setting and reviewing HSE objectives.

Goldplat commits to:

- Comply with all applicable occupational health and safety, environmental, legal and regulatory requirements, as well as subscribed industry codes of practice and standards;
- Identify hazards, assess risks, and implement effective controls to eliminate hazards and reduce occupational health and safety risks;
- Identify environmental aspects and impacts associated with plant activities and implement measures to prevent pollution and minimise environmental harm;
- As far as reasonably practicable provide and maintain a safe and healthy working conditions for the prevention of work-related injury and ill health;
- Prevent harm to the environment through responsible use of resources, effective waste management, and control of emissions, effluents and discharges as well as promote efficient use of energy, water and raw materials and support continual improvement in environmental performance;
- Ensure consultation with and participation of employees and, where applicable, contractors and their representatives on HSE matters;
- Encourage reporting of hazards, incidents and near misses without fear of reprisal;
- Ensure that all persons working under the control of Goldplat Recovery are competent through appropriate education, training or experience;
- Promote HSE awareness and responsibility at all levels of the organisation;
- Continually improve the effectiveness of the Occupational Health and Safety Management System and Environmental Management System; and
- Establish, implement and maintain emergency preparedness and response plans.


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# 3. REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

## 3.1 Legislative Framework

This chapter provides an overview of the policy and legislative context relevant to the reclamation of the Goldplat stock dams. It identifies all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to the planned activities and are to be considered in the assessment process which may be applicable or have relevance to the Proposed Project.

The foundation for Environmental Preservation is entrenched in the Constitution of South Africa (Act No. 108 of 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 and*
- *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:*
    - *Prevent pollution and ecological degradation;*
    - *Promote conservation; and*
    - *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."*

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.


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*Table 3-1: Applicable National Legislation and Guidelines*

| Legislation |
|---|
| **Constitution of the Republic of South Africa, 1996**<br><br>The Bill of Rights set out in Chapter 2 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)**<br><br>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:<br><br>• Cease, modify or control any act or process causing pollution;<br>• Comply with any prescribed waste standard or management practice;<br>• Contain or prevent the movement of pollutants;<br>• Eliminate any source of pollution;<br>• Remedy the effects of the pollution; and<br>• Remedy the effects of any disturbance to the bed and banks of a watercourse.<br><br>It also describes the actions that can be taken by the catchment management agency to enforce the requirements of the NWA. |
| **NWA Regulations:**<br><br>**Regulation GN R704**<br><br>This regulation enforces the separation of clean and dirty water systems including restrictions on activities within the 1:100 floodline or 100 m from a watercourse.<br><br>**Regulations regarding the procedural arrangements for water use licence applications and appeals (GN**<br><br>**R267, Gazette No. 40713, 24 March 2017).** The final decision on the WULA is required within 90 calendars<br><br>days from submission of the application. |


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| Legislation |
| --- |
| **The General Authorisation for Section 21(c) and (i) water uses (GN509, Gazette No. 40229, 26 August 2016**) defines a regulated area of a watercourse as either:<br>• The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the<br>• greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lakeor dam;<br>• 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 indefinable annual bank fill flood bench; or<br>• A 500 m radius from the delineated boundary (extent) of any wetland or pan. |
| **Water Services Act (Act No. 108 of 1997) (WSA)**<br>Provides for the regulation of water boards and the setting of national water quality standards. |
| **The National Water Amendment Act (Act No. 27 of 2014)**<br>The National Water Amendment Act, 2014 (Act No. 27 of 2014) amended the NWA to improve water resource management, strengthen institutions responsible for water governance, and align water legislation with broader government reforms. |
| **National Environment Management Act (Act No. 107 of 1998) (NEMA)**<br>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.<br>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. |
| **National Environmental Management Act (NEMA): Environmental Impact Assessment Regulations, 2014 (GN R982 of 8 December 2014, as amended, 7 April 2017 and 21 June 2021)**<br>• Regulates the procedure and criteria relating to the preparation and processing of applications for environmental authorisations<br>**Appendix 6 requirements** |


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| Legislation |
| --- |
| Minimum content for specialist reports |
| **National Environment Management: Waste Act (Act No. 59 of 2008) (NEM:WA)**<br><br>Follows the principle that waste generation must be avoided, or if it cannot be avoided, that it is reduced, reused, recycled or recovered, and as a last resort treated and/or safely disposed of. The objectives of this Act are-<br><br>a. to protect health, well-being and the environment by providing reasonable measures for-<br>i. minimising the consumption of natural resources;<br>ii. avoiding and minimising the generation of waste;<br>iii. reducing, re-using, recycling and recovering waste;<br>iv. treating and safely disposing of waste as a last resort;<br>v. preventing pollution and ecological degradation;<br>vi. securing ecologically sustainable development while promoting justifiable economic and social development;<br>vii. promoting and ensuring the effective delivery of waste services;<br>viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and<br>ix. achieving integrated waste management reporting and planning;<br>b. to ensure that people are aware of the impact of waste on their health, well-being and the environment;<br>c. to provide for compliance with the measures set out in paragraph (a); and<br>d. generally, to 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: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)**<br><br>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 bio-prospecting 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). |
| **Waste Classification and Management Regulations**<br><br>The Waste Classification and Management Regulations require that all waste generators must ensure that the waste they generate is classified in accordance with 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 |


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| Legislation |
| --- |
| Assessment of Waste for Landfill Disposal. |
| **South African National Standards (SANS) 1936**<br><br>The purpose of these regulations is to ensure for the safe development of areas where dolomite is present. This standard provides the required action needed to be implemented as well as specific investigations required to ensure for the safe development on top of dolomitic land. |


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## 3.2 Summary of all 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:

(a) taking water from a water resource;
(b) storing water;
**(c) impeding or diverting the flow of water in a watercourse;**
(d) engaging in a stream flow reduction activity contemplated in section 36;
(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
**(g) disposing of waste in a manner which may detrimentally impact on a water resource;**
(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
**(i) altering the bed, banks, course or characteristic of a watercourse;**
(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
(k) using water for recreational purposes.

As stated in Section 2.6.1, Section 21 (c), (i) and (g) water uses are applicable to the Proposed Project.

## 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:*

*(a) Which has taken place at any time during the period of two years immediately before the date of commencement of this Act and which;*
*I. was authorised by or under any law which was in force immediately before the date of commencement of this Act;*
*II. is a stream flow reduction activity contemplated in section 36(1); or*
*III. is a controlled activity contemplated in section 37(1)"*

*OR*

*(b) which has been declared an existing lawful water use under section 33."*

There are no ELUs associated with the Proposed Project.

## 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 Project. The Project requires exemption in relation to GN R704.

The GN R704 Exemption Motivation will be compiled and submitted as part of Phase 3 of the Project's IWULA.

## 3.5 Generally Authorised Water Uses

No General Authorisation (GA) is required for the Proposed Project. The project requires full licencing of water use activities.


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### 3.6 New Water Uses to be Licensed

The water uses to be licensed for this project are listed in Table 3-2 and shown in Figure 3-1.

*Table 3-2: Water Uses to be Licensed for the Proposed Project*

| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| | **Section 21(c) and (i)** | | | | | | |
| 1 | The Rooidam and Top stock dams and associated reclamation and stormwater management infrastructure | Reclamation and rehabilitation of Rooidam and Top stock dams, as well as the construction, operation, removal and rehabilitation of the associated reclamation and stormwater management infrastructure within 500m of a hydrogeomorphic (HGM) 1 channelled valley bottom and HGM 3 depression wetlands | Removal of tailings and land rehabilitation.<br><br>Stormwater management – separation of clean and dirty water. | Tailings | Width:254.23 m<br><br>Length:284.49 m<br><br>Height: 25m | Portion 1 (RE) of Modderfontein 76 IR | Start:<br><br>26° 10' 57.79" S<br><br>28° 22' 35.6" E<br><br>End:<br><br>26° 10' 49.73" S<br><br>28° 22' 46.07" E |
| 2 | Pump Station and Catchment Paddock | The construction, operation, removal and rehabilitation of the proposed pump station and catchment paddock within 500m of an HGM 1 channelled valley bottom | Management of slurry and stormwater | HDPE liner and earth material | TBC | Portion 1 (RE) of Modderfontein 76 IR | Start:<br><br>26° 10' 57.44" S<br><br>28° 22' 47.84" E<br><br>End:<br><br>26° 10' 55.81" S<br><br>28° 22' 48.81" E |
| 3 | Slurry Pipeline | The construction, operation, removal and rehabilitation of the proposed slurry pipeline within 500m of an HGM 1 channelled valley bottom | Transportation of slurry | HDPE steel, fusion bonding and concrete | Width: 0.15 m<br><br>Length: 426.07 m<br><br>Height: 0.15 m | Portion 1 (RE) of Modderfontein 76 IR | Start<br><br>26° 10' 56.72" S<br><br>28° 22' 43.6" E<br><br>End:<br><br>26° 11' 0.44" S<br><br>28° 22' 55.16" E |

[3] Dimensions for Section 21 (c) and (i) water use activities are only for areas that are within the regulated area.


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| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| 4 | Process Water Pipeline | The construction, operation, removal and rehabilitation of the proposed pipeline within 500m of a HGM 1 channelled valley bottom wetland | Transportation of process water | HDPE steel, fusion bonding and concrete | Width: 0.25 m<br>Length: 364.49<br>Height: 0.25 m | Portion 1 (RE) of Modderfontein 76 IR | Start<br>26° 10' 58.85" S<br>28° 22' 43.08" E<br>End:<br>26° 11' 0.44" S<br>28° 22' 55.16" E |
| 5 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing an HGM 1 channelled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 2 366.89 m<br>Height: 0.25 m | Portion 1 (RE) of Modderfontein 76 IR<br>Portion 24 of Modderfontein 76 IR | Start:<br>26° 11' 0.77" S<br>28° 22' 55.24" E<br>End:<br>26° 12' 5.66" S<br>28° 23' 19.8" E |
| 6 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing an HGM 1 channelled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 2 530.55 m<br>Height: 0.25 m | Portion 24 of Modderfontein 76 IR | Start:<br>26° 12' 5.66" S<br>28° 23' 19.8" E<br>End:<br>26° 12' 27.37" S<br>28° 24' 31.31" E |
| 7 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing an HGM 1 channelled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 403.97 m<br>Height: 0.25 m | Portion 24 of Modderfontein 76 IR<br>Portion 3 (RE) of Modderfontein 76 IR | Start:<br>26° 12' 27.37" S<br>28° 24' 31.31" E<br>End:<br>26° 12' 40.11" S<br>28° 24' 27.28" E |


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| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| 8 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of a HGM 1 channelled valley bottom, HGM 4 hillslope seep and HGM 2 channelled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 3 813.35 m<br>Height: 0.25 m | Portion 3 (RE) of Modderfontein 76 IR<br>Portion 129 (RE) of The Springs 129 IR | Start:<br>26° 12' 40.11" S<br>28° 24' 27.28" E<br>End:<br>26° 14' 16.71" S<br>28° 23' 44.5" E |
| 9 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the slurry and process water proposed pipelines crossing an HGM 2 channelled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 1 310.07 m<br>Height: 0.25 m | Portion 129 (RE) of The Springs 129 IR | Start:<br>26° 14' 16.71" S<br>28° 23' 44.5" E<br>End<br>26° 14' 57.3" S<br>28° 23' 41.05" E |
| 10 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of a HGM 2 channelled valley bottom and HGM 5 unchanneled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width:0.4 m<br>Length:2 051.32 m<br>Height: 0.25 m | Portion 0 (RE) of The Springs 129 IR<br>Portion 106 (RE) Rietfontein 128 IR | Start:<br>26° 14' 57.3" S<br>28° 23' 41.05" E<br>End:<br>26° 16' 1.53" S<br>28° 23' 43.74" E |
| 11 | Slurry and process water Pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipeline crossing within HGM 5 unchanneled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 647.94 m<br>Height: 0.25 m | Portion 106 (RE) Rietfontein 128 IR<br>Portion 128 (RE) Rietfontein 128 IR | Start:<br>26° 16' 1.53" S<br>28° 23' 43.74" E<br>End:<br>26° 16' 22.07" S<br>28° 23' 37.71" E |


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| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| 12 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of HGM 6 hilltop seep and HGM 5 unchanneled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 505.08 m<br>Height: 0.25 m | Portion 0 (RE) Rietfontein 128 IR<br>Portion 37 Kwa Thema 210 IR | Start:<br>26° 16' 22.07" S<br>28° 23' 37.71" E<br>End:<br>26° 16' 37.84" S<br>28° 23' 32.43" E |
| 13 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing within HGM 6 hilltop seep wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 213.23 m<br>Height: 0.25 m | Portion 37 Kwa Thema 210 IR<br>Remaining Portion of Kwa Thema 210 IR | Start:<br>26° 16' 37.84" S<br>28° 23' 32.43" E<br>End:<br>26° 16' 43.94" S<br>28° 23' 28.56" E |
| 14 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of a HGM 6 hilltop seep and HGM 7 channelled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 536.58 m<br>Height: 0.25 m | Remaining Portion of Kwa Thema 210 IR | Start:<br>26° 16' 43.94" S<br>28° 23' 28.56" E<br>End:<br>26° 16' 59.08" S<br>28° 23' 18.97" E |
| 15 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing within HGM 7 channelled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 135.71 m<br>Height: 0.25 m | Remaining Portion of Kwa Thema 210 IR | Start:<br>26° 16' 59.08" S<br>28° 23' 18.97" E<br>End:<br>26° 17' 2.95" S<br>28° 23' 16.52" E |


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| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| 16 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of a HGM 6 hilltop seep and HGM 7 channelled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 211.79 m<br>Height: 0.25 m | Remaining Portion of Kwa Thema 210 IR | Start:<br>26° 17' 2.95" S<br>28° 23' 16.52" E<br>End:<br>26° 17' 9.0" S<br>28° 23' 12.69" E |
| 17 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing within HGM 6 hilltop seep wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 11.37 m<br>Height: 0.25 m | Remaining Portion of Kwa Thema 210 IR | Start:<br>26° 17' 9.0" S<br>28° 23' 12.69" E<br>End:<br>26° 17' 9.31" S<br>28° 23' 12.5" E |
| 18 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500m of HGM 6 hilltop seep and HGM 8 unchanneled valley bottom wetlands | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 863.16 m<br>Height:0.25 m | Remaining Portion of Kwa Thema 210 IR<br>Portion 1 (RE) Witpoortje 117 IR | Start:<br>26° 17' 9.31" S<br>28° 23' 12.5" E<br>End:<br>26° 17' 8.03" S<br>28° 22' 48.58" E |
| 19 | Slurry and process water pipelines crossing | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines crossing an HGM 8 unchanneled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width:0.4 m<br>Length: 18.94 m<br>Height: 0.25 m | Portion 1 (RE) Witpoortje 117 IR<br>Remaining portion of Vulcania 279 IR | Start:<br>26° 17' 8.03" S<br>28° 22' 48.58" E<br>End:<br>26° 17' 7.59" S<br>28° 22' 48.07" E |


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| | Infrastructure/Activity | Description | Purpose of Activity | Materials used to build infrastructure | Dimensions[3] | Farm Portion | Co-ordinates |
|---|---|---|---|---|---|---|---|
| 20 | Slurry and process water pipelines | The construction, operation, removal and rehabilitation of the proposed slurry and process water pipelines within 500 m HGM 8 unchanneled valley bottom wetland | Transportation of slurry and process water | HDPE steel, fusion bonding and concrete | Width: 0.4 m<br>Length: 381.87 m<br>Height: 0.25 m | Remaining portion of Vulcania 279 IR<br>Portion 183 of Witpoortje 117 IR | Start:<br>26° 17' 7.59" S<br>28° 22' 48.07" E<br>End:<br>26° 16' 59.05" S<br>28° 22' 38.03" E |
| | **Section 21(g)** | | | | | | |
| 21 | Catchment Paddock | Disposing of access slurry or dirty water during a stormwater event or an electrical power trip. | Management of slurry and stormwater | HDPE liner and earth material | TBC | Portion 1 (RE) Modderfontein 76 IR | 26° 10' 57.03" S<br>28° 22' 48.3" E |


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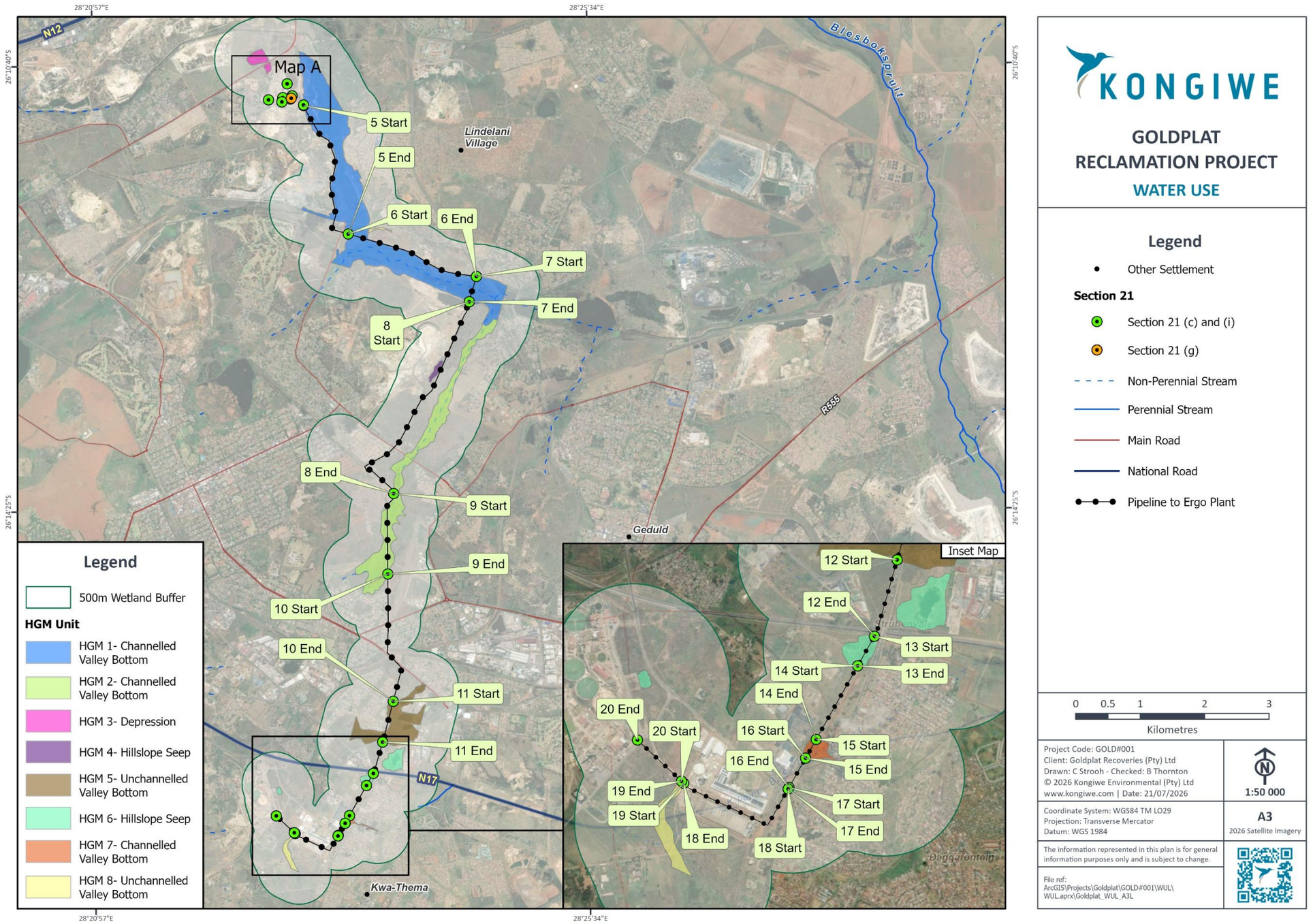


*Figure 3-1: Water Uses to be Licensed*


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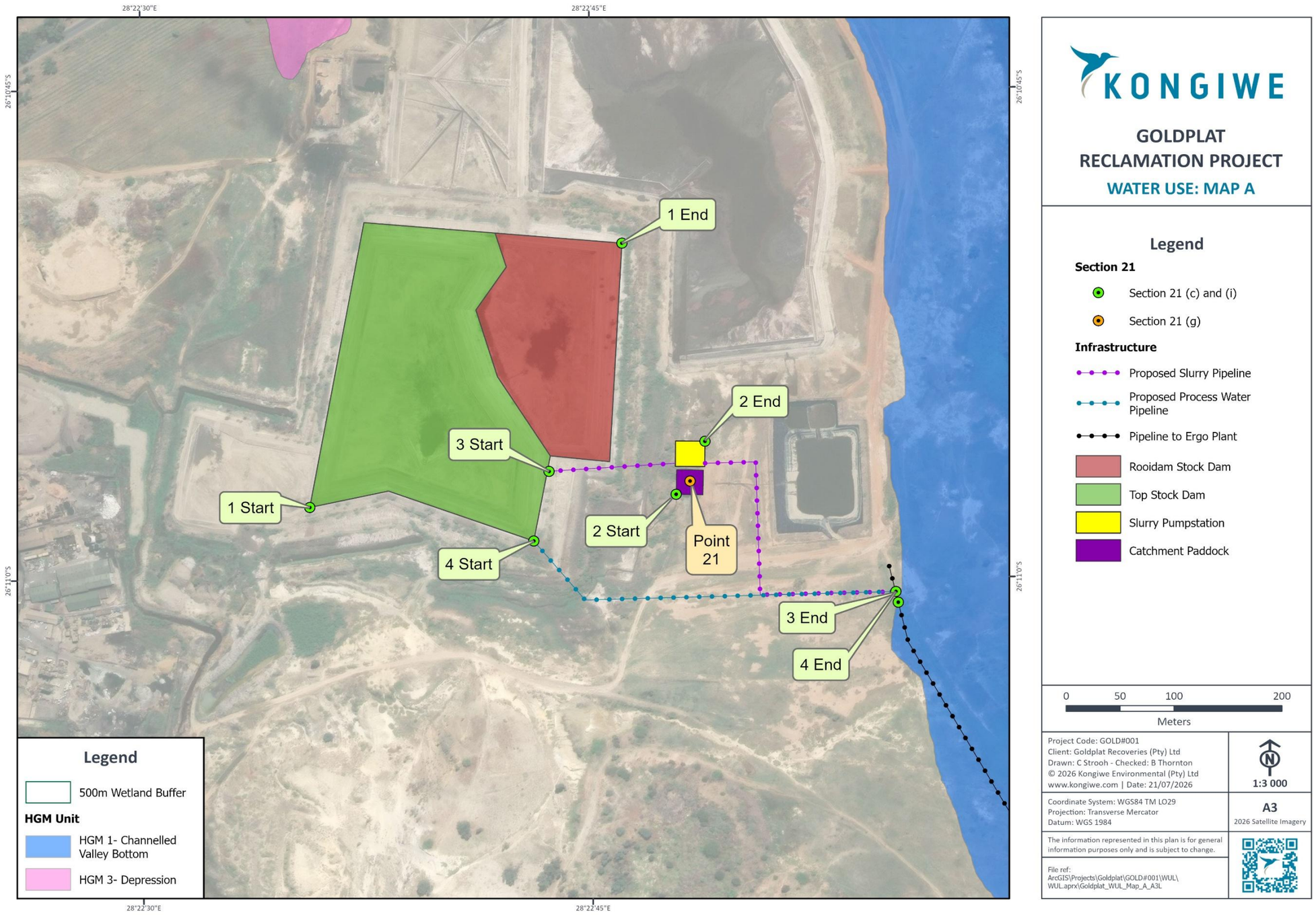


*Figure 3-2: Water Uses to be Licensed (Map A)*


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### 3.7 Waste Management Activity (NEM:WA)

The Proposed Project forms part of Goldplat's existing approved Environmental Management Plan (EMP), which includes the reclamation of tailings. As these activities are already authorised under the approved EMP and remain valid in terms of the transitional arrangements provided for in GN R 632, a Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act (NEMWA) is not required for the Proposed Project.

### 3.8 Other authorisations (EIAs, EMPs, RODs, Regulations)

Goldplat holds an Environmental Authorisation (EA) entitling it to reclaim and process the Goldplat stock dams. The DMPR reference for the abovementioned EA is GP30/5/1/2/3/2/1 (241) EM. It is the intention of the Goldplat to acquire a WUL for the Proposed Project hence the compilation of this IWWMP.


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# 4. PRESENT ENVIRONMENTAL SITUATION

This Chapter provides a description of the environment that may be affected by the Proposed Project. The information is provided to assist the reader in understanding the receiving environment within which the Project is proposed, and features of the biophysical, social, and economic environment that could be directly or indirectly affected by the proposed development.

## 4.1 Climate

### 4.1.1 Rainfall

Rainfall data for the area was obtained from the Springs-Olympia Park rainfall station (station no. 047636 W). The station is located approximately 12 km south-east of the Goldplat. Patched rainfall data was obtained for the period of 1920 to 2006. The mean monthly rainfall is indicated in Table 4-1 below.

The area has a Mean Annual Precipitation of 737 mm. Rainfall is highest over the months of October to March and lowest over the months of April to September.

*Table 4-1: Monthly Rainfall Data for the Project Area*

| Month | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (mm) | 68 | 112 | 117 | 131 | 99 | 94 | 49 | 20 | 7 | 7 | 9 | 24 | 737 |

### 4.1.2 Stormwater Rainfall Depths

The storm rainfall depths, which are required to calculate the peak flows, were extracted using the Design Rainfall Estimation in South Africa software programme. The programme uses the six closest rainfall stations (See Table 4-2) to the user specified coordinates, to calculate the storm rainfall depths for that site. Storm rainfall depths were extracted at 26°13’ S, 28°28’ E. The storm rainfall depths are indicated in Table 4-3.

*Table 4-2: Six Closest Rainfall Stations to the Project Area*

| Station Name | Station No. | Distance from Project area (km) | Latitude | Longitude | MAP (mm) | Altitude (mamsl) |
|---|---|---|---|---|---|---|
| Springs-Olympia Park | 0476766_W | 6.5 | 26°15’ | 28°25’ | 711 | 1622 |
| Springs (RWB) | 0476736_W | 7.6 | 26°16’ | 28°25’ | 709 | 1610 |
| Govt Gold Mine Areas | 0476673_W | 9.2 | 26°12’ | 28°23’ | 723 | 1603 |
| Rietfontein | 0476737_W | 9.7 | 26°18’ | 28°30’ | 702 | 1580 |
| Brakpan (MUN) | 0476644_W | 10.9 | 26°14’ | 28°22’ | 737 | 1618 |
| New Modderfontein (GM) | 0476641_W | 11.4 | 26°11’ | 28°22’ | 739 | 1615 |

*Table 4-3: Storm Rainfall Depths for the Project Area*

| Storm Duration | Return Period/Storm Rainfall Depth (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| min/hr/day | 1:2yr | 1:5yr | 1:10yr | 1:20yr | 1:50yr | 1:100yr | 1:200yr |
| **5 min** | 8.5 | 11.8 | 14.2 | 16.9 | 20.7 | 23.9 | 27.4 |
| **10 min** | 12.4 | 17.1 | 20.6 | 24.4 | 29.9 | 34.6 | 39.7 |


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| Storm Duration | Return Period/Storm Rainfall Depth (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| min/hr/day | 1:2yr | 1:5yr | 1:10yr | 1:20yr | 1:50yr | 1:100yr | 1:200yr |
| **15 min** | 15.3 | 21.2 | 25.6 | 30.3 | 37.2 | 42.9 | 49.2 |
| **30 min** | 19.6 | 27 | 32.7 | 38.7 | 47.5 | 54.8 | 62.9 |
| **45 min** | 22.6 | 31.2 | 37.7 | 44.7 | 54.8 | 63.2 | 72.6 |
| **1 hr** | 25 | 34.5 | 41.8 | 49.4 | 60.6 | 70 | 80.3 |
| **1.5 hr** | 28.9 | 39.8 | 48.2 | 57 | 69.9 | 80.7 | 92.7 |
| **2 hr** | 31.9 | 44.1 | 53.3 | 63.1 | 77.4 | 89.4 | 102.6 |
| **4 hr** | 38 | 52.4 | 63.4 | 75 | 92 | 106.2 | 121.8 |
| **6 hr** | 42 | 58 | 70.1 | 82.9 | 101.7 | 117.5 | 134.8 |
| **9 hr** | 45.1 | 62.3 | 75.3 | 89.1 | 109.2 | 126.2 | 144.8 |
| **10 hr** | 47.7 | 65.8 | 79.6 | 94.2 | 115.5 | 133.4 | 153 |
| **12 hr** | 49.9 | 68.9 | 83.3 | 98.5 | 120.8 | 139.5 | 160.1 |
| **16 hr** | 53.6 | 74 | 89.4 | 105.9 | 129.8 | 149.9 | 172 |
| **20 hr** | 56.6 | 78.2 | 94.5 | 111.9 | 137.2 | 158.4 | 181.8 |
| **24 hr** | 59.3 | 81.8 | 98.9 | 117.1 | 143.6 | 165.8 | 190.2 |
| **1 day** | 51.3 | 70.9 | 85.7 | 101.4 | 124.4 | 143.6 | 164.8 |
| **2 days** | 63.2 | 87.2 | 105.5 | 124.8 | 153 | 176.7 | 202.8 |
| **3 days** | 71.3 | 98.5 | 119.1 | 140.9 | 172.8 | 199.5 | 229 |
| **4 days** | 77.5 | 106.9 | 129.3 | 153 | 187.6 | 216.7 | 248.6 |
| **5 days** | 82.6 | 114 | 137.8 | 163.1 | 200 | 231 | 265.1 |
| **6 days** | 87 | 120.1 | 145.2 | 171.9 | 210.8 | 243.4 | 279.3 |
| **7 days** | 90.9 | 125.5 | 151.8 | 179.6 | 220.3 | 254.4 | 291.9 |

### 4.1.3 Evaporation

Symons Pan (S-Pan) evaporation data for the area were obtained from the WR2012 study for quaternary catchment C21D (See Table 4-4). S-Pan evaporation measurements are not a true reflection of evaporation from natural open water bodies, as the water temperatures in the S-Pan are higher, resulting in higher evaporation rates. To convert S-Pan measurements to open water evaporation, monthly open water evaporation factors were used, which were obtained from the WR2012 study. Evaporation is highest over the months of September to March, and lowest over the cooler months of April to August.


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*Table 4-4: Evaporation Data for the Area*

| Month | S-Pan Evaporation (mm) | Evaporation Factor | Open Water Evaporation (mm) |
|---|---|---|---|
| October | 177 | 0.84 | 149 |
| November | 177 | 0.88 | 156 |
| December | 191 | 0.88 | 168 |
| January | 185 | 0.88 | 163 |
| February | 153 | 0.87 | 133 |
| March | 143 | 0.85 | 122 |
| April | 108 | 0.83 | 90 |
| May | 88 | 0.81 | 71 |
| June | 71 | 0.81 | 58 |
| July | 77 | 0.81 | 62 |
| August | 111 | 0.82 | 91 |
| September | 150 | 0.83 | 125 |
| **Total** | **1631** | **N/A** | **1386** |

## 4.2 Topography

The Highveld inland plateau has elevations varying from 1 500 m to 1 700 m and prominent morphological features in the area include historic mine dumps which rise to about 50 - 60 m above ground.

Elevation varies from 1 660 metres above mean sea level (mamsl) near the Ergo Plant, to 1 600 mamsl along the northern side of the Goldplat TSF. The general topography of the area can be described as undulating with slopes less than 10 %. The only steep slopes (slopes in excess of 30 %) occur along the sides of the old mining dumps in the area. The topography of the project area is shown in Figure 4-1.


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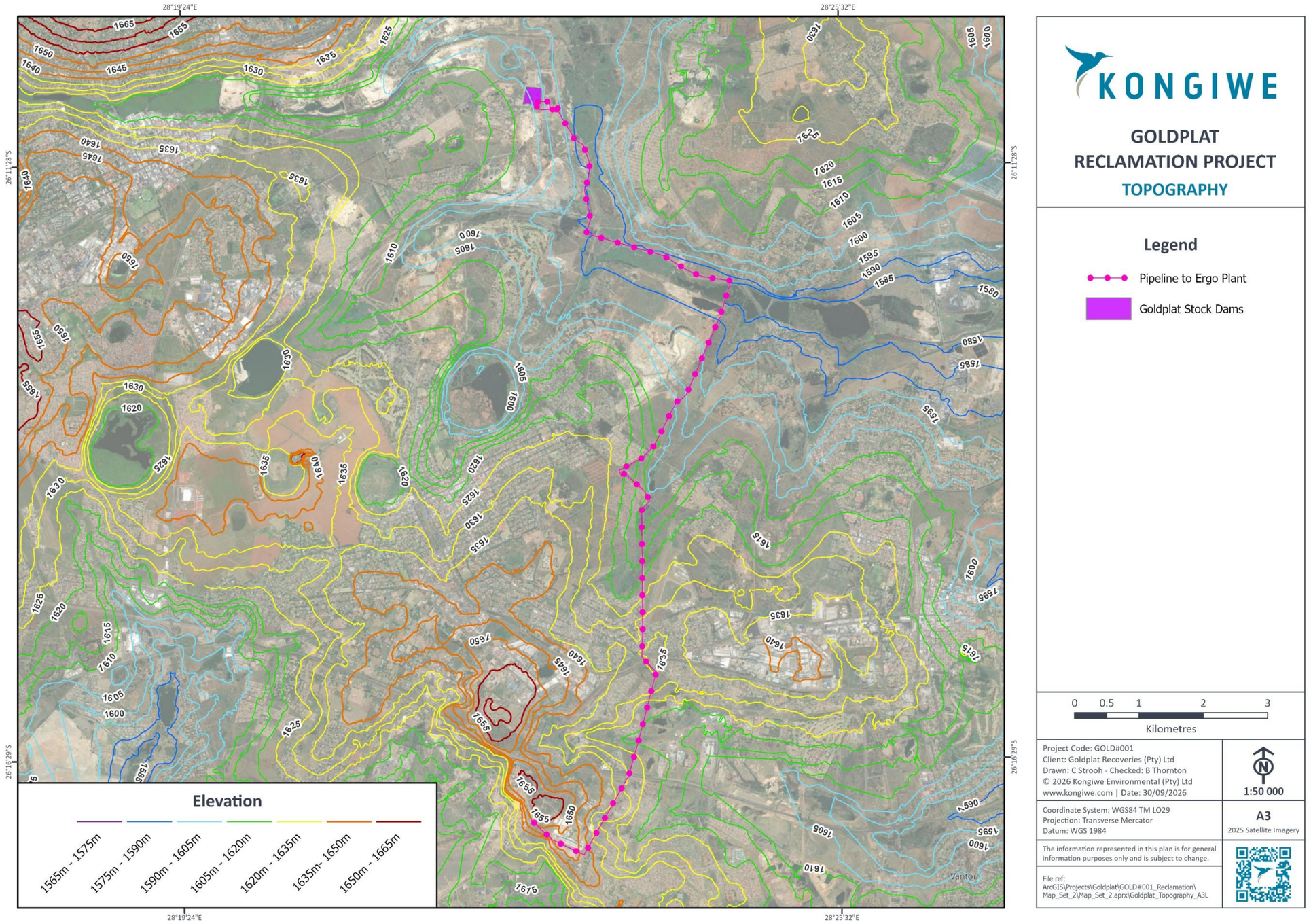


*Figure 4-1: Project Area Topography*


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## 4.3 Geology

The Proposed Project area is located within the Central Rand Goldfields of the Witwatersrand Supergroup. The Central Rand Goldfield's are geologically one of the most interesting and economically significant areas in South Africa's history (Figure 4-2). Having yielded more than one third of all the gold ever produced on the planet, the Witwatersrand Basin held the world's largest gold reserves (Tucker et al., 2016).

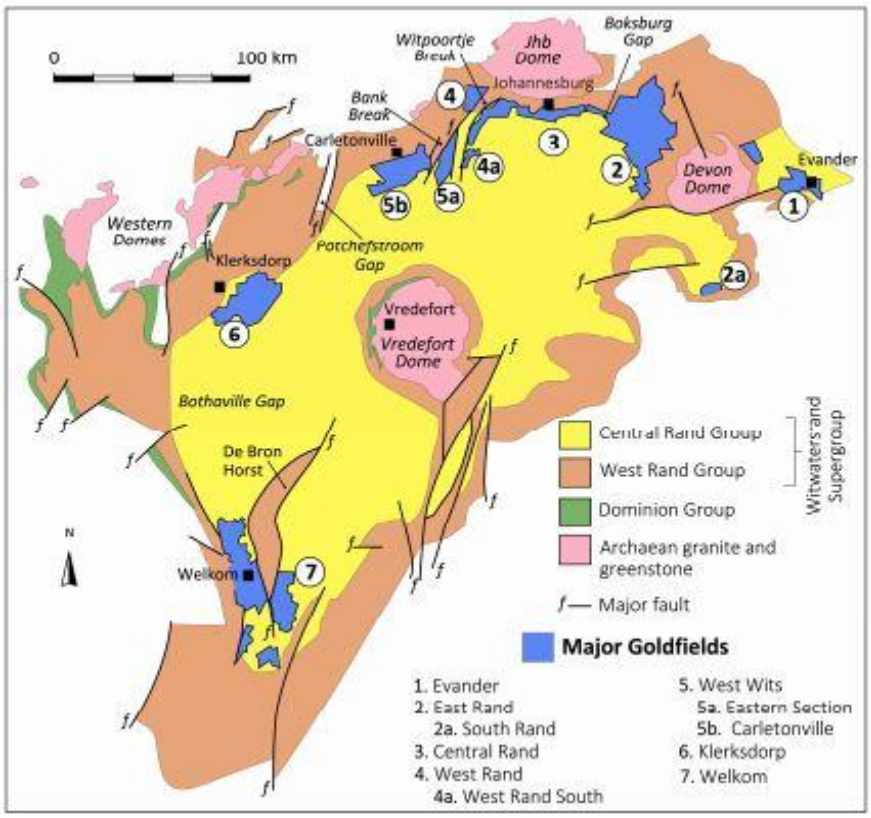


***Figure 4-2: The Geology of the Witwatersrand Basin Stripped of Younger Cover and Showing the Position of the Seven Major Goldfields (Source: Tucker et al., 2016)***

The Witwatersrand Supergroup comprises of a lower "West Rand Group" (WRG) and an upper "Central Rand Group" (CRG) (SACS, 1980). The continuity of the major geological units, marker horizons and individual conglomerate reef horizons around the auriferous northern and western basin edges, are features of the Witwatersrand as exemplified by the major stratigraphic units of the CRG.

The WRG comprises of the lower Hospital Hill Subgroup; middle Government Subgroup and upper Jeppestown Subgroup. The shales of the WRG are characterised by the presence of magnetite bearing interlayers. These layers played a significant role during deep basin exploration, as they were used as magnetic markers.

The CRG contains by far the bulk of the gold mineralisation. It is divided into a lower Johannesburg Subgroup and an upper Turffontein Subgroup. These Subgroups are separated by the Booysens Shale Formation, often called the "Upper Shale marker" in the Welkom Goldfield. The CRG comprises a number of formations which, although varying in thickness, can be traced and correlated, with a few exceptions, in all the goldfields. The gold-bearing conglomerate reefs tend to occur in clusters which are informally referred to as "reef groups". All of the important gold reefs lie on prominent unconformity surfaces, many of which can be traced around the entire basin. Refer to Figure 4-3 for the geology map of the project area.


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According to Tucker et al. (2016), another characteristic of the Witwatersrand mining area is a series of cross-cutting lineaments representing faults and dykes. The dykes are not 100% impermeable and fault appearance varies from a hairline width to large breccia filled widths and faults are commonly filled with intrusive material. The geology underlying the project area consist of the Turffontein and Johannesburg Subgroups of the CRG.


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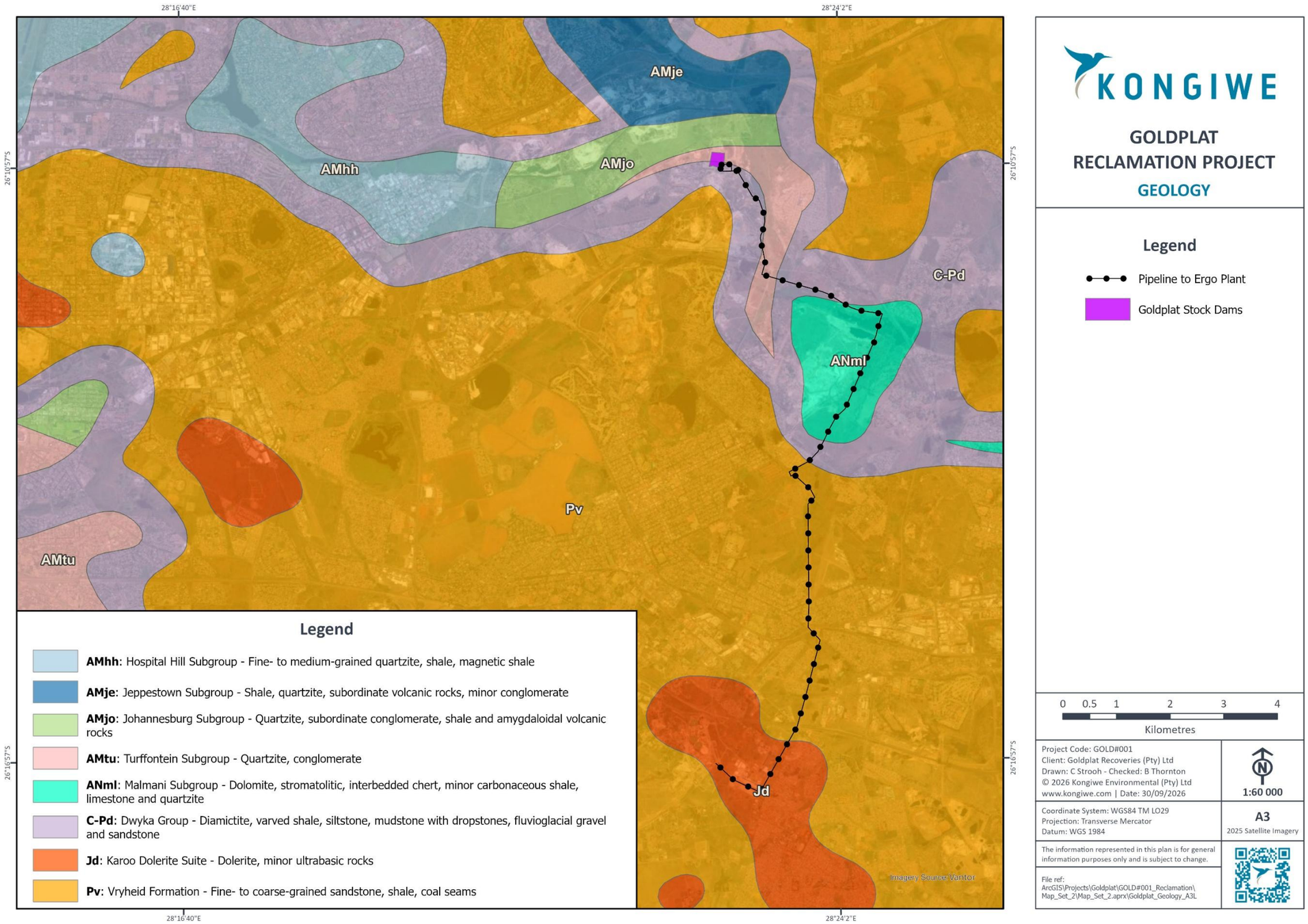


*Figure 4-3: Project Area Geology*


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## 4.4 Soils Land Capability and Land Use

### 4.4.1 Soil

The soil classification for the Project area is identified as Ba1, Ba2, and Bb3 Plinthic Catena, which typically consists of upland duplex and margalitic soils, though these are considered rare in this context (See Figure 4-4). The soils are primarily dystrophic and/or mesotrophic, indicating low to moderate natural fertility, with red soils being widespread throughout the landscape.

### 4.4.2 Land Cover and Land Use

Land Use data form an important component in the hydrological assessment undertaken to calculate the peak flows. The South African National Land Cover (SANLC) Dataset (2020) was used to assess the land use characteristics of the catchments.

The Blesbokspruit catchment is significantly developed, with extensive urban areas, industrial complexes, and other irrigation areas, lakes/dams and tailings dams. The Project area is predominantly surrounded by mining areas, industrial areas, residential areas, railway infrastructure, and existing road networks. Most of the Project area has been subject to significant disturbance due to past mining activities and infrastructure, the presence of the existing TSF and problems arising from mining activities, and grazing cattle roaming throughout the area. Most of the land cover of the Project area is classified as mines dumps, grassland, townships residential areas, wetlands and waterbodies as shown in Figure 4-5.


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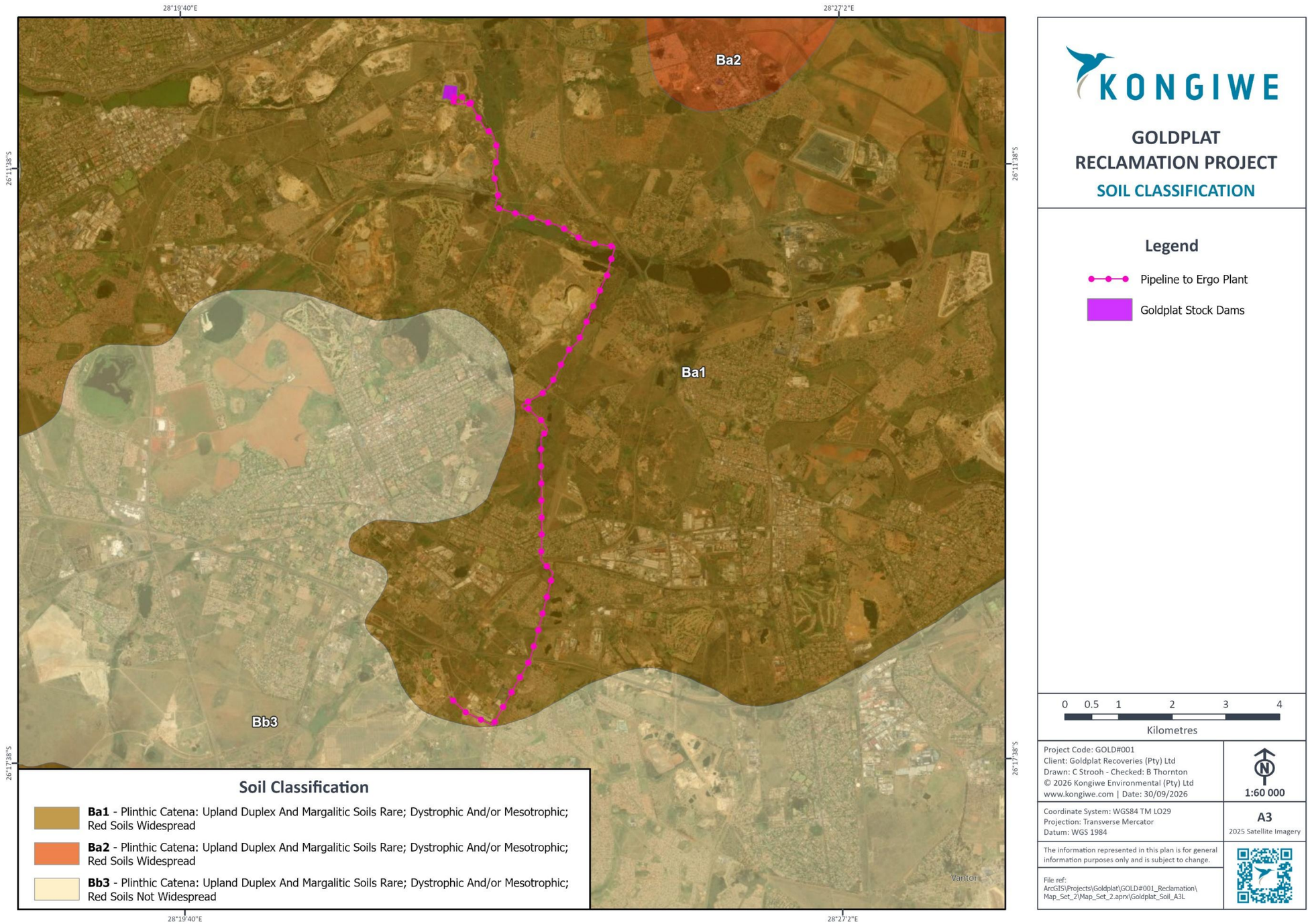


*Figure 4-4: Soil Classification of the Project Area*


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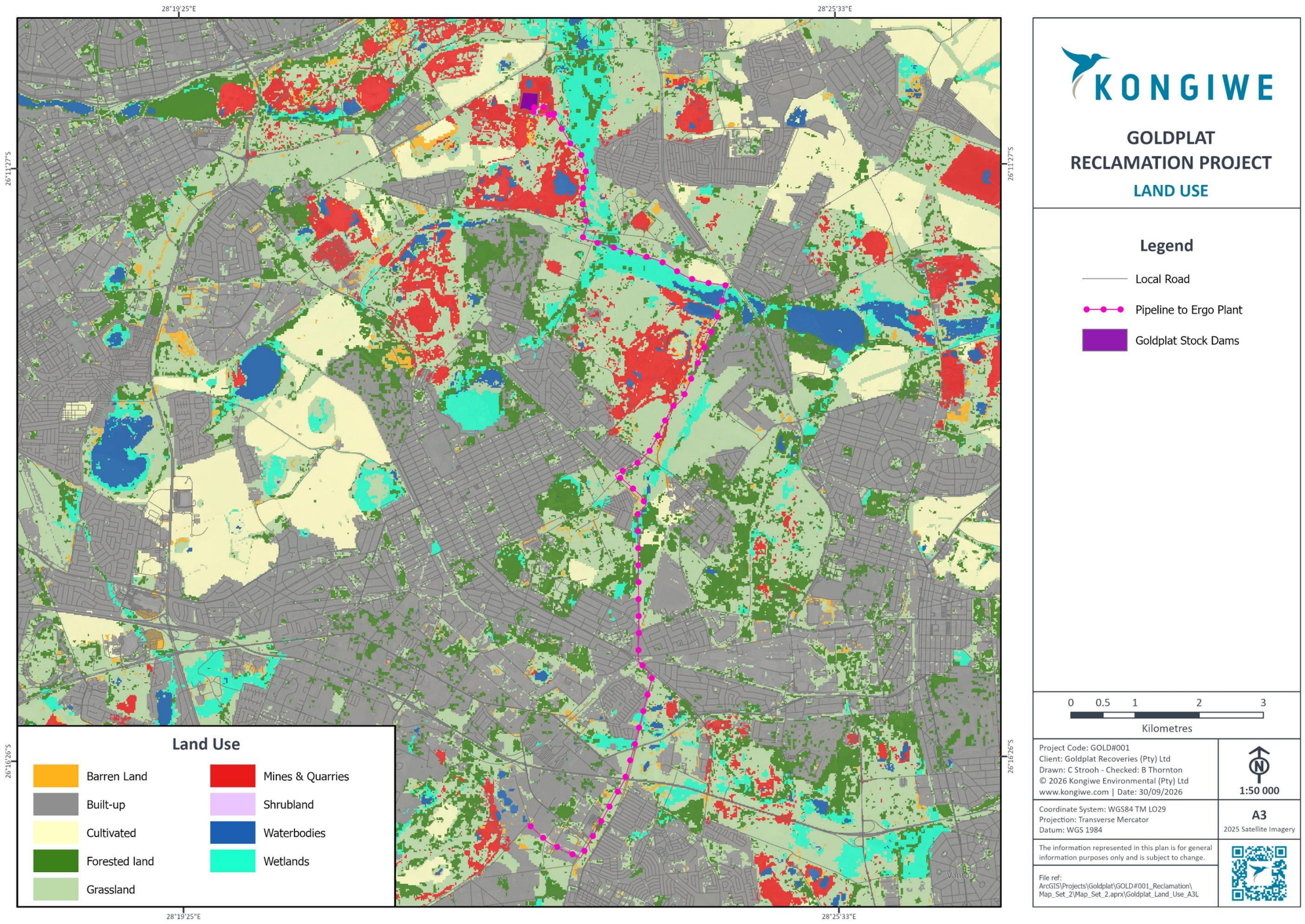


*Figure 4-5: Land Uses of the Proposed Project Site and Surrounding Area*


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## 4.5 Surface Water

**Refer to Specialist Study: Appendix A – Surface Water Assessment**

### 4.5.1 Regional Catchment and Drainage

The DWS has divided South Africa into primary, secondary, tertiary and quaternary catchments. Primary catchments are the largest defined catchments for South Africa, of which there are 22, and are assigned a letter ranging from A – X (excluding O). Secondary catchments are subdivisions of the primary catchments and are the second largest catchments in South Africa and are assigned the primary catchment letter within which they are located and a number e.g. A5 (secondary catchment 5 located within primary catchment A). Similarly, tertiary catchments are subdivisions of secondary catchments and are represented for example by A53 (tertiary catchment 3 located within secondary catchment A5). Lastly, quaternary catchments are the smallest defined catchments and are assigned the tertiary catchment number, along with a quaternary catchment letter, e.g. A53D (quaternary catchment D located within tertiary catchment A53).

Further to the above, the DWS has divided South Africa into six Water Management Areas (WMAs). The six WMAs include the Limpopo-Olifants, Inkomati-Usuthu, Pongola-Mtamvuna, Vaal-Orange, Mzimvubu-Tsitsikamma, and Breede-Olifants WMAs.

The Project area is located within the Vaal-Orange WMA, as shown in Figure 4-6. The site infrastructure and majority of the pipeline route is located within quaternary catchment C21D, with the remainder of the pipeline route traversing C21E and a small portion of C22C. The project drains in an easterly direction towards a tributary of the Blesbokspruit. The Blesbokspruit flows in a southerly direction until its confluence with the Suikerbosrand River, 37 km south-west of the Ergo Plant. The Suikerbosrand River flows into the Vaal River near the town of Vereeniging.


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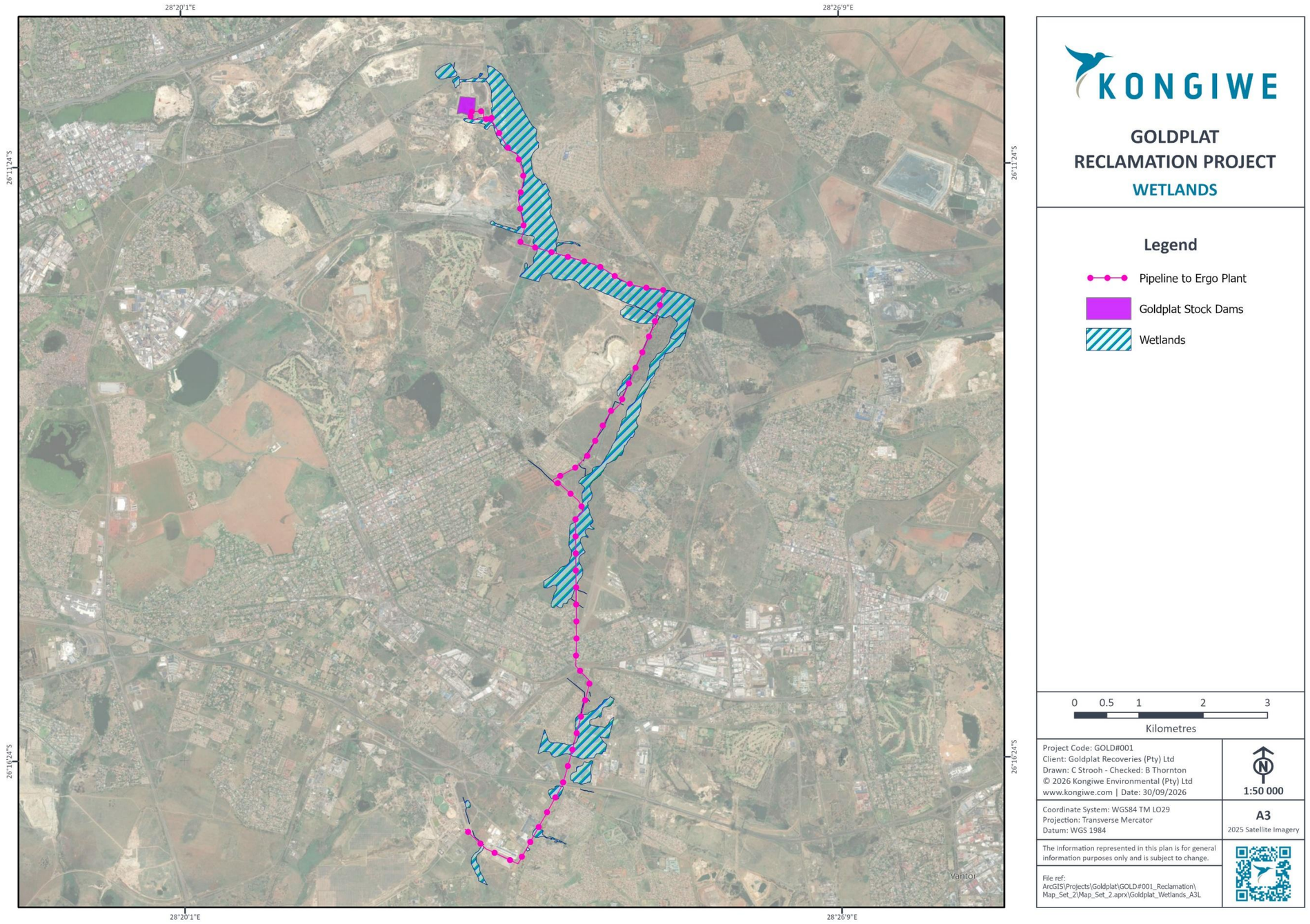


*Figure 4-6: Location of the Proposed Project in Relation to Catchments*


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### 4.5.2 Surface Water Runoff

The proposed infrastructure at the Goldplat site and the majority of the pipeline route are located in quaternary catchment C21D. According to the WR2012 study, the simulated Mean Annual Runoff (MAR) at the outlet of C21D, between October 2004 and September 2010, was 51.6 million cubic metres (mcm). The naturalised MAR, which is the runoff under natural virgin catchment conditions (i.e. no man-made land uses or activities), over the same period, was 27 mcm. Quaternary catchment C21D therefore produces almost double the runoff than it should under natural catchment conditions. This is due to the impermeable urban nature of the catchment as well as large effluent discharges into the catchment.

### 4.5.3 Surface Water Quality

Surface water quality data for the Proposed Project area and surrounding environment were sourced from water quality sampling undertaken during the site visit on 22 July 2026, water quality sampling conducted as part of the groundwater study by Irene Lea Environmental and Hydrogeology on 8 July 2026, and monthly water quality monitoring undertaken in accordance with Goldplat's WUL conditions (WUL Ref: 08/C21D/ACGI/11642).

#### 4.5.3.1 Surface Water Monitoring Point

The sampling locations are summarised in Table 4-5 and are indicated on Figure 4-7.

***Table 4-5: Details of the Surface Water Sampling Locations***

| Sampling Location | Description | Sampling Record | Latitude* | Longitude* |
|---|---|---|---|---|
| SW1 | Sample taken by Hydrospatial upstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Upstream) | Once off | -26.174439 | 28.383721 |
| SW2 | Sample taken by Hydrospatial downstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Downstream) | Once off | -26.200188 | 28.39012 |
| Stream1 | Sample taken by the groundwater specialist on a stream draining from an adjacent 3rd party dump | Once off | -26.183505 | 28.379379 |
| Toe1 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.181709 | 28.37977 |
| Toe2 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.182599 | 28.379645 |


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| Sampling Location | Description | Sampling Record | Latitude* | Longitude* |
|---|---|---|---|---|
| BBspruit Upstream | Goldplat monitoring point upstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.17458 | 28.38358 |
| BBspruit Downstream | Goldplat monitoring point downstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.200174 | 28.39007 |
| RWD | Goldplat monitoring point at the Return Water Dam (RWD), which receives seepage and runoff from the Goldplat stock dams | Monthly sampling from July 2022 – April 2026 | -26.182716 | 28.381353 |

*Decimal degrees, geographic coordinate system


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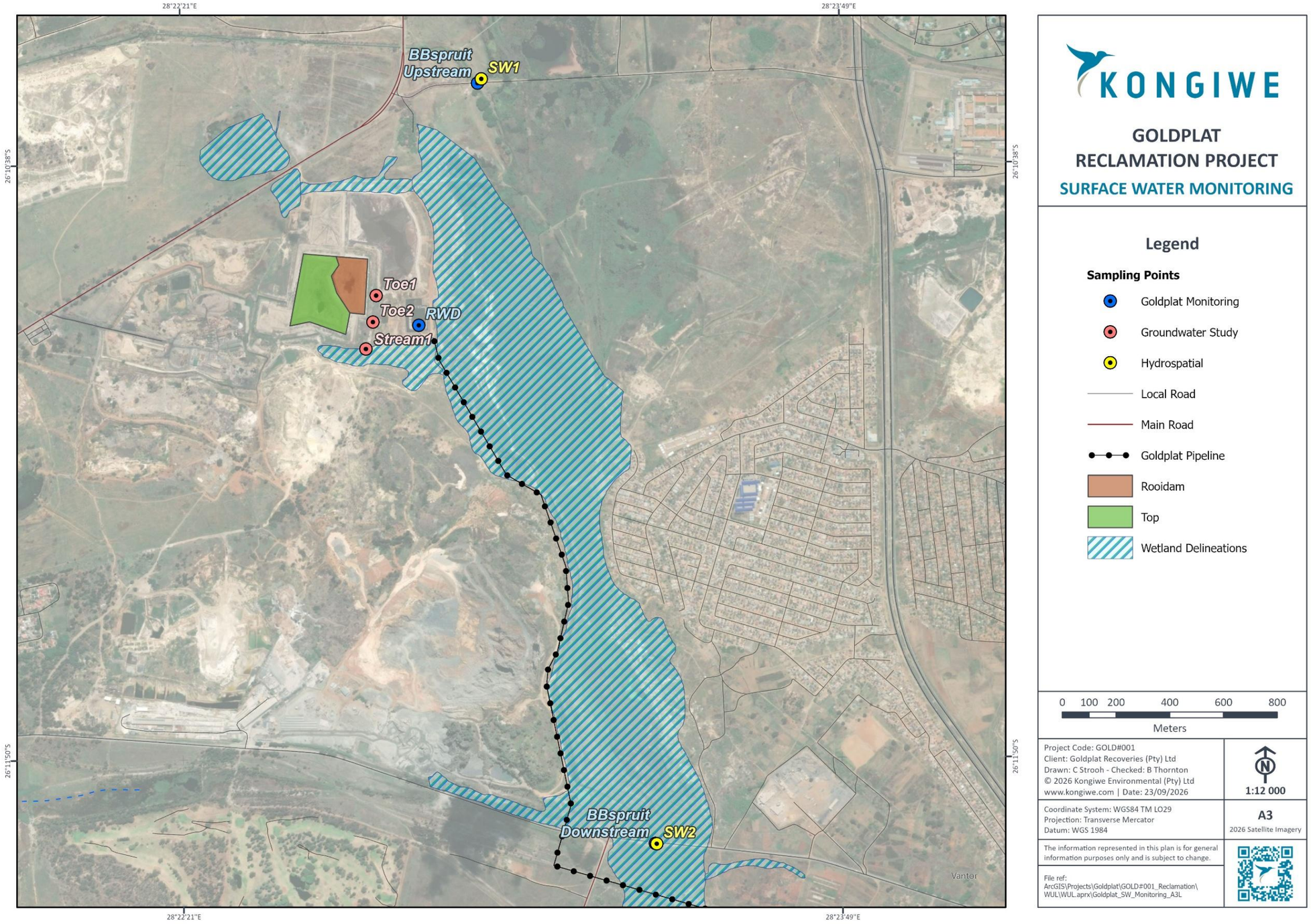


*Figure 4-7: Surface water quality sampling locations*


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#### 4.5.3.2 Guideline Limits

The water quality results were compared to the Blesbokspruit catchment guideline limits and the South African National Standard (SANS) 241:2015 Drinking Water Quality limits. The guideline limits are described below.

#### 4.5.3.3 Blesbokspruit Catchment Guideline Limits

The Blesbokspruit catchment guideline limits are specified as follows:

- **Ideal** – this is the range that results should ideally fall within;
- **Acceptable** – results that fall within this range are acceptable but not ideal;
- **Tolerable** – results that fall within this range are tolerable; and
- **Unacceptable** – results that fall within this range are unacceptable.

Results exceeding the Blesbokspruit catchment tolerable and unacceptable limits, are coloured in yellow and red respectively in Table 4-6 to Table 4-9.

#### 4.5.3.4 SANS 241:2015

SANS 241:2015 is generally used for water quality comparison purposes, albeit providing stringent limits that are required for drinking water purposes. SANS 241:2015 was used where there were no limits specified by the Blesbokspruit catchment guideline limits. The limits provided in SANS 241:2015 are separated into the following risks:

- Acute health: Parameter that poses immediate unacceptable health risk if consumed with water at concentration values exceeding the specified limit;
- Aesthetic: Parameter that taints water with respect to taste, odour and colour, and that does not pose an unacceptable health risk if present at concentration values exceeding the specified limit;
- Chronic health: Parameter that poses an unacceptable health risk if ingested over an extended period if present at concentration values exceeding the specified limit; and
- Operational: Parameter that is essential for assessing the efficient operation of treatment systems and risks to infrastructure.

Results exceeding the SANS 241:2015 limits are highlighted in orange Table 4-6


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*Table 4-6: Surface Water Quality Results from the Surface Water and Groundwater Study Site Visits*

| Parameter | Units | Blesbokspruit Catchment Guideline Limits | | | | SANS 241:2015 Drinking Quality Limits | | SW1 | SW2 | Toe1 | Toe2 | Stream1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ideal | Acceptable | Tolerable | Unacceptable | Risk | Limit | Jul-26 | Jul-26 | Jul-26 | Jul-26 | Jul-26 |
| pH | pH Units | 6.5 - 8.5 | --- | --- | < 6.5; >8.5 | Operational | ≥ 5 to ≤ 9.7 | 8.18 | 8.01 | 7.53 | 7.96 | 10.2 |
| Electrical Conductivity (EC) | mS/m | <45 | 45 - 70 | 70 - 120 | > 120 | Aesthetic | ≤ 170 | 38 | 54.7 | 1124 | 1293 | 841 |
| Total Dissolved Solids (TDS) | mg/ℓ | --- | --- | --- | --- | Aesthetic | ≤ 1 200 | 219 | 317 | 9372 | 10434 | 6226 |
| Total Alkalinity | mg $CaCO_3$/ℓ | --- | --- | --- | --- | --- | --- | 94.1 | 104 | 277 | 245 | 717 |
| Chloride (Cl) | mg/ℓ | < 80 | 80 - 150 | 150 - 200 | > 200 | Aesthetic | ≤ 300 | 34.3 | 63.2 | 761 | 880 | 1416 |
| Sulphate ($SO_4$) | mg/ℓ | < 150 | 150 - 300 | 300 - 500 | > 500 | Acute health | ≤ 500 | 46.7 | 73.6 | 5490 | 6637 | 1420 |
| Nitrate ($NO_3$) as N | mg/ℓ | < 0.5 | 0.5 - 3 | 3 - 6 | > 6 | Acute health | ≤ 11 | 0.22 | 0.199 | 6.77 | 22.1 | <0.194 |
| Ammonium ($NH_4$) as N | mg/ℓ | < 0.1 | 0.1 - 1.5 | 1.5 - 5.0 | > 5.0 | --- | --- | 0.045 | 0.084 | 119 | 99.6 | 43.1 |
| Orthophosphate ($PO_4$) as P | mg/ℓ | < 0.2 | 0.2 - 0.4 | 0.4 - 0.6 | > 0.6 | --- | --- | <0.009 | 0.03 | <0.009 | 0.02 | <0.009 |
| Fluoride (F) | mg/ℓ | < 0.19 | 0.19 - 0.7 | 0.7 - 1 | > 1 | Chronic health | ≤ 1.5 | <0.263 | <0.263 | 0.964 | 0.539 | 1.02 |
| Calcium (Ca) | mg/ℓ | --- | --- | --- | --- | --- | --- | 33.9 | 36 | 519 | 521 | 20.7 |
| Magnesium (Mg) | mg/ℓ | < 8 | 8 - 30 | 30 - 70 | > 70 | --- | --- | 13.3 | 15.3 | 28.2 | 52.6 | 18.9 |
| Sodium (Na) | mg/ℓ | < 70 | 70 - 100 | 100 - 150 | > 150 | Aesthetic | ≤ 200 | 24.7 | 51.8 | 2290 | 2749 | 1948 |
| Potassium (K) | mg/ℓ | --- | --- | --- | --- | --- | --- | 7.56 | 12.2 | 83.8 | 84 | 22.9 |
| Aluminium (Al) | mg/ℓ | --- | < 0.3 | 0.3 - 0.5 | > 0.5 | Operational | ≤ 0.3 | 0.085 | 0.084 | <0.003 | <0.003 | 0.228 |
| Iron (Fe) | mg/ℓ | < 0.1 | 0.1 - 0.5 | 0.5 - 1.0 | > 1 | Chronic health | ≤ 2 | <0.004 | <0.004 | 0.103 | 0.22 | 12.9 |
| Manganese (Mn) | mg/ℓ | < 0.2 | 0.2 - 0.5 | 0.5 - 1 | > 1 | Chronic health | ≤ 0.4 | 0.005 | 0.008 | 2.18 | 1.19 | 0.075 |
| Chromium (Cr) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.05 | <0.01 | <0.01 | --- | --- | --- |
| Copper (Cu) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 2 | 0.004 | 0.025 | <0.003 | <0.003 | 0.489 |
| Nickel (Ni) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.07 | <0.007 | <0.007 | 0.26 | 0.175 | 17.2 |
| Zinc (Zn) | mg/ℓ | --- | --- | --- | --- | Aesthetic | ≤ 5 | 0.011 | <0.006 | --- | --- | --- |
| Cobalt (Co) | mg/ℓ | --- | --- | --- | --- | --- | --- | <0.003 | <0.003 | 19 | 15.6 | 1.17 |
| Cadmium (Cd) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.003 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Lead (Pb) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.01 | <0.004 | <0.004 | <0.004 | <0.004 | 0.01 |
| Total Suspended Solids (TSS) | mg/ℓ | < 20 | 20 - 30 | 30 - 55 | > 55 | --- | --- | <4.5 | <4.5 | --- | --- | --- |
| Dissolved Uranium (U) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.03 | <0.015 | <0.015 | <0.015 | 1.9 | 0.238 |


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*Table 4-7: Goldplat Monitoring Results for BBspruit Upstream*

| BBspruit Upstream | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | **Ca** | **Mg** | **Na** | **SO4** | **NO3** | **Cl** | **F** | **Fe** | **Mn** | **NH3** | **NH4** | **pH** | **EC** | **T.Alk** | **TDS** | **TSS** |
| **Blesbokspruit Unacceptable Limit** | **-** | **>70** | **>150** | **>500** | **>6** | **>200** | **>1** | **>1** | **>1** | **-** | **>5** | **<6.5; >8.5** | **>120** | **-** | **-** | **>55** |
| 08/07/2022 | 28.92 | 12.67 | 27 | 24 | 1.23 | 26.4 | 0.08 | 0.201 | <0.01 | 1.2 | - | 7.03 | 372 | 89.5 | 224 | 12 |
| 12/08/2022 | 33.78 | 16.74 | 31 | 72 | 1.69 | 18.4 | 0.22 | 0.009 | 0.017 | 1.07 | - | 8.03 | 412 | 94.5 | 258 | 8 |
| 09/09/2022 | 34.3 | 10.77 | 39 | 65 | 2.9 | 105.6 | 0.43 | 0.388 | 0.05 | 3.93 | - | 7.5 | 458 | 107.9 | 254 | 16 |
| 13/10/2022 | 28.53 | 24.88 | 89 | 50 | 2.94 | 57 | 1.19 | 0.334 | 0.575 | 11.6 | - | 7.22 | 799 | 236.6 | 405 | 31 |
| 18/11/2022 | 21.42 | 14.14 | 17 | 41 | 2.64 | 34.4 | 0.38 | 0.08 | 0.08 | 1.63 | - | 7.58 | 302 | 64.3 | 219 | 16 |
| 16/01/2023 | 23.56 | 15.72 | 15 | 15 | 1.87 | 15.9 | <0.01 | 0.18 | 0.05 | 1.56 | - | 6.91 | 260 | 72.7 | 166 | 11 |
| 16/02/2023 | 31.09 | 8.71 | 14 | 17 | 1.73 | 12.7 | 0.28 | 0.14 | 0.04 | 1.1 | - | 7.19 | 337 | 83.7 | 211 | 16 |
| 16/03/2023 | 26.38 | 8.41 | 19 | 47 | 2.36 | 34.1 | 0.34 | 0.31 | 0.02 | 1.1 | - | 6.62 | 307 | 74.2 | 211 | 4 |
| 21/04/2023 | 27.25 | 13.25 | 23 | 45 | 3.44 | 26.2 | 0.35 | 0.27 | 0.04 | 1.41 | - | 8.13 | 374 | 91.4 | 258 | 4 |
| 26/05/2023 | 28.55 | 15.76 | 26 | 38 | 1.58 | 12 | 0.47 | 0.12 | 0.02 | 1.08 | - | 8.03 | 403 | 93.5 | 268 | 6 |
| 26/06/2023 | 24.77 | 21.1 | 21 | 32 | 2.03 | 8.2 | 0.34 | 0.13 | 0.01 | 1.53 | - | 6.49 | 426 | 94.4 | 296 | 0 |
| 19/07/2023 | 34.99 | 11.89 | 27 | 261 | 2.65 | 92.4 | 0.41 | 0.09 | 0.03 | 1.25 | - | 6.94 | 395 | 93.2 | 275 | 11 |
| 31/08/2023 | 42.97 | 9.85 | 32 | 47 | 3.92 | 106.9 | 0.54 | 0.05 | 0.02 | 1.56 | - | 8.04 | 460 | 104.1 | 317 | 12 |
| 28/09/2023 | 37.8 | 14.16 | 35 | 74 | 3.23 | 39.5 | 0.44 | 0.06 | 0.01 | 1.61 | - | 8.08 | 507 | 117.8 | 349 | 26 |
| 16/10/2023 | 36.56 | 10.46 | 35 | 40 | 2.83 | 39 | 0.95 | 0.16 | 0.03 | 1.57 | - | 8.4 | 502 | 128.4 | 483 | 4 |
| 10/11/2023 | 30.25 | 8.08 | 24 | 27 | 3.15 | 37.6 | 0.47 | 0.01 | 0.01 | 1.33 | - | 6.9 | 363 | 98.1 | 275 | 10 |
| 18/12/2023 | 24.44 | 9.63 | 25 | 22 | 6.67 | 38.9 | 0.39 | 0.03 | <0.01 | 4.76 | - | 8.35 | 365 | 101.6 | 247 | 9 |
| 22/01/2024 | 21.78 | 6.07 | 23 | 26 | 1.91 | 28.5 | 0.04 | 0.16 | <0.01 | 8.29 | - | 7.02 | 383 | 117.4 | 282 | 19 |
| 27/02/2024 | 20.8 | 9.4 | 23 | 40 | 2.66 | 22.8 | 0.36 | 0.18 | 0.17 | 5.67 | - | 6.72 | 319 | 96.3 | 251 | 15 |
| 18/03/2024 | 11.8 | 18.73 | 36 | 28 | 4.43 | 44.4 | 0.37 | 0.57 | 0.16 | 18.69 | - | 6.65 | 499 | 165 | 354 | 24 |
| 17/04/2024 | - | - | - | - | 2.86 | - | - | - | - | 5.59 | 5.92 | 6.41 | 345 | 92.6 | - | 14 |
| 21/05/2024 | - | - | - | - | 7.16 | - | - | - | - | 15.25 | 0 | 6.49 | 0.513 | 172.1 | - | 49 |
| 18/06/2024 | - | - | - | - | 2.67 | - | - | - | - | 23.1 | 108.57 | 6.69 | 0.582 | 184.1 | - | 45 |
| 15/07/2024 | - | - | - | - | 2.26 | - | - | - | - | 23 | 0 | 6.3 | 0.615 | 202.5 | - | 49 |
| 19/08/2024 | - | - | - | - | 1.41 | - | - | - | - | 26.73 | 125.62 | 6.7 | 0.596 | 186.8 | - | 94 |


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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 04/09/2024 | - | - | - | - | 3.35 | - | - | - | - | 3.99 | 22.8 | 6.3 | 0.44 | 107.4 | - | 11 |
| 15/10/2024 | - | - | - | - | 2.57 | - | - | - | - | 42.06 | 197.69 | 6.68 | 0.68 | 229.6 | - | 212 |
| 15/11/2024 | - | - | - | - | 1.29 | - | - | - | - | 1.78 | 8.34 | 6.63 | 0.53 | 150 | - | 24 |
| 05/12/2024 | - | - | - | - | 2.25 | - | - | - | - | 49.86 | 234.32 | 6.62 | 0.8 | 280.6 | - | 346 |
| 22/01/2025 | - | - | - | - | 2.58 | - | - | - | - | 2.8 | 16 | 7.84 | 0.28 | 80.9 | - | 28 |
| 27/02/2025 | - | - | - | - | 2.17 | - | - | - | - | 1.62 | 7.6 | 6.12 | 0.24 | 61.4 | - | 7 |
| 18/03/2025 | - | - | - | - | 1.67 | - | - | - | - | 1.18 | 5.54 | 6.19 | 0.27 | 70.29 | - | 7 |
| 15/04/2025 | - | - | - | - | 1.25 | - | - | - | - | 1.58 | 7.43 | 7.63 | 0.29 | 75.3 | - | 2 |
| 20/05/2025 | - | - | - | - | 1.83 | - | - | - | - | 1.82 | 8.57 | 5.77 | 0.3 | 74.4 | - | 12 |
| 20/06/2025 | - | - | - | - | 2.23 | - | - | - | - | 2.78 | 13.09 | 6.51 | 0.38 | 90.2 | - | 6 |
| 18/07/2025 | - | - | - | - | 2.12 | - | - | - | - | 2.57 | 12.06 | 8.55 | 0.39 | 91.9 | - | 7 |
| 22/08/2025 | - | - | - | - | 2.69 | - | - | - | - | 21.32 | 100.19 | 7.61 | 0.4 | 91.3 | - | 1 |
| 19/09/2025 | - | - | - | - | 2.94 | - | - | - | - | 2.72 | 12.8 | 8.44 | 0.53 | 129.2 | - | 0 |
| 29/10/2025 | - | - | - | - | 3.02 | - | - | - | - | 4.75 | 22.35 | 7.99 | 0.504 | 132.8 | - | 18 |
| 15/11/2025 | - | - | - | - | 3.04 | - | - | - | - | 2.41 | 11.32 | 7.62 | 0.52 | 166 | - | 8 |
| 03/12/2025 | - | - | - | - | 1.38 | - | - | - | - | 1.67 | 7.83 | 7.58 | 0.44 | 129.5 | - | 10 |
| 28/01/2026 | - | - | - | - | 3.65 | - | - | - | - | 5.54 | 26.06 | 10.38 | 0.4 | 121.3 | - | 24 |
| 23/02/2026 | - | - | - | - | 2.14 | - | - | - | - | 2.42 | 11.37 | 8 | 0.26 | 80.6 | - | 7 |
| 24/03/2026 | - | - | - | - | 3.02 | - | - | - | - | 2.37 | 11.14 | 6.5 | 0.24 | 68.75 | - | 4 |
| 21/04/2026 | - | - | - | - | 3.12 | - | - | - | - | 3.17 | 14.92 | 6.39 | 0.29 | 197 | - | 6 |


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*Table 4-8: Goldplat Monitoring Results for BBspruit Downstream*

| BBspruit Downstream | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | **Ca** | **Mg** | **Na** | **SO4** | **$NO_3$** | **Cl** | **F** | **Fe** | **Mn** | **$NH_3$** | **$NH_4$** | **pH** | **EC** | **T.Alk** | **TDS** | **TSS** |
| **Blesbokspruit Unacceptable Limit** | - | >70 | >150 | >500 | >6 | >200 | >1 | >1 | >1 | - | >5 | <6.5; >8.5 | >120 | - | - | >55 |
| 08/07/2022 | 43.08 | 12.93 | 45 | 46 | 2.15 | 36.1 | 0.21 | 0.099 | 0.004 | 1.15 | - | 6.93 | 497 | 109.5 | 310 | 171 |
| 12/08/2022 | 54.14 | 7.45 | 53 | 74 | 1.29 | 34 | 0.24 | 0.165 | 0.018 | 3.032 | - | 7.15 | 531 | 120.3 | 353 | 24 |
| 09/09/2022 | 33 | 18.32 | 59 | 53 | 2.69 | 86.4 | 0.12 | 0.137 | 0.07 | 29.78 | - | 7 | 538 | 138.4 | 253 | 15 |
| 13/10/2022 | 37.87 | 32.14 | 71 | 32 | 2.4 | 42.7 | 1.43 | 0.212 | 0.799 | 1.39 | - | 7.26 | 611 | 199.8 | 360 | 7 |
| 18/11/2022 | 28.01 | 17.08 | 26 | 41 | 2.8 | 19.9 | 0.23 | 0.03 | 0.04 | 1.4 | - | 6.82 | 343 | 87.6 | 280 | 19 |
| 16/01/2023 | 26.53 | 17.7 | 22 | 19 | 2.19 | 18.8 | 0.06 | 0.08 | 0.08 | 1.25 | - | 6.94 | 311 | 85.1 | 319 | 5 |
| 16/02/2023 | 28.87 | 4.03 | 21 | 18 | 1.73 | 11.7 | 0.25 | 0.16 | 0.04 | 1.26 | - | 7.16 | 311 | 83.3 | 233 | 9 |
| 16/03/2023 | 35.99 | 6.41 | 32 | 28 | 3.11 | 24.8 | 0.28 | 0.01 | 0.02 | 2.04 | - | 7.04 | 385 | 108.5 | 265 | 4 |
| 21/04/2023 | 30.14 | 17.26 | 38 | 51 | 3.44 | 27.1 | 0.28 | 0.06 | 0.06 | 2.5 | - | 7.06 | 469 | 110.5 | 323 | 4 |
| 26/05/2023 | 34.37 | 6.18 | 38 | 48 | 2.85 | 12 | 0.43 | 0.05 | 0.02 | 1.5 | - | 6.4 | 428 | 98.7 | 305 | 6 |
| 26/06/2023 | 32.97 | 19.08 | 42 | 49 | 3.12 | 22.1 | 0.41 | 0.06 | 0.03 | 1.7 | - | 6.35 | 507 | 98.7 | 351 | 0 |
| 19/07/2023 | 33.14 | 67.77 | 48 | 319 | 4.29 | 92.7 | 0.4 | 0.02 | 0.02 | 7.96 | - | 6.39 | 510 | 98.4 | 351 | 13 |
| 31/08/2023 | 44.64 | 22.17 | 60 | 38 | 2.98 | 28 | 0.36 | 0.02 | 0.01 | 1.58 | - | 7.56 | 602 | 153.9 | 415 | 17 |
| 28/09/2023 | 38.03 | 14.08 | 75 | 80 | 2.99 | 54.1 | 0.33 | <0.01 | 0.03 | 2.28 | - | 7.02 | 673 | 179.9 | 466 | 20 |
| 16/10/2023 | 32.46 | 18.87 | 67 | 18 | 2.83 | 45.8 | 0.87 | 0.1 | 0.26 | 2.13 | - | 7.26 | 595 | 183.8 | 513 | 8 |
| 10/11/2023 | 37.71 | 8.11 | 34 | 43 | 2.83 | 33.9 | 0.54 | <0.01 | 0.02 | 0.78 | - | 6.92 | 447 | 99.3 | 329 | 8 |
| 18/12/2023 | 27.21 | 0.04 | 46 | 13 | 7.14 | 57.7 | 0.39 | <0.01 | <0.01 | 7.94 | - | 8.3 | 497 | 145.8 | 345 | 16 |
| 22/01/2024 | 21.33 | 6.98 | 27 | 24 | 2.71 | 26.4 | 0.04 | 0.07 | <0.01 | 3.03 | - | 6.94 | 346 | 98.4 | 265 | 11 |
| 27/02/2024 | 25.46 | 10.45 | 29 | 38 | 2.97 | 25.9 | 0.48 | 0.02 | 0.21 | 8.15 | - | 7.3 | 397 | 126.4 | 277 | 9 |
| 18/03/2024 | 35.29 | 12 | 48 | 15 | 3.28 | 53.2 | 0.56 | 0.08 | 0.02 | 14.88 | - | 7.23 | 513 | 177.1 | 380 | 6 |
| 17/04/2024 | - | - | - | - | 3.01 | - | - | - | - | 8.3 | 8.8 | 6.21 | 466 | 149.3 | - | 8 |
| 21/05/2024 | - | - | - | - | 1.24 | - | - | - | - | 9.22 | 0 | 6.5 | | 170.9 | - | 10 |
| 18/06/2024 | - | - | - | - | 2.86 | - | - | - | - | 18.93 | 0 | 7.61 | | 200.8 | - | 7 |
| 15/07/2024 | - | - | - | - | 3.56 | - | - | - | - | 18.14 | 0 | 6.94 | 0.652 | 201.4 | - | 10 |
| 19/08/2024 | - | - | - | - | 2.19 | - | - | - | - | 24.08 | 113.16 | 7.04 | 0.671 | 218.8 | - | 9 |
| 04/09/2024 | - | - | - | - | 3.03 | - | - | - | - | 17.86 | 102.07 | 6.5 | 0.63 | 167.8 | - | 6 |
| 15/10/2024 | - | - | - | - | 5.95 | - | - | - | - | 6.26 | 29.43 | 6.74 | 0.65 | 157 | - | 14 |
| 15/11/2024 | - | - | - | - | 2.44 | - | - | - | - | 16.57 | 77.9 | 7.1 | 0.65 | 204.2 | - | 7 |
| 05/12/2024 | - | - | - | - | 2.89 | - | - | - | - | 11.43 | 53.72 | 7.25 | 0.67 | 184.8 | - | 4 |
| 22/01/2025 | - | - | - | - | 3.28 | - | - | - | - | 3.5 | 20 | 8 | 0.33 | 93.2 | - | 9 |
| 27/02/2025 | - | - | - | - | 2.37 | - | - | - | - | 2.23 | 10.45 | 6.36 | 0.31 | 80.2 | - | 8 |


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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18/03/2025 | - | - | - | - | 2.33 | - | - | - | - | 1.82 | 8.57 | 6.24 | 0.36 | 74.3 | - | 5 |
| 15/04/2025 | - | - | - | - | 2 | - | - | - | - | 2.38 | 11.2 | 7.41 | 0.38 | 87.1 | - | <0.01 |
| 20/05/2025 | - | - | - | - | 2 | - | - | - | - | 1.82 | 8.57 | 6.09 | 0.51 | 86.9 | - | 7 |
| 20/06/2025 | - | - | - | - | 4.57 | - | - | - | - | 5.56 | 26.212 | 6.29 | 0.53 | 98 | - | 4 |
| 18/07/2025 | - | - | - | - | 2.12 | - | - | - | - | 1.84 | 8.63 | 7.99 | 0.55 | 100.8 | - | 12 |
| 22/08/2025 | - | - | - | - | 3.51 | - | - | - | - | 22.74 | 106.87 | 7.46 | 0.55 | 99.4 | - | 1 |
| 19/09/2025 | - | - | - | - | 3.63 | - | - | - | - | 5.95 | 27.95 | 7.7 | 0.58 | 169.2 | - | 0 |
| 29/10/2025 | - | - | - | - | 3.3 | - | - | - | - | 2.89 | 13.6 | 7.91 | 0.561 | 154 | - | 5 |
| 15/11/2025 | - | - | - | - | 2.28 | - | - | - | - | 1.95 | 9.14 | 7.57 | 0.51 | 172 | - | 2 |
| 03/12/2025 | - | - | - | - | 1.98 | - | - | - | - | 3.42 | 16.06 | 7.68 | 0.49 | 137.2 | - | 7 |
| 28/01/2026 | - | - | - | - | 2.43 | - | - | - | - | 2.59 | 12.17 | 7.7 | 3.97 | 125.1 | - | 12 |
| 23/02/2026 | - | - | - | - | 3.36 | - | - | - | - | 3.62 | 17.03 | 7.94 | 1.02 | 122 | - | 24 |
| 24/03/2026 | - | - | - | - | 2.67 | - | - | - | - | 2.97 | 13.95 | 6.65 | 0.25 | 72.56 | - | 4 |
| 21/04/2026 | - | - | - | - | 3.12 | - | - | - | - | 2.41 | 11.32 | 6.7 | 0.33 | 145 | - | <0.01 |


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*Table 4-9: Goldplat Monitoring Results for RWD*

| RWD | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | Ca | Mg | Na | $SO_4$ | $NO_3$ | Cl | F | Fe | Mn | $NH_3$ | $NH_4$ | pH | EC | T.Alk | TDS |
| Blesbokspruit Unacceptable Limit | - | >70 | >150 | >500 | >6 | >200 | >1 | >1 | >1 | - | >5 | <6.5; >8.5 | >120 | - | - |
| 08/07/2022 | 151.2 | 32.9 | 1170 | 1104 | 6.91 | 576.73 | 1.11 | 3 | 0.082 | 40.94 | - | 8.87 | 5410 | 323 | 4039 |
| 12/08/2022 | 72.36 | 27.94 | 1620 | 1123 | 6.65 | 829.55 | 3.11 | 12.49 | 0.217 | 43.57 | - | 8.5 | 7120 | 274.1 | 5461 |
| 09/09/2022 | 10.49 | 1.4 | 2400 | 1887 | 10.13 | 1154.92 | 0.69 | 90.5 | 0.036 | 1.24 | - | 10.18 | 1020 | 1643.9 | 8170 |
| 13/10/2022 | 88.72 | 1.33 | 1390 | 1537 | 6.15 | 867.06 | 1.62 | 20.38 | 0.107 | 31.84 | - | 8.99 | 6540 | 224.6 | 5028 |
| 18/11/2022 | 117.86 | 24.25 | 470 | 649 | 3.73 | 218.08 | 0.85 | 1.02 | 0.05 | 19.29 | - | 8.64 | 2950 | 145.4 | 1630 |
| 16/01/2023 | 77.06 | 64.93 | 730 | 1054 | 3.29 | 665.6 | 0.8 | 0.78 | 0.06 | 26.06 | - | 8.55 | 4290 | 237.5 | 3406 |
| 16/02/2023 | 69.2 | 512.45 | 930 | 951 | 3.28 | 371.17 | 0.99 | 2.37 | 0.03 | 24.5 | - | 8.75 | 4550 | 262.9 | 2486 |
| 16/03/2023 | 95.42 | 450.63 | 1090 | 1269 | 18.5 | 246.6 | 1.58 | 0.87 | 0.01 | 33.45 | - | 8.68 | 3856 | 281.1 | 2345 |
| 21/04/2023 | 98.84 | 254.75 | 1170 | 1559 | 4.69 | 245.4 | 1.64 | 1.74 | 0.02 | 41.88 | - | 8.95 | 4134 | 384.1 | 2876 |
| 26/05/2023 | 30.98 | 43.44 | 1270 | 1211 | 3.64 | 240 | 0.71 | 0.75 | 0.41 | 33.69 | - | 9.01 | 5960 | 424 | 3454 |
| 26/06/2023 | 15.44 | 25.35 | 1650 | 652 | 4.34 | 182.2 | 1.53 | 4.29 | 0.03 | 29.3 | - | 9.41 | 5413 | 690.6 | 373 |
| 19/07/2023 | 48.06 | 10.38 | 1600 | 1251 | 5.93 | 221.74 | 1.66 | 9.22 | 0.03 | 31.53 | - | 9.18 | 5514 | 426.8 | 3851 |
| 31/08/2023 | 11.28 | 11.42 | 1800 | 1375 | 8.15 | 523.4 | 1.24 | 11.25 | 0.05 | 38.88 | - | 9.23 | 6394 | 157.9 | 4435 |
| 28/09/2023 | 127.5 | 194.97 | 2000 | 1955 | 4.88 | 1261.2 | 1.73 | 0.78 | 0.02 | 58.97 | - | 8.62 | 5988 | 469 | 4131 |
| 16/10/2023 | 17.62 | 215.48 | 2100 | 1993 | 7.64 | 1844.8 | 1.31 | 34.3 | 0.04 | 44.33 | - | 9.06 | 7680 | 592.6 | 5159 |
| 10/11/2023 | 198.2 | 45.96 | 980 | 1440 | 3.3 | 607.8 | 1.49 | 0.48 | 0.04 | 40.73 | - | 8.39 | 5590 | 193.7 | 2964 |
| 18/12/2023 | 251.3 | 918.72 | 1210 | 1619 | 8.1 | 1415.8 | 2.15 | 0.06 | 0.01 | 47.94 | - | 8.53 | 4702 | 296.4 | 3314 |
| 22/01/2024 | 236.71 | 54.61 | 1100 | 1830 | 5.42 | 867.4 | 1.46 | 0.13 | 0.04 | 40.04 | - | 8.39 | 6090 | 241.3 | 3081 |
| 27/02/2024 | 194.57 | 495.74 | 2180 | 1748 | 10.33 | 1758.8 | 1.46 | 26.4 | <0.01 | 51.77 | - | 10.45 | 8910 | 1530.8 | 5929 |
| 18/03/2024 | 154.85 | 25.86 | 1660 | 1409 | 5.11 | 1209.2 | 1.72 | 0.32 | 0.01 | 70.48 | - | 8.49 | 8090 | 303.3 | 4131 |
| 17/04/2024 | 212.2 | 256.06 | 840 | 1163 | 4.6 | 424.8 | - | - | - | 39.65 | 41.98 | 8.7 | 3890 | 191.7 | - |
| 21/05/2024 | 97.32 | 38.7 | 1690 | 1358 | 2.78 | 1759.1 | - | - | - | 70.28 | 0 | 8.44 | 6.059 | 247.2 | - |
| 18/06/2024 | 391.83 | 807.43 | 1480 | 1787 | 8.34 | 1334.5 | - | - | - | 31.44 | 147.77 | 8.76 | 5.631 | 288.4 | - |
| 15/07/2024 | 519.44 | 68.72 | 1240 | 1766 | 6.15 | 1548.1 | - | - | - | 25.43 | 0 | 8.27 | 4.972 | 222.9 | - |
| 19/08/2024 | 464.62 | 29.86 | 1910 | 2508 | 7.55 | 2663.4 | - | - | - | 3.04 | 14.29 | 8.32 | 6.851 | 311.7 | - |
| 04/09/2024 | 247.2 | 178.43 | 1550 | 2121 | 10.65 | 3655 | - | - | - | 31.17 | 178.14 | 8.27 | 8.41 | 223.3 | - |
| 15/10/2024 | 550.4 | 11.12 | 1450 | 2150 | 12.88 | 76.68 | - | - | - | 45.82 | 215.35 | 8.07 | 8.23 | 209.6 | - |
| 15/11/2024 | 392.34 | 77.74 | 113 | 1670 | 9.08 | 1249.5 | - | - | - | 33.04 | 155.28 | 8.1 | 6.84 | 184.2 | - |
| 05/12/2024 | 182.16 | 119.73 | 1540 | 2281 | 8.04 | 1146.2 | - | - | - | 71.16 | 334.45 | 8.2 | 9.32 | 265.1 | - |
| 22/01/2025 | 370.46 | 564.28 | 800 | 884 | 9.21 | 284 | - | - | - | 35 | 20 | 8.36 | 4.56 | 181.7 | - |
| 27/02/2025 | 374.51 | 37.78 | 680 | 1443 | 4.63 | 285.8 | - | - | - | 51.94 | 244.1 | 8.33 | 3.95 | 197.7 | - |


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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18/03/2025 | 479.21 | 20.83 | 570 | 1368 | 4.33 | 263.1 | - | - | - | 51.08 | 240.1 | 8.48 | 3.79 | 140.7 | - |
| 15/04/2025 | 464.4 | 500.67 | 620 | 1609 | 4.47 | 320.8 | - | - | - | 60.22 | 283.02 | 8.9 | 4.25 | 175.5 | - |
| 20/05/2025 | 426.44 | 77.09 | 700 | 1446 | 5.64 | 332.2 | - | - | - | 62.65 | 294.45 | 8.28 | 4.58 | 191.3 | - |
| 20/06/2025 | 241.76 | 131.19 | 1190 | 1719 | 9.72 | 1709 | - | - | - | 83.34 | 391.72 | 8.2 | 6.03 | 203.7 | - |
| 18/07/2025 | 415.26 | 51.01 | 1430 | 1871 | 6.32 | 1337.6 | - | - | - | 82.98 | 390.01 | 8.72 | 6.45 | 215.4 | - |
| 22/08/2025 | 250.48 | 73.68 | 1470 | 1878 | 6.47 | 2770.3 | - | - | - | 120.85 | 567.98 | 8.53 | 6.12 | 167.6 | - |
| 19/09/2025 | 547.12 | 45.79 | 1630 | 2024 | 10.29 | 1753.4 | - | - | - | 80.55 | 378.57 | 8.28 | 9.21 | 249.7 | - |
| 29/10/2025 | 377.49 | 98.83 | 1420 | 1857 | 13.7 | 1630.5 | - | - | - | 92.37 | 434.13 | 8.88 | 8.35 | 321.29 | - |
| 15/11/2025 | 312.26 | 106.78 | 1170 | 1595 | 8.66 | 766.3 | - | - | - | 77.36 | 363.6 | 8.76 | 5.54 | 318 | - |
| 03/12/2025 | 287.74 | 49.44 | 1240 | 1697 | 5.85 | 811.6 | - | - | - | 84.44 | 396.86 | 8.82 | 5.9 | 302.4 | - |
| 28/01/2026 | 407.9 | 77.53 | 1250 | 1732 | 6.24 | 962.3 | - | - | - | 78.37 | 368.34 | 8.63 | 7.14 | 254.6 | - |
| 23/02/2026 | 300 | 396 | 1150 | 1681 | 4.86 | 842.6 | - | - | - | 88.76 | 417.15 | 8 | 7.18 | 198.7 | - |
| 24/03/2026 | 20.42 | 30.81 | 15 | 20 | 2.9 | 19.5 | - | - | - | 10.82 | 50.87 | 6.72 | 0.27 | 81.85 | - |
| 21/04/2026 | 92 | 472 | 1130 | 1284 | 6.54 | 4137.8 | - | - | - | 76.06 | 357.49 | 8.08 | 6.81 | 385 | - |


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#### 4.5.3.5 Results and Discussion

The following provides a summary of the surface water quality presented in Table 4-6 to Table 4-9:

- pH levels were slightly below the Blesbokspruit catchment guideline limit of 6.5 at BBspruit Upstream and Downstream on several occasions. At Stream1 and generally at the Return Water Dam (RWD), the pH levels were high exceeding the limit;
- Electrical Conductivity (EC), which provides an indication of the dissolved salts in water, exceeded the limit at BBspruit Upstream and Downstream between July 2022 and April 2024, and then significantly decreased up until 2026. It is unknown what may have resulted in the significant decrease, or whether the results were perhaps captured incorrectly. EC at SW1 and SW2 were within the limit, however, the seepage water from the Goldplat stock dams at Toe1 and Toe2, as well as the stream emanating from the neighbouring dump at Stream1, were well above the limit;
- High regular exceedances of chloride, sulphate and sodium were recorded at Toe1, Toe2, Stream1 and RWD;
- Nitrate exceeded the limit at Toe1, Toe2 as well as the RWD on a regular basis;
- Ammonium was also regularly exceeded at BBspruit Upstream and Downstream and RWD, but also at Toe1, Toe2 and Stream1;
- Fluoride exceeded the limits at Toe1 and Stream1, but also regularly at RWD;
- Iron was elevated at Stream1 and also at the RWD on many occasions;
- Manganese exceeded the limit at Toe1 and Toe2;
- High concentrations of nickel and cobalt occurred at Toe1, Toe2 and Stream1;
- Uranium exceeded the limit at Toe2 and Stream1; and
- Total Suspended Solids (TSS) were mostly within the limit at BBspruit Upstream and Downstream.

In summary, the water quality of the tributary of the Blesbokspruit only exceeded ammonium and EC on a regular basis, whilst the other parameters were mostly within the guideline limits. The seepage water from the Goldplat stock dams at Toe1 and Toe2, the RWD, as well as the stream emanating from the neighbouring dump at Stream1, were found to contain high dissolved salts, heavy metals as well as uranium. The pH levels at these sampling points, however, were found not to be acidic.

### 4.5.4 Floodlines

A 1:100 year floodline determination was undertaken as part of the Surface Water Study for the Proposed Reclamation of the 5L23 Tailings Storage Facility (Hydrospatial, 2022) and was used in this study. The 1:100-year floodline for the proposed infrastructure at the Goldplat site is shown on Figure 4-8, whilst Figure 4-9 shows the floodline for the pipeline route to the Ergo Plant.


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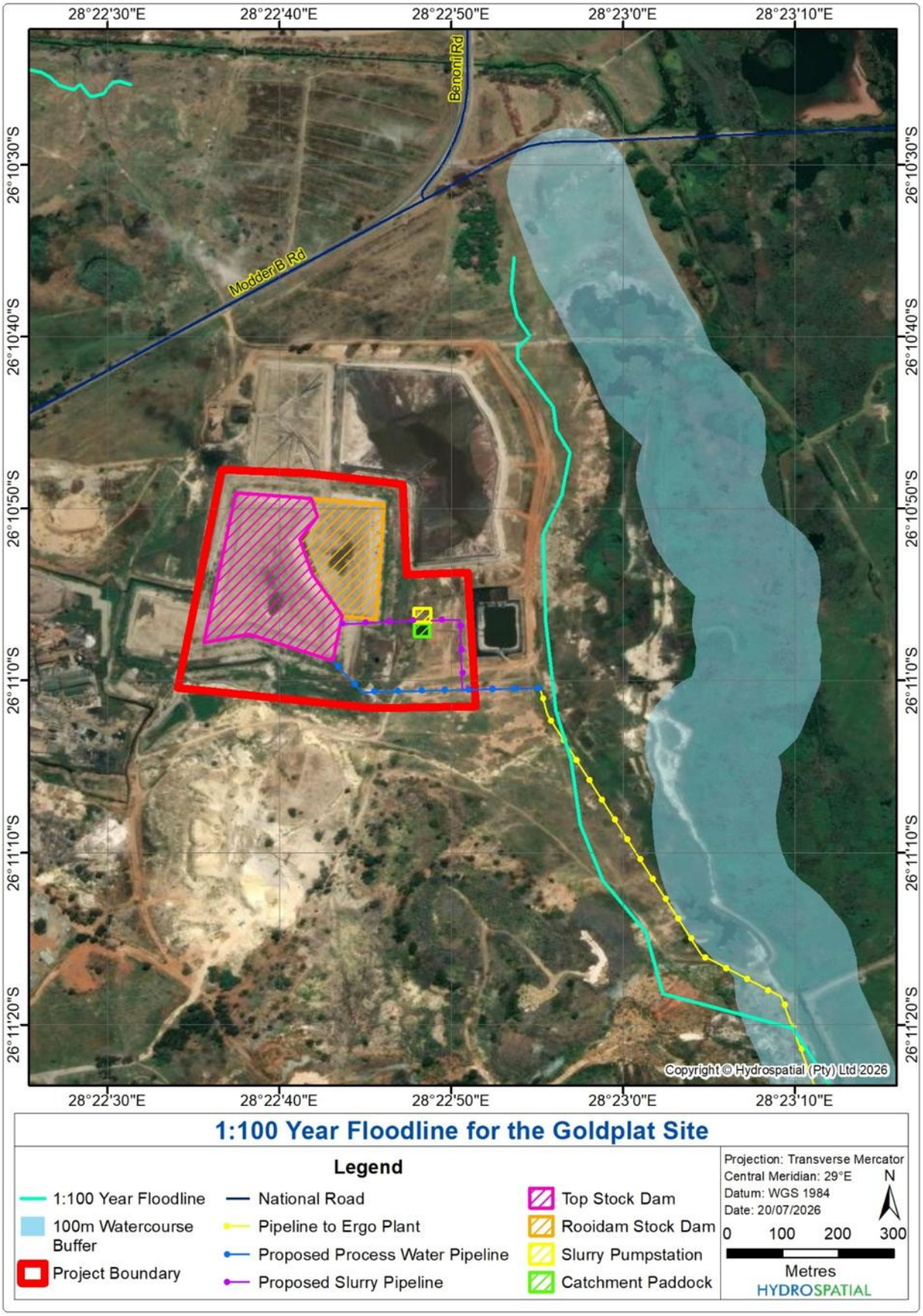


*Figure 4-8: 1:100-year floodline for the proposed infrastructure at the Goldplat site*


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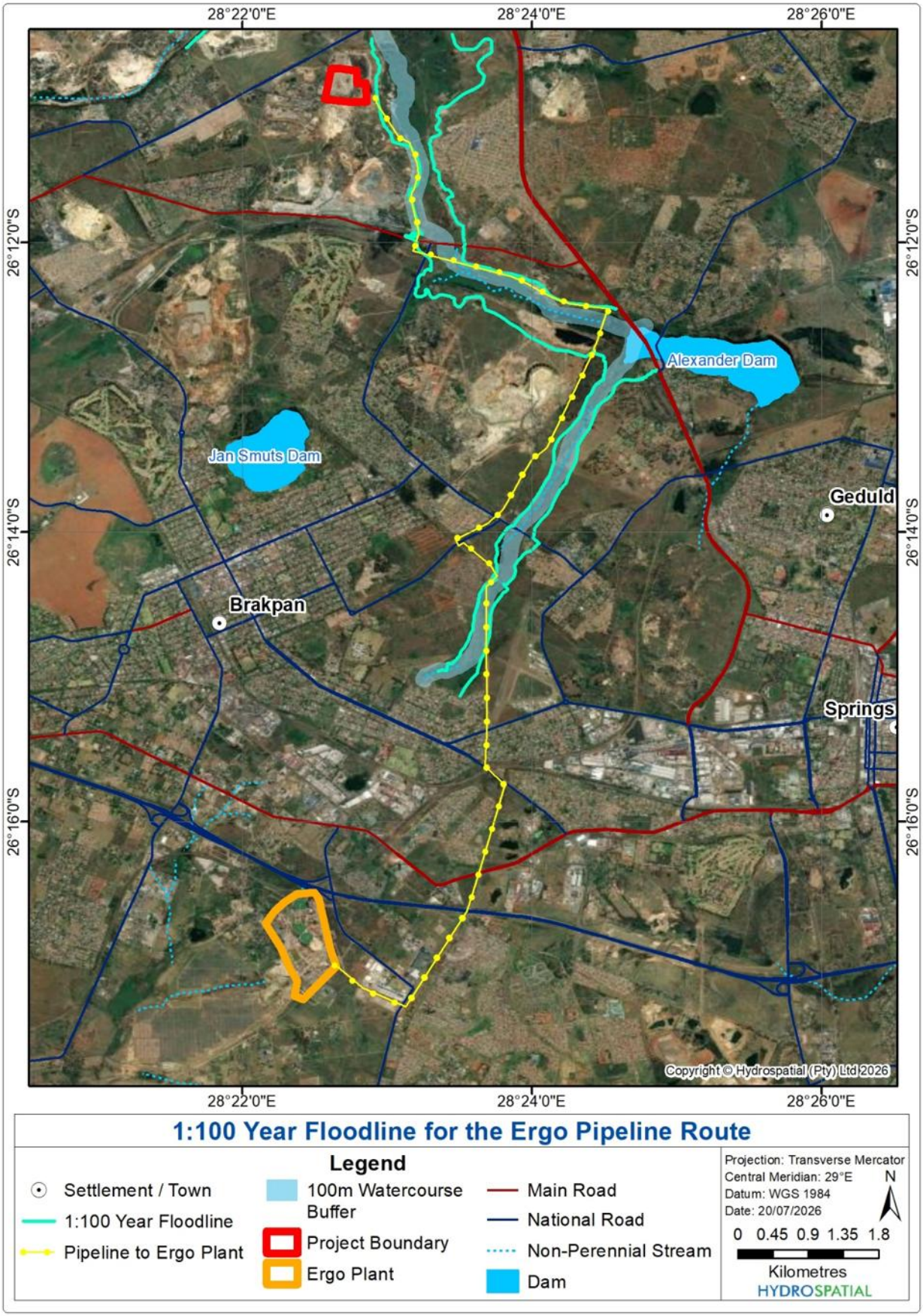


*Figure 4-9: 1:100-year floodline for the pipeline route to the Ergo Plant*


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## 4.6 Groundwater

**Refer to Specialist Study: Appendix B – Groundwater Assessment**

The groundwater specialist study was completed using the existing Goldplat groundwater specialist studies and monitoring results, the outcome of a hydrocensus completed by iLEH in July 2026 and the analysis of water samples taken during the hydrocensus to characterise ambient groundwater quality as well as potential sources to contamination.

### 4.6.1 Aquifer Characterisation

Based on aquifer classification methodology and regions published in the Aquifer Classification Map Series of South Africa (DWS, 2012), the aquifers present in the project area are minor aquifers with low yields and variable quality. It is however noted that groundwater is often the sole source of water available to local users and for this reason, should be protected. Ambient groundwater quality associated with the Karoo sediments are generally acceptable for potable use except where mining activities have affected groundwater quality.

The aquifers fall in a moderately vulnerable category, which means they are vulnerable to some pollutants in the long-term when these are continuously discharged or leached. The presence of various sources of contamination associated with historical gold mining will however pose a threat to the aquifers. Overall, the aquifers presented are ranked with a medium susceptibility to the impacts of pollutants. Based on the information above, as well as the methodology described by Parsons (1995), the aquifer protection classification is rated as medium. This is due to the fact that groundwater is often the only water resource available to farmers and that groundwater can been impacted by regional mining activities (iLEH, 2026).

### 4.6.2 Hydrocensus

A hydrocensus and site walk over was conducted during July 2026. The survey included the Goldplat Recovery stock dams and Plant area as well as the adjacent properties and concentrated on identifying existing private boreholes and groundwater use. The existing Goldplat monitoring boreholes were included in the hydrocensus.

The hydrocensus points visited are indicated on Figure 4-10. During the hydrocensus the following information was collected for each site:

- Borehole position (X, Y, Z-coordinates);
- Information relating to equipment installed;
- Borehole construction details;
- Borehole yield – if known by the landowner;
- Groundwater level, if possible; and
- Current use.

A groundwater sample was collected in one accessible hydrocensus borehole. Due to the fact that Goldplat maintains an extensive groundwater monitoring programme, resampling of their boreholes was not undertaken.

Two private boreholes were identified on neighbouring properties during the hydrocensus, indicated as boreholes Benoni 1 and Benoni 2. One borehole is fitted with a submersible pump but is not in use. The other borehole is also not in use. A third borehole is present on the property, but is filled with rocks, sand and waste and is not accessible.

Goldplat currently have 11 boreholes on their property, of which nine are monitored on a monthly basis in terms of groundwater levels and quality. Goldplat does not use these boreholes for groundwater abstraction.


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A summary of the hydrocensus points included in the 2026 hydrocensus is presented in Table 4-10. All coordinates were taken with a hand-held Garmin GPS (Global Positioning System) (WGS84). The construction and depth information of the private boreholes were not available.


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*Table 4-10: 2026 Hydrocensus Borehole Information*

| Sample ID | Description | Decimal degrees | | Elevation (mamsl) | Groundwater Level (mbgl) | Groundwater Elevation (mamsl) | Depth (mbgl) |
|---|---|---|---|---|---|---|---|
| | | Latitude | Longitude | | | | |
| **Goldplat monitoring boreholes** | | | | | | | |
| FM4 | Float Borehole | -26.18397˚ | 28.37503˚ | 1613 | 10,2 | 1602,8 | 54 |
| GP2 | Borehole behind slime dam to right | -26.18223˚ | 28.38026˚ | 1600 | 3,9 | 1596,1 | 30 |
| GP3 | Borehole behind kiln woodchips, left of slime dam | -26.18095˚ | 28.37554˚ | 1609 | 4,4 | 1604,6 | 29,4 |
| GP4 | Borehole inside Plant behind kiln | -26.18244˚ | 28.37408˚ | 1613 | 2,1 | 1610,9 | 10,9 |
| GP5 | Borehole behind GP6 | -26.18680˚ | 28.36811˚ | 1620 | 11,1 | 1608,9 | 23 |
| GP6 | Borehole behind petrol station | -26.18482˚ | 28.36837˚ | 1620 | 8,4 | 1611,6 | 17,9 |
| GP7 | Borehole between TSF expansion and wetland | -26,17800° | 28,38100° | 1597 | 11,9 | 1585,1 | 35 |
| GP8 | Borehole between neighboring operations. | -26.18466° | 28.37441° | 1615 | 3,3 | 1611,7 | 35 |
| GP9 | Borehole between RWD and Wetland | -26.18112° | 28.38236° | 1594 | 1,6 | 1592,4 | 20 |
| **Private boreholes** | | | | | | | |
| Benoni1 | BH to northwest | -26.18081° | 28.36061° | 1618 | 10,39 | 1607,3 | unknown |
| Benoni2 | BH to northwest | -26.18029° | 28.35904° | 1615 | 7,12 | 1607,6 | unknown |


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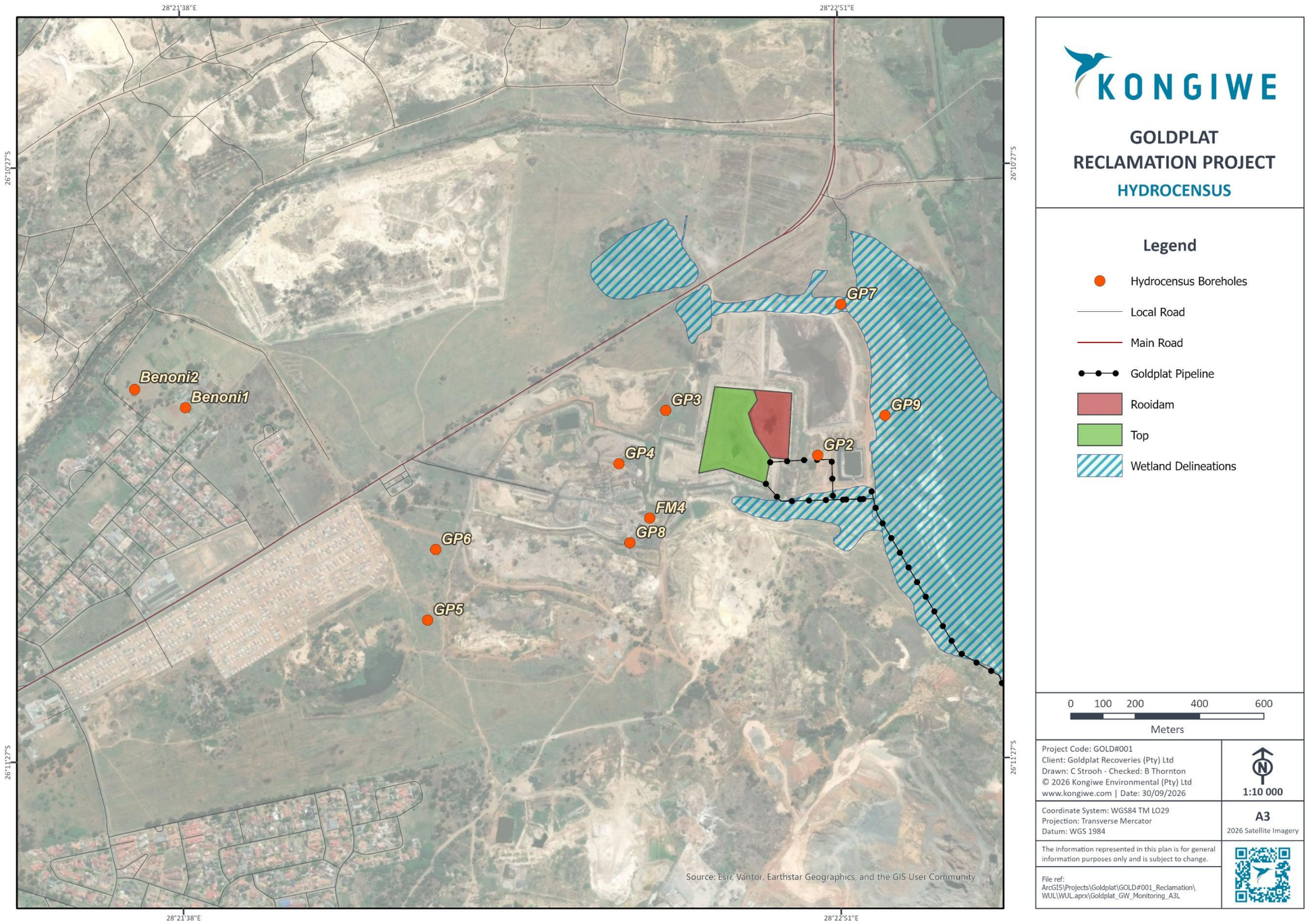


*Figure 4-10: Borehole Location Map*


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### 4.6.3 Groundwater levels

Groundwater level measurements from the 2026 hydrocensus dataset were used to assess groundwater flow patterns. The information is presented in Figure 4-11. The following factors influence groundwater flow patterns in this area:

- The topography and the position of water bodies. An analysis of the relationship between topographical and groundwater level elevations indicates a strong correlation (>97%) for both shallow and deeper groundwater levels. This relationship is indicated in Figure 4-11. This confirms that groundwater flow patterns follow the topography and drains towards local water bodies. Groundwater is therefore expected to discharge to local rivers, streams and wetlands as baseflow.
- The average depth to groundwater in the boreholes that indicate shallow conditions is 3.8 m below surface. In boreholes that indicate deeper water levels, the average depth to groundwater is 10.4m.
- The underground water level in the East Rand Basin is controlled through pumping from the Grootvlei No 3 shaft, situated approximately 13km southeast project. According to information made available by GoldOne, the underground water level is estimated to be around 120m below the groundwater levels measured in hydrocensus boreholes. Due to the fact that there is a strong correlation between topography and groundwater level elevation, the dataset suggests that underground dewatering does not impact significantly or perhaps at all on groundwater flow in the Goldplat area.

The groundwater level fluctuation information presented in Figure 4-12 indicates a general decline in groundwater levels around the Top and Rooidam Stock Dams in GP2, GP3 and GP7 between 2022 and 2023. Groundwater levels have risen between 2025 and 2026 in these boreholes. Groundwater levels fluctuate by between 1 and 5m between due to the recharge or rainwater during the wet season and a decline in groundwater levels in the dry season. The depth to groundwater in these boreholes varies between 4 and 12m below surface at present.

The groundwater level in borehole GP9, located on the edge of the Blesbokspruit wetlands, has risen steadily from 2023 to 2026. Seasonal fluctuations are also notable, which suggests that groundwater level rise is probably associated with flooding in the Blesbokspruit into the wetlands during the wet season. The depth to groundwater in GP9 currently fluctuates between 1 and 2m below surface. These shallow groundwater level conditions in the wetland confirm that groundwater discharges to the watercourse, especially during the rainy season.


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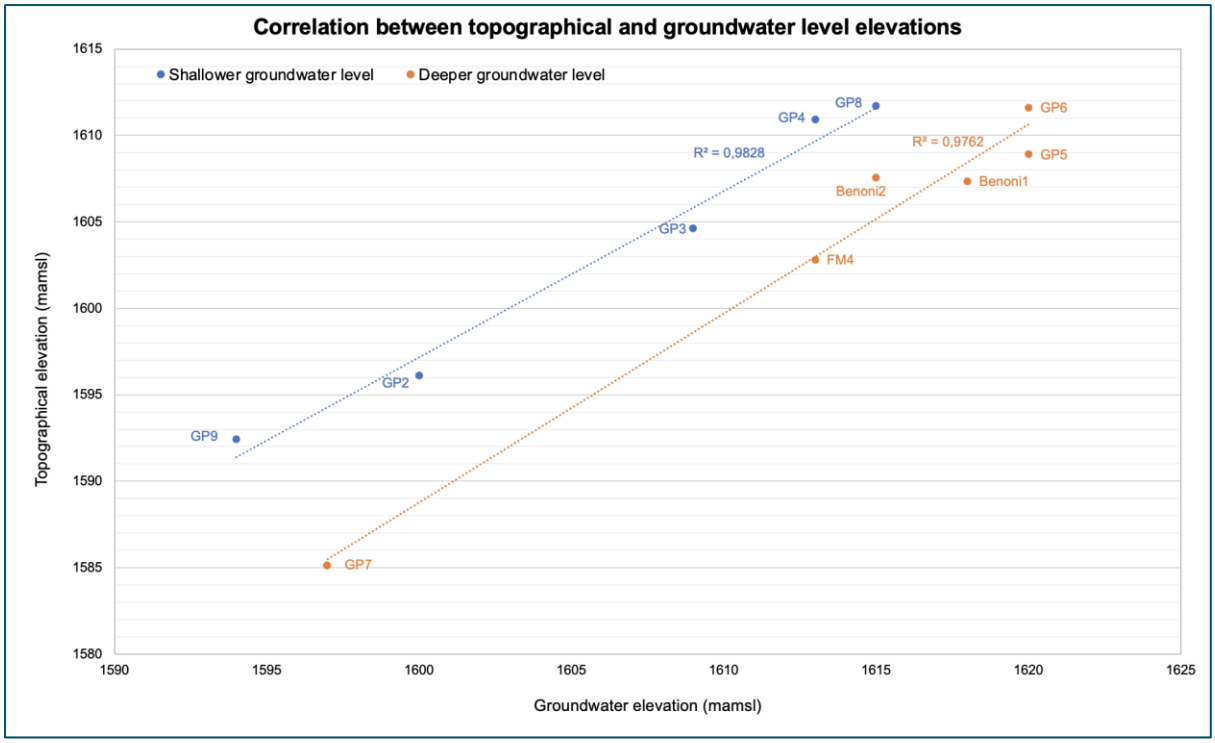


*Figure 4-11: Correlation Between Measured Groundwater and Topographical Elevations*

Goldplat includes groundwater level measurements in their monitoring programme. Data for the boreholes in the immediate vicinity of the Top and Rooidam Stock Dams are presented in Figure 4-12, including GP2, GP3, GP7 and GP9.

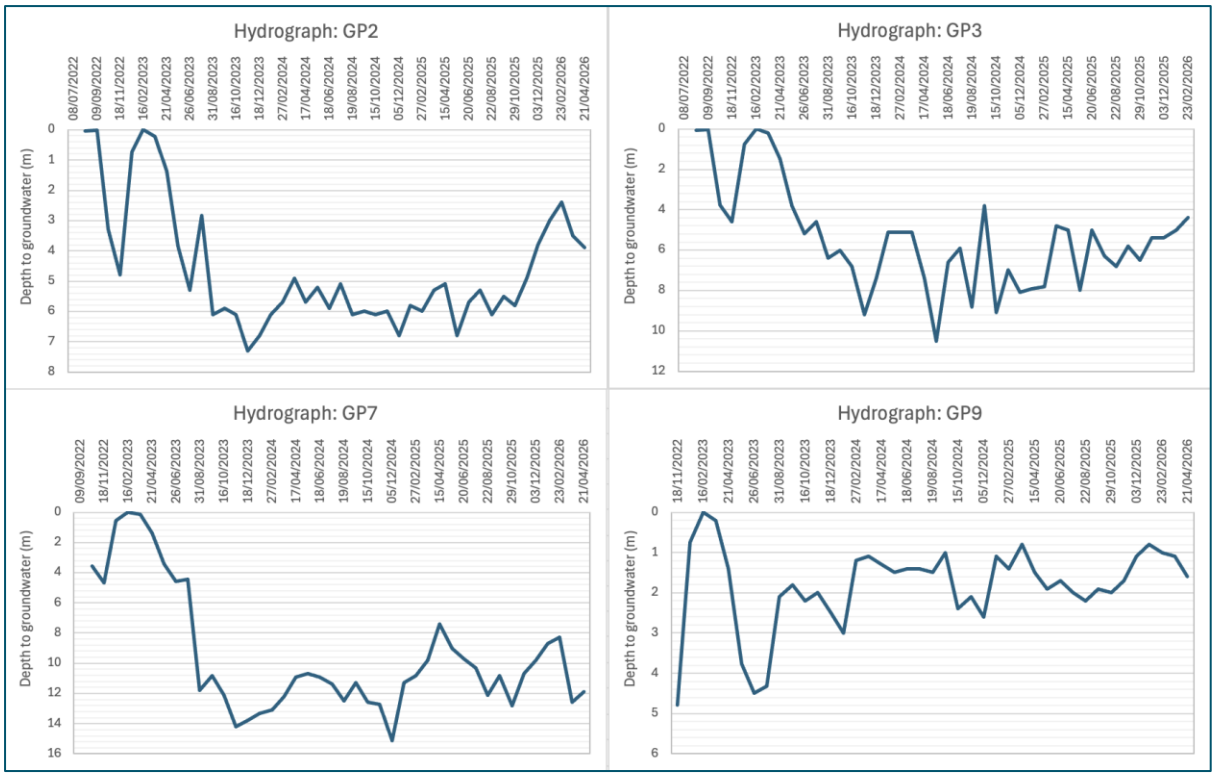


*Figure 4-12: Groundwater Level Fluctuations in Boreholes Near the TSFs*


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Groundwater flow contours were generated with the 2026 hydrocensus data. The shallow and deeper groundwater level trends are presented separately in the groundwater flow contour map presented in Figure 4-12. The data confirms that groundwater flow is generally in an easterly to northeasterly direction towards the Blesbokspruit at a flow gradient of 0,025 (1:40).

This confirms that groundwater from the Goldplat Top and Rooidam Stock Dams flows towards the Blesbokspruit and its wetlands. As indicated above, the groundwater will discharge to the streams and wetlands as baseflow. The rate at which this takes place is difficult to assess without data from shallow and deep monitoring boreholes located adjacent to the stream.

Regionally, groundwater flow is from the Goldplat Plant in a northwesterly direction towards the two hydrocensus boreholes Benoni1 and Benoni2. Groundwater flow from the Top and Rooidam Stock Dams is however not towards these private boreholes.

### 4.6.4 Groundwater Potential Contaminants

The risk to groundwater contamination is associated with potential sources of groundwater contamination. In this instance, water quality data obtained from the toe seepage collected from the Top and Rooidam Stock Dams and the stream draining from the adjacent TSF (not owned by Goldplat) was used to identify potential contaminants associated with these sources. The results are presented in Figure 4-14 and summarised Table 4-11.

The information presented in Figure 4-15 indicates that sulphate is the dominant ion in the Goldplat toe seepage samples taken. Sulphate concentrations in the toe seepage vary between 5 500 and 6 800 mg/l. Sodium is the dominant macro element in seepage from the adjacent TSF.

In terms of trace elements, cobalt is the indicator element for the toe seepage from the Goldplat TSFs, and iron and nickel are the indicator elements for the adjacent TSF. Cobalt concentrations in the Goldplat toe seepage vary between 15 and 16mg/l. It is noteworthy that approximately 2mg/l of uranium is present in the Toe2.

A comparison of the toe seepage and stream qualities is presented with the Goldplat monitoring data in Table 4-11 pH levels are also indicated as a reference. The Goldplat monitoring data represents average concentrations for the monitoring period (June 2022 to April 2026). Monitoring of iron concentrations in the Goldplat return water dams (RWD) was stopped in March 2024. No data is available for 2026. Goldplat also does not include cobalt or uranium in their monitoring programme. This prevents the assessment of all the indicator elements identified in the return water.

The information presented in Table 4-11 indicates that sulphate in all the potential sources of groundwater contamination exceeds the Blesbokspruit Water Quality Objective of 500mg/l significantly. The highest concentrations are associated with the toe seepage from the Top and Rooidam Stock Dams. Elevated iron concentrations are not reported for the toe seepage, only for the return water.


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*Table 4-11 Comparison of Indicator Element Concentrations*

| Element | Blesbokspruit Catchment WQO | Toe1 (Rooidam) | Toe2 (Top) | Stream 1 | Goldplat RWD | Goldplat Slime RWD |
|---|---|---|---|---|---|---|
| pH | 6.5 - 8.5 | 7,73 | 7,96 | 10,2 | 8,62 | 8,31 |
| Sulphate (mg/l) | 150 - 500 | 5 490 | 6 637 | 1 420 | 1 523 | 1 155 |
| Iron (mg/l) | 0.1 - 1 | 0,1 | 0,2 | 12,9 | 11,0 | 3,4 |
| Manganese (mg/l) | 0.1 - 1 | 2,18 | 1,19 | 0,075 | 0,07 | 0,90 |
| Cobalt (mg/l) | NS | 19,0 | 15,6 | 1,2 | NA | NA |
| Nickel (mg/l) | NS | 0,3 | 0,2 | 17,2 | NA | NA |
| Uranium (mg/l) | NS | 0,02 | 1,90 | 0,24 | NA | NA |


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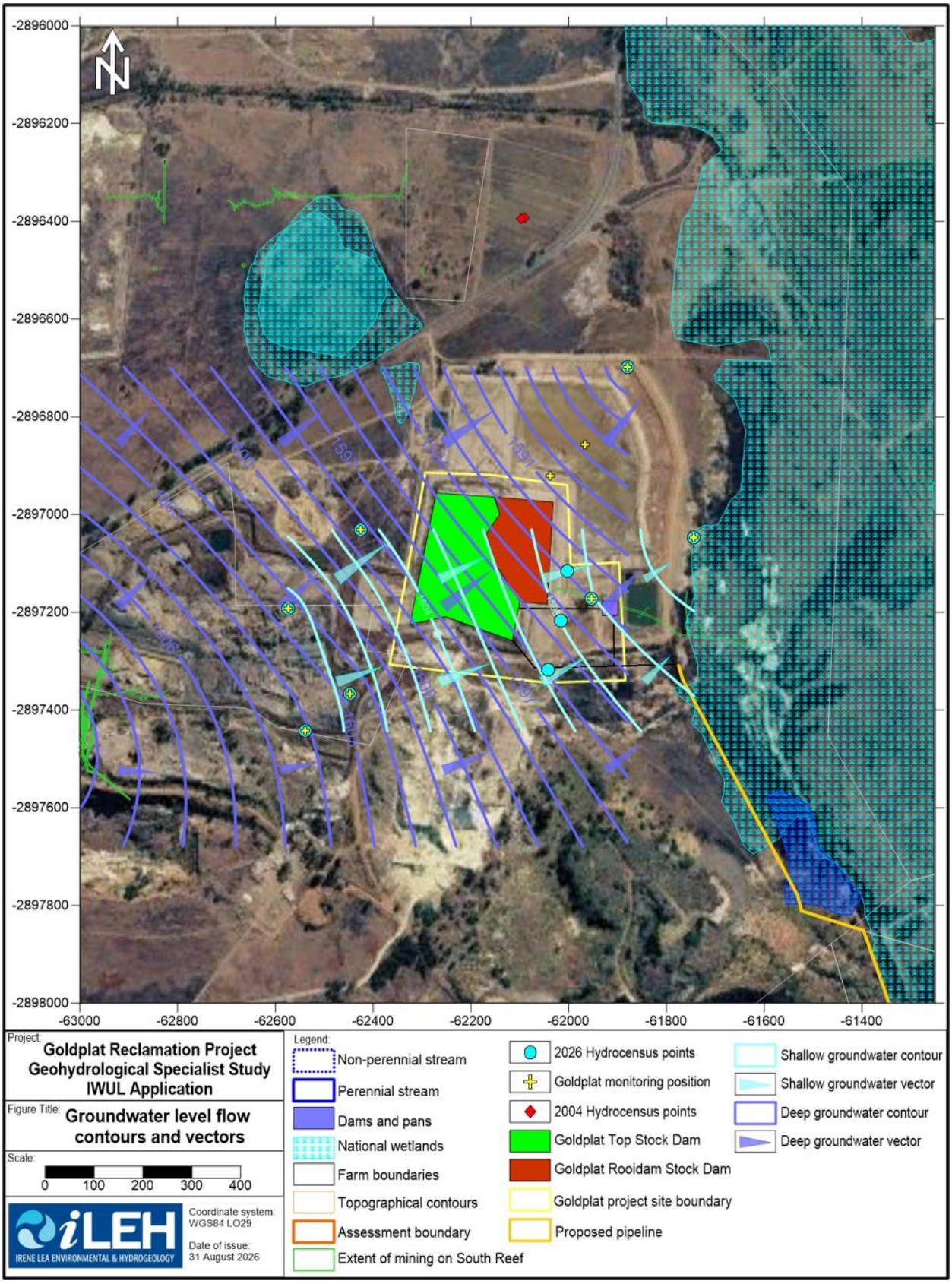


*Figure 4-13: Estimated Groundwater Flow Patterns*


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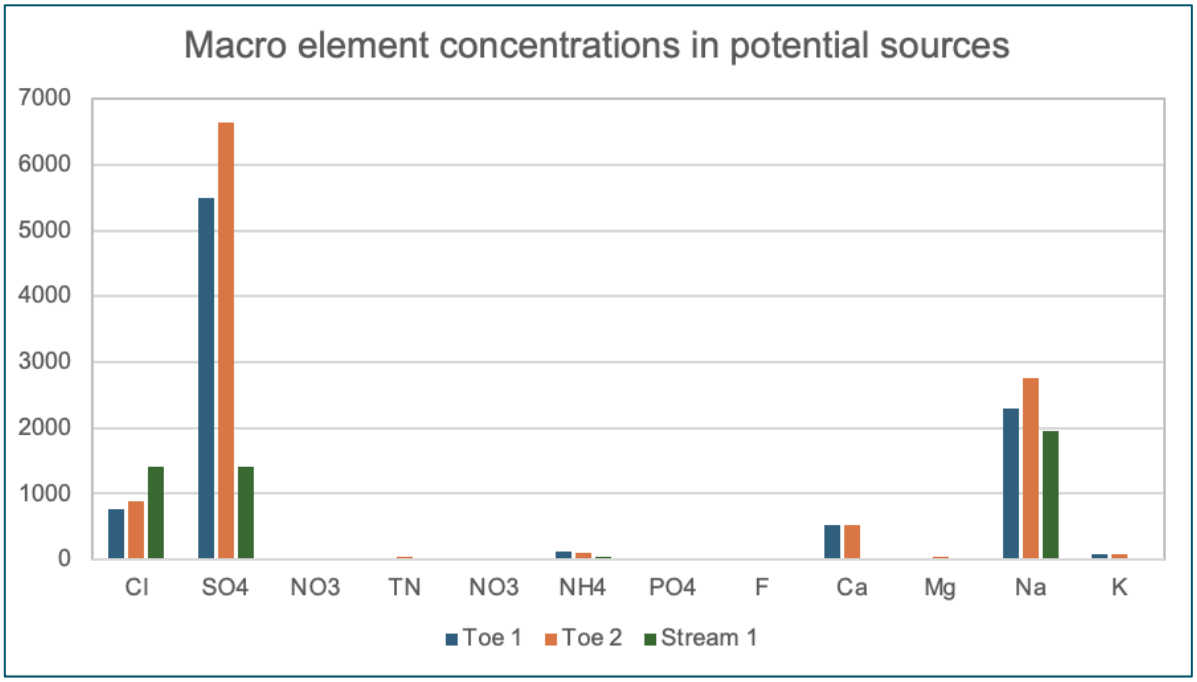


*Figure 4-14: Macro and Trace Elements in Seepage from TSFs*

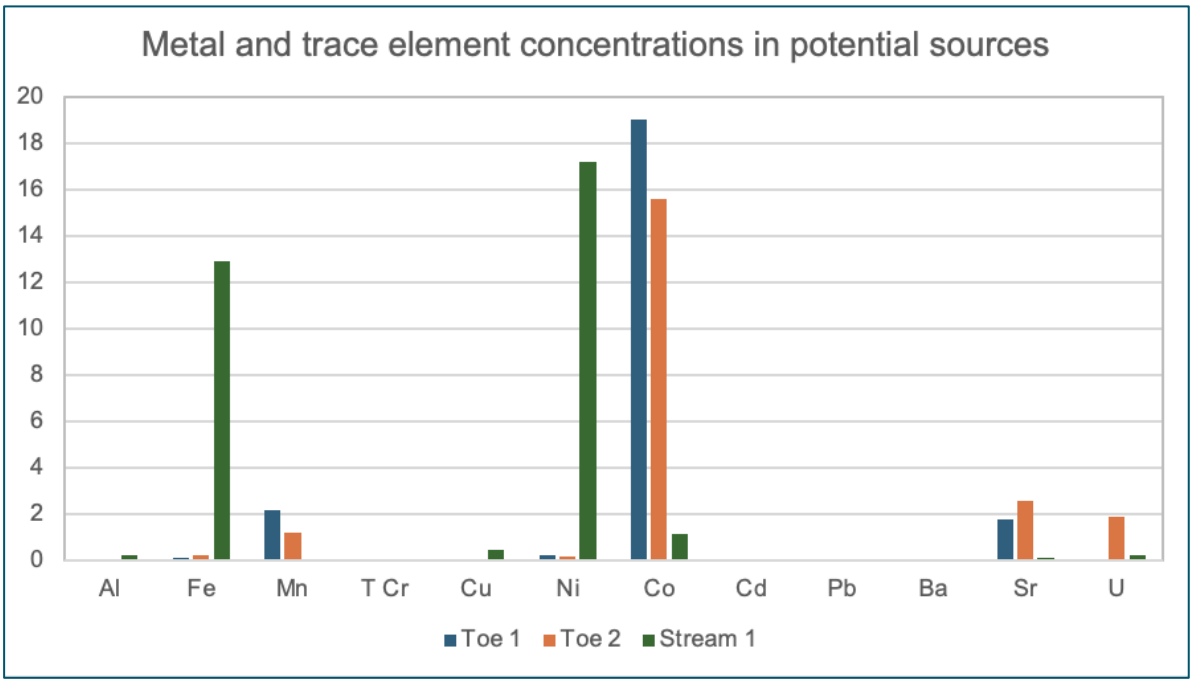


*Figure 4-15: Metal and Trace Elements in Seepage from TSFs*

Based on the assessment presented above and the available monitoring dataset, the impact assessment presented in this report will be completed at the hand of sulphate as an indicator element. It is however recommended that the Goldplat monitoring is expanded to include cobalt, nickel and uranium. The outcome of the expanded monitoring dataset must be used to confirm whether or not additional impact prediction simulations are required for the indicator metals for the Top and Rooidam Stock Dams.


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### 4.6.5 Groundwater Quality

Four groundwater samples were taken during the July 2026 hydrocensus for chemical analysis at Aquatico Laboratory, a SANAS accredited laboratory. These samples include:

- Benoni1 – property directly west of 5L23 TSF and the borehole that was accessible for sampling. The borehole currently not in use.
- Toe1 – Toe drain sample from Rooidam Stock Dam.
- Toe2 – Toe drain sample from Top Stock Dam.
- Stream1 – local unlined surface drainage flowing along the southern boundary of the project area. This stream originates from an adjacent TSF that is not owned by Goldplat.

The Benoni1 sample was taken using a single valve decontaminated bailer. The other three were taken as grab samples. Sterilised 500ml sample bottles were used and filled to the top during sampling. Samples were stored and transported to the laboratory in a cooler box.

As indicated in the SANS241:2015 Drinking Water Standards, the following elements may pose health risks. Acute health risks relate to an immediate and unacceptable health risk whereas chronic health risks pose an unacceptable risk if ingested over an extended period. Aesthetic impacts relate to taints with respect to taste, odour and colour and does not pose an unacceptable health risk. Operational impacts relate to efficient operation of treatment systems and risk to infrastructure.

- Chronic Health Limit Exceedances:
  - Iron – sample from Stream 1.
  - Lead – sample from Stream 1.
  - Manganese – samples from Toe drain 1 and Toe drain 2.
  - Nickel – samples from Stream 1, Toe drain 1 and Toe drain 2.
  - Total Chrome – sample from Toe drain 1.
  - Uranium – samples from Stream 1 and Toe drain 2.
- Acute Health Limit Exceedances:
  - Nitrate – sample from Toe drain 2.
  - Nitrite – samples from Toe drain 1 and Toe drain 2.
  - Sulphate - Toe drain 1 and 2 and Stream 1
- Aesthetic / Operational effects:
  - Ammonium – all 4 samples.
  - Chloride – samples from Stream 1, Toe drain 1 and Toe drain 2.
  - Electrical Conductivity – samples from Stream 1, Toe drain 1 and Toe drain 2.
  - pH – Stream 1.
  - Sodium – samples from Stream 1, Toe drain 1 and Toe drain 2.
  - TDS – samples from Stream 1, Toe drain 1 and Toe drain 2.
  - Total Hardness – samples from Stream 1, Toe drain 1 and Toe drain 2.

Groundwater sampled from private borehole Benoni1 is generally fit for use and complies with the SANS241:2015 Drinking Water Standards, with the exception of Ammonium, which slightly exceeds the aesthetic limit. At the concentrations present the groundwater may have slight taste and odour problems. Impacts on this borehole are unrelated to the Goldplat Top and Rooidam Stock Dams, as the latter are down gradient of the borehole and groundwater from Goldplat does not flow towards this borehole.


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*Table 4-12: 2026 Hydrocensus Groundwater Quality Results*

| Parameter | Unit | SANS241 Standard Limits | | DWS Drinking Standards | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
|---|---|---|---|---|---|---|---|---|
| Ammonium | mg N/ℓ | Aesthetic ≤1.5 | | | 119 | 99,6 | 43,1 | 1,97 |
| Chloride | mg Cl/ℓ | Aesthetic ≤300 | | | 761 | 880 | 1416 | 53,6 |
| Aluminium | mg Al/ℓ | ≤0.3 | | | <0,003 | <0,003 | 0,228 | 0,006 |
| Cadmium | mg Cd/ℓ | | Chronic health ≤0.003 | | <0,002 | <0,002 | <0,002 | <0,002 |
| Calcium | mg Ca/ℓ | | | No health. Scaling intensifies from 32mg/L | 519 | 521 | 20,7 | 8,98 |
| Copper | mg Cu/ℓ | | Chronic health ≤2 | | <0,003 | <0,003 | 0,489 | <0,003 |
| Iron | mg Fe/ℓ | Aesthetic ≤0.3 | Chronic health ≤2 | | 0,103 | 0,22 | 12,9 | <0,004 |
| Lead | mg Pb/ℓ | | Chronic health ≤0.01 | | <0,004 | <0,004 | 0,01 | <0,004 |
| Magnesium | mg Mg/ℓ | | | Diarrhoea and scaling issues from 70mg/L | 28,2 | 52,6 | 18,9 | 11,3 |
| Manganese | mg Mn/ℓ | Aesthetic ≤0.1 | Chronic health ≤0.4 | | 2,18 | 1,19 | 0,075 | 0,015 |
| Nickel | mg Ni/ℓ | | Chronic health ≤0.07 | | 0,26 | 0,175 | 17,2 | <0,007 |
| Total Chrome | mg/ℓ | | Chronic health ≤0.05 | | 0,05 | 0,03 | <0,01 | <0,01 |
| Barium | mg/ℓ | | Chronic health ≤0.7 | | 0,043 | 0,06 | <0,002 | 0,015 |
| Strontium | | | | | 1,8 | 2,57 | 0,111 | 0,052 |
| Uranium | | | Chronic health ≤0.03 | | <0,015 | 1,9 | 0,238 | <0,015 |


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| Parameter | Unit | SANS241 Standard Limits | | DWS Drinking Standards | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
|---|---|---|---|---|---|---|---|---|
| Electrical Conductivity at 25°C | mS/m | Aesthetic ≤170 | | | 1124 | 1293 | 841 | 26,1 |
| Fluoride | mg/ℓ | | Chronic health ≤1.5 | | 0,964 | 0,539 | 1,02 | <0,263 |
| Nitrate | mg/ℓ | | Acute health ≤11 | | 6,77 | 22,1 | <0,194 | <0,194 |
| Nitrite | mg/ℓ | | Acute health ≤0.9 | | 5,09 | 12,6 | 0,347 | 0,152 |
| Total Oxidized Nitrogen | mg/ℓ | | | | 11,9 | 34,7 | 0,363 | 0,253 |
| Total Nitrogen | mg/ℓ | | | | 174 | 201 | 108 | 2,22 |
| Total Kjeldahl Nitrogen | mg/ℓ | | | | 162 | 166 | 107 | 1,97 |
| pH at 25°C | | ≥5 < ≤9.7 | | | 7,53 | 7,96 | 10,2 | 9,17 |
| Potassium | mg K/ℓ | | | No aesthetic or health effects below 50mg/L | 83,8 | 84 | 22,9 | 3,78 |
| Sodium | mg Na/ℓ | Aesthetic ≤200 | | | 2290 | 2749 | 1948 | 15,8 |
| Sulphate | mg $SO_4$/ℓ | Aesthetic ≤250 | Acute health ≤500 | | 5490 | 6637 | 1420 | 4,04 |
| Total Alkalinity | mg $CaCO_3$/ℓ | | | | 277 | 245 | 717 | 34 |
| Bicarbonate alkalinity | mg $CaCO_3$/ℓ | | | | 277 | 243 | 285 | 29,2 |
| Total Dissolved Solids | mg/ℓ | Aesthetic ≤1200 | | | 9372 | 10434 | 6226 | 188 |
| Total Hardness | mg $CaCO_3$/ℓ | 60–120 mg/l, moderately hard | 120–180 mg/l, hard | more than 180 mg/l, very hard | 1412 | 1518 | 130 | 69 |


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| Parameter | Unit | SANS241 Standard Limits | DWS Drinking Standards | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
|---|---|---|---|---|---|---|---|
| Orthophosphate ($PO_4$) as P | mg/ℓ | | | <0,009 | 0,016 | <0,009 | <0,009 |
| Cobalt | mg/ℓ | | | 19 | 15,6 | 1,17 | <0,003 |

Water seeping from the Goldplat Top and Rooidam Stock Dams is not suitable for use. The stream flowing towards the Proposed Project from the adjacent TSF is also not suitable for use. Health risks associated with the chronic and acute health exceedances (indicated in red in Table 4-12) are presented in Table 4-13 (DWAF, 1996).

***Table 4-13: Health Risks Associated with Significantly Elevated Elements***

| Element | Unacceptable concentration range (mg/l) | Associate health risks |
|---|---|---|
| Iron | 10 – 30 | Severe aesthetic effects (taste) and effects on plumbing (slimy coatings). Slight iron overload possible in some individuals. Chronic health effects in young children and sensitive individuals occur in the range of 10 - 20mg/l and occasional acute effects towards the upper end of this range |
| Lead | 0.01 - 0.05 | No danger of any adverse health effects except for a slight risk of behavioural changes and possibly neurological impairment if exposure is not minimised. |
| Manganese | 2 – 5 | Extreme staining, likely to be aesthetically unacceptable to a large proportion of users. No health effects |
| Nickel | Not specified | Not specified |
| Total Chrome | 0.05 – 1 | Possible risk of induction of gastrointestinal cancer following long-term exposure |
| Uranium | >1.42 | Increasing cancer risk in long-term. Increasing risk of renal damage in short-term. |
| Nitrate and Nitrite | >20 | Methemoglobinemia occurs in infants. Occurrence of mucous membrane irritation in adults |
| Sulphate | >1000 | Diarrhoea in all individuals. User-adaptation does not occur. Very strong salty and bitter taste. |


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A detailed discussion on the Goldplat monitoring dataset falls outside the scope of this report. Average concentrations for selected elements considered in this impact assessment are presented in Table 4-14. Concentrations marked in red exceed the Blesbokspruit Water Quality Objective (WQO) (unacceptable concentration). Total dissolved solid (TDS) concentrations that exceed the SANS241:2015* standard is also indicated in red.

*Table 4-14: Average Goldplat Water quality for Selected Elements*

| Average monitoring concentrations | pH | TDS (mg/l) | $SO_4$ (mg/l) | Fe (mg/l) | Mn (mg/l) |
|---|---|---|---|---|---|
| Blesbokspruit WQO | 6.5 - 8.5 | 1200* | 150 - 500 | 0.1 - 1 | 0.5 - 1 |
| Blesbokspruit Downstream | 7,08 | 335 | 52 | 0,08 | 0,10 |
| Blesbokspruit Upstream | 7,23 | 280 | 51 | 0,17 | 0,08 |
| Goldplat RWD | 8,62 | 3 813 | 1 523 | 11,06 | 0,07 |
| Goldplat Slime RWD | 8,31 | 2 413 | 1 155 | 3,43 | 0,90 |
| FM4 | 6,22 | 2 132 | 1 181 | 0,16 | 21,62 |
| GP2 | 8,78 | 987 | 293 | 0,23 | 0,14 |
| GP3 | 9,00 | 972 | 241 | 0,06 | 0,02 |
| GP4 | 7,52 | 2 657 | 440 | 0,13 | 19,00 |
| GP5 | 7,06 | 120 | 14 | 0,23 | 0,10 |
| GP6 | 7,24 | 246 | 58 | 0,10 | 0,08 |
| GP7 | 8,06 | 1 086 | 479 | 4,02 | 1,56 |
| GP8 | 7,31 | 2 401 | 1 119 | 0,19 | 80,82 |
| GP9 | 6,69 | 1 537 | 889 | 0,22 | 4,62 |

As discussed earlier, the pH of the surface, process and groundwater is generally neutral to alkaline, with the exception of borehole FM4, which has a slightly acidic pH. The water is further saline with elevated TDS concentrations, except for boreholes GP5 and GP6 located outside and upgradient of the Goldplat Plant. Sulphate concentrations in the return water exceeds 1000mg/l, but is generally low in the monitoring boreholes, with the exception of boreholes GP8 and GP9. Sulphate concentrations in groundwater downgradient of the Top and Rooidam Stock Dams in boreholes GP2 and GP3 is below 300mg/l on average. This suggests that historical tailings deposition and the Goldplat activities do not significantly impact on groundwater in the immediate vicinity of the project.

Only iron and manganese are currently included in the Goldplat monitoring programme. Elevated iron concentrations are recorded in the return water, but not significantly so in groundwater downgradient of the Top and Rooidam Stock Dams. Borehole GP7 located north and upgradient of the project area also has elevated iron concentrations. Some areas in the Goldplat Plant have significantly increased manganese concentrations in


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groundwater, for example boreholes FM4, GP4 and GP8. These boreholeisnd sources of manganese contamination are however upgradient of the Top and Rooidam Stock Dams. Borehole GP7, with elevated manganese concentrations, is located northeast and also upgradient of the project. Borehole GP9 is located downgradient of the project area and shows elevated manganese concentrations. This borehole is located on the edge of the Blesbokspruit wetland. It is unclear what the source of manganese contamination is in this position, as the return water has low concentrations of manganese.

The Blesbokspruit upstream and downstream of the TSFs is not significantly affected and water quality complies with the WQO for the elements indicated.

A Piper Diagram was prepared using the complete groundwater monitoring dataset (Goldplat and 2026 hydrocensus) and is presented in Figure 4-16. These diagrams are used to plot the equivalent concentrations of several elements in order to characterise the types of water in the study area according to hydrogeological facies and the dominant cation and ion concentrations. The results indicate that the groundwater quality generally does not plot in the recently recharged magnesium-bicarbonate dominant quadrant (left). The groundwater is generally calcium-sulphate (top quadrant) and sodium-chloride (right quadrant) dominant. This is indicative of saline conditions as well as gypsum weathering. This outcome is in line with the discussion above.

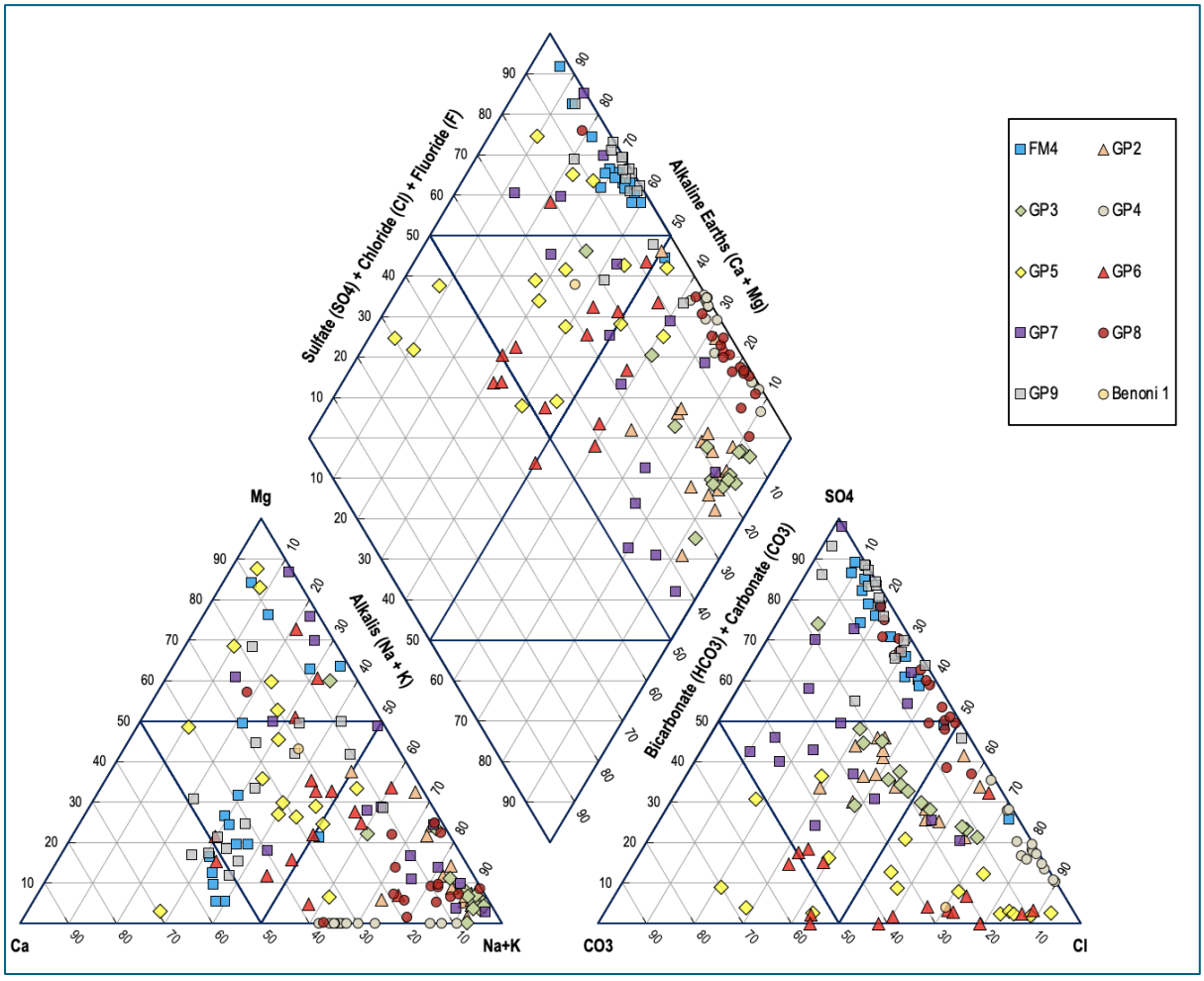


*Figure 4-16: Piper Diagram of the complete dataset*


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### 4.6.6 Groundwater Modelling

The available information discussed above was used to construct a conceptual model of the aquifers present in the project area. The conceptual model forms the basis of the numerical groundwater model constructed and calibrated to complete the impact assessment for this project.

A schematic cross section through the project area is presented in Figure 4-17. The figure demonstrates the locations and extent of the various geological formations that are present. It is shown that the Goldplat Top and Rooidam Stockpile footprints are underlain by Vryheid Formation shales and Dwyka Tillite. The extent of the Karoo sediments is limited and is expected to extend to depths of 20 – 50m below surface. The groundwater table rests in the Karoo sediments, as indicated by information gathered during the hydrocensus. The Karoo sediments are underlain by Malmani Dolomite and Black Reef, which are located deeper under the footprints.

The Karoo sediments and dolomites are regionally underlain by quartzites, shales and conglomerates of the Witwatersrand Supergroup, including the Johannesburg Subgroup. The South Reef is located within the Johannesburg Subgroup, as indicated. The reef dips steeply and is mined at depths of between 100 and 240m northwest of the Goldplat project.

The level of flooding in the East Rand Basin is also indicated on the cross section. Available groundwater level data indicates that groundwater levels at the Goldplat are not lowered due to deep underground gold mine dewatering.

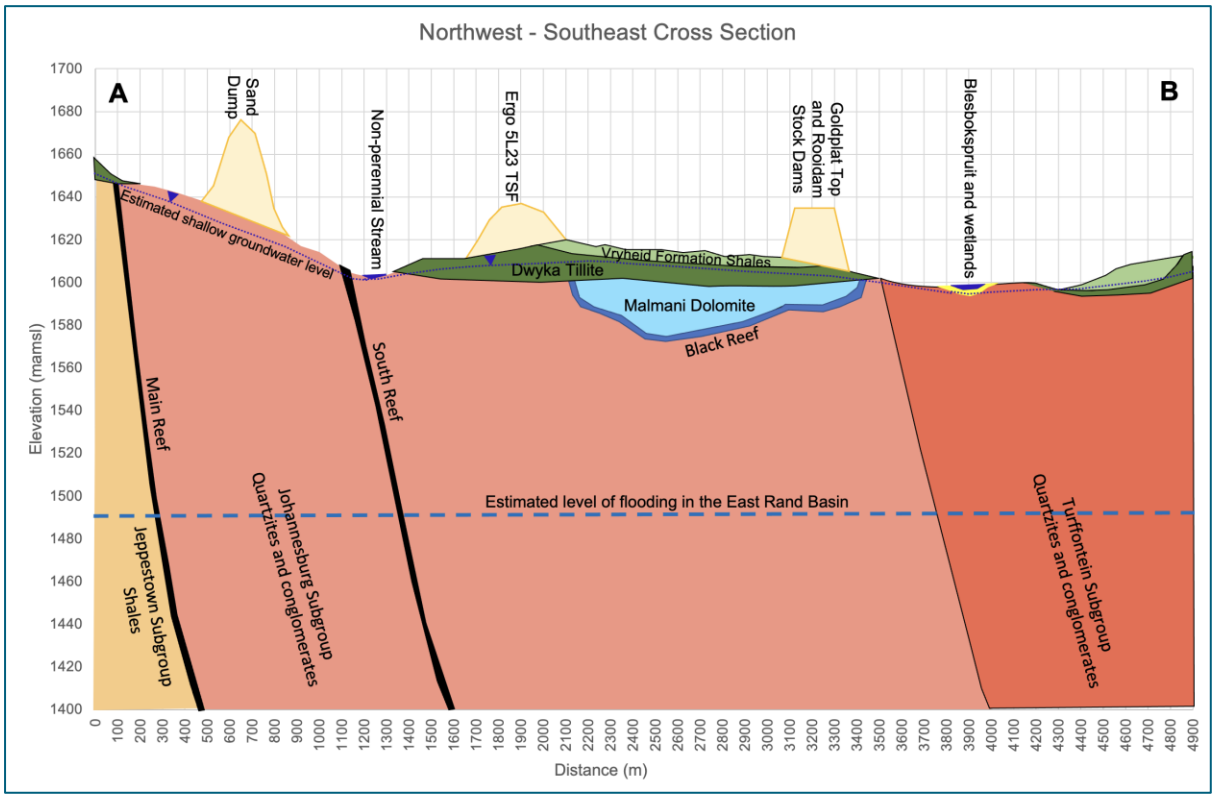


*Figure 4-17: Schematic Cross Section Through the Project Area*

#### 4.6.6.1 Numerical Modelling Objectives

The objectives of the numerical modelling presented in this report are based on the requirements of the water use licence application requirements. The following objectives are therefore reported:


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- Estimate the impact of the proposed Top and Rooidam Stock Dam Reclamation Project during the construction and operational phases of the project on groundwater quality. No significant impacts on groundwater levels are expected.
- Predict the long-term impact of the project on groundwater quality post closure and rehabilitation. The following scenarios will be tested
    - The No Project Option during which the Top and Rooidam Stock Dams will remain in situ in future.
    - Reclamation of the Top and Rooidam Stock Dams and rehabilitation of the footprint areas.

- Develop a groundwater monitoring programme, based on the outcome of the impact prediction study.
- Develop a groundwater management programme geared at reducing the impacts on groundwater quality identified.

#### 4.6.6.2 Model Construction

The numerical modelling was undertaken according to accepted industry principles and standards, including the South African Department of Water and Sanitation's Best Practice Guideline for Impact Prediction (DWS BPG G4, 2008).

The numerical model for the Proposed Project was constructed using MODFLOW and MT3DS. MODFLOW is a modular three-dimensional groundwater flow model and MT3DS is a modular three-dimensional solute transport model published by the United States Geological Survey. MODFLOW and MT3DS use finite difference discretization and flow codes to solve the governing equations. MODFLOW and MT3DS are a widely used simulation codes, which are well documented. MODFLOW is used to simulate groundwater flow rate and direction. MT3DS is superimposed on the MODFLOW simulation results and is used to predict the rate and direction of contaminant movement in the aquifers.

The positions where rivers and streams exit the model area were simulated as a constant head boundary. The eastern and western model boundaries were included as no-flow boundaries, based on estimated groundwater flow lines. The northern and southern model boundaries were simulated as general head boundaries.

Perennial rivers, streams and wetlands inside the model boundary were simulated with discrete cells.

In order to accommodate the large area over which simulations will be undertaken, the model area was refined into block cells of 10 x 10m around the Proposed Project areas and the model grid size was gradually increased away from this area of interest to 100 x 100m. The finer grid allowed more detailed simulations around the areas of interest.

Three layers were included in the model. The upper layer presents the stock dams, the upper weathered Karoo aquifer and the alluvium associated with the Blesbokspruit. This layer is included to facilitate a more accurate simulation of the wetlands, rivers and streams included in the model. The second layer represents the weathered Karoo and dolomitic aquifers. The deeper fractured rock aquifers are simulated in the third layer. The upper layer was simulated as an unconfined aquifer. This layer was allowed to vary between confined and unconfined conditions, depending on water level fluctuations.

All units used during simulations were presented in metres (length) and days (time).

#### 4.6.6.3 Groundwater Elevation and Gradient

The July 2026 measured groundwater water levels in hydrocensus boreholes were used to calibrate the model for this assessment. The groundwater elevations and gradient for this dataset are discussed above.


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Hydrographs in the Goldplat boreholes could not be used during calibration as on-site rainfall data was not available for the project.

#### 4.6.6.4 Conceptual Groundwater Model

The parameters that will be used during groundwater modelling, as derived from field data, the Goldplat dataset and assumed or obtained from literature, as discussed above. These will be used as a starting point during model calibration for this phase of the project and will be adjusted to minimise the model calibration error, as discussed below.

#### 4.6.6.5 Numerical Model

**Model input files and integration**

The conceptual model discussed above was used to construct the numerical model for the project area. The geometry of the numerical model is based on the conceptualisation of the aquifers and on the regional geology. The geological formations are included as discrete zones in the model.

The topographical surface was interpolated from the Digital Terrain Model (DTM) (i.e. the surface topography) and incorporated into the model to ensure that the elevations of the drains used to simulate the streams reflect the topography.

The top of the upper layer of the model was simulated with the surface contours for the project, which were obtained from the DTM for the catchment.

The initial water levels in the model layers of the model were kriged from available information.

During contaminant transport modelling it was assumed that horizontal and vertical transverse dispersivity is 0.01. The effective molecular diffusion coefficient is 8,64E-5 $m^2/d$ and that the longitudinal dispersivity is 90m. The latter was calculated using the empirical equation developed by Neuman (1990) for an average travel distance of 1000m.

No chemical reaction was taken into consideration during simulations.

The timelines considered during modelling are presented in Table 4-15. No detailed information is available to accurately reflect historical tailings deposition and reclamation. Some of the dates are therefore assumptions. These are indicated with an asterix (*). It is understood that the Goldplat Plant does not have a traditional life of mine, as it processes mining by-products and waste materials instead of a single depleting deposit. For the purpose of simulations, it is assumed that the Plant will be operational for 10 years after reclamation of the Top and Rooidam Stock Dams is completed.

***Table 4-15: Assumed Timeline Used During Simulations***

| Simulation period | Start date | End date | Time (years) | Description |
|---|---|---|---|---|
| 1 | 1930* | 1995* | 65 | Historical operational phase of regional TSFs |
| 2 | 1996* | 2026 | 30 | GoldPlat Plant operation, historical TSF dormant phase |
| 3 | 2027 | 2032 | 5 | Top and Rooidam reclamation phase |
| 4 | 2033 | 2043 | 10 | Estimated remainder of life of Goldplat Plant |
| 5 | 2044 | 2046 | 2 | Rehabilitation and closure |


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| | | | | |
|---|---|---|---|---|
| 6 | 2047 | 2112 | 65 | Long-term simulation |
| 7 | 2113 | 2148 | 35 | Long-term simulation |

#### 4.6.6.6 Calibration results

Calibration of a numerical model refers to the demonstration that the model is capable of reproducing field-measured data, which are the calibration values. Calibration is achieved when a set of parameters, boundary conditions, source terms and stresses are found that produce simulated heads and concentrations that match field measured data within the calibration criteria set for the project. This is an important step in the modelling project, which ensures that model results are reliable.

Calibration was completed with groundwater level measurements in boreholes visited during the 2026 hydrocensus. The calibration criteria set for the project are presented in Table 4-16.

***Table 4-16: Calibration Criteria***

| Requirement | Acceptability criteria | Compliance |
|---|---|---|
| Model convergence | Maximum change in head of 0,001m | Complied with (see discussion below) |
| Water balance | Difference between inflow and outflow <1% | Complied with (see discussion below) |
| Root Mean Square Error | <5m for targets | Complied with (see discussion below) |
| Calibration error | At least 80% of targets with <5m error between simulated and measured head | Complied with (see discussion below) |

The calibration criteria take the impacts of historical mine dewatering on groundwater levels into consideration. As discussed earlier, the extent, depth and timing of the historical dewatering are not well understood. This uncertainty affects the outcome of the calibration process.

The results of the calibration process are presented in Table 4-16 and Figure 4-18. It is shown that the calibration error (the difference between measured and simulated head) is less than 5m for all but 2 of the groundwater levels measured. This provides a calibration error target of 86%, which complies with the calibration criteria. The calibration error is scattered evenly around the line of perfect fit, which means the model does not under- or over-estimate groundwater levels. The root mean square error, which provides an indication of the goodness of fit during calibration, is 2.87m, which is within the acceptable criteria limit of 5m.

The water balance error calculated with the numerical model is 0.1%, which also complies with the acceptable calibration criteria set.

Factors that influence the calibration process and results include the following:

- Errors in the coordinates and elevations recorded for the boreholes. The coordinates for the hydrocensus boreholes were recorded with a hand-held GPS.
- The absence of borehole logs with which to characterise the aquifer conditions that groundwater levels in the hydrocensus and Goldplat monitoring boreholes represent. This hampers the understanding of the geology that governs groundwater level depth. The aquifer conceptualisation was therefore based on the regional geological map.


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- As mentioned earlier in this report, the modelling code assumes a continuous porous medium, which means that the aquifers are simulated using average parameters. This does not allow for local variations in permeability that affect groundwater levels in the aquifers. Discrete zones were however included for geological contact zones.

Model calibration can be improved once additional monitoring information becomes available from the proposed monitoring programme. Model recalibration and verification can be undertaken with this data. Groundwater monitoring requirements are discussed later in this report.

***Table 4-17: Calibration Results***

| Calibration point | Simulated head (mamsl) | Measured head (mamsl) | Residual (m) |
|---|---|---|---|
| BENONI1 | 1609,286 | 1607,2 | 2,09 |
| BENONI2 | 1607,019 | 1607,6 | -0,58 |
| CEN468 | 1593,972 | 1593 | 0,97 |
| CEN469 | 1594,125 | 1593 | 1,13 |
| GP8 | 1609,859 | 1611,7 | -1,84 |
| GP4 | 1607,195 | 1610,9 | -3,71 |
| GP2 | 1596,355 | 1596,1 | 0,26 |
| GP3 | 1604,027 | 1604,6 | -0,57 |
| GP9 | 1592,41 | 1592,4 | 0,01 |
| FM4 | 1608,741 | 1602,8 | 5,94 |
| GP7 | 1591,377 | 1585,1 | 6,28 |
| GP5 | 1611,73 | 1608,9 | 2,83 |
| GP6 | 1611,829 | 1611,6 | 0,23 |


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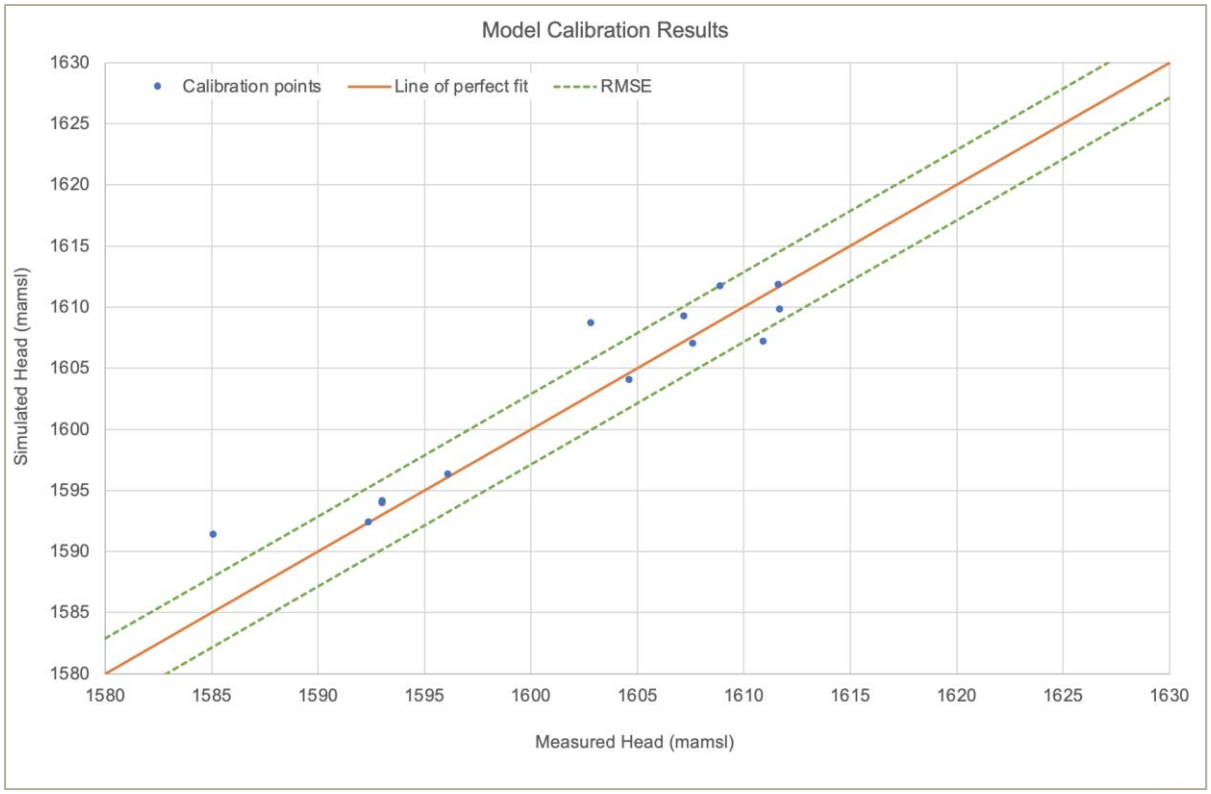


*Figure 4-18: Calibration Results*


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**Sensitivity**

A sensitivity analysis was completed on the model. The purpose of the sensitivity analysis is to quantify the uncertainty in the calibrated model caused by uncertainty in the estimates of aquifer parameters, stresses and boundary conditions. The level of heterogeneity of the aquifer material can never be accurately measured with field data. The uncertainty of the impact of heterogeneity on simulations is therefore assessed as part of the sensitivity analysis.

The results of a sensitivity analysis can be used to identify data gaps and to plan for additional fieldwork, including monitoring requirements, once the modelling has been completed.

The comparative sensitivity for the parameters included during calibration is presented in Figure 4-19. The comparative sensitivity provides an indication of how sensitive the model is to changes in each parameter, compared to the other parameters tested. A low value indicates a low sensitivity and a high value a high sensitivity. The results indicate the following:

- The model is sensitive to changes in the permeability and specific yield of the weathered Karoo aquifer.
- The model is also sensitive to variations in the rate of recharge to the alluvium associated with the Blesbokspruit and its wetlands.

As discussed in the calibration section above, model sensitivity can be addressed through additional calibration with groundwater monitoring data that will become available from the operations once the monitoring programme is implemented.

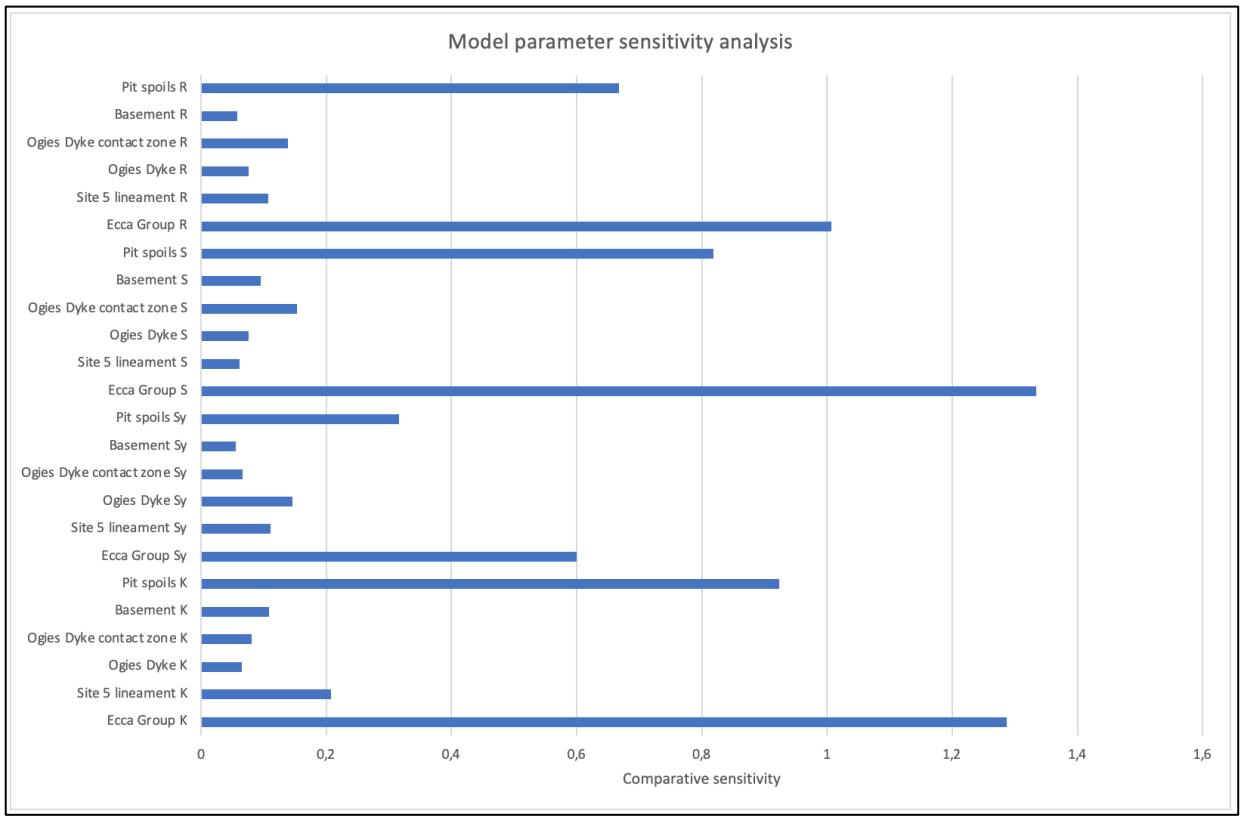


*Figure 4-19: Sensitivity Analysis*


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**Assessment of uncertainties**

The accuracy of the modelling project depends on the quality of the input data and the available information. Even with an unchanging environment, impacts are difficult to predict with absolute certainty. Predictions were undertaken with the calibrated flow model, which is a simplified version of reality. The model represents a tool that can be used to assess the impact of the proposed tailings reclamation activities on the aquifers and to identify data gaps. The calibration error is discussed above and is acceptable within the limitations of the study. The model should be updated and verified with site-specific monitoring information, when it becomes available. Calibration against hydrographs (groundwater level fluctuation with time) and on-site rainfall data will be of specific value in improving the current understanding of aquifer parameters. Uncertainties are approached conservatively, based on the precautionary principle, in order to ensure that the predictions and impact assessment in this report address the maximum potential impact of the proposed development. The uncertainties in the model include:

- **Uncertainties regarding aquifer conditions within the project area**: This understanding can be improved through the continuation of groundwater level and quality monitoring at the mine.
- **Uncertainties regarding borehole depth, construction and geology intersected**: This information is not available for the hydrocensus or Goldplat monitoring boreholes. For this reason, it was assumed that all hydrocensus boreholes target the fractured rock aquifer.
- **Uncertainties regarding the borehole elevations**: The elevations used during simulations were inferred from hand-held GPS measurements and inaccuracies may occur. It is however thought that the error in elevation will not exceed the calibration error of 5m.
- **Mathematical modelling uncertainties**: It is not possible with the available information to quantify the heterogeneity present in the aquifers simulated. For this reason, there are inherent uncertainties in the model. The level of confidence in the model can be improved with the incorporation of additional monitoring data.

The uncertainties listed above can be reduced or eliminated through continuation of the groundwater monitoring programme at the mine. It can further be reduced by integrating the results of the groundwater monitoring programme proposed in this study. This information can be used to improve aquifer parameter estimation and model calibration.


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## 4.7 Aquatic Biodiversity

**Refer to Specialist Study: Appendix D – Wetland Assessment**

### 4.7.1 Flora

The project area falls within the Grassland and Savanna biome. As majority of the project area fall within the grassland its description follows. The grassland biome is centrally located in southern Africa, and adjoins all biomes except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include seasonal precipitation and low temperatures in winter (Mucina & Rutherford, 2006).

The project area falls within the Soweto Highveld Grassland vegetation type (Mucina & Rutherford, 2006) (Figure 4-20) and this type if grassland is considered endangered.

Red grass Themeda triandra exclusively dominates areas which are not severely degraded. Characteristic species are *Three-awn Rolling Grass (Aristida bipartite), Blackseed Fingergrass (Digitaria ternate), Largeseed Setaria (Setaria nigrirostris), S. incrassata and Panicum coloratum. Other important species are Weeping Lovegrass (Eragrostis curvula), Speargrass (Heteropogon contortus), Golden Setaria (Setaria sphacelate), Elionurus muticus, Microchloa caffra, Brachiaria serrata, Eragrostis plana with Feathered Chloris (Chloris virgata), Couchgrass (Cynodon dactylon) and Tassel Bristlegrass (Aristida congesta) prominent at degraded sites. Dicotyledonous forbs are prominent and include Berkheya pinnatifida, Flower-in-a-cage (Crabbea acaulis), Hairflower (Chaetacanthus costatus), Salvia repens, Pseudognaphalium luteo-album, Abildgaardia ovata, Anthospermum pumilum, Bulbostylis contexta and Evolvulus alsinoides*

### 4.7.2 Fauna

As mentioned above, Gauteng is relatively prosperous in biodiversity, but this resource tends to be poorly conserved. The province has a vast range of mammal, bird, amphibian and reptile species.

The prevalence of all these species occurring at the specific project site is slim due to the availability of habitats suitable for survival, and anthropogenic influences which have led to the current altered state of the immediate project area.

The specific Proposed Project area has an extremely altered and degraded habitat due to the historical mining activities that have occurred there. As a result, the possibility of many species being supported by the remaining immediate habitat is quite low. The anticipated fauna of the Proposed Project area is likely to be limited and associated with grasslands and cultivated lands on site.


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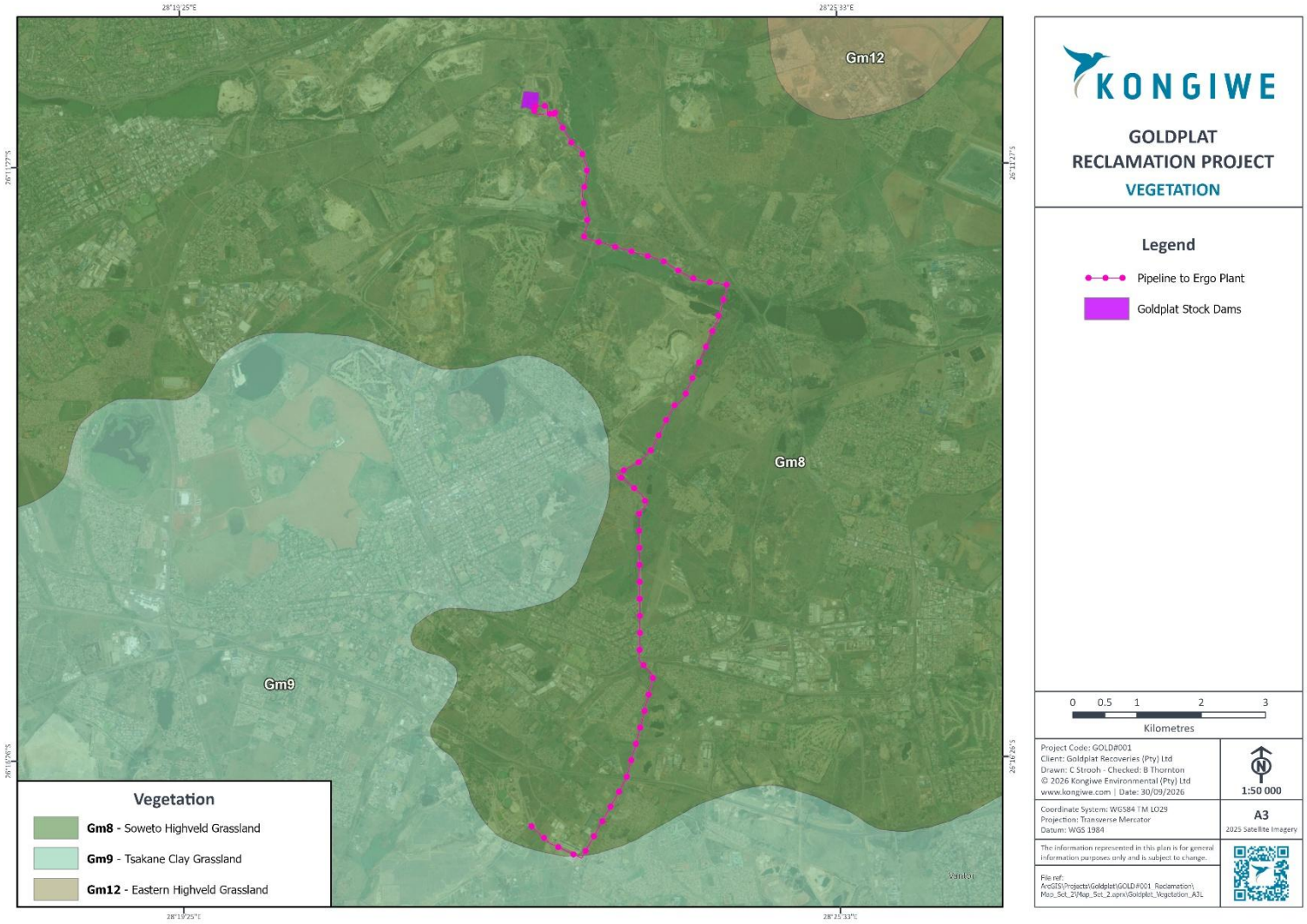


*Figure 4-20: Vegetation Type in and Around the Project Area*


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### 4.7.3 Wetlands

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach for the sustainable and equitable development of South Africa's scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the NWA. This directly applies to the NWA, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives. The NFEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM: BA)'s biodiversity goals, informing both the listing of threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel et al., 2011).

Six wetland types have been identified within the 500 m regulated area, namely channelled valley bottom wetlands, unchannelled valley bottoms, depressions, floodplain wetlands, seep and a wetland flat (see Figure 4-23). The mapped NFEPA river and associated channelled valley-bottom and floodplain wetlands form the main drainage corridor through the northern and central portions of the PAOI (Figure 4-21). Additional unchannelled valley-bottom wetlands occur in adjacent low-lying areas, while depressions, seeps and wetland flats are scattered throughout the broader study area, particularly toward the south.

These mapped NFEPA features indicate a relatively high degree of freshwater ecological sensitivity within and surrounding the project area and were used to inform the desktop identification of potentially sensitive aquatic areas. However, the NFEPA dataset is a national-scale conservation planning tool and does not replace site-specific wetland delineation and field verification (Figure 4-21).


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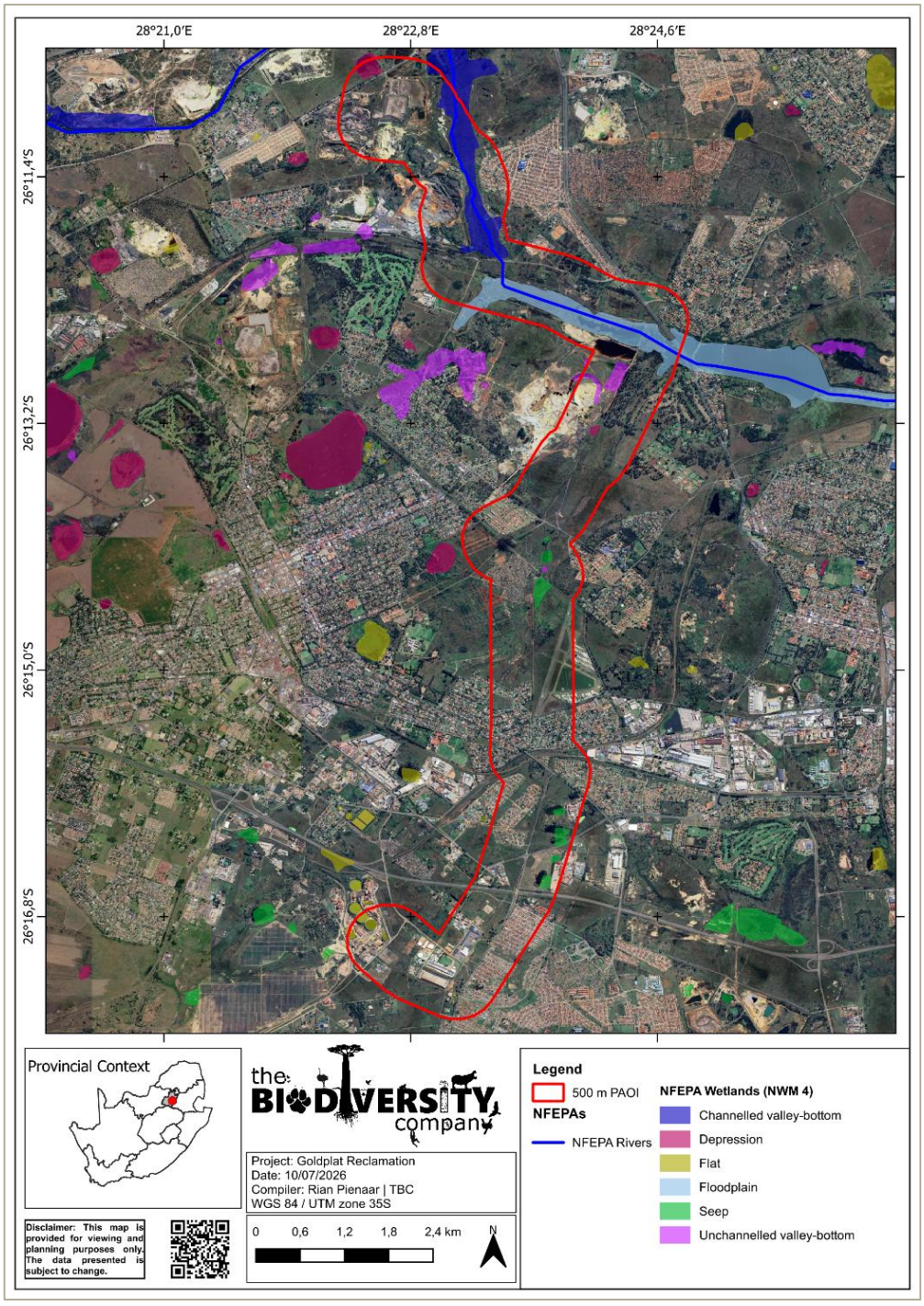


*Figure 4-21: NFEPA Wetlands Located Within 500 m Regulated Area*

### 4.7.4 South African Inventory of Inland Aquatic Ecosystems

The spatial dataset released as part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) and included in the National Biodiversity Assessment (NBA 2018) was used to identify wetlands within the 500 m regulated area (Figure 4-22). Three wetland types were identified within the Project PAOI, namely unchannelled valley-bottom wetlands, depressions and seeps. The unchannelled valley-bottom wetlands represent the dominant wetland type within the study area and occur extensively within the northern, central and southern portions of the PAOI. According to the NBA 2018 dataset, these systems are rated as Critically Endangered (CR) and Not Protected. Depression wetlands are scattered throughout the broader project area and are rated as


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Least Concern (LC) and Poorly Protected, while the smaller seep systems occur as isolated features associated with slopes and transitional terrain positions and are rated as Critically Endangered (CR) and Poorly Protected.

These mapped features indicate a moderate to high likelihood of wetland occurrence across portions of the PAOI and were considered during the desktop assessment of the project area. The SAIIAE dataset serves as a useful conservation planning and screening tool; however, the national-scale mapping does not replace site-specific field verification, and therefore the extent and classification of wetlands were confirmed during the field assessment where access was possible.

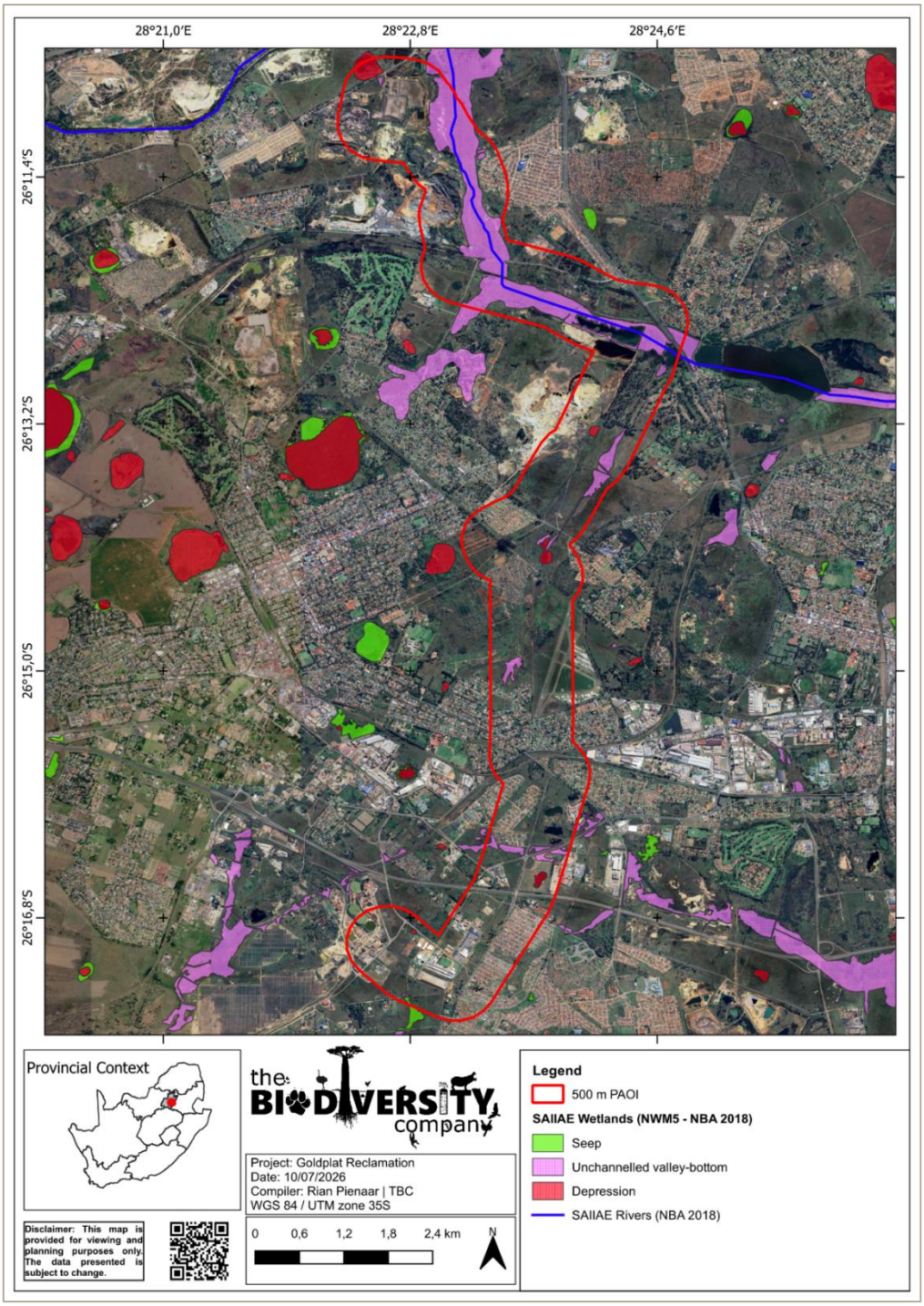


*Figure 4-22: SAIIAE Wetlands as well as Topographical River Lines and Inland Water Areas Located Within 500 m Regulated Area*


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### 4.7.5 Wetland Delineation

The wetland areas were delineated in accordance with the Department of Water Affairs and Forestry (DWAF) (2005) guidelines. A total of eight Hydrogeomorphic (HGM) units were identified within the 500 m regulated area, comprising three channelled valley-bottom wetlands (HGM 1, HGM 2 and HGM 7), two unchannelled valley-bottom wetlands (HGM 5 and HGM 8), two hillslope seep wetlands (HGM 4 and HGM 6), and one depression wetland (HGM 3) (see Figure 4-23 and Figure 4-24). In addition to these natural wetland systems, several drainage features and artificial wetland areas were also identified within the broader project area.

The delineated wetlands are distributed across the northern, central and southern portions of the project area. The most extensive systems are associated with the main drainage corridor traversing the central and northern parts of the PAOI, where the channelled and unchannelled valley-bottom wetlands occur. The hillslope seep wetlands occur as more localised systems associated with sloping terrain, while the depression wetland is present as an isolated feature within the broader landscape. The artificial wetland areas are associated with transformed or disturbed portions of the site, particularly in relation to historical mining and infrastructure development. Together, these delineated systems indicate a relatively complex aquatic environment within and surrounding the project.


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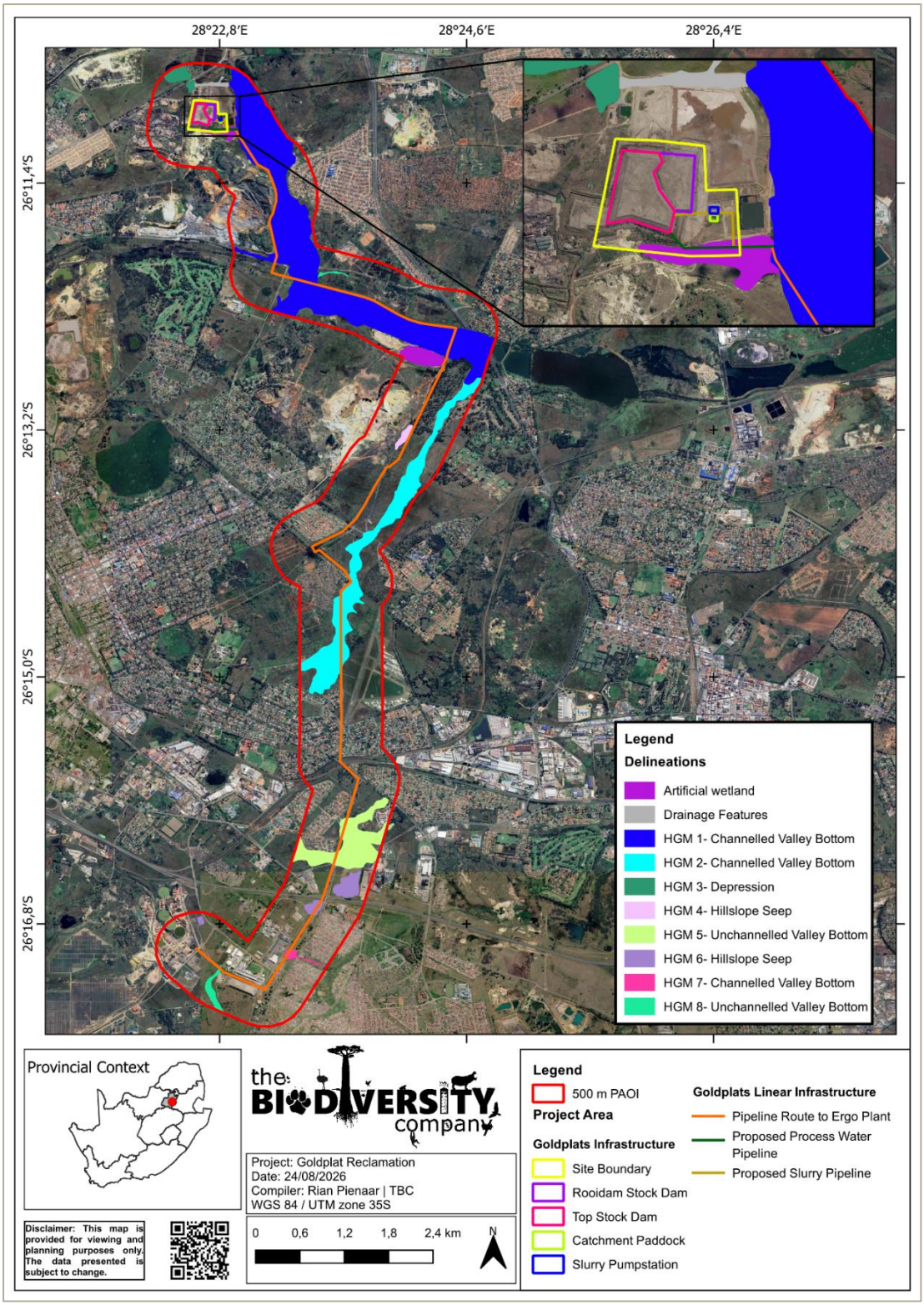


*Figure 4-23: Delineation of the Watercourses within Cluster 1 within the PAOI*


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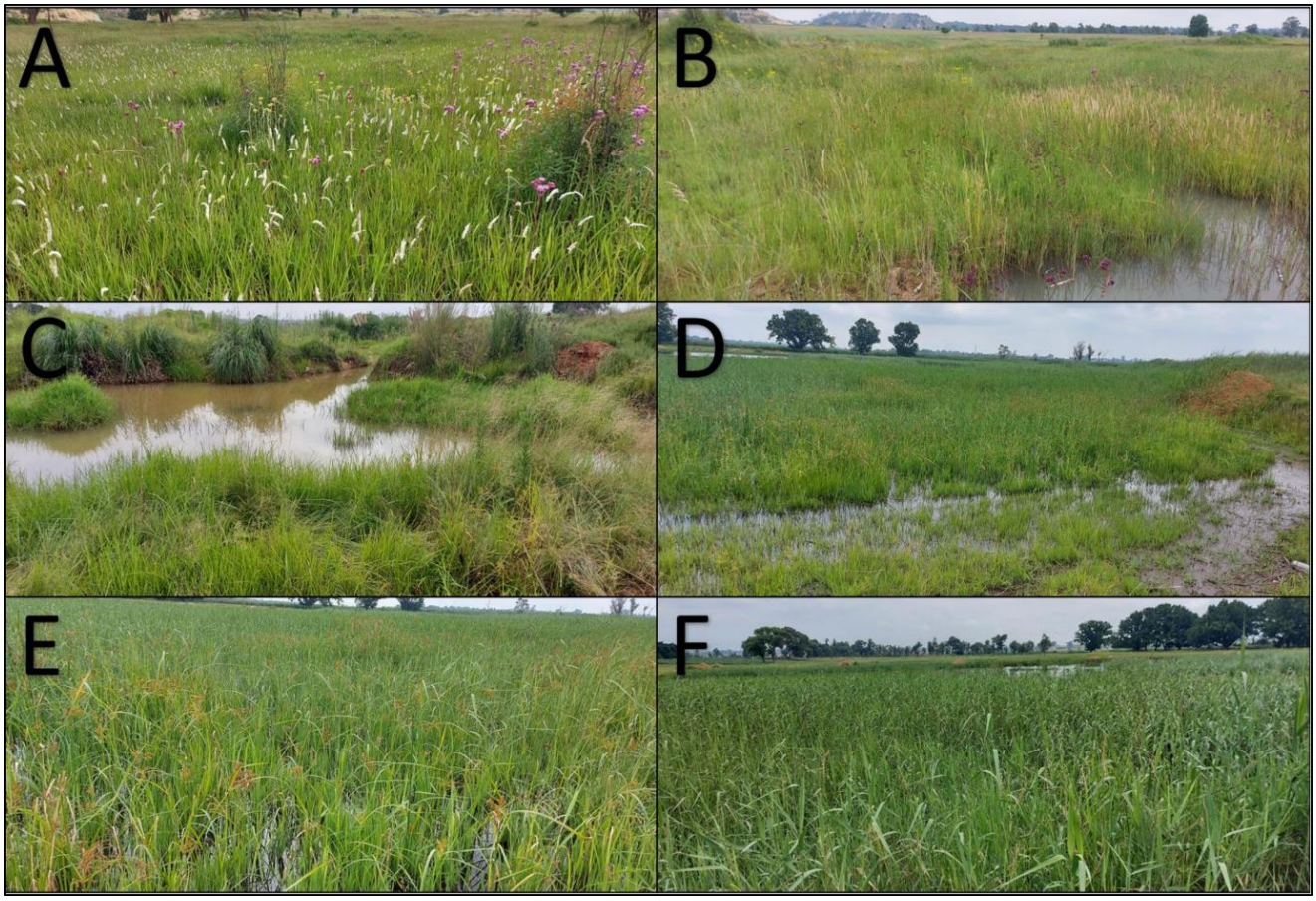


*Figure 4-24: Examples of the Different Wetlands Found within the Project Area A) Hillslope Seep; B) Hillslope Seep; C & D) Channelled Valley Bottoms; and E & F) Unchannelled Valley Bottoms (The Biodiversity Company, 2026).*

### 4.7.6 Area of Wetlands

Table 4-18 below summarises the individual wetland areas and the percentage that each HGM unit comprises of the total wetland area within the PAOI, which amounts to 391.61 ha.

*Table 4-18: Summary of Wetland Areas Within the Project Area of Influence*

| HGM Units | Area (Ha) | Size (%) |
|---|---|---|
| HGM 1 | 216.60 | 55.31 |
| HGM 2 | 83.91 | 21.43 |
| HGM 3 | 6.67 | 1.70 |
| HGM 4 | 2.65 | 0.68 |
| HGM 5 | 42.54 | 10.86 |
| HGM 6 | 12.24 | 3.13 |
| HGM 7 | 2.47 | 0.63 |
| HGM 8 | 5.36 | 1.37 |
| Artificial Wetlands | 14.32 | 3.66 |
| Drainage Features | 4.85 | 1.24 |
| **Total** | **391.61** | **100** |


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### 4.7.7 Ecosystem Services

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze et al., 2009). The results of the assessment are discussed below. Ecosystem services contributing to these scores include flood attenuation, stream flow regulation, sediment trapping, nutrient and toxicant assimilation, erosion control and the maintenance of biodiversity.

*Table 4-19: Summary of the Average Ecosystem Scores for the Assessed Systems*

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

The channelled valley-bottom wetlands (HGM 1, HGM 2 and HGM 7) and the unchannelled valley-bottom wetlands (HGM 5 and HGM 8) contribute most strongly to ecosystem services related to flood attenuation, stream flow regulation, sediment trapping, nutrient and toxicant assimilation, and biodiversity maintenance. These systems are associated with the main drainage corridors and lower-lying parts of the landscape and therefore play an important role in moderating runoff, slowing surface flows, promoting infiltration, and improving water quality. The more extensive valley-bottom systems, particularly HGM 1, are considered especially important in this regard due to the extent of wetland vegetation and their position within the broader drainage network.

The depression wetland (HGM 3) contributes primarily to water quality enhancement, sediment retention and biodiversity maintenance. Depression wetlands are often effective at trapping sediments and assimilating nutrients and toxicants due to their inward-draining nature and tendency to retain water for longer periods. These characteristics allow such systems to perform an important ecological function within transformed landscapes by improving water quality and supporting wetland-dependent biota.

The hillslope seep wetlands (HGM 4 and HGM 6) contribute mainly to sub-surface flow regulation, nutrient and toxicant assimilation, and biodiversity maintenance. Although seep systems generally contribute less to flood attenuation than valley-bottom systems, they remain important in regulating local hydrology and maintaining ecological connectivity across the landscape. These systems also assist in filtering diffuse runoff and supporting specialised wetland vegetation within sloping terrain.

Overall, HGM 1 scored the highest ecological functionality and was rated as High. HGM 2, HGM 3, HGM 5 and HGM 7 were rated as “Moderately High”, indicating that these wetlands remain important providers of ecosystem services despite varying levels of disturbance. HGM 4 was rated as “Intermediate”, while HGM 6 and HGM 8 were rated as “Moderately Low”, reflecting the reduced ecological functioning of these systems due to historical and ongoing anthropogenic disturbance within the project area.

### 4.7.8 Present Ecological State

The Present Ecological State (PES) of the delineated wetlands was assessed to determine the extent to which each system has been modified by historical and current anthropogenic activities within the project area.


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*Table 4-20 Average Present Ecological State Scores for the Assessed Wetlands*

| D - Largely Modified | E – Seriously Modified | F- Critically Modified |
|---|---|---|
| **HGM 1** | HGM 5 | HGM 4 |
| **HGM 2** | HGM 6 | |
| **HGM 3** | HGM 8 | |
| **HGM 7** | - | |

The results indicate that the delineated wetlands range in condition from Largely Modified (Class D) to Critically Modified (Class F). These ratings reflect the cumulative influence of historical mining activities, tailings deposition, altered hydrology, vegetation disturbance, erosion, infrastructure development and surrounding urban land uses within the broader landscape.

HGM 1, HGM 2, HGM 3 and HGM 7 were assigned a PES Class D (Largely Modified). Although these wetlands have been affected by surrounding anthropogenic activities, they still retain recognisable wetland characteristics and continue to perform important ecological functions. These systems remain influenced by altered runoff inputs, adjacent development, disturbed catchment conditions and historical mining-related impacts, but still support wetland vegetation and some degree of hydrological and ecological functioning.

HGM 5, HGM 6 and HGM 8 were assigned a PES Class E (Seriously Modified). These systems show a greater degree of ecological disturbance and modification, with impacts including vegetation loss, hydrological alteration, localised infilling or erosion, and disturbance associated with roads, infrastructure and historical land transformation. While these wetlands still retain identifiable wetland features, their ecological functioning has been substantially reduced.

HGM 4 was assigned a PES Class F (Critically Modified). This wetland has been extensively altered by historical disturbance, resulting in severe modification of ecological processes and a substantial loss of natural wetland structure and functioning. Although remnants of wetland characteristics remain identifiable, the system is considered critically modified in its current state.

Overall, the PES assessment indicates that all delineated wetlands within the project area have been affected to varying degrees by anthropogenic disturbance. However, several wetlands still retain sufficient ecological function to warrant protection, while the more degraded systems will require management intervention and rehabilitation where impacts cannot be avoided.

### 4.7.9 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) assessment was applied to the HGM unit 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 (SWSAs), 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 4-21. The wetland EIS score is within the “C– Moderate” class.

The EIS assessment was applied to the delineated HGM units in conjunction with the ecosystem service scores presented in the preceding sections in order to determine the relative sensitivity and ecological importance of the wetlands within the project area. Various components were considered as part of the EIS assessment, including overlap with SWSAs, the NFEPA and NBA 2018 wetland ecosystem threat status and protection level, as well as the present condition of the wetlands.


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These factors were considered collectively to provide an indication of the ecological importance, sensitivity and conservation value of each delineated wetland unit, with higher EIS categories indicating wetlands that are more ecologically important, more sensitive to disturbance and therefore require greater protection and more careful management of potential impacts.

Table 4-21 provides a summary of the broader ecological context considered in the EIS assessment for the delineated wetland types.

***Table 4-21 Aspects Considered in the Ecological Importance and Sensitivity Assessment***

| HGM Type | NFEPA Wet Type | | | NBA Wetlands | | | SWSA (Y/N) | CBA/ESA (Y/N) | EIS Rating |
|---|---|---|---|---|---|---|---|---|---|
| | Type | Ecosystem Threat Status | Ecosystem Protection Level | Wetland Condition | Ecosystem Threat Status 2018 | Ecosystem Protection Level | | | |
| Channelled Valley-Bottom | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| Depression | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| Hillslope Seep | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| Unchannelled Valley-Bottom | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |

### 4.7.10 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the delineated wetlands were determined from the results of the PES and EIS assessments. These assessments indicated that the wetland features within the project area have been transformed by historical and current impacts but still provide ecological services within the broader landscape. Based on the assessment, the target ecological category for all delineated wetlands is Class D. Wetlands currently in PES Class D should be maintained, while wetlands currently in PES Class E or F should be improved to Class D. The appropriate REC and RMO estimated for the wetland areas are presented in Table 4-22 below.


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*Table 4-22: Summary of the REC and RMO Categories Assigned to the Relevant Wetlands*

| HGM Unit | REC – RMO |
|---|---|
| HGM 1 | D – Maintain |
| HGM 2 | D – Maintain |
| HGM 3 | D – Maintain |
| HGM 4 | D - Improve |
| HGM 5 | D - Improve |
| HGM 6 | D - Improve |
| HGM 7 | D – Maintain |
| HGM 8 | D - Improve |

### 4.7.11 Buffer Requirements

The scientific buffer calculation (Macfarlane et al., 2014) was applied to determine the appropriate buffer zone widths relevant to the proposed pipeline infrastructure and stock dam reclamation areas. Based on the outcome of the assessment, the post-mitigation buffer for the proposed slurry pipeline and proposed process water pipeline was determined to be 15 m, while the post-mitigation buffer for the Top Stock Dam and Rooidam Stock Dam reclamation areas was determined to be 40 m.

*Table 4-23 Buffer Requirements*

| Aspect | Post-Mitigation |
|---|---|
| Pipelines | 15 m |
| Top Stock Dam and Rooidam Stock Dam reclamation areas | 40 m |


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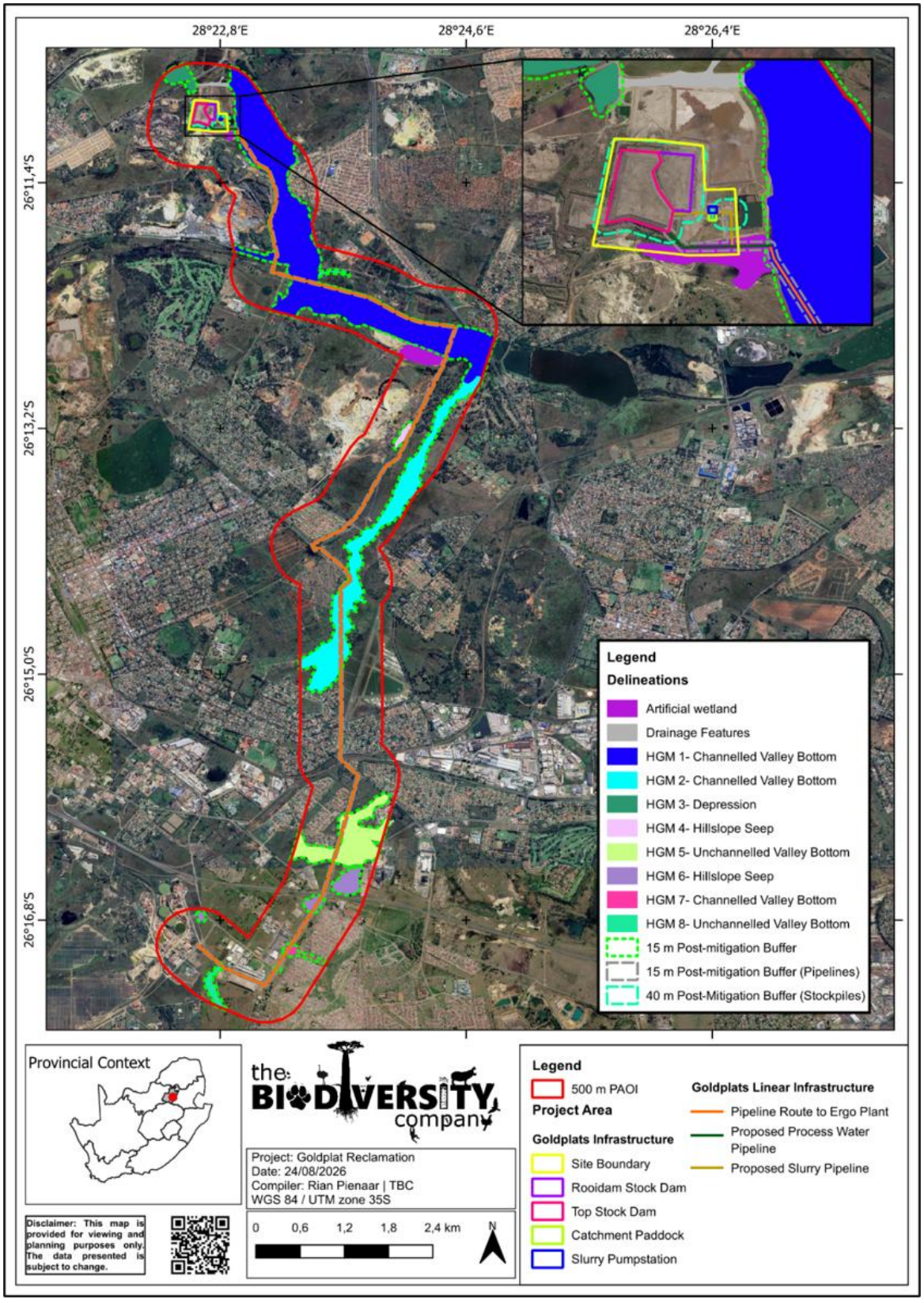


*Figure 4-25: Recommended Buffers for the Identified Wetlands (excluding activities within watercourses)*


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### 4.7.12 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas as shown in Table 4-24 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 PES and EIS assessment processes followed in the previous section, and consideration has been given to any observed or likely presence of sensitive fauna and flora. A map highlighting the Freshwater Sensitivity for the PAOI is depicted in Figure 4-26.

It should be noted that the EIS ratings and the specialist sensitivity verification represent different assessment approaches and are therefore not directly equivalent.

***Table 4-24: 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 - 8 | Aquatic Biodiversity Theme | Very High | High | Screening Tool Sensitivity Disputed.<br>Rationale for the specialist assigned 'High' rating:<br>These wetland systems have experienced historical impacts related to mining and impoundments. Even though largely and seriously modified, the wetlands still present functionality and this has contributed towards determining the sensitivity ratings. The wetlands have therefore been assigned a 'High' sensitivity rating. |
| Non-perennial Drainage | | Low | Medium | Screening Tool Sensitivity Disputed.<br>Rationale for the specialist assigned 'Medium' rating:<br>These watercourses have experienced historical impact related to mining activities. The connectivity of some of the features to downstream watercourses increases their importance in maintaining the hydrological functioning of these systems and providing a corridor to the larger watercourses. This has contributed towards determining the sensitivity rating. The watercourses have therefore been assigned a 'Medium' sensitivity rating. |
| Artificial Wetlands | | Low | Low | Screening Tool Sensitivity Validated.<br>Rationale for the specialist assigned 'Low' rating:<br>This is an off-channel feature and is artificial and has therefore been assigned a 'Low' sensitivity rating. |
| Remaining Area | | Low | Low | Screening Tool Sensitivity Validated.<br>Rationale for the specialist assigned 'Low' rating:<br>Much of the area has been historically modified through agricultural and mining activity. The proposed activities are not anticipated to significantly modify the hydrological characteristics of the entire area; therefore a 'Low' sensitivity has been assigned for these areas in relation to freshwater biodiversity. |


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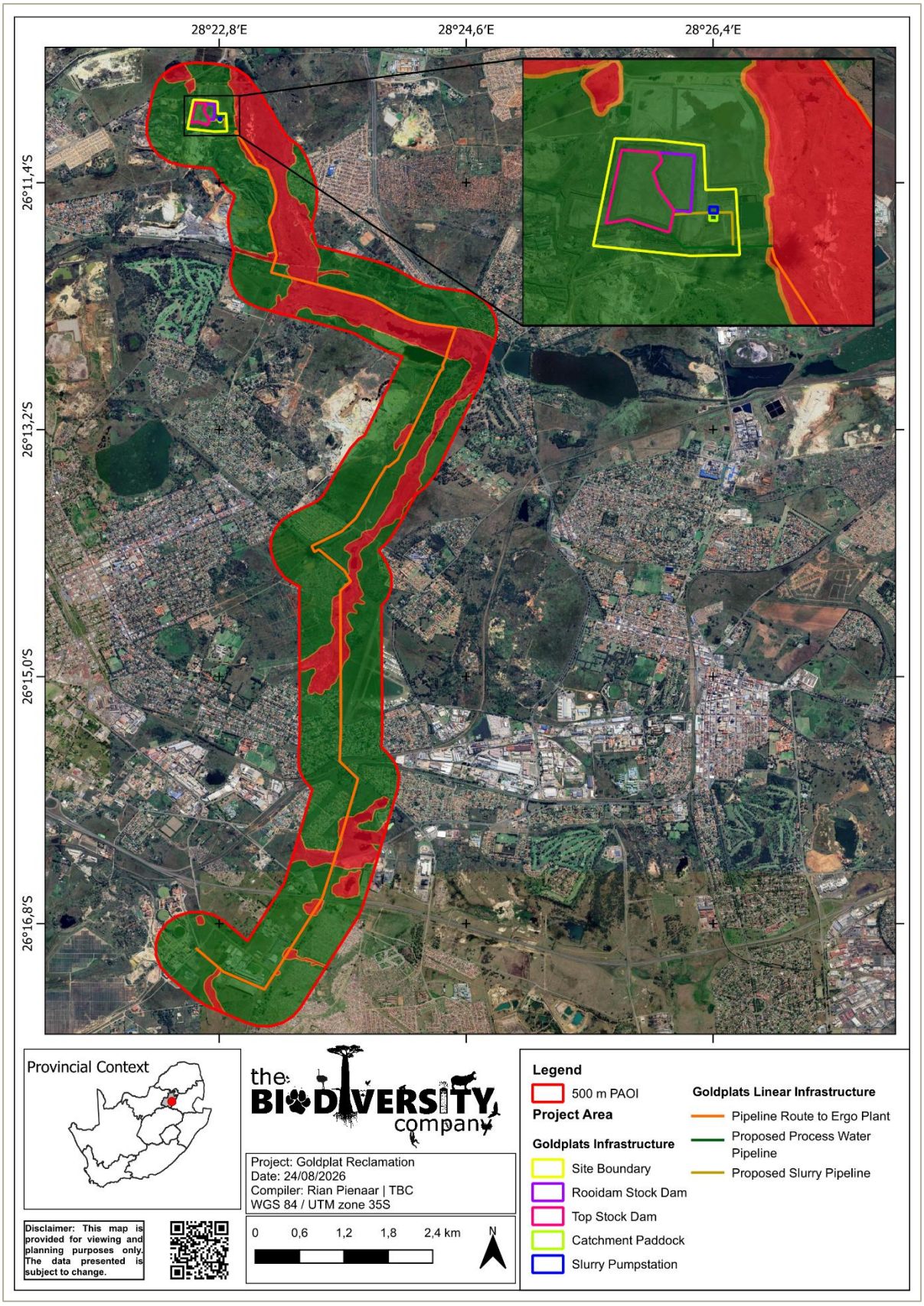


*Figure 4-26: Sensitivity Map for the Project Area of Influence*


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## 4.8 Socio-economic Baseline

The following baseline assessment outlines various aspects of the socio-economic profile of various administrative levels relevant to the Project, including the ward level (Wards 72 and 97), the local municipality level (CoE) and the provincial level (Gauteng).

The baseline assessment investigated trends concerning population, number of households, number of informal households, gender distribution, age distribution, ethnicity, language, education, unemployment rate, industry sector contributions, and access to services (including piped water, electricity, sanitation facilities and refuse disposal).

Unless otherwise specified, information was derived from the 2011 and 2022 Census data compiled by Statistics South Africa (StatsSA). Note that the availability of ward data in 2022 was limited to population, gender ratio, age distribution and ethnicity. For other aspects of the socio-economic profile at the ward level, only 2011 data was available. This limited information is outdated and should be considered with caution.

### 4.8.1 Population

Table 4-25 presents available data regarding population, from 2011 to 2022 at all administrative levels. The average annual population growth rate between 2011 and 2022 was approximately 3.0% in Ward 72 and 3.2% in Ward 97. The average annual population growth rate in the CoE was comparatively lower, at 2.5%.

*Table 4-25: Population*

| Administrative Level | Population (2011) | Population (2022) | Average Annual Population Growth Rate (%) between 2011 and 2022 |
|---|---|---|---|
| Gauteng Province | 12,272,263 | 15,099,424 | 2.09 |
| CoE | 3,178,470 | 4,066,691 | 2.54 |
| Ward 72 | 28,948 | 38,478 | 2.99 |
| Ward 97 | 28,725 | 38,712 | 3.16 |

### 4.8.2 Number of Households

Table 4-26 shows that, in 2011, the number of households in both wards was similar at the ward level, with approximately 10,500 households in Ward 97 and almost 11,000 households in Ward 72. Between 2011 and 2022, the number of households increased by approximately 31% in the CoE – and by 28% in Gauteng. No household data was available at the ward level, for the 2022 Census.

*Table 4-26: Number of Households*

| Administrative Level | Number of Households (2011) | Number of Households (2022) |
|---|---|---|
| Gauteng Province | 4,164,641 | 5,318,672 |
| CoE | 1,080,646 | 1,421,003 |
| Ward 72 | 10,998 | Not available |
| Ward 97 | 10,515 | Not available |


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### 4.8.3 Informal Household

Table 4-27 shows that, in 2011, the proportion of households that lived in informal dwellings (shacks) was almost 37% in Ward 72, compared to just 1% in Ward 97. This illustrates the much higher extent of poverty among households in Ward 72, compared to Ward 97. Between 2011 and 2022, there has been little change in the proportion of households residing in shacks within the CoE.

*Table 4-27: Household Residing in Informal Dwellings, by Proportion (%)*

| Administrative Level | Proportion (%) of Households (2011) | Proportion (%) of Households (2022) |
|---|---|---|
| Gauteng Province | 11.1 | 13.7 |
| CoE | 13.6 | 13.4 |
| Ward 72 | 36.8 | Not available |
| Ward 97 | 1.4 | Not available |

### 4.8.4 Gender Ratio

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. A gender ratio of well over 1.0 can be indicative of population in-migration (influx), as unskilled job seekers moving into an area tend to be male. Table 4-28 shows the gender ratios for each administrative level, for both 2011 and 2022.

The high gender ratio for Ward 72 indicates that some degree of population influx has occurred. The high proportion of informal households in Ward 72 supports the finding that population influx has occurred. For Ward 72, The gender ratio in 2022 (1.12) is similar to that recorded in 2011 (1.11), indicating that the population influx has stabilised over the past decade.

Gender ratios for Ward 97 and the other administrative levels indicate relatively equal proportions of males and females.

*Table 4-28: Gender Ratio*

| Administrative Level | Gender Ratio (2011) | Gender Ratio (2022) |
|---|---|---|
| Gauteng Province | 1.02 | 1.02 |
| CoE | 1.05 | 1.04 |
| Ward 72 | 1.11 | 1.12 |
| Ward 97 | 0.99 | 1.01 |

### 4.8.5 Age Distribution

Table 4-29 shows the distribution of 5-year age categories, by proportion (%), for 2011 and 2022. Data for 2011 is shown in parentheses. Figure 4-27 illustrates the age distribution data presented in Table 4-29.

Ward 72 shows a similar trend to that of Gauteng and the CoE, with peaks between the ages of 20 and 34 years. In comparison, Ward 97 shows an a generally older population. An older population is linked to declining fertility and increasing longevity, which is a characteristic of improved economic conditions.

In 2022, the youth population for Gauteng, the CoE and Ward 72 was approximately 28 to 29%. In comparison, Ward 97 had a youth population of 24%, reflecting a lower dependency ratio than Ward 72 and the other administrative levels.


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Figure 4-28 shows the distribution of the population (by 5-year age categories) of both Wards, for 2011 and 2022. For both wards, the youth population (persons under 20 years of age) has remained static. However, a notable increase occurred over the same period concerning the number of people aged between 30 and 44 years – for both wards. For Ward 97, increases in the number of people aged between 45 and 69 years are also noted.

*Table 4-29: Age Categories for 2011 and 2022, by Proportion (%) Data for 2011 Shown in Parentheses*

| Age Category (Years) | Gauteng | CoE | Ward 72 | Ward 97 |
|---|---|---|---|---|
| 0 – 4 | 8.6 (9.7) | 8.4 (10.0) | 8.6 (9.4) | 6.5 (8.5) |
| 5 – 9 | 6.9 (7.4) | 6.7 (7.5) | 6.3 (7.1) | 6.2 (6.8) |
| 10 – 14 | 7.1 (6.6) | 7.1 (6.8) | 6.4 (6.9) | 6.2 (7.1) |
| 15 - 19 | 6.8 (7.5) | 6.7 (7.5) | 6.8 (7.7) | 5.5 (7.4) |
| 20 - 24 | 9.1 (11.2) | 9.1 (10.9) | 9.6 (10.4) | 7.0 (8.6) |
| 25 - 29 | 10.5 (12.1) | 10.9 (12.2) | 10.9 (11.5) | 7.6 (9.4) |
| 30 - 34 | 10.7 (10.0) | 11.1 (10.1) | 10.1 (9.6) | 9.4 (8.7) |
| 35 - 39 | 9.9 (8.2) | 10.1 (8.3) | 10.1 (8.7) | 10.4 (8.8) |
| 40 - 44 | 7.9 (6.7) | 8.0 (6.7) | 8.4 (7.2) | 8.6 (7.4) |
| 45 - 49 | 5.7 (5.6) | 5.7 (5.5) | 6.3 (5.9) | 7.1 (6.4) |
| 50 - 54 | 4.6 (4.6) | 4.5 (4.5) | 4.7 (5.4) | 6.5 (5.6) |
| 55 - 59 | 3.8 (3.6) | 3.8 (3.5) | 3.9 (4.0) | 5.4 (4.3) |
| 60 - 64 | 3.1 (2.5) | 3.0 (2.5) | 3.3 (1.8) | 4.4 (3.7) |
| 65 - 69 | 2.3 (1.6) | 2.2 (1.6) | 2.3 (1.6) | 3.6 (2.7) |
| 70 - 74 | 1.4 (1.2) | 1.4 (1.1) | 1.2 (1.0) | 2.4 (2.0) |
| 75 - 79 | 0.9 (0.7) | 0.8 (0.7) | 0.6 (0.5) | 1.7 (1.3) |
| 80 - 84 | 0.5 (0.5) | 0.4 (0.4) | 0.2 (0.2) | 0.9 (0.8) |
| 85+ | 0.4 (0.4) | 0.3 (0.3) | 0.1 (0.2) | 0.5 (0.5) |
| Total | 100.0 (100.0) | 100.0 (100.0) | 100.0 (100.0) | 100.0 (100.0) |


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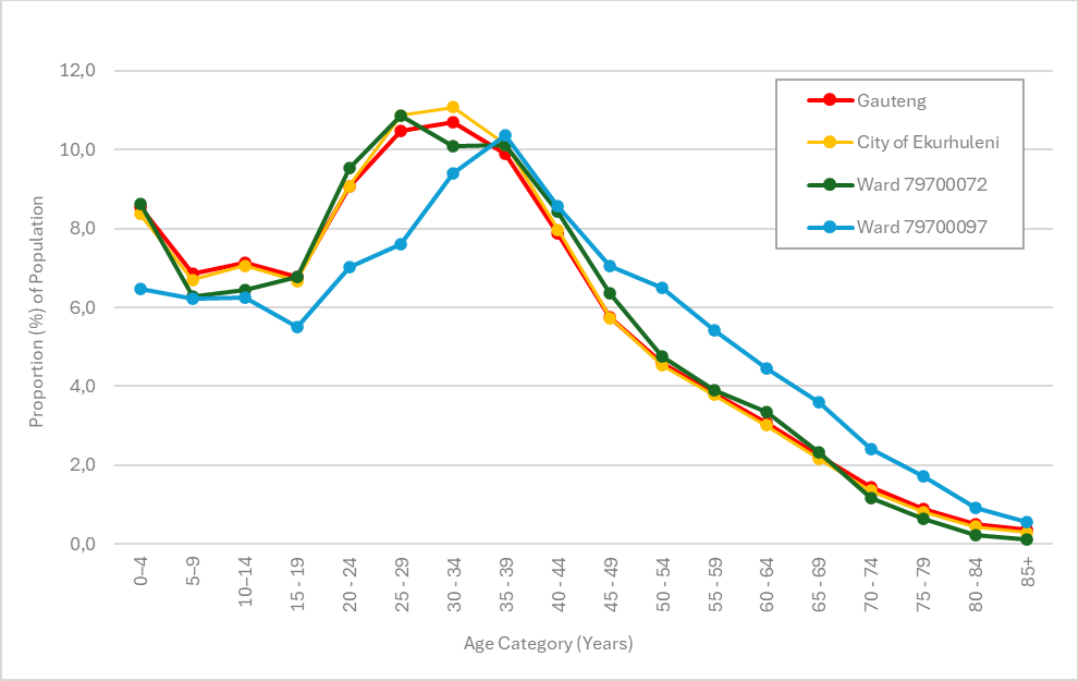


*Figure 4-27: Age Distribution at Each Administrative Level, 2022.*

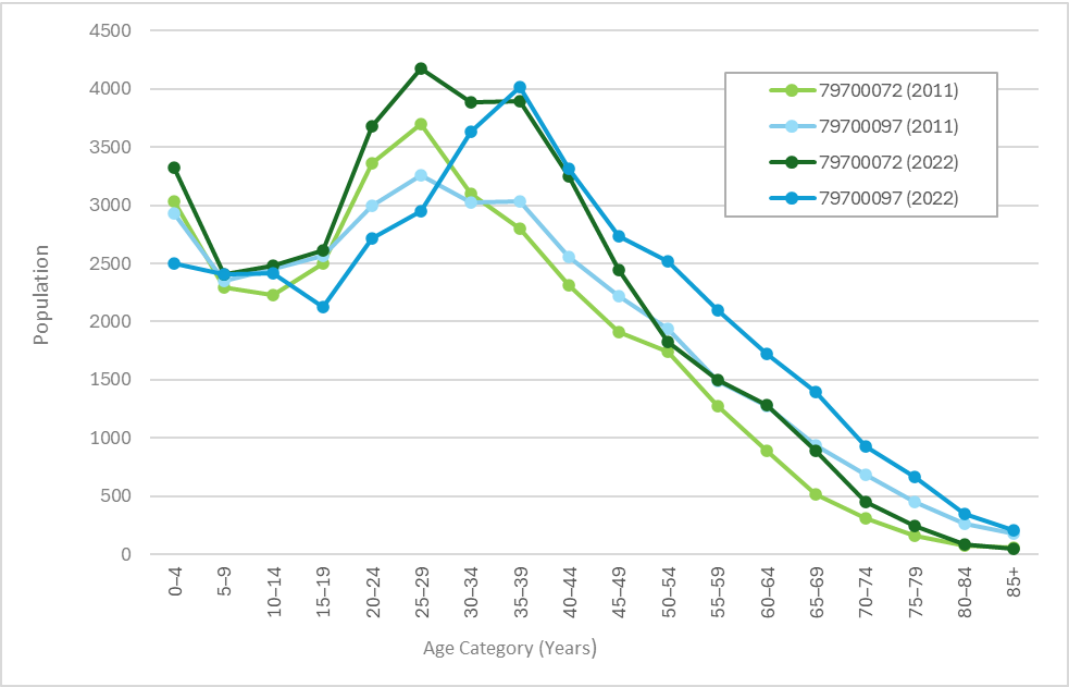


*Figure 4-28: Age Distribution at Ward Level, 2011 and 2022.*

### 4.8.6 Ethnicity

Table 4-30 summaries the proportion of the population of Black African, White, Indian and Coloured ethnicity. Data for 2011 is shown in parentheses. Note that the ethnicity category of 'Other' was omitted from the 2011 data summary, as there was no such category in the 2022 data. Thus, the totals for 2011 do not sum to 100%.


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In 2022, the proportion of Black Africans for Gauteng and the CoE was each 85% in 2022, increasing from 77-78% in 2011. Ward 72 experienced a significant increase in the proportion of Black Africans, from 64% in 2011 to 80% in 2022. In comparison, the proportion of Black Africans in Ward 97 was only 36% in 2022, slightly increasing from 33% in 2011.

The proportion of the White population decreased from 16% in 2011 to 10% in 2022, for both Gauteng and the CoE. In Ward 72, the proportion of the White population almost halved in Ward 72 (from 21% in 2011 to 12% in 2022). The proportion of the White population was much higher in Ward 97, decreasing slightly from 63 to 61% from 2011 to 2022. At both the CoE and Gauteng, the proportion of the White population decreased 16% to 10%, from 2011 to 2022.

The proportion of the Indian population was highest in Ward 72, although this decreased from 13% in 2011 to 6% in 2022. The proportion of the Indian population was approximately 2% in 2022, for Gauteng, the CoE and Ward 97.

The proportion of the Coloured population for Gauteng and the CoE was each 3% in 2022, compared to 1% each in Wards 72 and 97.

***Table 4-30: Population by Ethnicity, by Proportion (%)***

| Ethnicity | Gauteng | CoE | Ward 72 | Ward 97 |
|---|---|---|---|---|
| Black African | 84.5 (77.4) | 85.2 (78.7) | 80.2 (64.3) | 35.9 (32.6) |
| White | 10.0 (15.6) | 10.3 (15.8) | 11.9 (20.7) | 60.5 (62.8) |
| Indian | 2.2 (2.9) | 1.8 (2.1) | 6.3 (13.2) | 2.1 (2.4) |
| Coloured | 2.9 (3.5) | 2.5 (2.7) | 1.0 (1.2) | 1.3 (1.9) |
| Other | 9.1 (11.2) | 9.1 (10.9) | 9.6 (10.4) | 7.0 (8.6) |
| Total | 100.0 (99.3) | 100.0 (99.4) | 100.0 (99.4) | 100.0 (99.7) |

### 4.8.7 Language

Table 4-31 shows that the main languages at each administrative level included IsiZulu, English and Afrikaans. Afrikaans was particularly predominant in Ward 97, with 56% of the population speaking this language in 2011, compared to 19% in Ward 72. In 2011:

- The proportion of the population speaking English in Wards 72 and 97 was 18 and 14% respectively;
- IsiZulu was spoken by 17% of the population in Ward 17, compared to 10% in Ward 97; and
- Sepedi, Sesotho and IsiXhosa was collectively spoken by 29% of the population in Ward 72, compared to only 9% in Ward 97.

No 2022 data was available in regard to languages spoken at the ward level. However, 2022 data at the Gauteng and CoE levels indicated decreases in the proportion of the population (since 2011) speaking English and Afrikaans – in contrast to increases in the proportion of the population speaking IsiZulu.

***Table 4-31: Population by Language, by Proportion (%)***

| Ethnicity | Gauteng | CoE | Ward 72 | Ward 97 |
|---|---|---|---|---|
| IsiZulu | 22.2 (19.5) | 34.4 (28.6) | - (17.2) | - (9.9) |
| English | 8.9 (13.1) | 8.6 (11.9) | - (18.2) | - (14.1) |


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| Ethnicity | Gauteng | CoE | Ward 72 | Ward 97 |
|---|---|---|---|---|
| Afrikaans | 7.5 (12.2) | 6.9 (11.8) | - (18.7) | - (55.9) |
| Sepedi | 12.1 (10.5) | 12.0 (11.3) | - (9.3) | - (3.6) |
| Sesotho | 12.6 (11.4) | 9.9 (9.9) | - (8.3) | - (3.6) |
| IsiXhosa | 6.4 (6.5) | 8.2 (8.0) | - (10.9) | - (2.2) |
| Xitsonga | 6.8 (6.5) | 6.7 (6.6) | - (5.3) | - (1.3) |
| Setswana | 10.0 (8.9) | 2.4 (2.8) | - (2.4) | - (1.9) |
| Other | 13.5 (8.9) | 10.9 (6.1) | - (8.6) | - (6.0) |
| Total | 100.0 (100.0) | 100.0 (100.0) | - (100.0) | - (100.0) |

### 4.8.8 Education

Table 4-32 shows that, in 2011, approximately 33% of the population (aged 20 years and above) in Ward 72 had a Matric qualification or higher, compared to 38% in Ward 97. At the CoE and Gauteng levels, the proportion of the population (aged 20 years and above) with a Matric qualification or higher had increased from 34-36% in 2011 to 39% in 2022.

***Table 4-32: Population (Aged 20 years and above) Attaining a Matric Qualification or Higher, by Proportion (%)***

| Administrative Level | Proportion (%) of Population (2011) | Proportion (%) of Population (2022) |
|---|---|---|
| Gauteng Province | 35.7 | 39.2 |
| CoE | 33.5 | 39.2 |
| Ward 72 | 33.0 | Not available |
| Ward 97 | 38.2 | Not available |

### 4.8.9 Unemployment

Unemployment rates are high in the CoE. According to the data from the South Africa Regional eXplorer, the unemployment rate[4] in 2025/25 was 36.3% in the municipality. In the CoE budget speech in 2023, it was stated that the unemployment rate in the municipality was 41.9%[5].

The most recent StatsSA Quarterly Labour Force Survey (for Quarter 2, 2025) indicated that, of those persons employed in CoE, 19.3% were informally employed.

Unemployment rates were not available at the ward level.

[4] The unemployment rate is the proportion of the labour force that is unemployed and includes only the unemployed who are actively searching for work, thus excluding the discouraged.
[5] https://www.ekurhuleni.gov.za/wp-content/uploads/2023/05/Budget-Speech-2023.pdf


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# 5. ANALYSIS AND CHARACTERISATION OF WATER USE ACTIVITY

## 5.1 Site Delineation for Characterisation

As described in Secton 1.1, the Proposed Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni (CoE) Metropolitan Municipality. The Modder Bee Road is situated to the west to northwest of the project, while the R51 is to the east, and the N12 to the north of the project.

The project area is predominantly surrounded by mining and industrial activities, residential settlements, railway infrastructure, and existing road network.

The Goldplat stock dams and the proposed pipeline are located within quaternary catchment C21D, with the remainder of the pipeline route traversing C21E and a small portion of C22C.


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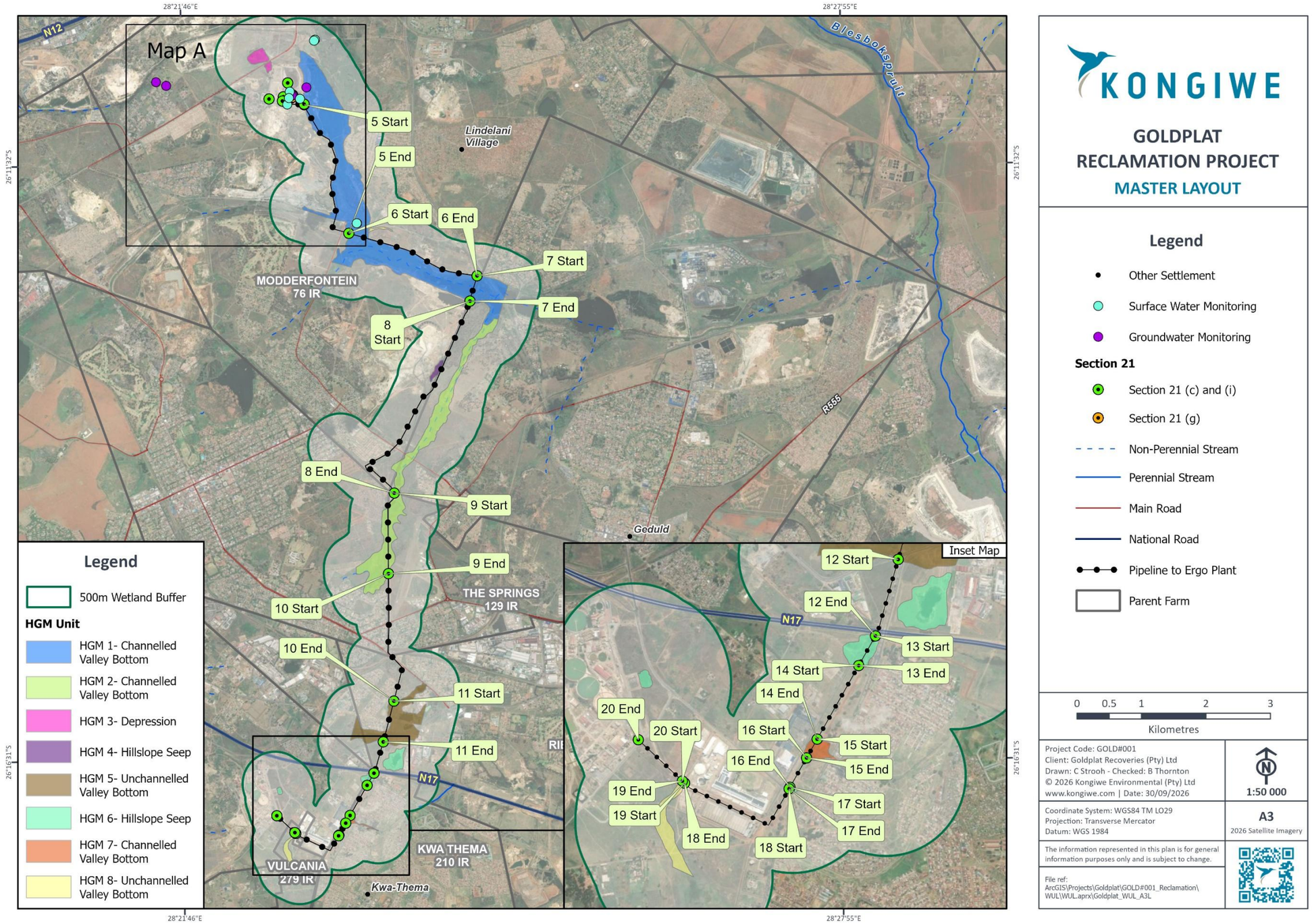


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**GOLDPLAT RECLAMATION PROJECT**

**MASTER LAYOUT**

**Legend**

- Other Settlement
- Surface Water Monitoring
- Groundwater Monitoring

**Section 21**

- Section 21 (c) and (i)
- Section 21 (g)
- Non-Perennial Stream
- Perennial Stream
- Main Road
- National Road
- Pipeline to Ergo Plant
- Parent Farm

0 0.5 1 2 3
Kilometres

Project Code: GOLD#001
Client: Goldplat Recoveries (Pty) Ltd
Drawn: C Strooh - Checked: B Thornton
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1:50 000

Coordinate System: WGS84 TM LO29
Projection: Transverse Mercator
Datum: WGS 1984

A3
2026 Satellite Imagery

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File ref:
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*Figure 5-1: Master Layout Map 1*


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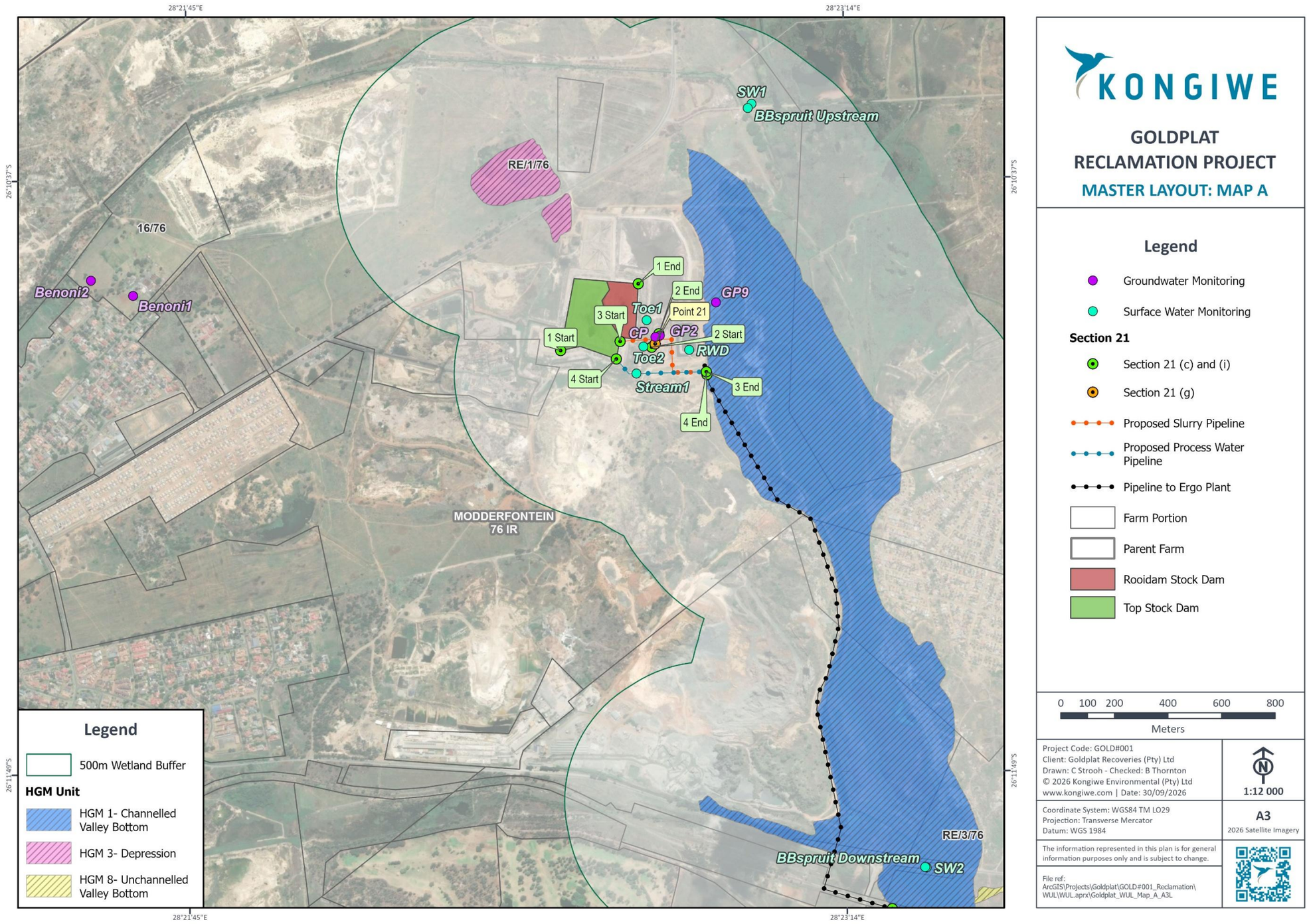


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GOLDPLAT
RECLAMATION PROJECT
MASTER LAYOUT: MAP A

Legend

- Groundwater Monitoring
- Surface Water Monitoring

**Section 21**

- Section 21 (c) and (i)
- Section 21 (g)
- Proposed Slurry Pipeline
- Proposed Process Water Pipeline
- Pipeline to Ergo Plant
- Farm Portion
- Parent Farm
- Rooidam Stock Dam
- Top Stock Dam

0 100 200 400 600 800
Meters

Project Code: GOLD#001
Client: Goldplat Recoveries (Pty) Ltd
Drawn: C Strooh - Checked: B Thornton
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Coordinate System: WGS84 TM LO29
Projection: Transverse Mercator
Datum: WGS 1984

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2026 Satellite Imagery

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*Figure 5-2: Master Layout Map A*


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## 5.2 Water and Waste Management

### 5.2.1 Water Supply

The potable water for the Proposed Project will be sourced from the existing Goldplat plant. Process water required for the reclamation activity will be sourced from the Ergo Plant and conveyed through a new process water pipeline to the project site for reuse in a closed-circuit system. The pipeline will follow existing servitudes / SRPs held by Ergo and in agreement with Ergo.

## 5.3 Conceptual Stormwater Management Plan

The purpose of the conceptual Stormwater Management Plan (SWMP) is to ensure that clean and dirty water are adequately separated by diverting clean water away from dirty areas and ensuring that dirty water from the operation is captured, contained, and managed appropriately in accordance with GN R704 regulations and the DWS BPG G1: Storm Water Management

### 5.3.1 Design Philosophy

The following design philosophy was adopted to guide the development of the SWMP, and is based on GN R704 and the DWS Best Practice Guideline (BPG) G1: Storm Water Management:

- Confine or divert any unpolluted water to a clean water system, away from a dirty area;
- Runoff from dirty areas must be captured, contained and managed appropriately;
- Clean and dirty water systems must be designed and constructed to prevent cross-contamination;
- Dirty water must, as far as possible, be recycled and reused;
- Clean and dirty water systems must convey/contain runoff from the 1:50 year storm event, and should not lie within the 100-year floodline or within a horizontal distance of 100 m from any watercourse, whichever is the greater of the two; and
- Appropriate maintenance and management of stormwater-related infrastructure should be ensured at all times.

### 5.3.2 Assumptions and Limitations

The following are assumptions and limitations for the conceptual SWMP:

- The working area i.e., the active area at the stock dams where hydraulic reclamation is taking place, was estimated to be 5% of the stock dam's footprint area at any time and would be the only area contributing runoff to the slurry collection sump, as the remaining area would be sectioned off into paddock compartments to contain runoff; and
- The SWMP is conceptual. A detailed SWMP should be designed based on the concept design prior to construction.

### 5.3.3 Clean and Dirty Areas

Dirty areas include the entire footprint area of the stock dams, the slurry pumpstation and the catchment paddock. The areas surrounding the stock dams are also dirty areas managed by Goldplat.

### 5.3.4 Existing Stormwater Measures

According to Goldplat, runoff and seepage from the stock dams report to the Return Water Dam (RWD). Pumps are located in low-lying areas on the western and north-western side of the stock dams to pump any accumulation of water in those areas to the plant for use as process water.


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### 5.3.5 Proposed Stormwater Measures

The proposed SWMP is indicated on Figure 5-3. The SWMP has been designed as a closed system (i.e. no discharge of dirty water runoff to the surrounding environment). Stormwater measures proposed to separate clean and dirty water areas are discussed below.

#### 5.3.5.1 Berms

A berm is proposed to be constructed around the stock dams. The berm will ensure that the stock dams dirty footprint area is contained and that no runoff reports to the surrounding environment. The berm will further ensure that all surrounding runoff is diverted away from the stock dams. It is further proposed that a berm is constructed around the slurry pumpstation and catchment paddock to ensure that any spills or overflows will be contained. The proposed berms should be vegetated with natural grass species.

#### 5.3.5.2 Stock Dam Paddocks

It is proposed that the stock dam's footprint area is sectioned off into compartments referred to as paddocks. The paddocks will ensure that dirty runoff from the stock dams is contained within the dirty footprint area at the site. The paddock walls should be constructed to be no less than 1.5 m in height, which is higher than the 1:50-year storm event depth, including the depth of an average year of rainfall. It should, as far as possible, be ensured that the floor of the paddocks is flat, or shaped inwards towards the centre of the paddock compartment. This will ensure that water does not congregate along the downslope wall of the paddock, which could lead to overflows.

#### 5.3.5.3 Slurry Sump

All slurry generated from hydraulic reclamation will report to the slurry sump before entering the slurry pipeline to the pumpstation. The slurry sump has been sized to contain runoff from the wet-scenario water balance, including runoff from the 1:50-year, 24-hour storm event from the working area. The slurry pipeline to the pumpstation will be fitted with a valve which can be closed during high rainfall events (as well as during maintenance), to ensure that all stormwater is contained on top of the stock dams.

#### 5.3.5.4 Catchment Paddock

A lined catchment paddock will be constructed adjacent to the slurry pumpstation. The purpose of the catchment paddock is to contain any spills from the slurry pumpstation, as well as if maintenance needs to be done. As discussed above, under high rainfall events, stormwater will be managed within the stock dam's footprint area and will not report to the pumpstation. The catchment paddock should therefore be sized to contain the slurry in the pipeline from the slurry sump to the pumpstation, the volume of slurry at any given time at the pumpstation, as well as the 1:50-year 24-hour runoff from the pumpstation. Based on these parameters, the conceptual estimated size of the catchment paddock should be 1 162 $m^3$ and is provided in Table 5-1.


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*Table 5-1: Conceptual Sizing of the Catchment Paddock*

| Parameter | Volume ($m^3$) |
|---|---|
| Rainfall onto catchment paddock (1:50 year, 24-hour storm event) | 72.6 |
| Runoff from slurry pumpstation (1:50 year, 24-hour storm event) | 82 |
| Slurry in pipeline between slurry sump and pumpstation | 7 |
| Slurry in tanks at pumpstation (assumed) | 1 000 |
| Total | 1 162 |


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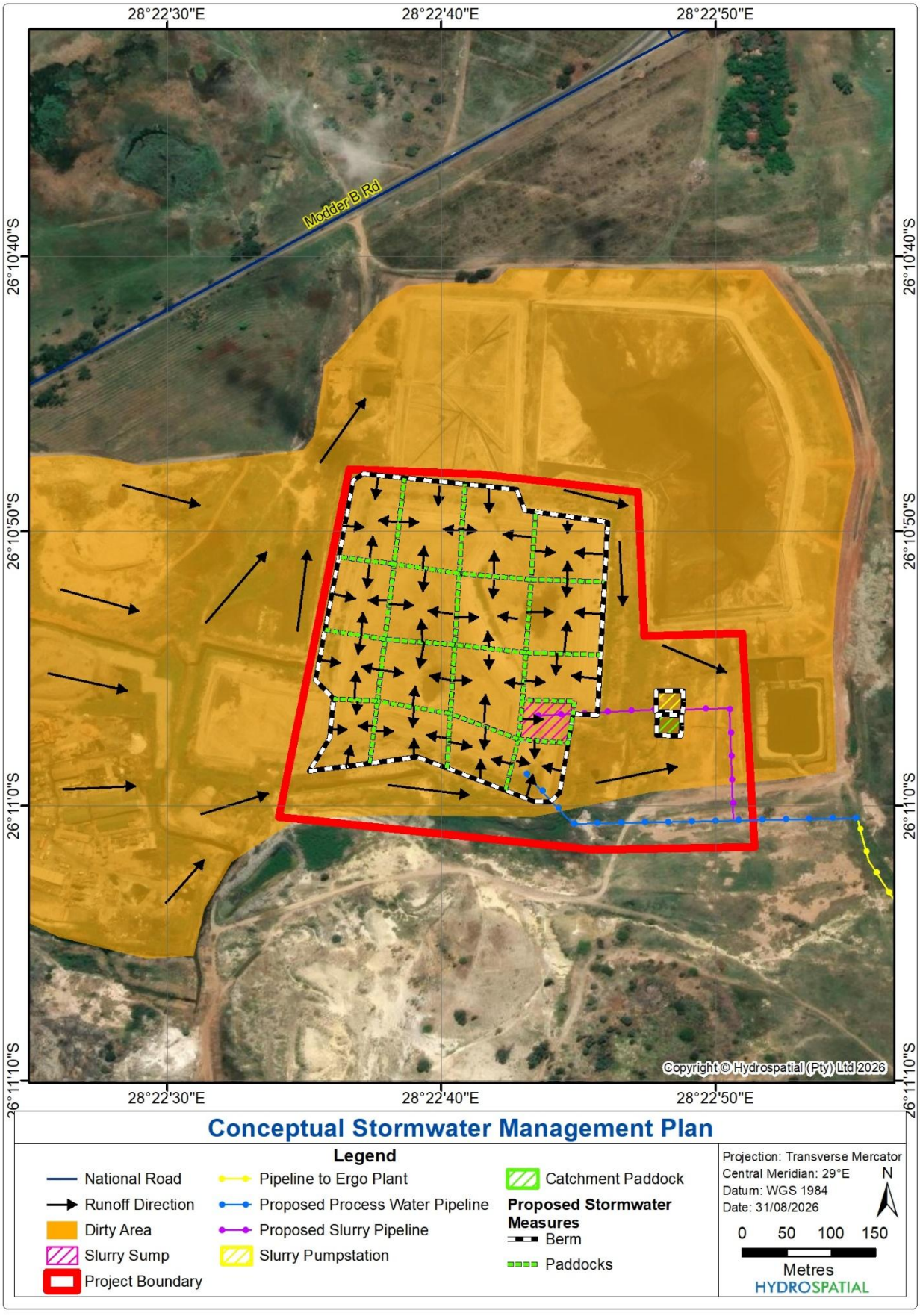


*Figure 5-3: Proposed Conceptual Stormwater Management Plan*


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### 5.3.6 Recommendations

The following is recommended:

- The proposed SWMP is continuously revised as mining progresses, to ensure compliance with GN R704 regulations, which will prevent any unnecessary spills;
- The proposed SWMP is implemented prior to the commencement of mining; and
- The proposed stormwater measures are monitored and maintained on a continuous basis.

## 5.4 Water Balance

A monthly water balance was setup in Microsoft Excel spreadsheet format, to estimate the volumes of water in the reclamation circuit. The water balance has been setup to simulate the average yearly, average dry, and average wet season volumes. This section details the water balance, which has been prepared in accordance with the Best Practice Guideline G2: Water and Salt Balances.

### 5.4.1 Objectives

The objectives of the water balance included the following:

- Estimate the monthly water requirements for hydraulic reclamation;
- Estimate the monthly runoff volumes from the working or active area of the stock dams;
- Estimate the monthly volumes of water that would be pumped to the plant; and
- Estimate the required storage capacities of the slurry collection sump.

### 5.4.2 Water Balance Components

The water balance components include the following:

- Water inflows include:
  - Runoff from rainfall from the working area;
  - Runoff from the high-pressure water cannons/monitors; and
  - Potable water supply from municipal sources.
- Water losses include:
  - Evaporation and seepage; and
  - Water in slurry pumped to the plant.

### 5.4.3 Hydraulic Reclamation Water Requirements

50 000 tons/month of slurry will be pumped to the Ergo Plant. Assuming that 1 $m^3$ of water is required to reclaim 1 ton of the stock dam's material, and factoring in assumed water losses (evaporation, seepage and ponding) of approximately 20% that occur during hydraulic reclamation, then an estimated 62 500 $m^3$/month of water will be required.

#### 5.4.3.1 Assumptions and Limitations

The water balance is based on the following assumptions:

- Calculations are based on the values, assumptions, and data sources in Table 5-2;
- The working area, i.e. the active area at the stock dams where hydraulic reclamation is taking place, was estimated to be 5% of the stock dams footprint area. It is assumed that the SWMP will be implemented and that the remaining area of the dump will therefore not contribute runoff to the slurry collection sump;


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- Estimated runoff coefficients were fixed for all months of the year;
- It has been assumed that 80% of the monthly water used for hydraulic reclamation would run off as slurry and that 20% would be lost (evaporation, ponding and seepage);
- It has been assumed that 50% of the average monthly rainfall will run off to the slurry sump;
- The wet season scenario is the average volumes for the three wettest months (November, December and January), whilst the dry season scenario is the average volumes for the three driest months (June, July and August). The average yearly scenario is the average volumes over a 12-month period;
- Potable water will be sourced from the current Goldplat plant and was therefore not included in the water balance calculations;
- No water is needed for sanitation purposes as chemical toilets will be used; and
- Any dust suppression requirements were not included in the water balance calculations.

### 5.4.4 Input Parameters

The parameters and assumptions/sources used in the water balance calculations are provided in Table 5-2.

***Table 5-2: Parameters and Assumptions/Sources Used in the Water Balance Calculations***

| Parameter | Value | Units | Assumption/Source |
|---|---|---|---|
| Stock dams area | 84 731 | $m^2$ | Dirty area of dump measured from proposed SWMP |
| Stock dams working area | 4 237 | $m^2$ | Assumed to be 5% of dirty area |
| Slurry collection sump area | 2 369 | $m^2$ | Assumed |
| Working area rainfall-runoff coefficient | 0.5 | - | Assumed 50% of monthly rainfall runs off from the dirty areas to slurry sump |
| Reclamation water runoff coefficient | 0.8 | - | Assumed 80% of water used for reclamation runs off as slurry. 20% losses |
| Slurry pumped to Ergo Plant | 50 000 | tons/month | Project description provided by Kongiwe |
| Monthly water volume required for hydraulic reclamation | 62 500 | $m^3$/month | Calculated based on $1m^3$ of water required to reclaim 1 ton of tailings material |

### 5.4.5 Water Balance Results

The average yearly, average wet-season, and average dry-season scenario water balance for the Goldplat stock dams is indicated in Figure 5-4.


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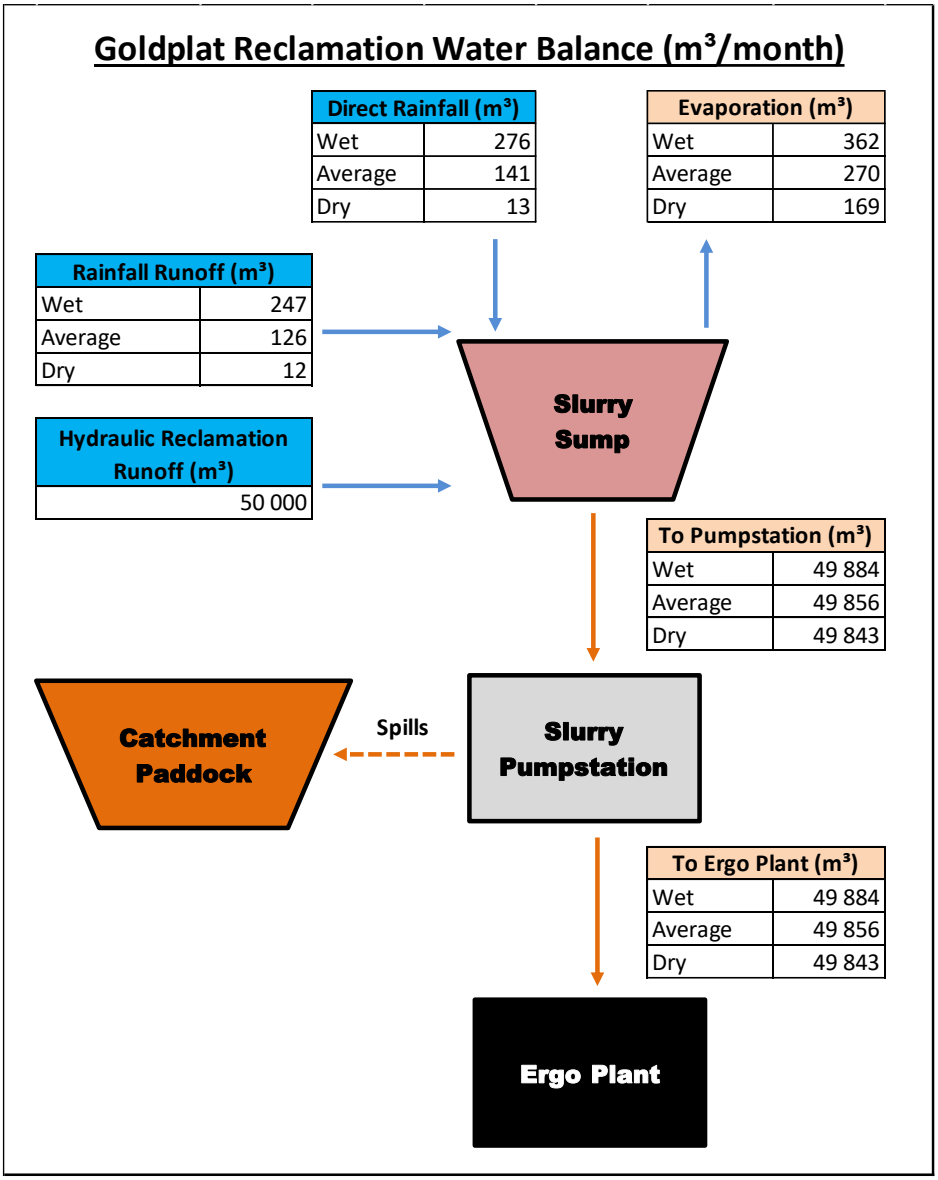


*Figure 5-4: Monthly Water Balance for the Reclamation of the Stock Dams*

### 5.4.6 Slurry Collection Sump Size

The slurry collection sump was sized to contain runoff from the wet-scenario water balance, including runoff from the 1:50-year, 24-hour storm event from the working area. The 1:50-year runoff was calculated using the SCS method. The proposed conceptual sump dimensions are provided in Table 5-3.

*Table 5-3: Proposed Slurry Collection Sump Size*

| Storage Capacity ($m^3$) | Surface Area ($m^2$) | Depth (m) |
|---|---|---|
| 2 004 | 2 369 | 0.85 |


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## 5.5 Waste Management

Waste management will be uniformly conducted for the project.

### 5.5.1 Domestic Waste

Domestic waste will be stored in clearly demarcated waste skips, in designated areas on the project site. The waste will frequently be disposed of at a local municipal domestic waste handling facility. The waste skips will be demarcated as follows:

- Green: general waste;
- Black: hazardous waste; and
- Blue: steel / scrap waste.

### 5.5.2 Industrial Waste

Industrial waste will be contained in steel skips or bins and removed by licenced contractors and disposed of in a licenced industrial waste disposal site located off the project site.

### 5.5.3 Sewage Effluent

No sewage effluent will be generated on the project site as mobile toilets will be utilised and replaced on a weekly basis.

### 5.5.4 Unclaimable Material

Unclaimable material generated during the reclamation process will be separated and managed in accordance with the site's Waste Management Plan. Recyclable materials will be sent for recycling where practicable, while general and hazardous wastes will be disposed of at appropriately licensed waste disposal facilities.

### 5.5.5 Reuse and Recycling

The water usage strategy for the project is designed to operate as a closed water system and therefore most of water on site will be captured and re-used as much as possible, thereby creating a complete balance. This water balance operation is required to minimise the water losses that occur during operations and conserve and re-use as much water as possible to attain a closed water system. Adhering to this water balance model will produce a sustainable and socially responsible water balance scheme.

Measures will be taken to ensure that water is re-used/recycled as much as possible, these include:

- Water in the paddocks, as a result of spills or rainfall, will be reused for reclamation activities. This will ensure that the water levels within the paddocks are kept at a minimum at all times.
- Dirty water must, as far as possible, be recycled and reused, or treated and discharged.

## 5.6 Operational Management

The roles, responsibilities and authority of personnel at Goldplat are assigned to facilitate effective environmental management.

## 5.7 Business and Corporate policies

Business and corporate policies provide the framework for the effective management of water and waste throughout the project life cycle. These policies demonstrate an organisation’s commitment to environmental stewardship, regulatory compliance, sustainable resource use, pollution prevention, risk management, and continual improvement.


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### 5.7.1 Resource and Competence

The reclamation methods, technologies, and operational management for the Goldplat Reclamation Project will be undertaken by Goldplat, with certain activities outsourced to suitably qualified service providers. The processing of gold-bearing tailings will be conducted by Goldplat at Ergo's facility, while the deposition of the resultant tailings will be managed by Ergo. Goldplat will have a competent Environmental Management Coordinator who will be responsible for environmental management at each site.

## 5.8 Environmental Communication Strategies

Mine management is required to establish procedures for internal communication between the various levels and functions of the organisation. Processes for receiving, documenting, and responding to environmental risks during each phase of the project should be implemented across the management, administrative, and workforce sectors of Goldplat, as well as among contractors. The organisation shall conduct processes for external communication on its significant environmental aspects and record its decision in line with Goldplat communication policy as well as conditions stated in any EA or Licence.

### 5.8.1 Internal Communication

Internal communication should be done within the Administrative Sector.

### 5.8.2 External Communication

The following communication channels and media can be used to communicate environmental issues to individuals who are not employed by Goldplat or its subcontractors:

- **Environmental Stakeholder engagement meetings:** An Environmental Stakeholder Engagement Meeting should be established to keep interested and affected parties informed of significant environmental aspects identified through the Environmental Impact Assessments and Environmental Management Plans, and to provide a forum for the discussion of environmental concerns. Records of all discussions, concerns raised, and decisions taken should be maintained. The meeting should be chaired by the Manager or a suitably appointed competent individual.
- **Publications:** Selected publications should be produced and used to communicate environmental issues to outside parties. Examples include newsletters and Annual Reports.
- **Communications from External Parties and Employees:** A clear communication point should be established within the company through the Goldplat communication procedure that determines who is responsible for liaison with the media in respect of any crisis that may arise. A complete procedure for media liaison should be available to all employees. Communication from external interested and affected parties may be received by email, fax, telephonically or by mail. Where required, a written response should be sent, on receiving such communication, by the appropriately appointed individual under signature of the Mine Manager, to the respective interested and / or affected party. All telephonic or facsimile correspondence received should be forwarded to the relevant department for action. All events or concerns should be captured and actioned on an existing and / or future database.
- **E-mail:** E-mail communication received should be stored, with replies, in an appropriate folder on a server. E-mail messages, relevant to environmental management, should be kept for a minimum of two years before deletion.
- **Mail:** Correspondence received by mail should be filed, along with the response (where relevant), within the relevant department's filing system for a minimum period of two years. Paper correspondence will be archived in this department.
- **Storage of Correspondence:** All original correspondence must be retained by the Mine Manager for a minimum period of three years.
- **Environmental Reports:** Copies of relevant specialist study reports and Environmental Impact Assessments should be available on request from an external party by the Mine Manager.


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- **Queries from Interested And Affected Parties:** Response to queries about environmental impacts and aspects should be addressed by the relevant department and approved by the Mine Manager.
- **Queries and Requests from the Media:** Requests for articles from the media on environmental issues regarding the mine operation should be co-ordinated by the Corporate Communication manager according to the public communication strategy, with input from the relevant department, as approved by the General Manager, in line with the Goldplat Public and Community Communication and Liaison Strategy. Due to the environmental awareness generated by induction, on the job training etc., employees are able to identify environmental problems, issues, concerns and pollution timeously.

### 5.8.3 Evaluation of the Environmental Awareness Plan

The evaluation of the environmental awareness and training plan should be conducted by Goldplat management. This evaluation entails the auditing of the operation in both the construction and operation phase once activity has commenced. The environmental awareness and training plan described above is sufficient to make all those involved in the project aware of those risks that may occur as well as the necessary mitigation required to minimize these risks.

The environmental awareness and training plan demonstrate Goldplat commitment in the well-being of the environment and empowerment of the local people. Environmental issues should be discussed at monthly meetings scheduled at the mine.

### 5.8.4 Emergency Incident Reporting

Environmental incident reporting is a vital part of communication in the project. Employees are required to report any and all environmentally related problems, incidents and pollution, so that the appropriate litigator action can be implemented timeously. In the event of an Environmental Incident, the incident must be reported according to the Incident Reporting Procedure.

An Emergency Incident Preparedness and Response Plan need to be developed.

## 5.9 Monitoring and Control

### 5.9.1 Surface Water Monitoring

A surface water quality monitoring programme is essential as a management tool to detect negative water quality impacts as they arise and to ensure that the necessary mitigation measures are implemented. It is recommended that the sampling locations BBSpruit Upstream and BBspruit Downstream continue to be monitored on a monthly basis. Water quality sampling of seepage water emanating from the stock dams indicated that the water contained elevated levels of EC, chloride, sulphate, nitrate, ammonium, fluoride, iron, manganese, nickel, cobalt, lead and uranium. It is recommended that these parameters form part of the monitoring programme.

Water quality sampling should be done in accordance with the DWS Best Practice Guideline G3: Water Monitoring Systems. Samples must be kept cool (+-4°C) and out of direct sunlight and should be transported immediately to an accredited laboratory for water quality analysis within 24 hours of sampling. The impacts on water quality should be determined by comparing the monitoring results against the Blesbokspruit catchment guideline limits and SANS 241:2015, and importantly against previous results, to determine any deviations in trends over time. If the trend analysis indicates any deviations from the baseline monitoring, in terms of deteriorating water quality, then an immediate investigation must be undertaken to determine whether the mine may be responsible. If responsible, urgent action must be undertaken to implement mitigation measures to prevent further contamination.


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Reporting should be done on a monthly basis (or as recommended by the VOCMA). It is recommended that monitoring reports include trend analyses. It is further recommended that the water quality from the upstream monitoring point (BBspruit Upstream) is compared to the downstream (BBSpruit Downstream) monitoring point.

The sampling locations are summarised in Table 5-4 and Figure 5-5 below.

***Table 5-4: Details of the Surface Water Sampling Locations***

| Sampling Location | Description | Sampling Record | Latitude* | Longitude* |
|---|---|---|---|---|
| SW1 | Sample taken by Hydrospatial upstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Upstream) | Once off | -26.174439 | 28.383721 |
| SW2 | Sample taken by Hydrospatial downstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Downstream) | Once off | -26.200188 | 28.39012 |
| Stream1 | Sample taken by the groundwater specialist on a stream draining from an adjacent 3rd party dump | Once off | -26.183505 | 28.379379 |
| Toe1 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.181709 | 28.37977 |
| Toe2 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.182599 | 28.379645 |
| BBspruit Upstream | Goldplat monitoring point upstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.17458 | 28.38358 |
| BBspruit Downstream | Goldplat monitoring point downstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.200174 | 28.39007 |


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| Sampling Location | Description | Sampling Record | Latitude* | Longitude* |
|---|---|---|---|---|
| RWD | Goldplat monitoring point at the Return Water Dam (RWD), which receives seepage and runoff from the Goldplat stock dams | Monthly sampling from July 2022 – April 2026 | -26.182716 | 28.381353 |

*Decimal degrees, geographic coordinate system


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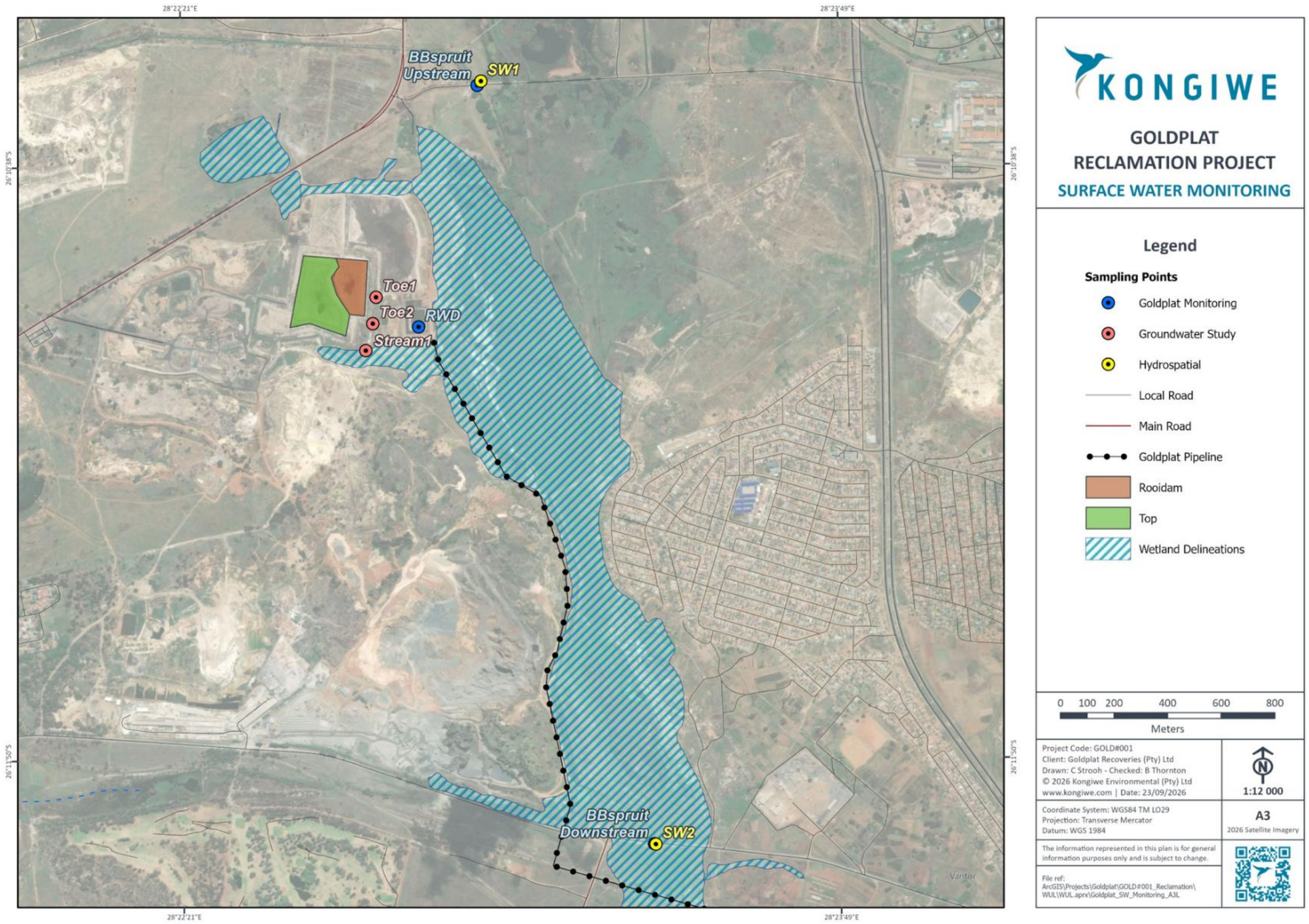


*Figure 5-5: Surface Water Monitoring Points*


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### 5.9.2 Stormwater Infrastructure Monitoring

Water infrastructure (paddocks, trenches, berms and slurry sumps) should be monitored on a monthly basis during the dry season, and on a weekly basis during the wet season. They should further be monitored immediately after any large storm events. Should blockages, silted-up structures, or breaches occur, immediate action should be undertaken to remove debris and repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received prior to inspection;
- Photographs of blockages, silted-up structures or breaches witnessed;
- What action was undertaken to fix issues, and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be kept ready and supplied to the VOCMA when requested, or as part of the WUL conditions.

The Surface Water Specialist has made the following recommendations regarding surface water monitoring:

- The proposed pipelines must run within the approved pipeline servitude route. Where the pipelines cross the floodline, it should be ensured that they are constructed in a suitable manner to handle a 1:100-year flood;
- The SWMP is implemented, and all conditions specified in GN R704 are taken into account;
- The impact mitigation measures are implemented; and
- The monitoring plans are implemented.
- Should the above recommendations be implemented, then from a surface water hydrological perspective, the project can commence.

### 5.9.3 Groundwater Monitoring

The key objectives of the groundwater monitoring programme are to:

- Detect short and long-term groundwater level and quality trends;
- Recognise changes in groundwater quality and levels;
- Measure impacts and define mitigation measures; and
- Develop improved monitoring systems.

Groundwater monitoring must be undertaken to establish the extent of contamination in the shallow weathered and deeper fractured aquifers, during and after the reclamation activities.

#### 5.9.3.1 Monitoring locations

The current Goldplat monitoring programme must be maintained throughout the life of the project and up to the closure of the Goldplat operations. Impacts associated with the project can be monitored using the existing groundwater monitoring borehole configuration, specifically in boreholes GP2 and GP9. Borehole GP2 is drilled to a depth of 30m and borehole GP9 to 20m, which is considered suitable to monitor surface sources of contamination to groundwater in these locations.

Monitoring in all other boreholes currently included in the Goldplat monitoring programme must be continued and maintained in addition to GP2 and GP9.


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The two private boreholes identified during the 2026 hydrocensus are located upgradient of the Top and Rooidam Stock Dams. Groundwater flow from the proposed tailings reclamation areas are not towards the two private boreholes. Despite this, it is recommended that the boreholes are monitored on an annual basis to set a baseline.

The catchment paddock that will be used to manage runoff during reclamation must be included in the monitoring programme to evaluate operational water quality.

The proposed project monitoring locations are presented in Table 5-5 and Figure 5-6 .

*Table 5-5: Proposed Dedicated Monitoring Programme: Monitoring locations*

| Monitoring ID | X Coordinate (WGTM 29) | Y Coordinate (WGTM 29) | Depth (m) | Purpose |
|---|---|---|---|---|
| GP2 | -26.18223˚ | 28.38026˚ | 30 | Monitor impacts immediately downgradient of the project |
| GP9 | -26.18112° | 28.38236° | 20 | Monitor impacts on the wetlands immediately downgradient of the project |
| Catchment paddock | As per the project designs | | - | Monitor operational water quality |
| Benoni1 | -26.18081° | 28.36061° | Unknown | Upgradient hydrocensus boreholes within a 3km radius, included to set a baseline |
| Benoni2 | -26.18029° | 28.35904° | Unknown | |

#### 5.9.3.2 Monitoring requirements

Monitoring of groundwater levels in all the existing Goldplat monitoring boreholes must be maintained . This information is important to improve the understanding of water level fluctuations and groundwater level rise and fall in response to rainfall. This information will be interpreted at the hand of on-site rainfall figures and will be used to improve the conceptual understanding of the aquifers. In order to analyse this information accurately, daily rainfall must be monitored and recorded on site.

It is recommended that the two upgradient hydrocensus boreholes are monitored on an annual basis, including groundwater levels and a water sample for chemical analysis from Benoni1.

In order to keep continuity with the baseline information presented in this report, it isrecommended that the elements listed in the Goldplat monitoring programme are maintained, but with the addition of cobalt, nickel and uranium in the proposed Reclamation Project monitoring positions. The addition of these metals in the analysis is based on the outcome of the sampling of toe seepage from the Top and Rooidam Stock Dams. These analyses indicated that cobalt, nickel and uranium are indicator elements for the project but are not currently included in the Goldplat monitoring programme. The monitoring requirements are presented in Table 5-6.

*Table 5-6: Monitoring requirements in all proposed monitoring positions*

| Monitoring parameter | Element for analysis | Monitoring frequency | Monitoring trigger-response criteria |
|---|---|---|---|
| Depth to groundwater level all Goldplat monitoring boreholes | Groundwater level | Monthly | Variations by more than 3m for 2 consecutive monitoring runs should be investigated. |
| Depth to groundwater level in hydrocensus boreholes Benoni1 and Benoni2 | Groundwater level | Annually | Variations by more than 3m for 2 consecutive monitoring runs should be investigated. |


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| | | | |
|---|---|---|---|
| Water quality analysis in Goldplat boreholes GP2 and GP9 as well as the catchment paddock | All elements included the current Goldplat monitoring programme, plus cobalt, nickel and uranium | Monthly | Variations in concentrations by more than 15% for major cations and anions and more than 7% for metal concentrations for more than 2 consecutive monitoring runs should be investigated. Any result that exceed sspecified water quality objectives must be investigated when it occurs. |
| Water quality analysis in hydrocensus borehole Benoni1 | All elements included the current Goldplat monitoring programme, plus cobalt, nickel and uranium | Annually | Variations in concentrations by more than 15% for major cations and anions and more than 7% for metal concentrations for more than 2 consecutive monitoring runs should be investigated. Any result that exceeds specified water quality objectives must be investigated when it occurs. |
| Water quality analysis in all remaining Goldplat monitoring boreholes | All elements included the current Goldplat monitoring programme | Monthly, as per the current programme | As above |
| Rainfall | Rain depth (mm) | Daily on site | None |

The monitoring trigger-response criteria listed in Table 5-6 must be reviewed on an annual basis and updated, based on the outcome of the monitoring programme results. All monitoring information must be entered into a spreadsheet for record-keeping and analysis. Copies of the certificates of analysis must be kept on file for inspection. If significant exceedances are recorded during the monitoring programme, the following actions should be taken:

- Log the exceedances in the incident reporting system within 24-hours of it occurring.
- Undertake an investigation to identify causes of the exceedances.
- Implement the necessary remedial actions according to the outcome of the investigation and consultation with the affected parties.
- Report significant exceedances to the Environmental and General Managers as well as to the regulatory authority and track the incident until completion.
- The results of the monitoring programme must be reported as part of the Goldplat internal water management process, where exceedances must be discussed and projects to resolve exceedances developed. Goldplat must further report the results of their groundwater monitoring programme to the Department of Water and Sanitation according to the requirements of its WUL.


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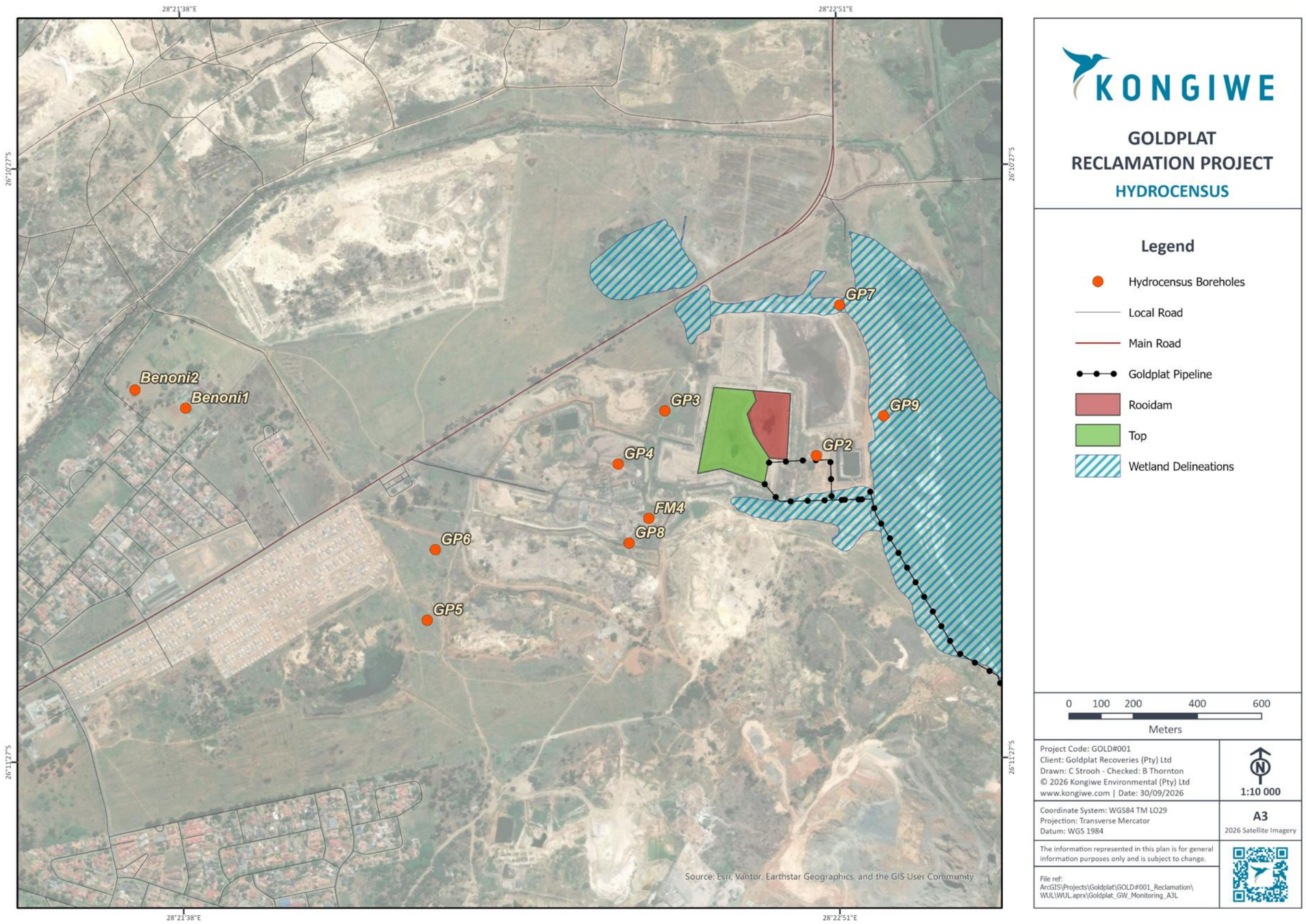


*Figure 5-6: Groundwater Monitoring Location*


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### 5.9.4 Wetland Monitoring

- Disturbed and denuded areas must be revegetated with suitable locally indigenous species where feasible;
- Alien invasive vegetation must be controlled within disturbed areas for the duration of the project and during rehabilitation;
- Rehabilitated areas must be monitored to assess recovery and to identify where additional intervention is required; and
- Wetlands impacted by the project should be rehabilitated in support of the REC / RMO of Class

### 5.9.5 Waste Monitoring

Waste streams generated with in a project area should be monitored and recorded on a monthly basis. A waste management assessment/ audit to evaluate the characteristics of the mine waste stream should be completed biennially or when a process is changed, or a new process is instituted which may influence waste management.

## 5.10 Risk Assessment / Best Practice Assessment

### 5.10.1 Methodology for Assessing the Significant of Environmental Impact Assessment

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance. As read within the DWS's Best Practice Guideline: G4 – Impact Prediction, there are three basic components that define an impact (or a risk). Table 5-7 represents the relationship between these three components and their influence on the significance of a certain impact of a project.

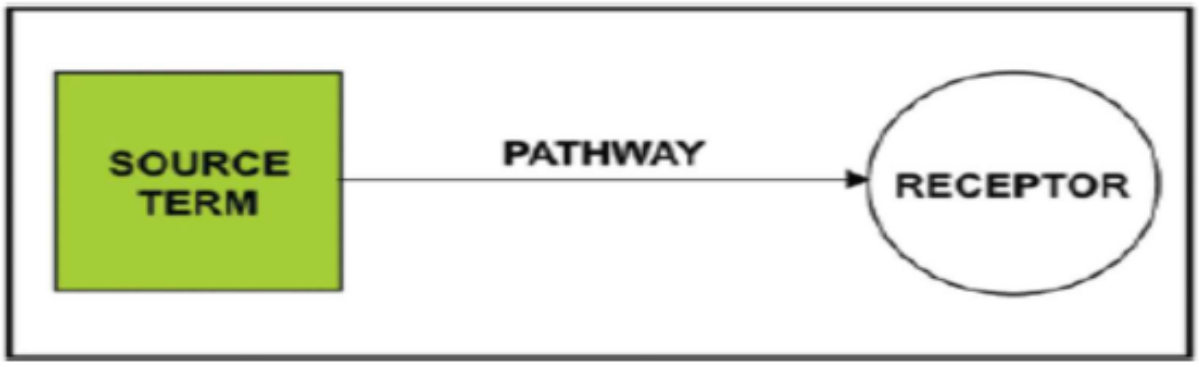


*Table 5-7: Impact Prediction Model*

The impact significance rating process serves to highlight the critical impacts requiring consideration in the management and approval process. The impact significant rating system is presented in Table 5-8, Table 5-9, and Table 5-10, and involves three parts:

- **Part A:** Define impacts consequence using the three primary impacts characteristics of magnitude, spatial scale/population and duration;
- **Part B:** Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- **Part C:** Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.


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### 5.10.2 Part A: Defining Consequences in Terms of Magnitude, Duration and Spatial Scale

Use these definitions to define the consequences in Part B.

*Table 5-8: Consequences Rating Definitions*

| IMPACT CHARACTERISTICS | DEFINITION | CRITERIA |
|---|---|---|
| **Magnitude** | Major - | Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded |
| | Moderate - | Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded |
| | Minor - | Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded |
| | Minor + | Minor improvement; change not measurable; or threshold never exceeded |
| | Moderate + | Moderate improvement; within or better than the threshold; or no observed reaction |
| | Major + | Substantial improvement; within or better than the threshold; or favourable publicity |
| **Spatial scale or population** | Site or local | Site specific or confined to the immediate project area |
| | Regional | May be defined in various ways, e.g. cadastral, catchment, topographic |
| | National/ International | Nationally or beyond |
| **Duration** | Short term | Up to 18 months. |
| | Medium term | 18 months to 5 years |
| | Long term | Longer than 5 years |

### 5.10.3 Part B: Determining Consequences Rating

Rate consequences based on definition of magnitude, spatial extent and duration.

*Table 5-9: Consequences Rating Methodology*

| MAGNITUDE | DURATION | SPATIAL SCALE/ POPULATION | | |
|---|---|---|---|---|
| | | Site or Local | Regional | National/ International |
| **Minor** | Long term | Medium | Medium | High |


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| MAGNITUDE | DURATION | SPATIAL SCALE/ POPULATION | | |
|---|---|---|---|---|
| | | Site or Local | Regional | National/ International |
| | Medium term | Low | Low | Medium |
| | Short term | Low | Low | Medium |
| Moderate | Long term | Medium | High | High |
| | Medium term | Medium | Medium | High |
| | Short term | Low | Medium | Medium |
| Major | Long term | High | High | High |
| | Medium term | Medium | Medium | High |
| | Short term | Medium | Medium | High |

### 5.10.4 Part C: Determining Significant Rating

Rate significance based on consequences and probability.

*Table 5-10: Significance Rating Methodology*

| PROBABILITY (OF EXPOSURE TO IMPACTS) | CONSEQUENCE NEGATIVE | | | CONSEQUENCE POSITIVE | | |
|---|---|---|---|---|---|---|
| | Low | Medium | High | Low | Medium | High |
| Definite | Medium | Medium | High | Medium | Medium | High |
| Possible | Low | Medium | High | Low | Medium | High |
| Unlikely | Low | Low | Medium | Low | Low | Medium |

### 5.10.5 Impact Assessment and Mitigation

#### 5.10.5.1 Construction Phase

**Surface Water**

During the construction phase, site preparation will take place, which may result in an alteration of the topography. The construction phase is likely to be less than 2 years. The activities and impacts that are likely to occur during the construction phase are summarised in Table 5-11.

*Table 5-11: Summary of Activities and Impacts for the Construction Phase*

| Activity | Impact Description |
|---|---|
| Site preparation and alteration to the topography. | Erosion and wash-off of exposed soils leading to siltation in down gradient watercourses. |

The ratings and proposed mitigation measures for the construction phase are provided in Table 5-12.


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*Table 5-12: Significance Rating of Construction Impact*

| NATURE OF IMPACT: Site preparation exposing soils to water erosion that may lead to a deterioration in water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Short term | Short term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Moderate | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **Medium** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>None foreseen | | |
| **Mitigation measures**<br>Clearance of vegetation must be limited as far as possible;<br>Temporary erosion measures such as sediment nets should be employed around exposed working areas;<br>The SWMP must be implemented as a first step during the construction phase; and<br>Water quality monitoring must be implemented upstream and downstream of construction sites. | | |

**Wetlands**

A risk assessment was conducted in line with Section 21 (c) and (i) of the NWA to investigate the level of risk posed by the Goldplat Reclamation Project to wetlands and associated aquatic features within the project area. The assessment considered the likely impacts associated with the reclamation of the Top Stock Dam and Rooidam Stock Dam, together with the construction, operation, decommissioning and rehabilitation of the proposed slurry pipeline, proposed process water pipeline and associated supporting infrastructure, including the slurry pumpstation, and the lined catchment paddock.

The most significant risks are expected to be associated with the direct disturbance of delineated wetlands during pipeline installation, indirect impacts associated with reclamation activities occurring adjacent to or upslope of wetland features, and operational risks linked to leaks, spills, erosion, sedimentation and altered surface water flow. Potential impacts include the loss or disturbance of wetland vegetation, loss of hydromorphic soils, erosion and sedimentation of wetlands, changes to flow patterns, degradation of habitat, reduced water quality, and the loss of ecosystem services. Additional risks may arise from construction traffic, storage of fuels and chemicals, stormwater concentration, vegetation clearing, and inadequate rehabilitation of disturbed wetland areas.

Although several of these impacts may be temporary and localised if effectively mitigated, the cumulative effect of mining-related disturbance in the area increases the sensitivity of the affected systems. Where impacts to delineated wetlands cannot be avoided, strict mitigation, rehabilitation and monitoring measures will be required to reduce the residual risk to an acceptable level.


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*Table 5-13: Activities and Impacts Relevant to the Proposed Activity*

| Phase | Activity | Aspect | Potential Impact |
|---|---|---|---|
| Construction Phase | Vegetation clearing and site preparation | Removal of wetland vegetation | Loss of wetland habitat; loss of indigenous vegetation; reduced ecological functioning |
| | Excavation for the Proposed Slurry Pipeline and Proposed Process Water Pipeline | Trenching through wetlands and buffers | Disturbance of hydromorphic soils; direct wetland habitat loss; erosion and sedimentation |
| | Construction of the Slurry Pumpstation | Surface disturbance within sensitive areas | Altered surface runoff; compaction of soils |
| | Temporary stockpiling of soil and materials | Soil disturbance and exposed surfaces | Increased erosion; sedimentation of wetlands; spread of invasive species |
| | Vehicle and machinery movement | Traffic within or near wetlands | Soil compaction; vegetation disturbance; increased erosion and runoff |
| | Storage of fuels, oils, chemicals and cementitious materials | Potential contamination | Water quality impairment; contamination of wetlands and downstream systems |
| | Stormwater management | Concentrated runoff | Flow modification; erosion of watercourses; sedimentation of wetlands |
| | Construction activities in sensitive areas | General disturbance | Loss of biodiversity; habitat fragmentation; reduced ecosystem service supply |
| | Construction of catchment paddock | Soil disturbance and exposed surfaces | Increased erosion; sedimentation of wetlands; spread of invasive species |


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*Table 5-14: Summative Results of the Risk Assessment Conducted for the Proposed Project*

| Phase | Activity | Impact | Potentially affected watercourses | Significance (max = 100) | Risk Rating | Confidence level |
|---|---|---|---|---|---|---|
| | | | | | | |
| CONSTRUCTION | Construction of pipelines | Traffic | HGM 1 - 2 & HGM 4 – 8 | 19,2 | L | High |
| | | Clearing vegetation outside wetland areas | HGM 1 - 2 & HGM 4 – 8 | 4,8 | L | High |
| | | Clearing wetland vegetation | HGM 1 - 2 & HGM 4 – 8 | 38,4 | M | High |
| | | Construction of laydown yard | HGM 1 - 2 & HGM 4 – 8 | 11,2 | L | High |
| | | Stormwater management | HGM 1 - 2 & HGM 4 – 8 | 19,2 | L | High |
| | | Operation of machinery and equipment | HGM 1 - 2 & HGM 4 – 8 | 4,8 | L | High |
| | | Storage of chemicals, mixes and fuel | HGM 1 - 2 & HGM 4 – 8 | 24 | L | High |
| | | Ablution facilities | HGM 1 - 2 & HGM 4 – 8 | 24 | L | High |
| | | Excavations within wetlands | HGM 1 - 2 & HGM 4 – 8 | 48 | M | High |
| | Reclamation site set-up | Traffic | HGM 1 - 2 & HGM 4 – 8 | 28,8 | L | High |


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| | | | | | | |
|---|---|---|---|---|---|---|
| | | Clearing vegetation outside riparian and wetland areas | HGM 1 - 2 & HGM 4 – 8 | 4,8 | L | High |
| | | Construction of laydown yard | HGM 1 - 2 & HGM 4 – 8 | 32 | M | High |
| | | Digging cut-off trenches | HGM 1 - 2 & HGM 4 – 8 | 32 | M | High |
| | | Operation of machinery and equipment | HGM 1 - 2 & HGM 4 – 8 | 11,2 | L | High |
| | | Storage of chemicals, mixes and fuel | HGM 1 - 2 & HGM 4 – 8 | 16 | L | High |
| | | Ablution facilities | HGM 1 - 2 & HGM 4 – 8 | 24 | L | High |
| | Construction of catchment paddock | Soil disturbance and exposed surfaces | HGM 1 - 2 & HGM 4 – 8 | 12,8 | L | High |


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#### 5.10.5.2 Operational Phase

**Surface Water**

During the operational phase, hydraulic reclamation of the stock dams will take place. The operational phase will be approximately 5 years.

The mixing of water with the tailings material during hydraulic mining will add water and oxygen to the material, which could potentially result in acidic water, with leaching of metals and salts. Due to the close proximity of the stock dams to the stream to the east, it is of utmost importance that runoff from the operation is contained as recommended in the proposed SWMP.

Poor maintenance of stormwater infrastructure, such as the silting up of paddocks, as well as the erosion of berms, can result in spills from the operation. It is therefore important that stormwater infrastructure is regularly monitored and maintained.

The floodline determination indicated that the pipeline will be located within the 1:100-year flood extent at a number of locations along its route to the Ergo Plant. It is recommended that the pipeline is constructed in a suitable manner to withstand a 1:100-year flood.

The pipelines conveying slurry from the site to the Ergo Plant may potentially result in unforeseen spills. Where pipelines cross watercourses, it is proposed that these sections of the pipeline do not contain flanges that may result in leaks.

The activities and impacts that could potentially occur during the operational phase are summarised in Table 5-15.

*Table 5-15: Summary of Activities and Impacts for the Operational Phase*

| Activity | Impact Description |
|---|---|
| Uncontained runoff from the operational areas at the stock dams. | Impact 1: Runoff into the downslope watercourses impacting on water quality. |
| Poor maintenance of stormwater infrastructure. | Impact 2: Silted paddocks and channels as well as eroded berms which lead to spills into the downslope watercourses impacting water quality. |
| Flooding resulting in damage to the proposed pipeline between the site and Ergo Plant (due to the close proximity to watercourses). | Impact 3: Flooding resulting in damage of the pipelines may result in downstream water quality impacts. |
| Leaks from the proposed pipelines. | Impact 4: Leaks from the pipelines running off into down gradient watercourses impacting water quality. |

The ratings and proposed mitigation measures for the operational phase are indicated in Table 5-16 to Table 5-19.

*Table 5-16: Significance Rating of Operational Impact 1*

| NATURE OF IMPACT 1: Uncontained runoff from the operational area at the stock dams running off into the downslope watercourses impacting water quality | | |
|---|---|---|
| | Impact Rating without Mitigation | Impact Rating with Mitigation |
| Extent (Local, Regional, International) | Regional | Local |


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| NATURE OF IMPACT 1: Uncontained runoff from the operational area at the stock dams running off into the downslope watercourses impacting water quality | | |
|---|---|---|
| Duration (Short term, Medium term, Long term) | Medium term | Medium term |
| Magnitude (Major, Moderate, Minor) | Major | Moderate |
| Probability (Definite, Possible, Unlikely) | Definite | Possible |
| Calculated Significance Rating (Low, Medium, High) | High | Medium |
| Impact Status: (positive or negative) | Negative | Negative |
| Reversibility: (Reversible or Irreversible) | Irreversible | |
| Irreplaceable loss of resources: (Yes or No) | No | |
| Can impacts be enhanced: (Yes or No) | Yes | |
| Residual impacts<br>None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| Mitigation measures<br>Implementation of the proposed SWMP. It must be ensured that stormwater measures are designed, constructed, and operated to ensure that stormwater does not spill more than once in 50 years, in order to be compliant with GN R704 regulations; and<br>Water quality monitoring must be implemented upstream and downstream of the mining activities. | | |

*Table 5-17: Significance Rating of Operational Impact 2*

| NATURE OF IMPACT 2: Poor maintenance of stormwater infrastructure resulting in silted paddocks and eroded berms, leading to spills into the downslope watercourses impacting on water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Moderate |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | High | **Medium** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>None, as the impact will cease provided that rehabilitation is done appropriately. | | |


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| **NATURE OF IMPACT 2: Poor maintenance of stormwater infrastructure resulting in silted paddocks and eroded berms, leading to spills into the downslope watercourses impacting on water quality** |
|---|
| **Mitigation measures**<br>Implementation of the stormwater monitoring plan detailed in this report. |

*Table 5-18: Significance Rating of Operational Impact 3*

| **NATURE OF IMPACT 3: Flooding and damage of the proposed pipeline between the site and Ergo Plant resulting in spills and consequent downstream water quality issues** | | |
|---|---|---|
| | Impact Rating without Mitigation | Impact Rating with Mitigation |
| Extent (Local, Regional, International) | Regional | Local |
| Duration (Short term, Medium term, Long term) | Long term | Short term |
| Magnitude (Major, Moderate, Minor) | Major | Minor |
| Probability (Definite, Possible, Unlikely) | Possible | Possible |
| Calculated Significance Rating (Low, Medium, High) | High | Low |
| Impact Status: (positive or negative) | Negative | Negative |
| Reversibility: (Reversible or Irreversible) | Irreversible | |
| Irreplaceable loss of resources: (Yes or No) | No | |
| Can impacts be enhanced: (Yes or No) | Yes | |
| Residual impacts<br>None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| Mitigation measures<br>Where the pipelines cross the floodline, it should be ensured that they are constructed in a suitable manner to handle a 1:100-year flood; and<br>Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | | |

*Table 5-19: Significance Rating of Operational Impact 4*

| **NATURE OF IMPACT 4: Leaks from the proposed pipelines impacting on down gradient water quality** | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Local | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |


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| NATURE OF IMPACT 4: Leaks from the proposed pipelines impacting on down gradient water quality | | |
|---|---|---|
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | High | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| **Mitigation measures**<br>Regular inspections and maintenance of the pipelines;<br>Immediate containment of leaks, repair of the pipeline and clean-ups; and<br>Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | | |


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**Wetland**

*Table 5-20: Activities and Impacts Relevant to the proposed Activity*

| Phase | Activity | Aspect | Potential Impact |
|---|---|---|---|
| Operational Phase | Reclamation of the Top Stock Dam and Rooidam Stock Dam | Hydraulic reclamation activities | Sediment mobilisation; increased turbidity; contamination of downstream wetlands; altered runoff pathways |
| | Operation of the Proposed Slurry Pipeline | Pipeline leaks, bursts or spills | Water quality deterioration; contamination of wetland habitat; loss of ecological functioning |
| | Operation of the Proposed Process Water Pipeline | Pipeline leaks or spills | Water quality impairment; altered wetland chemistry; downstream contamination |
| | Operation and maintenance of the Slurry Pumpstation | Localised disturbance and contamination risk | Habitat disturbance; spills; localised erosion and sedimentation |
| | Ongoing operation of reclaimed areas | Altered topography and runoff | Changes to flow paths; wetland drying or inundation; erosion and instability |
| | Operation and maintenance of lined catchment paddock | Runoff/stormwater containment and management | Alteration of natural hydrology; overtopping or containment failure; leakage/seepage from the paddock; deterioration in water quality; failure to detect liner or berm damage; localised erosion and hydrocarbon or chemical spills |


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*Table 5-21: Summative results of the Risk Assessment conducted for the proposed project*

| Phase | Activity | Impact | Potentially affected watercourses | Significance (max = 100) | Risk Rating | Confidence level |
|---|---|---|---|---|---|---|
| | | | Name/s | | | |
| OPERATIONAL | Reclamation of waste impoundments | Pumping of tailings by means of hydraulic system | HGM 1 - 2 & HGM 4 – 8 | 38,4 | M | High |
| | | Spills and leaks | HGM 1 - 2 & HGM 4 – 8 | 32 | M | High |
| | Operation of pipelines | Maintenance / management of pipeline | HGM 1 - 2 & HGM 4 – 8 | 24 | L | High |
| | | Impeding flows | HGM 1 - 2 & HGM 4 – 8 | 24 | L | High |
| | Operation of lined catchment paddock | Containment of stormwater / dirty water | HGM 1 - 2 & HGM 4 – 8 | 16 | L | High |
| | | Overtopping, spills and leaks | HGM 1 - 2 & HGM 4 – 8 | 19,2 | L | High |
| | Maintenance of lined catchment paddock | Maintenance / management of paddock and berm integrity | HGM 1 - 2 & HGM 4 – 8 | 14,4 | L | High |


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**Groundwater**

Due to the fact that no groundwater will be abstracted during tailings reclamation, impacts on groundwater levels are not expected to be significant during the operational phase of the project. For this reason, the impact assessment presented in this report focuses on operational and long-term impacts on groundwater quality.

The long-term groundwater quality assessment evaluates two future management scenarios using sulphate concentration contour maps to predict the extent of contaminant plume migration.

**Scenario 1 (Do-Nothing Option)** assumes that the Top and Rooidam Stock Dams remain in situ, together with the Plant TSF, East TSF, and lined catchment Paddock, allowing the continued long-term seepage of contaminants from these unlined tailings storage facilities to the underlying aquifers.

The extent of the groundwater quality impact zones at the end of the operational phase of the tailings reclamation project is presented in Figure 5-7. The assessment indicates that the zone of unacceptable groundwater quality, as defined by the Blesbokspruit Water Quality Objectives, is not expected to extend to the Blesbokspruit or its associated wetlands during the operational phase. The assessment also indicates that the two privately owned boreholes located northwest of the Reclamation Project area are not expected to be affected during the operational phase of the project.

**Scenario 2 (Reclamation and Rehabilitation Option)** assumes that the Top and Rooidam Stock Dams are fully reclaimed and their footprints rehabilitated, while the Plant TSF, East TSF, and Emergency Paddock remain in place. The comparison of these scenarios provides an assessment of the long-term groundwater quality benefits associated with the proposed reclamation and rehabilitation of the Top and Rooidam Stock Dams.


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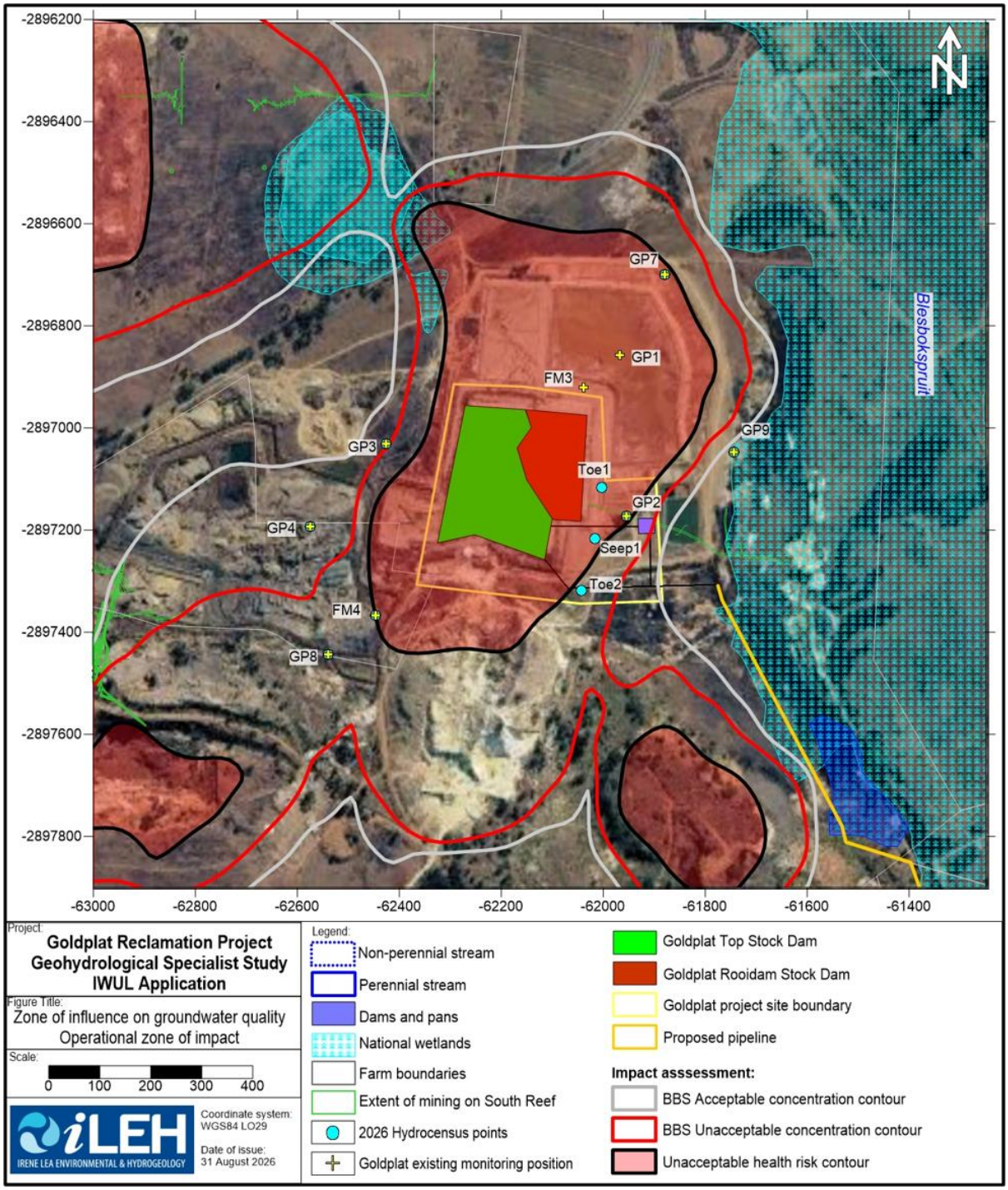


*Figure 5-7: Estimated Operational Zone of Impact on Groundwater Quality*

**Long-term Scenario 1 – No Project Option**

The outcome of the long-term impacts associated with the No Project Option is presented in Figure 5-8. With time, the extent of the zones of impact will increase and groundwater contamination plumes will migrate east towards the Blesbokspruit. Under the conditions of this scenario, the 500mg/l sulphate contour is expected to reach the Blesbokspruit, resulting in unacceptable impacts on the quality of groundwater baseflow to the watercourses.


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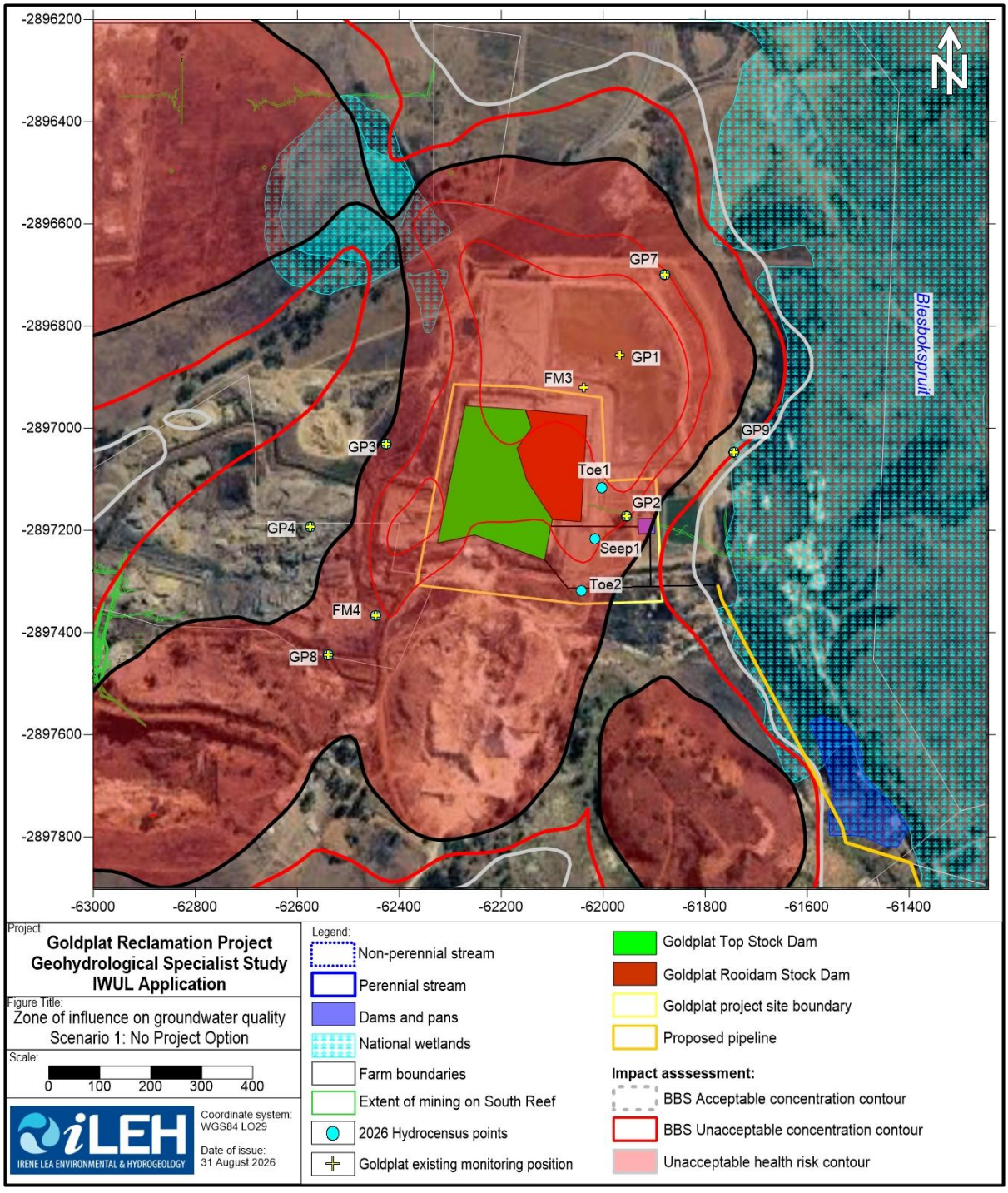


*Figure 5-8: Zone of Impact on Groundwater Quality: No Project Option*

The zone of unacceptable health risks is also expected to increase to outside the stock dam footprints, especially downgradient of the Goldplat stock dams that will remain in situ. This zone is not expected to reach the Blesbokspruit and its wetlands but may migrate to within 70m of the wetlands. As there are uncertainties regarding long-term plume movement, the risk of sulphate concentrations exceeding 1000mg/l in baseflow to the wetlands cannot be excluded from this outcome.


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#### 5.10.5.3 Closure and Rehabilitation Phase

**Surface Water**

As reclamation progresses to ground level, the stock dam's footprint will continue to be sectioned off into paddocks. This will be a short-term measure to prevent contaminated runoff from flowing offsite. The area will be assessed for contamination (particularly in terms of radiation). Contaminated soil will be removed and backfilled with uncontaminated soil. The land will be levelled to its original functioning topography. The land will then be made available to the landowner to use at their discretion.

The activities and impacts that are likely to occur during the closure and rehabilitation phase are summarised in Table 5-22.

*Table 5-22: Summary of Activities and Impacts for the Closure Phase*

| Activity | Impact Description |
|---|---|
| Exposure of potentially contaminated soils during the closure and rehabilitation phase once the dumps have been removed. | Erosion and wash-off of contaminated soils resulting in water quality issues in the surrounding watercourses. |

The ratings and proposed mitigation measures for the closure and rehabilitation phase are provided in Table 5-23

*Table 5-23: Significance Rating of Closure and Rehabilitation Impact 1*

| NATURE OF IMPACT: Erosion and wash-off of potentially exposed contaminated soils resulting in water quality issues in the surrounding watercourses | | |
|---|---|---|
| | Impact Rating without Mitigation | Impact Rating with Mitigation |
| Extent (Local, Regional, International) | Regional | Local |
| Duration (Short term, Medium term, Long term) | Long term | Medium term |
| Magnitude (Major, Moderate, Minor) | Major | Minor |
| Probability (Definite, Possible, Unlikely) | Possible | Possible |
| Calculated Significance Rating (Low, Medium, High) | High | Low |
| Impact Status: (positive or negative) | Negative | Negative |
| Reversibility: (Reversible or Irreversible) | Irreversible | |
| Irreplaceable loss of resources: (Yes or No) | No | |
| Can impacts be enhanced: (Yes or No) | Yes | |
| Residual impacts<br>Possible, unless potential spills are rehabilitated. | | |
| Mitigation measures<br>Runoff must be contained onsite through the implementation of paddocks until any contaminated soils are removed;<br>Once contaminated soils are removed, the area should be backfilled with uncontaminated soils, and levelled to its original functioning topography; and<br>Water quality monitoring must continue upstream and downstream until the site has been fully rehabilitated. | | |


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**Wetland**

*Table 5-24: Activities and Impacts Relevant to the Proposed Activity*

| Phase | Activity | Aspect | Potential Impact |
|---|---|---|---|
| Decommissioning Phase | Removal of pipeline infrastructure | Excavation in or near wetlands | Disturbance of wetland soils and vegetation; erosion; temporary habitat loss |
| | Removal of ancillary infrastructure | Surface disturbance | Localised habitat degradation; increased runoff and soil disturbance |
| | Traffic and machinery movement | Access through sensitive areas | Soil compaction; vegetation damage; erosion |
| | Removal of the lined catchment paddock | Removal or closure of the paddock and associated infrastructure, regrading, stabilisation and rehabilitation of disturbed areas | Mobilisation of retained sediment/material; temporary erosion and sedimentation; failure to restore natural drainage and poor revegetation/invasion by alien species |


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*Table 5-25: Summative Results of the Risk Assessment Conducted for the Proposed Project*

| Phase | Activity | Impact | Potentially affected watercourses | Significance (max = 100) | Risk Rating | Confidence level |
|---|---|---|---|---|---|---|
| | | | | | | |
| DECOMMISSIONING | Decommissioning pipelines | Excavation within wetlands | HGM 1 - 2 & HGM 4 - 8 | 38,4 | M | High |
| | | Removal of pipelines | HGM 1 - 2 & HGM 4 - 8 | 19,2 | L | High |
| | | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | 19,2 | L | High |
| | Decommissioning lined catchment paddock | Excavation, removal of liner and reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | 12,8 | L | High |
| | Rehabilitation of tailing facilities | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | 9,6 | L | High |
| | | Reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | 24 | L | High |
| | Rehabilitation of pipeline footprint areas | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | 3,2 | L | High |
| | | Reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | 12,8 | L | High |


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**Groundwater**

The outcome of the impact of tailings reclamation and rehabilitation of the Top and Rooidam Stock Dams on groundwater quality is presented in Figure 5-9. The main benefit of this scenario is that the zones of impact reduce with time, specifically the unacceptable impacts. It must be noted that the extent of the plumes is similar to what is presented for the No Project Option above. This is due to the cumulative impact of historical tailings deposition as well as surrounding sources of contamination that will remain in situ. Due to the fact that the aquifers have low permeabilities, reversal of historical impacts will take a long time to manifest, if at all. This is applicable to all scenarios tested.

In the long-term, sulphate concentrations for this scenario in baseflow to the Blesbokspruit wetlands could also exceed 500mg/l, which is the unacceptable water quality standard for the stream. The frequency of this impact is however expected to reduce with time.

The zone of impact in terms of unacceptable health risks, delineated by the 1000mg/l sulphate contour is expected to recede compared to the outcome of Scenario 1, but not significantly so due to the reasons presented above. This is expected to reduce the risk of the frequency of unacceptable impacts on the baseflow to the Blesbokspruit, but the risk of sulphate concentrations exceeding 1000mg/l in the long-term entering the wetlands as baseflow cannot be excluded for this scenario.


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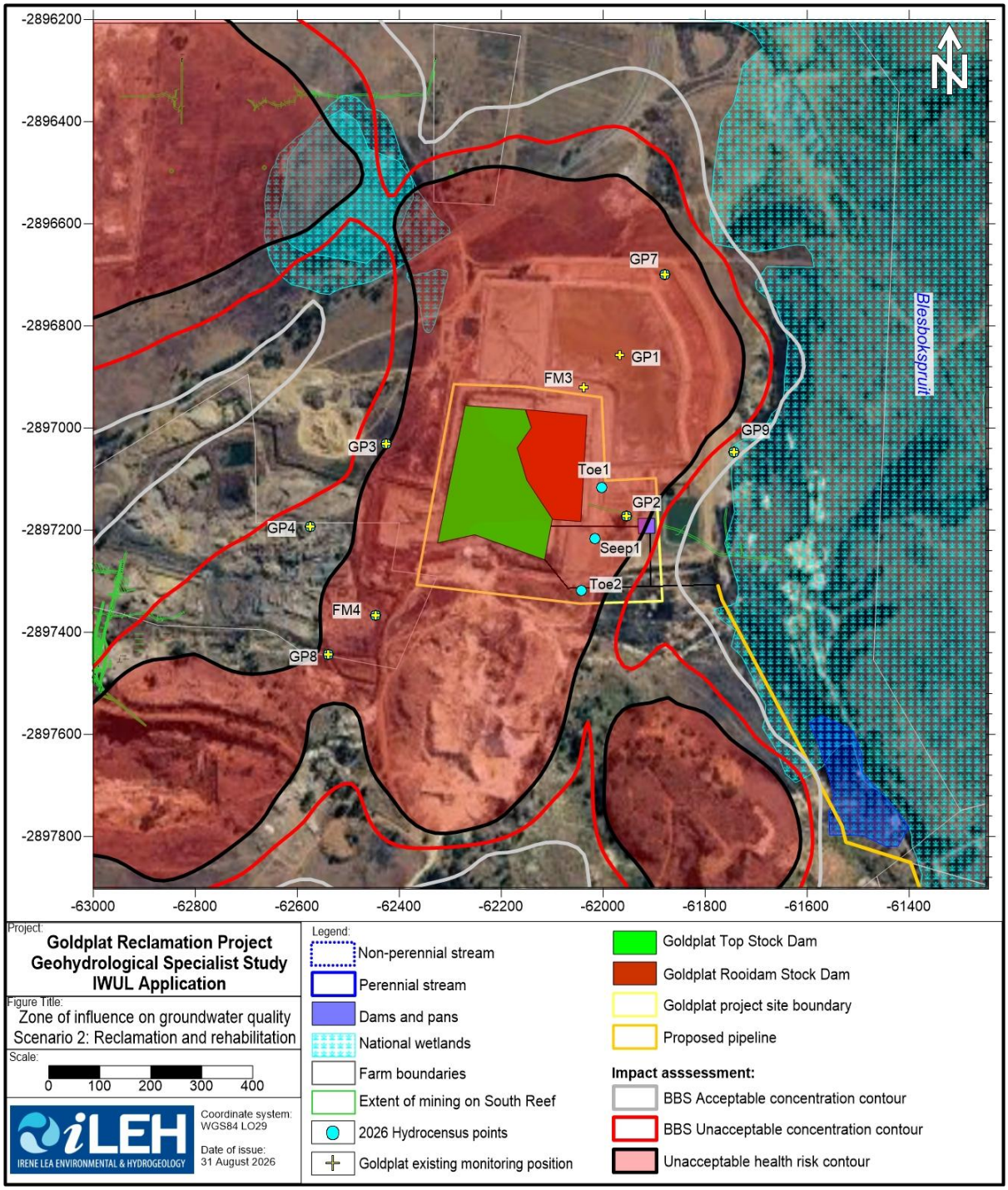


*Figure 5-9: Zone of Impact on Groundwater Quality: Reclaim and Rehabilitate Option*

#### 5.10.5.4 Post Closure Phase

**Surface Water**

Should rehabilitation be successfully implemented, then it is unlikely that any negative impacts will occur during the post closure phase. The removal of the stock dams is likely to result in a long-term positive impact on the surrounding watercourses, provided that rehabilitation is successfully implemented.


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**Groundwater**

The outcome of the impact assessment is presented as sulphate breakthrough curves at strategic monitoring positions. These include groundwater quality at the East TSF (observation location GP1), which provides an indication of the impact of the surrounding Goldplat TSFs. The second monitoring position is down-gradient of the Top and Rooidam Stock Dams (GP2), which provides an indication of the anticipated impacts of the Goldplat Reclamation Project within a complex setting. It is acknowledged that groundwater quality at this monitoring location is affected by other sources not related to the Reclamation Project. It is difficult to absolutely distinguish between all impacts. The third monitoring point (GP9) is located downgradient of the Reclamation Project on the edge of the Blesbokspruit wetlands and provides an indication of the Reclamation Project on downstream watercourses.

The following is generally concluded from the information presented in Figure 5-10:

- Anticipated impacts immediately downgradient of the proposed Reclamation Project (GP2):
  - Sulphate concentrations are expected to gradually increase over time to between 1550 and 1750 mg/l in the long-term for the two scenarios tested. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the TSF unfit for use.
  - The No Project outcome is expected to result in the most significant impact, with sulphate concentrations rising to above 1700mg/l and an increasing trendline. This suggests that sulphate concentrations are expected to continue to increase at the position until it approximates the source concentration.
  - If the Top and Rooidam Stock Dam Reclamation Project is implemented, sulphate concentrations will increase with time, but is expected to plateau and reduce with time, once the effect of source removal is noted. Due to the fact that the aquifers are low-yielding and groundwater flow is slow, this is likely to take more than 50 years after closure of the site.

- Potential impacts associated with the surrounding Goldplat TSFs (observation location GP1):
  - The impact of the Reclamation Project is not expected to significantly change sulphate concentrations at the surrounding TSFs due to the fact that these will remain in situ for the scenarios tested. Sulphate concentrations are expected to increase to above 3300mg/l for all scenarios tested. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the TSF unfit for use.
  - Reclamation and rehabilitation of the Top and Rooidam Stock Dams are however expected to have the best outcome in terms of sulphate concentrations at this monitoring position but will not reduce sulphate concentrations to within acceptable levels.
  - The surrounding Goldplat and other third-party TSFs will continue to impact on groundwater quality, regardless of the reclamation scenario tested.


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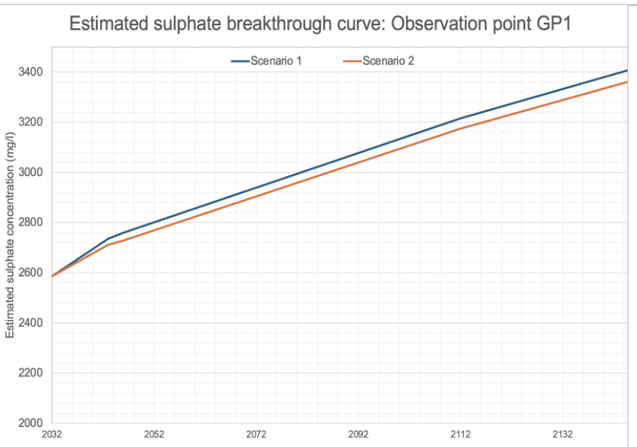
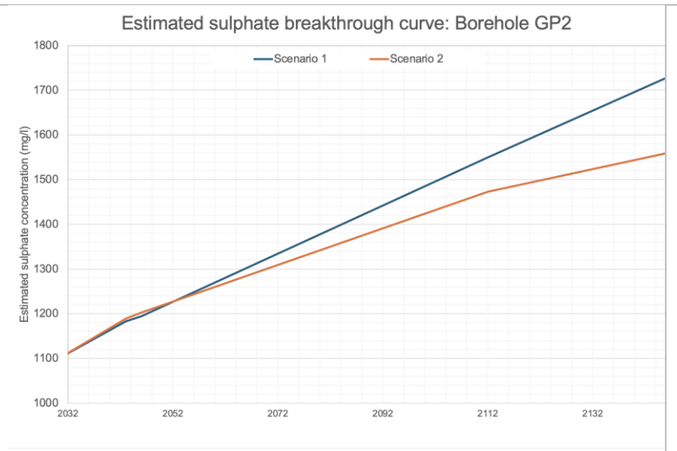
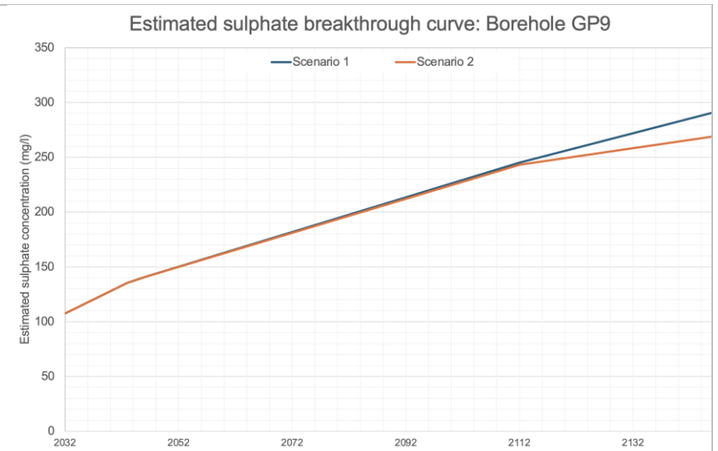



Borehole located within the East TSF. Was lost previously. Indication of groundwater quality in surrounding Goldplat TSF




Borehole located downgradient of Top and Rooidam Stock Dams. Indication of long-term impacts of the proposed Reclamation Project




Borehole located down gradient of the Top and Rooidam Stock Dams adjacent to the Blesbokspruit wetlands. Indication of impact on downstream watercourses

***Figure 5-10: Sulphate Breakthrough Curves***

- Potential impacts in the downstream Blesbokspruit wetlands (GP9):
  - The information presented in Figure 5-10 is an estimation of the impacts of the Goldplat Reclamation Project. It is noted that sulphate concentrations in this location are currently elevated above 500mg/l, which is the Blesbokspruit unacceptable water quality standard. As discussed earlier, the source of this contamination is not clearly understood, as groundwater in the upstream Goldplat borehole GP2 is of better quality at present (<300mg/l).
  - Simulations suggests that impacts associated with the Goldplat project is not expected to increase sulphate concentrations to above 300mg/l in future. This means that sulphate concentrations are likely to remain below the ideal water quality objective for the Blesbokspruit.
  - The No Project option is anticipated to result in the highest sulphate concentration at this location with an increasing trendline. Tailings reclamation and rehabilitation of the footprint is likely to result in the best outcome, with sulphate concentrations reducing with time at this location. It is however noted that the scenarios have similar impacts on the wetlands.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#### 5.10.5.5 Cumulative Impacts

**Groundwater**

The anticipated cumulative impact of regional tailings deposition is considered for all scenarios presented above. In order to achieve this, the assumptions made for tailings leachate quality discussed earlier were used to simulate the other TSF within the project sub-catchment. During long-term simulations, it was assumed that these facilities would remain in-situ.

**Surface Water**

Cumulative impacts are impacts that result from the incremental impact of the proposed activities on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

The project is located in a catchment that is highly impacted by mining, urban and industrial activities. The implementation of a sound SWMP is crucial to contain contaminated runoff from the operational area. The monitoring and maintenance of the implemented SWMP is of utmost importance to ensure that spillages into the downslope watercourses do not occur. The removal of the stock dams and the implementation of a rehabilitation plan that ensures that the area is free draining could enhance the catchment water quality. Should the above not be done, then in the long term, the proposed project has the potential to cumulatively add to the already deteriorated water quality within the Blesbokspruit catchment.

The cumulative impact of the proposed project on the surface water quality of the catchment is rated in Table 5-26.

*Table 5-26: Cumulative Impact for Surface Water Quality*

| **NATURE OF IMPACT: Should dirty water runoff not be contained and an appropriate rehabilitation plan for the area not be undertaken and successfully implemented, then the proposed project has the potential to add cumulatively to the already deteriorated surface water quality of the catchment** | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Unlikely |
| ***Calculated Significance Rating (Low, Medium, High)*** | High | **Low** |


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| **NATURE OF IMPACT: Should dirty water runoff not be contained and an appropriate rehabilitation plan for the area not be undertaken and successfully implemented, then the proposed project has the potential to add cumulatively to the already deteriorated surface water quality of the catchment** | | |
|---|---|---|
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• None, provided that the tailings material is removed, and appropriate rehabilitation is undertaken. | | |
| **Mitigation measures**<br>• Effective stormwater management that captures and contains all site runoff as proposed in this report, and in accordance with GN R704 regulations;<br>• Removal of all tailings material and successful rehabilitation of the area to a free-draining area; and<br>• Water quality monitoring upstream and downstream of the proposed project until rehabilitation is successfully completed. | | |


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*Table 5-27: Summary of the Potential Surface Water Impacts and Proposed Mitigation Measures*

| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| **Construction Phase** | | | | | | | | | | | | | |
| 1 | Site preparation and alteration to the topography. | Erosion and wash-off of exposed soils leading to siltation in down gradient watercourses. | *Moderate -* | *Short Term < 18 months* | *Regional* | *Possible* | Medium | • Clearance of vegetation must be limited as far as possible;<br>•Temporary erosion measures such as sediment nets should be employed around exposed working areas;<br>• The SWMP must be implemented as a first step during the construction phase; and<br>• Water quality sampling must be implemented upstream and downstream of construction sites. | *Minor -* | *Short Term < 18 months* | *Site or Local* | *Possible* | Low |
| **Operational Phase** | | | | | | | | | | | | | |
| 1 | Uncontained runoff from the operational area at the stock dams. | Runoff into the downslope watercourses impacting on water quality. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Implementation of the proposed SWMP. It must be ensured that stormwater measures are designed, constructed and operated to ensure that stormwater does not spill more than once in 50 years, to be compliant with GN R704 regulations; and<br>• Water quality monitoring must continue upstream and downstream of the proposed project. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Possible* | Medium |


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| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| 2 | Poor maintenance of stormwater infrastructure. | Silted paddocks and eroded berms can lead to spills in the downslope watercourses. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Implementation of the stormwater monitoring plan detailed in this report. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Possible* | Medium |
| 3 | Flooding resulting in damage to the proposed pipeline to the Ergo Plant (due to the close proximity to watercourses). | Flooding resulting in damage to the pipelines may result in downstream water quality impacts. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | •Where the proposed pipelines cross watercourses, they should be constructed in such a manner so as to be able to handle a 1:100-year flood; and<br>•Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | *Minor -* | *Short Term < 18 months* | *Site or Local* | *Possible* | Low |
| 4 | Leaks from the proposed pipelines. | Leaks running off into down gradient watercourses, impacting water quality. | *Major -* | *Long Term > 5 years* | *Local* | *Possible* | High | • Regular inspections and maintenance of the pipelines;<br>• Immediate containment of leaks, repair of the pipeline and clean-ups; and<br>• Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | *Minor -* | *Medium Term > 18 months < 5 years* | *Site or Local* | *Possible* | Low |
| **Closure & Rehabilitation Phase** | | | | | | | | | | | | | |


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| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| 1 | Exposure of potentially contaminated soils during the closure and rehabilitation phase once the stock dams have been removed. | Erosion and wash-off of contaminated soils resulting in water quality issues in the surrounding watercourses. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Runoff must be contained onsite through the implementation of paddocks until contaminated soils are removed;<br>• Once contaminated soils are removed, the area must be backfilled with uncontaminated soils, and levelled to its original functioning topography; and<br>• Water quality monitoring must continue upstream and downstream until the site has been fully rehabilitated. | *Minor -* | *Medium Term > 18 months < 5 years* | *Site or Local* | *Possible* | Low |
| **Cumulative Impacts** | | | | | | | | | | | | | |
| 1 | Unsuccessful containment of dirty water runoff from the operation as well as unsuccessful rehabilitation | The proposed project has the potential to cumulatively impact the already deteriorated surface water quality of the catchment. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Effective stormwater management that captures and contains all site runoff as proposed in this report, and in accordance with GN R704 regulations;<br>• Removal of all tailings material and successful rehabilitation of the area to a free-draining area; and<br>• Water quality monitoring upstream and downstream of the proposed project until rehabilitation is successfully completed. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Unlikely* | Low |


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## 5.11 Mitigation Measures

Mitigation measures for the Goldplat Reclamation Project must follow the mitigation hierarchy, with priority given to the avoidance of delineated wetlands and their associated buffer areas wherever feasible. Where avoidance is not possible, impacts must be minimised through careful planning, restricted working areas, appropriate construction methods, pollution prevention, and rehabilitation of disturbed areas.

### 5.11.1 General Mitigation Measures

- All delineated wetlands and associated buffer areas must be clearly demarcated on site prior to the commencement of any construction or operational activities;
- All project personnel must be inducted on the sensitivity and location of wetlands and buffer areas;
- No laydown areas, stockpiles, batching areas, refuelling areas, waste storage, or hazardous material storage may be located within delineated wetlands or their buffers, unless specifically authorised;
- All activities must remain within the approved development footprint and unnecessary disturbance outside these areas must be prohibited;
- Existing roads, tracks and disturbed access routes must be used wherever possible, and the creation of new access routes through wetlands must be avoided; and
- A suitably qualified environmental specialist or Environmental Control Officer (ECO) must monitor compliance with wetland-related mitigation measures during all relevant phases of the project.

### 5.11.2 Reclamation-Specific Mitigation

- Reclamation activities associated with the Top Stock Dam and Rooidam Stock Dam must remain strictly within the approved reclamation footprint;
- Active reclamation areas must be managed in a phased manner so that disturbance is limited to the minimum area required at any one time;
- Rehabilitation of disturbed areas must be undertaken progressively, where feasible, rather than being postponed until the end of the project;
- Temporary cut-off trenches, berms or other suitable stormwater diversion measures must be installed where required to prevent contaminated runoff or sediment-laden water from entering adjacent wetlands;
- Stormwater must be managed through appropriately designed structures that reduce flow concentration and erosion;
- Areas of higher soil saturation, seepage and preferential flow paths must be identified and avoided where possible;
- Surface stabilisation measures must be implemented on exposed and disturbed areas to reduce erosion and sediment mobilisation; and
- Water quality monitoring should be undertaken upstream and downstream of sensitive wetland systems where there is a risk of contamination associated with reclamation

### 5.11.3 Pipelines and Pumpstation Mitigation

- The Proposed Slurry Pipeline, Proposed Process Water Pipeline and Slurry Pumpstation must be located in already disturbed areas as far as practicable to reduce additional impacts to wetlands;
- The construction footprint within and adjacent to wetlands must be kept to the minimum necessary extent;


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- Heavy machinery should be excluded from delineated wetlands wherever feasible. Where machinery access is unavoidable, disturbance must be minimised and carefully controlled;
- Excavated wetland soils should, where feasible, be kept separate from upland soils and replaced in the correct profile order during reinstatement;
- Disturbed wetland crossings and adjacent areas must be reinstated immediately after installation to restore original contours and hydrological functioning as far as possible;
- Effective erosion and sediment control measures must be installed and maintained at all wetland crossings and disturbed areas;
- Cement, fuels, oils and other hazardous materials must be managed in a manner that prevents contamination of wetlands and drainage features;
- Pipelines and associated infrastructure must be routinely inspected and maintained to minimise the risk of leaks, spills and structural failure; and
- Any leaks or spills associated with the Proposed Slurry Pipeline, Proposed Process Water Pipeline or Slurry Pumpstation must be contained and remediated immediately.

### 5.11.4 Rehabilitation and Monitoring

- All disturbed wetland areas must be rehabilitated as soon as practicable following disturbance;
- Rehabilitation must aim to restore landform, soil stability, hydrological functioning and vegetation cover as far as possible;
- Disturbed and denuded areas must be revegetated with suitable locally indigenous species where feasible;
- Alien invasive vegetation must be controlled within disturbed areas for the duration of the project and during rehabilitation;
- Rehabilitated areas must be monitored to assess recovery and to identify where additional intervention is required; and
- Wetlands impacted by the project should be rehabilitated in support of the REC / RMO of Class D.

### 5.11.5 Groundwater Management Programme

Based on the outcome of the information presented in this report, a number of groundwater management measures are proposed for the project. These are detailed below.

#### 5.11.5.1 Groundwater objectives and targets

The following objectives and targets are proposed for groundwater management at the operations:

- Implement a management plan aimed at reducing and/or eliminating adverse impacts on the receptors identified, including watercourses. The management plan must strive at achieving conditions comparable to the preferred alternative scenario presented in this report, which is reclamation of tailings from the Top and Rooidam Stock Dams and rehabilitation of the footprint without further tailings deposition.
- Track and record the progress of implementation of all groundwater management measures.
- Implement sufficient monitoring procedures to measure the effectiveness of groundwater management measures.
- Analyse the information obtained from all monitoring programmes against compliance targets to establish trends and to determine the need to trigger additional actions to reduce adverse impacts.


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- Should the trends indicate adverse impacts on groundwater levels and/or quality, implement suitable measures within the shortest possible time to remediate and/or eliminate such adverse impacts identified.

#### 5.11.5.2 Over-arching groundwater management measures

A number of broad over-arching groundwater management measures should be implemented by Goldplat for the project in order to minimise impacts on groundwater, as detailed in Table 5-28.

*Table 5-28: Over-arching Groundwater Management Measures*

| Construction Phase |
|---|
| A dedicated groundwater monitoring network must be established. Details of this are presented below. |
| Make provision for sufficient groundwater level and quality monitoring budget to implement the groundwater monitoring programme, before the reclamation starts. |
| Hydrocensus boreholes located within 3km of the Top and Rooidam Stockpiles must be included in the monitoring programme, including Benoni1 and Benoni2. This information will form the basis for future assessments. |
| Develop effective surface runoff management plans to ensure that all dirty runoff is contained and reused as soon as possible. Avoid ponding of water over exposed areas. |
| Ensure that water control infrastructure and catchment paddocks are designed to contain all dirty water generated during the desilting to prevent overflows and spillages. |
| If tailings are to be redeposited on the reclaimed Top and Rooidam Stock Dams, the designs for this option must be completed as part of the planning phase of the project. Any changes to the impact assessment presented in this report must be updated. |
| Implement sound house-keeping measures to prevent and clean spills, address leaks and undertake regular inspections. Ensure that the record-keeping procedure is in place and that instructions given are carried out. |
| Measure rainfall on site. |
| **Operational Phase** |
| Complete regular inspections of water control infrastructure and catchment paddocks, specifically noting incidences of overflow and leakage. If the latter is identified, measures must be taken to rectify immediately. |
| Maintain sound house-keeping measures to prevent spills and leaks. |
| Maintain the groundwater monitoring programme in boreholes. |
| Measure rainfall on site. |
| Record all groundwater-related complaints and deal with each complaint within the agreed upon timeframe. |
| **Decommissioning and Closure Phase** |
| Complete all rehabilitation to a satisfactory level, focussing specifically on creating free-draining rehabilitated surfaces where applicable. |
| Ensure that all tailings material is removed from the footprint. Soils must be tested to identify potential risks to groundwater contamination post closure. |
| If Goldplat intends to redeposit new tailings on the reclaimed Top and Rooidam Stock Pile footprints, the footprint barrier system must comply with legal requirements and/or be determined based on the outcome of a risk-based approach. The designs of this facility must be considered as part of a more detailed geohydrological impact assessment at this time if this scenario is opted for. |
| Continue with the groundwater monitoring period for a minimum of two years after completion of the rehabilitation. The continued need for groundwater monitoring will depend on the outcome of the final closure assessment. |

### 5.11.6 Specific groundwater management measures

The specific groundwater management measures presented below are aimed at reducing the risk of acid mine drainage, to isolate potential contamination and to minimise the infiltration of poor-quality leachate to the underlying aquifers.

#### 5.11.6.1 Measures to reduce impacts on groundwater availability


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As no groundwater will be abstracted for use during tailings reclamation, impacts on groundwater levels during the operational phase are not considered significant. As such no specific groundwater management measures are required for impacts related to groundwater availability.

#### 5.11.6.2 Measures to reduce impacts on groundwater quality

The following specific measures are recommended to minimise and/or eliminate the impacts on groundwater quality:

- In order to minimise negative long-term impacts associated with the project, it is important that tailings reclamation must be completed to soil level at the site. All tailings must be removed.
- No ponding must be allowed on exposed areas during or after reclamation. After rehabilitation, the footprint area must be made free draining to minimise infiltration of water to the aquifers. This must be achieved through the development of a dedicated stormwater management plan for the rehabilitated footprint area.
- The stream of water draining from the TSF located south of the Goldplat Reclamation Project identified and sampled during the 2026 hydrocensus must not be allowed to enter the Goldplat area of responsibility. This water adds to the overall salt load in the Goldplat TSF complex as it drains into an unnamed and unlined dam located immediately east of the Rooidam Stock Dam adjacent to borehole GP2. The quality of this leachate is poor. It is saline with elevated concentrations of iron, lead, nickel, uranium and sulphate that could lead to health risks.
- A dedicated groundwater monitoring network must be established, as detailed below. This monitoring programme must include private boreholes identified during the hydrocensus.
- It is recommended that the groundwater monitoring programme must be expanded to include additional metals, specifically cobalt, nickel and uranium.
- Ensure that clean and dirty water is separated at the reclamation areas and that dirty water is contained in the dedicated catchment paddocks. The paddocks must be adequately sized to contain stormwater and to prevent dirty water runoff from leaving the area.
- All dirty water being captured from the reclamation areas should reused during tailings reclamation to prevent accumulation of excess water that could increase the risk of spills or overflows.
- Implement the necessary cutoff trenches and berms to prevent wash-in of additional silt and slimes from surrounding TSFs that will remain in situ.
- Any project changes considered following the completion of this geohydrological impact assessment must be assessed and included in the geohydrological impact assessment for the project.

#### 5.11.6.3 Measures to reduce the risk of acid mine drainage

The following over-arching acid mine drainage (AMD) management strategies are recommended from a groundwater management perspective for the project. During tailings reclamation, focus must be placed on creating conditions that are not conducive to acid mine drainage. In this regard, the following specific management measures are recommended:

- Avoid leaving sulphide-rich material, like the tailings from the Stock Dams, exposed to oxygen and water for an extended period of time. The Reclamation Project must be completed to soil level in the 5-year life indicated. No areas of the Top and Rooidam Stock Dams may be left in situ at the end of the Reclamation Project. All tailings must be removed to soil level.


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- The outcome of the 2021 geochemical assessment confirms that tailings that are unsaturated is more likely to produce acid mine drainage.
- Remove and/or ameliorate contaminated soils.
- Create free-draining surfaces during rehabilitation.
- Ensure that dirty areas are bunded until final rehabilitation is completed.
- Monitoring of water quality must be undertaken during the operational phase and must be used to confirm the outcome of this assessment, which indicates that water pH levels around the site are neutral to alkaline in nature. The current geochemical assessment (Aquatox, 2021) indicates the risk of acidification is low.
- Avoid stockpiling material containing metal sulphides for any extended period on the tailings footprint, unless waste classification is completed on the material according to the requirements of the NEMWA and a suitable barrier system is in place on the footprint of affected areas.
- If sulphide-rich material is to be left in-situ post closure, for example if tailings are to be redeposited on the reclaimed footprint, measures must be identified and put in place to reduce ingress of rainwater and oxygen into the tailings, especially post closure. The designs for this option must be completed during the planning phase. Any changes to the work presented in this report should be updated and re-evaluated at the hand of these designs.
- Divert dirty runoff to dedicated catchment paddocks until final rehabilitation is completed and clean runoff is confirmed from rehabilitated areas. Paddocks that will not be required for post-closure surface water management must be removed and rehabilitated once runoff is clean.

## 5.12 Issues and Response from Public Participation 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 Proposed Project, to raise issues of concern and to make suggestions for enhanced project benefits. The project team has considered all relevant issues and suggestions during the IWULA process.

The primary objectives of the PPP include:

- Meaningful and timeous participation of Interested and Affected Parties (I&APs);
- Identification of issues and concerns of key stakeholders and I&APs with regards to the proposed development, i.e. focus on important issues;
- Promotion of transparency and an understanding of the Proposed Project 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;
- Assisting in identifying potential environmental (social and biophysical) impacts associated with the
- proposed development; and
- Inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process).

Issues and responses documented during the public consultation process will be included in the Comments and Responses Report (CRR) The Public Participation (PP) report can be found in Appendix C of this report. The full PP report will be submitted in Phase 3 of the IWULA.


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### 5.13 Assessment of level and confidence of information

Detailed specialist studies have been conducted as part of impact assessment for the Proposed Project development and the level of confidence of the information provided is medium to high level. More detailed information on the wetland and terrestrial impacts can only be determined once the Proposed Project is operational, with real time data monitoring and information being interpreted.

# 6. WATER AND WASTE MANAGEMENT

## 6.1 Water and Waste Management Philosophy

Goldplat's approach to water and waste management is through a hierarchy that strives to prevent waste/water pollution as far as practically possible; secondly, to reduce the production and impact of waste/wastewater; and thirdly, to reuse/recycle wastewater after treatment.

Goldplat is committed to the following in regard to the Proposed Project:

- To plan, design, construct, operate, decommission and close the Proposed Project in a responsible manner, and in accordance with its policies, strategies and all applicable legislative requirements;
- To minimise the impacts on the receiving environment by limiting the extent of the Proposed Project footprint and by properly implementing engineered barriers, where possible, to prevent seepage of contaminants.
- To the implementation of long-term water management measures and to conduct the required monitoring during all phases of the Proposed Project; and
- To implement technically proven and acceptable rehabilitation measures during the operational, decommissioning and closure phases.

## 6.2 Strategies

To give effect to the water and waste management philosophies discussed in the previous chapters, the following strategies will be implemented:

### 6.2.1 Surface Water

- Construct and maintain adequate stormwater control measures to keep clean and dirty water separate; and
- Monitor water quality at the identified monitoring positions (see Table 4-5).

### 6.2.2 Groundwater

- Mininse the impact on groundwater resources through the design and construction of engineered barriers for all potential pollution sources;
- Implement ongoing monitoring of groundwater quality and levels to inform the detailed geochemical impact predictions and to validate groundwater models; and
- Implement long term water management strategies by managing groundwater levels and prevent dirty water seepage.

### 6.2.3 Wetland

- Avoid disturbance of wetlands and maintain buffer zones;
- Prevent pollution through effective erosion and stormwater controls;
- Maintain natural wetland hydrology and flow regimes; and
- Monitor wetland health and rehabilitate disturbed areas where necessary.


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#### 6.2.4 Waste

- Implement waste separation;
- Maximise recycling and reuse of waste streams;
- Dispose of waste on authorised waste disposal facilities in accordance with legal requirements;
- Implement on-going waste monitoring to inform waste management; and
- Identification and rehabilitate contaminated land.

#### 6.2.5 Process Water

- Source process water from Ergo Plant
- Recycle as much as practically possible during the operations to feed closed water system.

#### 6.2.6 Portable Water

- Portable water will be sourced from the existing Goldplat plant.

### 6.3 Performance Objectives

The overall objective of water and waste management is to reduce or mitigate negative environmental consequences resulting from the project and to limit negative impacts as far as possible. The environmental objectives are to ensure that all necessary steps will be taken to ensure the following with regard to the identified reclamation impacts:

- That appropriate pollution control and other environmental protection measures are taken by the applicant, in accordance with all applicable laws and regulations;
- That the applicant will not degrade the degree of environmental setting beyond existing environmental conditions; and
- That, socio-economic and bio-physical conditions will be addressed to ensure that negative impacts associated with the project are kept to a minimum.

The following specific performance objectives have been identified for the Proposed Project:

- Develop and update the water balance annually or as will be required by the IWUL;
- Contain dirty storm water;
- Monitor and record ambient water quality in the receiving surface water and various points on site to confirm / assess the effectiveness of the implemented water pollution control measures;
- Prevent erosion
- Assess the impact/s that project is having on local groundwater and surface water resources;
- Monitor groundwater levels; and
- Monitor wetland areas.

### 6.4 Measure to Achieve and Sustain Performance Objectives

Management activities and mitigation measures will be implemented during construction, operation and decommissioning/closure phases of the Proposed Project to achieve the required performance objectives.

The following measures have been identified to achieve the set performance objectives (Table 6-1).


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*Table 6-1: Performance Objectives Relevant to Goldplat Reclamation Project.*

| Performance Objectives | Management Measure |
|---|---|
| **Process Water** | |
| Update water and salt balance | Update water balance annually or implement a water balance model that can be updated as needed |
| **Surface Water** | |
| Contain dirty storm water | Construct and maintain adequate storm water control measures to keep clean and dirty water separate |
| Minimise the contamination of surface water resources | Monitor water quality at the surface water monitoring points identified and compare them with the baseline water qualities to assess the effectiveness of the implemented water pollution control measures |
| | Interpret the results and institute remedial action as required |
| **Groundwater** | |
| Minimise the impact on local groundwater resources | Implement dedicated groundwater quality monitoring as required |
| | Implement the required monitoring to confirm the success of the implemented groundwater protection/mitigation measures |
| Maintain groundwater levels if possible | Implement dedicated groundwater monitoring to determine water levels compared to baseline water levels |
| **Sensitive Landscapes** | |
| Minimise impact on the wetlands and sensitive areas in and around the reclamation boundary | Implement a wetland monitoring programme to assess the ongoing impacts on the wetlands in and around the reclamation area to determine changes and loss of vulnerable wetland types |
| | Interpret monitoring results and institute remedial actions as required to prevent, minimise, or rectify impacts on wetlands and sensitive ecological areas. |

## 6.5 Option Analyses and Motivation for Implementation of Preferred Options

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

The Proposed Project is a reclamation and reprocessing of an already existing Stock dams. Therefore, there are no **alternative sites / location**.


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### 6.5.2 The Type of Activity to be Undertaken

The only optional activity for Goldplat is the reclamation and processing of the existing stock dams. This process entails the recovery and treatment of gold-bearing surface tailings derived from underground mining operations.

### 6.5.3 The Design and Layout of the Activity

The current layout plan for the Proposed Project is considered the preferred alternative. The layout has been informed by recommendations from independent specialist studies, as well as the existing location of the stock dams, associated infrastructure, and the proposed pipeline routes. The route of these pipelines is limited to existing SRPs that are held by Ergo. Where Ergo does not hold an SRP, a new servitude, right of way or wayleave will be sought.

### 6.5.4 The Technology to be Used in the Activity

No alternatives exist for the Proposed Project. The preferred options, in terms of recycling, water and energy have been describes below.

#### 6.5.4.1 Recycling

The reclamation project will, in its construction and operational phase, implement recycling policies and measures for optimal utilisation of resources and minimisation of waste generation.

#### 6.5.4.2 Water

Portable water will be sourced from the existing Goldplat Plant. Process water required for the reclamation activity will be sourced from the Ergo Plant and conveyed through a new process water pipeline to the Proposed Project for reuse in a closed-circuit system. The pipeline will follow existing servitudes /SRPs held by Ergo and in agreement with Ergo.

#### 6.5.4.3 Energy

Power supply for the reclamation activities will be sourced from Eskom and connected at the existing Goldplat Plant.

### 6.5.5 The Operational Aspects of the Activity

Goldplat proposes to reclaim and reprocess its ‘Top’ and ‘Rooidam’ Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method. Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing gold plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water. This option is preferred option

#### 6.5.5.1 Processing Plant Options

There is no alternative to the processing plant as all the reclaimed slurry will be processed at the already existing Ergo Plant.

#### 6.5.5.2 Transport Options

There is no alternative means of transporting the reclaimed slurry, as the proposed pipeline route will follow the existing SRPs to transport the slurry from the Goldplat stock dams to the existing Ergo Plant for processing.


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### 6.5.6 The "No-Go" Option

The Option of the 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 such as environmental pollution source removal, economic development, employment creation, skills development, poverty alleviation and the availability of land for redevelopment would not occur. The "No-Go" Option also assumes the continuation of the current land use of the proposed reclamation area, implying the absence of any additional waste treatment activities and associated infrastructures.

If the Proposed Project were not to proceed, the expected revenue, economic activity, skills development, job opportunities, and the continued upliftment of the surrounding communities as a whole would not be realised. Furthermore, the gold reserves at the Proposed Project area would remain unmined and the continued supply of gold to the local and national markets, and subsequent contribution to local, provincial and national economy would not be realised.

## 6.6 IWWMP Action Plan (Priority Actions and Other Short-, Medium- and Long-Term Actions)

*Table 6-2: Goldplat Reclamation Project's Action Plan*

| Performance Objectives | Management Measure | Responsible Department | Timeframe |
|---|---|---|---|
| **Process Water** | | | |
| Update water and salt balance | Update water balance or implement a water balance model that can be updated as needed | Hydrology | Annually or as instructed by the VOCMA |
| **Surface Water** | | | |
| Contain dirty storm water | Construct and maintain adequate storm water control measures to keep clean and dirty water separate | Engineering / Environmental | On-going after authorisation |
| Minimise the contamination of surface water resources | Monitor water quality at the surface water monitoring points identified and compare them with the baseline water qualities to assess the effectiveness of the implemented water pollution control measures | Environmental / Geology | On-going |


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| Performance Objectives | Management Measure | Responsible Department | Timeframe |
|---|---|---|---|
| | Interpret the results and institute remedial action as required | Geology/Hydrology | On-going |
| **Groundwater** | | | |
| Minimise the impact on local groundwater resources | Implement dedicated groundwater quality monitoring as required | Hydrology/Environmental/Management | On-going |
| | Implement the required monitoring to confirm the success of the implemented groundwater protection/mitigation measures | | |
| Maintain groundwater levels if possible | Implement dedicated groundwater monitoring to determine water levels compared to baseline water levels | | |
| **Sensitive Landscapes** | | | |
| Minimise impact on the wetlands and sensitive areas in and around the reclamation boundary | Implement a wetland monitoring programme to assess the ongoing impacts on the wetlands in and around the reclamation area to determine changes and loss of vulnerable wetland types | Management/Environmental | On-going |


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## 6.7 Control and Monitoring

### 6.7.1 Monitoring of Change in Baseline Information

Reports of the updated Baseline information (for the Proposed Project) will be submitted to the appropriate government departments as required and other formal institutions as stipulated by management objectives, conformance targets and applicable legislation and other legal requirements. All of these results will be shared with VOCMA.

### 6.7.2 Audit and Report on Performance Measures

The IWWMP action plan will be reviewed and updated annually or alternatively as required in terms of the WUL.

### 6.7.3 Audit and Report on Relevance of Action Plan

An audit on the IWWMP action plan should be conducted at least once annually by an independent external auditor, while internal audits should be conducted bi-annually.


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# 7. CONCLUSION

## 7.1 Specialist Studies Conclusions and Recommendations

### 7.1.1 Wetland

It is the opinion of the specialist that the Proposed Project may be considered for authorisation by the Competent Authority, provided that all recommended mitigation measures and wetland management requirements are implemented in full. Where feasible, the layout and construction methodology for the Proposed Slurry Pipeline, Proposed Process Water Pipeline, Lined Catchment Paddock, and Slurry Pumpstation should avoid delineated wetlands and their associated buffer areas, and infrastructure should be positioned within already disturbed areas as far as practicable.

All disturbed wetland areas should be rehabilitated as soon as practicable following disturbance, with the objective of restoring landform, soil stability, hydrological functioning, and indigenous vegetation cover as far as possible. Ongoing monitoring of wetland condition, erosion, stormwater management, and any leaks or spills associated with the pipeline infrastructure and reclamation areas should be undertaken for the duration of the project. Where direct impacts to delineated wetlands cannot be avoided, the affected systems should be rehabilitated in support of the REC / RMO target of Class D.

### 7.1.2 Surface Water

The following is recommended by the Specialist

- The proposed SWMP is continuously revised as mining progresses, to ensure compliance with GN R704 regulations, which will prevent any unnecessary spills;
- The proposed SWMP is implemented prior to the commencement of mining; and
- The proposed stormwater measures are monitored and maintained on a continuous basis.

### 7.1.3 Groundwater

It is the opinion of the professional geohydrologist that the reclamation and footprint rehabilitation of the Goldplat Top and Rooidam Stock Dams can be authorised, provided that all tailings are reclaimed to soil level; and that sound surface water/storm water management measures are put in place and maintained throughout the life of the project. No ponding must be allowed over the reclaimed footprint. In the short term there could be water quality impacts (increased salts and metal concentrations) during tailings reclamation. The risk of this impact must be controlled through the implementation of the groundwater management measures presented in this report and confirmed through a dedicated groundwater monitoring programme in existing monitoring boreholes. Potential impacts associated with future alternative use of the reclaimed footprint have been assessed to a lower level of confidence in this report and must be updated once detailed plans and designs are available. Analysis of all monitoring information must be considered as part of an updated risk assessment to be completed as part of the closure application for the Goldplat operations. Overall, the project is expected to deliver a long-term positive impact on groundwater quality after tailings reclamation, and the resultant footprints are carefully rehabilitated.

## 7.2 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 3.6. The Ergo Plant and the Brakpan TSF/Withok are existing facilities and are licensed and/or currently undergoing the licensing process, respectively.


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## 7.3 Statement of Water Uses Requiring Authorisation, Dispensing with Licencing Requirements and Possible Exemption from Regulations.

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

Summary of the Water Uses Associated with the Project

Water uses associated with the Proposed Project are Section 21 (c) and (i) and Section 21 (g) water uses.

The triggered **Section 21 (c) and (i)** water uses for activities within the regulated area of the watercourse are:

- Reclamation of the Goldplat stock dams, as well as the operation, decommissioning and rehabilitation of the associated reclamation and stormwater management infrastructure within 500 m of a CVB wetland and a depression wetland,
- The construction, operation, decommissioning and rehabilitation of the lined catchment paddock within 500 m of a CVB wetland; and
- The construction, operation decommissioning and rehabilitation of the pump station within 500 m of a CV wetland.
- The construction, operation, removal and rehabilitation of the proposed slurry pipeline within 500m of an CVB, hillslope seep and UVB wetalnd.

**Section 21 (g)** for the disposal of water containing waste into the waste facilities:

- Disposing of excess stormwater and slurry during a stormwater event

The GN R704 Exemption Motivation will be compiled and submitted as part of Phase 3 of the Project's IWULA.

## 7.4 Section 27 (1) Motivation Report: Considerations for Issuing of Water Use Licence

Section 27 of the NWA specifies the following factors regarding water use authorisation that must be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a licence;
- Alignment with the catchment management strategy;
- The impact of the water use, resource-directed measures; and
- Investments made by the applicant in respect of the water use in question.
-

The motivation in terms of Section 27 for the planned water uses is listed in the Table 7-1below.

***Table 7-1: Section 27 Motivation***

| Section 27(1) | Content | Description of issues |
|---|---|---|
| (a) | Existing Lawful Water Uses | There are no Existing Lawful Water Uses (ELUs) associated with the Goldplat Reclamation Project (Proposed Project).<br><br>The water uses requiring authorisation are:<br><br>• Section 21 (c) - Impeding or diverting the flow of water in a watercourse;<br>• Section 21 (g) - Disposal of effluent into a water containment facility, dust suppression and stockpiles; and |


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| Section 27(1) | Content | Description of issues |
|---|---|---|
| | | • Section 21 (i) - Altering the bed, banks, courses or characteristics of a watercourse.<br><br>The Section 21 (c) and (i) water uses include reclamation and rehabilitation of Rooidam and Top stock dams, as well as the construction, operation, removal and rehabilitation of the associated reclamation, stormwater management infrastructure, pump station and catchment paddock, and slurry and process water pipelines located within the regulated area and crossing the watercourses.<br><br>Section 21 (g) water uses include the lined catchment paddock that will be used for the disposal of access slurry or dirt water during a stormwater event or an electrical power trip. |
| (b) | Need to redress the results of past racial and gender discrimination | Goldplat Recovery (Pty) Ltd (Goldplat)'s transformation initiatives in South Africa centre on Black Economic Empowerment (BEE) transactions, local stakeholder alignment, and sustainable processing structures for mining by-products. Goldplat is a subsidiary of Goldplat PLC, which holds a 90.63% ownership interest in the company, while the remaining 9.37% is owned by Aurelian Capital (Pty) Ltd (Goldplat plc, n.d).<br><br>Goldplat's key empowerment and corporate alignment steps include:<br><br>• **BEE Compliance Ownership:** Partnered initially with Amabubesi Capital through its subsidiary Dartingo Trading, selling a 15% stake in Goldplat to achieve compliance with South African BEE regulations;<br>• **Share Buyback and Restructuring:** Increased group ownership through subsequent share buybacks from minority holders while retaining strategic local partnership involvement; and<br>• **Environmental Support Integration:** Operating a 22-hectare site near Benoni, Gauteng, recovering gold and precious metals from waste materials (such as woodchips, fine carbon, and mill liners) to assist major producers like AngloGold Ashanti, Gold Fields, and Harmony Gold in meeting their environmental obligations. |
| (c) | Efficient and beneficial use of water in the public interest | Process water required for the Goldplat reclamation activities will be supplied from the Ergo Plant. The slurry generated during the reclamation process will be pumped back to the Ergo Plant for processing, while the resultant tailings will be deposited at the Brakpan/Withok Tailings Storage Facility (TSF). Water recovered from the TSF will be directed to the return water dam, from where it will be pumped back to the Goldplat reclamation site. This arrangement will facilitate a closed-loop water recycling system, thereby minimising freshwater demand and optimising water reuse throughout the operation. |
| (d) | The socio-economic impact- | The Proposed Project will generate positive socio-economic benefits through direct employment, contractor engagement and investment in new infrastructure. The Proposed Project is expected to sustain existing employment at Goldplat and create |


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| Section 27(1) | Content | Description of issues |
|---|---|---|
| | (i) of the water use or uses if authorised; or<br>(ii) of the failure to authorise the water use or uses | additional temporary employment opportunities during construction and commissioning activities.<br><br>In addition to economic benefits, the Proposed Project contributes to environmental risk reduction through the removal and reprocessing of mine residue materials, thereby reducing the long-term pollution burden.<br><br>Failure to authorise the water uses would prevent implementation of the reclamation project, resulting in the continued presence of mining waste materials and associated environmental liabilities. Potential economic benefits, employment opportunities and investment in environmental rehabilitation would not be realised. |
| (e) | Any catchment management strategy applicable to the relevant water resource | The Proposed Project is situated within the Vaal-Orange Water Management Area (WMA) (previously the Vaal WMA) within quaternary catchment C21D and C21E. Water quality varies from poor in highly developed areas, to good in less developed areas.<br><br>According to the Vaal Internal Strategic Perspective (ISP), the vision for this WMA is to facilitate water conservation and demand management as a primary point of focus, to which Goldplat is fully committed. |
| (f) | The likely effect of the water use to be authorised on the water resource and other water users; | Potable water for the Proposed Project will be sourced from the existing Goldplat plant water supply infrastructure. Process water required for the Goldplat reclamation activities will be sourced from the Ergo Plant. The slurry generated during reclamation will be pumped back to the Ergo Plant for processing, while the resulting tailings will be deposited on the Brakpan/Withok TSF. Water recovered from the TSF will drain to the return water dam, from where it will be pumped back to the Goldplat reclamation site, thereby maintaining a closed-loop water recycling system.<br><br>All working areas will have a dirty water containment/management system to prevent pollution of clean water areas. |
| (g) | Class and the resource quality objectives of the water resource | The Proposed Project is located within quaternary catchments C21D and C21E associated with the Blesbokspruit catchment in the Vaal-Orange WMA. The Blesbokspruit is a highly modified system that has been influenced by historical mining, industrial development, urbanisation and agriculture. Nevertheless, the catchment continues to provide important ecological and water resource functions that require protection.<br><br>The Proposed Project has been designed to minimise impacts on the water resource through the implementation of a closed-loop process water system, lined pollution control facilities, stormwater diversion structures, containment of contaminated water and appropriate spill prevention measures.<br><br>No discharge of contaminated process water to the receiving environment is proposed. Water reuse and recycling will reduce dependence on external water resources while minimising the potential for water quality impacts. |


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<table>
<tr><th>Section 27(1)</th><th>Content</th><th>Description of issues</th></tr>
<tr><td></td><td></td><td>The table below displays the water quality standards for domestic use and aquatic ecosystem for the Blesbokspruit Catchment (Makanda, Nzama, & Kanyerere, 2023). The specified water quality parameters are critical for assessing drinking water quality in accordance with the national standards, and for aquatic ecosystem assessment.<br><br>
<table>
<tr><th>WQ Variables</th><th>Measurement Units</th><th>Class 0</th><th>Class I</th><th>Class II</th><th>Class III</th></tr>
<tr><td>pH</td><td>pH units</td><td>6–9</td><td>5–6 and 9–9.5</td><td>4–5 and >9.5–10</td><td><4 and >10</td></tr>
<tr><td>EC</td><td>mS/m</td><td><70</td><td>70–150</td><td>150–370</td><td>>370</td></tr>
<tr><td>Ca</td><td>mg/L</td><td><80</td><td>80–150</td><td>150–300</td><td>>300</td></tr>
<tr><td>Cl</td><td>mg/L</td><td><100</td><td>100–200</td><td>200–600</td><td>>600</td></tr>
<tr><td>F</td><td>mg/L</td><td><0.7</td><td>0.7–1.0</td><td>1.0–1.5</td><td>>1.5</td></tr>
<tr><td>Mg</td><td>mg/L</td><td><70</td><td>70–100</td><td>100–200</td><td>>200</td></tr>
<tr><td>$NO_3$</td><td>mg/L</td><td><6</td><td>6–10</td><td>10–20</td><td>>20</td></tr>
<tr><td>Na</td><td>mg/L</td><td><100</td><td>100–200</td><td>200–400</td><td>>400</td></tr>
<tr><td>$SO_4$</td><td>mg/L</td><td><200</td><td>200–400</td><td>400–600</td><td>>600</td></tr>
<tr><td>$PO_4$</td><td>mg/L</td><td><0.005</td><td>0.005–0.025</td><td>0.025–0.25</td><td>>0.25</td></tr>
</table></td></tr>
<tr><td>(h)</td><td>Investments already made and to be made by the water user in respect of the water use in question</td><td>No financial investments have been made with respect to the water uses being applied for, for the new infrastructure required upon commencement of the Proposed Project. The reclamation infrastructure consists of a pumpstation (slurry sump with a floating pontoon, vibrating screen, water tank, motor centre and slurry associated pumps), stormwater management infrastructure (lined catchment paddock and perimeter berm), slurry and process water pipelines.</td></tr>
<tr><td>(i)</td><td>The strategic importance of the water use to be authorised</td><td>Firstly, the granting of this Water Use Licence (WUL) will facilitate an increase in gold production and contribute positively to the economy of the Gauteng Province.<br><br>The Proposed Project cannot proceed without the issuance of the WUL as the proposed activities involve the impeding or diverting the flow of water in a watercourse and/or altering the bed, banks, course or characteristics of a watercourse (Section 21 (c) and (i) water uses). In addition, the Proposed Project involves activity that triggers a Section 21 (g) water use, relating to the disposal of waste in a manner that could have a detrimental impact on a water resource.<br><br>The WUL is also essential in enabling Goldplat to remove the stock dams, which could be a pollution source to the surrounding environment. Their removal will therefore contribute to the reduction of the environmental risks and support the rehabilitation of the affected area.</td></tr>
</table>


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<table>
<tr><th>Section 27(1)</th><th>Content</th><th>Description of issues</th></tr>
<tr><td>(j)</td><td>The quality of water in the water resource which may be required for the Reserve and for meeting international obligations</td><td>The Reserve Determination for the Vaal Management Catchment Area was promulgated on 21 September 2020, and the Proposed Project will comply with the requirements set out therein. Surface water quality and quantity data for quaternary catchments C21D and C21E are not included in the 2020 determination; therefore, information from the adjacent C21F catchment has been considered as a proxy, based on hydrological similarity (see the table below).
<table>
<tr><th>Quaternary Catchment</th><th>Water Resource</th><th>Water Resource Class</th><th>PES</th><th>EIS</th><th>TEC5</th><th>MAR (MCM)[1]</th><th>Reserve[2] (%MAR)</th><th>Ecological Reserve[3] (%MAR)</th><th>(BHN) Reserve[4] (%MAR)</th></tr>
<tr><td>C21F</td><td>Blesbokspruit – EWR 11</td><td>III</td><td>D</td><td>Low</td><td>D</td><td>100.69</td><td>18.145</td><td>18.14</td><td>0.0050</td></tr>
</table></td></tr>
<tr><td>(k)</td><td>The probable duration of any undertaking for which a water use is to be authorised</td><td>The Proposed Project is proposed to be undertaken for five years, including the construction, operation decommissioning and rehabilitation phases.</td></tr>
</table>

## 7.5 Key Commitments

Goldplat is committed to the correct implementation of the IWWMP action plan contained in this report and the water use licence conditions that will be stipulated in the WUL once issued.


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# Appendix A: Surface Water Assessment

Can be accessed here: https://kongiwe.com/projects/

# Surface Water Study for the Proposed Goldplat Reclamation Project

*Project Number:*

**KON051**

**Prepared for:**

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**September 2026**

# DOCUMENT CONTROL

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| **Client** | Kongiwe Environmental (Pty) Ltd |
| **Project Number** | KON051 |
| **Report Number** | 02 |
| **Report Status** | Final |
| **Submission Date** | 18 September 2026 |
| **Author** | Andy Pirie (Senior Hydrologist, M.Sc., *Pr.Sci.Nat.114988*) |
| **Author Signature** | |

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# DECLARATION OF INDEPENDENCE

I, Andy Pirie 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 the expertise in conducting the specialist study relevant to this application, including knowledge of the various Acts, regulations and any guidelines that have relevance to the proposed project;
- I will comply with the Acts, 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.

Andy Pirie
Senior Hydrologist
Pr.Sci.Nat (reg no. 114988)

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BPG | Best Practice Guideline |
| CN | Curve Number |
| CV | Curriculum Vitae |
| CMA | Catchment Management Agencies |
| DEM | Digital Elevation Model |
| DWS | Department of Water and Sanitation |
| DTM | Digital Terrain Model |
| ECO | Environmental Control Officer |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Programme |
| GIS | Geographical Information Systems |
| GN R704 | Government Notice No. 704 |
| ha | Hectares |
| kV | Kilovolt |
| kVA | Kilovolt-amperes |
| MAP | Mean Annual Precipitation |
| MAR | Mean Annual Runoff |
| mamsl | metres above mean sea level |
| MPRDA | Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) |
| $m^2$ | Square metres |
| $m^3$/month | Cubic metres per month |
| mbgl | Metres below ground level |
| mm | Millimetres |
| NEMA | National Environmental Management Act, 1998 (Act No. 107 of 1998) |
| NWA | National Water Act, 1998 (Act No. 36 of 1998) |
| Pr.Sci.Nat. | Professional Natural Scientist |
| RWD | Return Water Dam |
| SANRAL | South African National Roads Agency Limited |
| SWMP | Stormwater Management Plan |
| SANS | South African National Standards |
| SACNASP | South African Council for Natural Scientific Professions |
| SCS | Soil Conservation Service |
| TSS | Total Suspended Solids |
| WR2012 | Water Resources of South Africa, 2012 Study |
| WUL | Water Use Licence |
| WULA | Water Use Licence Application |
| WMAs | Water Management Areas |
| WRC | Water Research Commission |

# EXECUTIVE SUMMARY

## Introduction and Background

Hydrospatial (Pty) Ltd was appointed by Kongiwe Environmental (Pty) Ltd ("Kongiwe") to conduct a surface water hydrological study for the proposed reclamation and reprocessing of the Goldplat Recovery (Pty) Ltd ("Goldplat") Top and Rooidam stock dams and associated pipeline route (hereafter referred to as the "project"). This report provides the surface water study for the Integrated Water Use Licence Application (IWULA) processes.

The project is located 7 kilometres (km) north-east of Brakpan in the City of Ekurhuleni Metropolitan Municipality (CoE) in the Gauteng Province. The pipeline route runs in a southerly direction from the Goldplat site to the Ergo Mining (Pty) Ltd (''Ergo'') Processing Plant (hereafter Ergo Plant).

Goldplat proposes to reclaim and reprocess its Top and Rooidam stock dams (hereafter referred to as the "stock dams") with the objective of recovering residual gold using the hydraulic reclamation method. Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material, forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

The life of the proposed project is expected to be five years. An estimated maximum amount of 50 000 tons/month of slurry is expected to be pumped from Goldplat via a new pipeline to the Ergo Plant for beneficiation.

The following infrastructure will be utilised:

- Reclamation infrastructure at the stock dams consisting of a pumpstation which includes:
  - Slurry sump;
  - Vibrating Screen;
  - Water tank;
  - Motor control centre; and
  - Slurry and associated Pumps.
- Stormwater management infrastructure associated with the stock dams, including:
  - Lined catchment paddock; and
  - Perimeter berm.
- 11 kilovolt (kV) overhead powerline capable of transmitting 3 kilovolt-amperes (kVA) of electricity and electricity reticulation, sourced from the Goldplat plant or Eskom;

- Existing administration buildings, including change houses and ablution facilities at the Goldplat plant;
- Existing access roads;
- Construction contractors' yards (temporary facilities); and
- Slurry and process water pipelines running on the same route:
  - One slurry pipeline of 300 mm in diameter to Ergo Plant; and
  - One process water pipeline of 300 mm in diameter from Ergo Plant.

### Scope of Work

The scope of work included the following:

- Description of the baseline (current) surface water hydrology in terms of water quality and quantity. The purpose of the baseline is to ensure that a thorough understanding of the pre-reclamation surface water conditions is provided;
- Development of a conceptual Stormwater Management Plan (SWMP) in accordance with the DWS Best Practice Guideline G1: Storm Water Management and GN R704 regulations[1]. The primary purpose of the SWMP is to ensure that clean (non-impacted water) and dirty water (mine impacted water) are clearly separated in accordance with the above-mentioned guideline and regulations;
- Determination of the 1:100 year floodlines. According to GN R704 regulations, no mine infrastructure should be developed within the floodlines, unless exemption from GN R704 is obtained from the DWS;
- Development of a water balance according to the DWS Best Practice Guideline G2: Water and Salt Balances. The water balance will provide the water volumes for the proposed project;
- An assessment of the potential surface water impacts and recommended mitigation measures; and
- Development of monitoring plans that can be used to monitor potential impacts resulting from the proposed project.

### Baseline Hydrology

The area has a Mean Annual Precipitation (MAP) of 716 mm. Rainfall is highest over the months of October to March, and lowest over the months of April to September.

The project is located in the Vaal-Orange Water Management Area (WMA). The stock dams and the majority of the pipeline route are located within quaternary catchment C21D, with the remainder of the pipeline route traversing C21E and a small portion of C22C. The stock dams site drains in an easterly direction towards a tributary of the Blesbokspruit. The Blesbokspruit flows in a southerly direction until its confluence with the Suikerbosrand River,

[1] Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources; 4 June 1999

37 km south-west of the Ergo Plant. The Suikerbosrand River flows into the Vaal River near the town of Vereeniging.

Elevation varies from 1 660 metres above mean sea level (mamsl) near the Ergo Plant, to 1 590 mamsl along the eastern side of the project boundary. The general topography of the area can be described as undulating with slopes less than 10 %. The only steep slopes (slopes in excess of 30 %) occur along the sides of the old mining dumps in the area.

The area around the project boundary is dominated by mining and agricultural activities. The northern part of the pipeline route follows a wetland system which flows into the Alexander Dam. The middle section of the pipeline route traverses open grassland areas, whilst the southern section passes through built-up, industrial and residential areas.

The proposed infrastructure at the Goldplat site and the majority of the pipeline route are located in quaternary catchment C21D. According to the WR2012 study, the simulated Mean Annual Runoff (MAR) at the outlet of C21D, between October 2004 and September 2010, was 51.6 million cubic metres (mcm). The naturalised MAR, which is the runoff under natural virgin catchment conditions (i.e. no man-made land uses or activities), over the same period, was 27 mcm. Quaternary catchment C21D therefore produces almost double the runoff than it should under natural catchment conditions. This is due to the impermeable urban nature of the catchment as well as large effluent discharges into the catchment.

The water quality of the tributary of the Blesbokspruit to the east of Goldplat only exceeded ammonium and EC, whilst the other parameters were mostly within the guideline limits. The seepage water from the Goldplat stock dams, the RWD, as well as the stream emanating from the neighbouring dump, were found to contain high dissolved salts, heavy metals as well as uranium. The pH levels at these sampling points, however, were found not to be acidic.

### Floodline Determination

A 1:100 year floodline determination was undertaken as part of the Surface Water Study for the Proposed Reclamation of the 5L23 Tailings Storage Facility (Hydrospatial, 2022) and was used in this study. The 1:100 year floodline showed that none of the proposed infrastructure at the Goldplat site is located within the floodlines; however, the pipeline route to the Ergo Plant crosses a number of watercourses and should be constructed in a suitable manner to handle a 1:100 year flood.

### Stormwater Management Plan

A conceptual SWMP was designed to ensure that clean and dirty water are adequately separated, in accordance with GN R704 regulations. The SWMP was designed to ensure that clean water is diverted away from dirty areas, and that dirty water runoff from the operation is captured, contained, and managed. More details on the SWMP can be found under section 4.

### Water Balance

A monthly water balance was setup in Microsoft Excel spreadsheet format to estimate the volumes of water in the reclamation circuit. The water balance was setup to simulate the

average yearly, average dry, and average wet season conditions. The water balance is presented under section 5.

### Surface Water Impact Assessment

The impact assessment indicated that the identified impacts in most cases can be mitigated to a low impact. Key impacts include uncontained dirty runoff from the operation as well as flooding of the pipeline route, due to the close proximity to the watercourses. Key mitigation includes the implementation of a SWMP that adequately captures and contains runoff from the operational area of the site, in accordance with GN R704 regulations, as well as constructing the pipelines in a suitable manner to withstand a 1:100 year flood.

### Monitoring Plans

Monitoring plans for surface water quality and stormwater infrastructure are provided under section 7.

### Conclusions and Recommendations

In conclusion, the most important aspect to prevent negative impacts from a surface water perspective is to ensure that a sound SWMP is implemented prior to the commencement of mining activities, in accordance with the conditions stipulated in GN R704. Monitoring and maintenance of stormwater measures is of utmost importance and should be conducted as outlined in this report. Furthermore, water quality monitoring must continue upstream and downstream of the proposed project. The removal of the stock dams is expected to have a positive long-term impact on the surrounding watercourses, provided that rehabilitation is successfully undertaken.

The following is recommended:

- The proposed pipelines must run within the approved pipeline servitude route. Where the pipelines cross the floodline, it should be ensured that they are constructed in a suitable manner to handle a 1:100 year flood;
- The SWMP is implemented, and all conditions specified in GN R704 are taken into account;
- The impact mitigation measures are implemented; and
- The monitoring plans are implemented.

Should the above recommendations be implemented, then from a surface water hydrological perspective, the project can commence.

# 1 INTRODUCTION AND BACKGROUND

Hydrospatial (Pty) Ltd was appointed by Kongiwe Environmental (Pty) Ltd ("Kongiwe") to conduct a surface water hydrological study for the proposed reclamation and reprocessing of the Goldplat Recovery (Pty) Ltd ("Goldplat") Top and Rooidam stock dams and associated pipeline route (hereafter referred to as the "project"). This report provides the surface water study for the Integrated Water Use Licence Application (IWULA) processes.

## 1.1 Project Location

The project is located 7 kilometres (km) north-east of Brakpan in the City of Ekurhuleni Metropolitan Municipality in the Gauteng Province. The pipeline route runs in a southerly direction from the project to the Ergo Mining (Pty) Ltd (''Ergo'')Processing Plant (hereafter Ergo Plant). Figure 1-1 indicates the location of the proposed project.

## 1.2 Project Description

Goldplat proposes to reclaim and reprocess its Top and Rooidam stock dams (hereafter referred to as the "stock dams") with the objective of recovering residual gold using the hydraulic reclamation method.

Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments, and the process water then mixes with the unconsolidated material, forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

A Water Use Licence (WUL) is required for all the project activities that may impact water resources. Kongiwe has been appointed by Goldplat to undertake the IWULA for the project.

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 and will be supported by an Integrated Water and Waste Management Plan (IWWMP). The IWULA will be reviewed and considered by the Department of Water and Sanitation (DWS) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the project comply with the National Water Act, 36 of 1998 (Act No. 36 of 1998).

### 1.2.1 Mining Method

The proposed reclamation method which will be used to reclaim the stock dam compartments is referred to as a top-down hydraulic reclamation process. It must be noted that only the Rooidam and Top stock dams are earmarked for reclamation as part of this project, and not the other Goldplat stock dams. This technique uses high-pressure water monitors to erode unconsolidated tailings material within the stock dam compartments. The water from the water monitor mixes with the tailings and forms a slurry. The slurry then flows under gravity feed to a collection sump which is positioned at the lowest elevation of the bench being reclaimed.

At the sump, finger screens remove any detritus that may impact pumping operations, and the screened slurry then flows into the sump and is subsequently conveyed to the pumpstation. The position of the collection sump will change as the reclamation progresses. To control the volume of slurry reporting to the reclamation station, valves are used to hold and release slurry contained in the collection sump. From the pumpstation, located at the lowest point of the stock dams, slurry will then be pumped and conveyed via a new pipeline to the Ergo Plant for reprocessing. Approximately 50 000 tons/month of slurry will be pumped to the Ergo Plant. Process water used in the reclamation activities will be sourced from Ergo through the same pipeline route.

Ensuing tailings from the Ergo Plant will be deposited onto the Brakpan/Withok Tailings Storage Facility (TSF).

### 1.2.2 Proposed Infrastructure

The following infrastructure will be utilised:

- Reclamation infrastructure at the stock dams consisting of a pump station which includes:
  - Slurry sump;
  - Vibrating Screen;
  - Water tank;
  - Motor control centre; and
  - Slurry and associated Pumps.
- Stormwater management infrastructure associated with the stock dams, including:
  - Lined catchment paddock; and
  - Perimeter berm.
- 11 kilovolt (kV) overhead powerline capable of transmitting 3 kilovolt-amperes (kVA) of electricity and electricity reticulation, sourced from the Goldplat plant or Eskom;
- Existing administration buildings, including change houses and ablution facilities at the Goldplat plant;
- Existing access roads;
- Construction contractors' yards (temporary facilities); and
- Slurry and process water pipelines running on the same route:
  - One slurry pipeline of 300 mm in diameter to Ergo Plant; and
  - One process water pipeline of 300 mm in diameter from Ergo Plant.

Figure 1-2 presents the site infrastructure layout for the project.

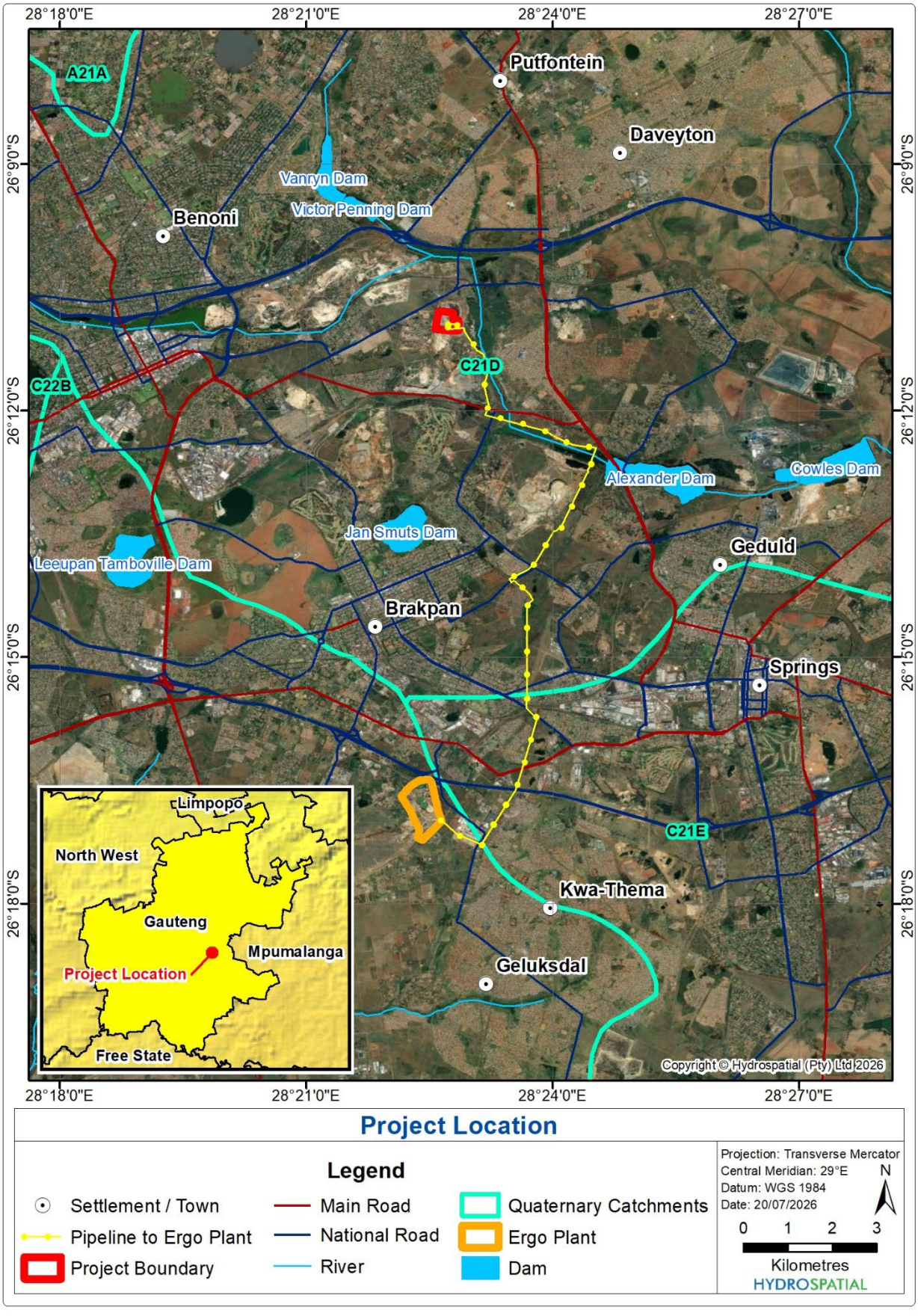


Figure 1-1: Location of the project

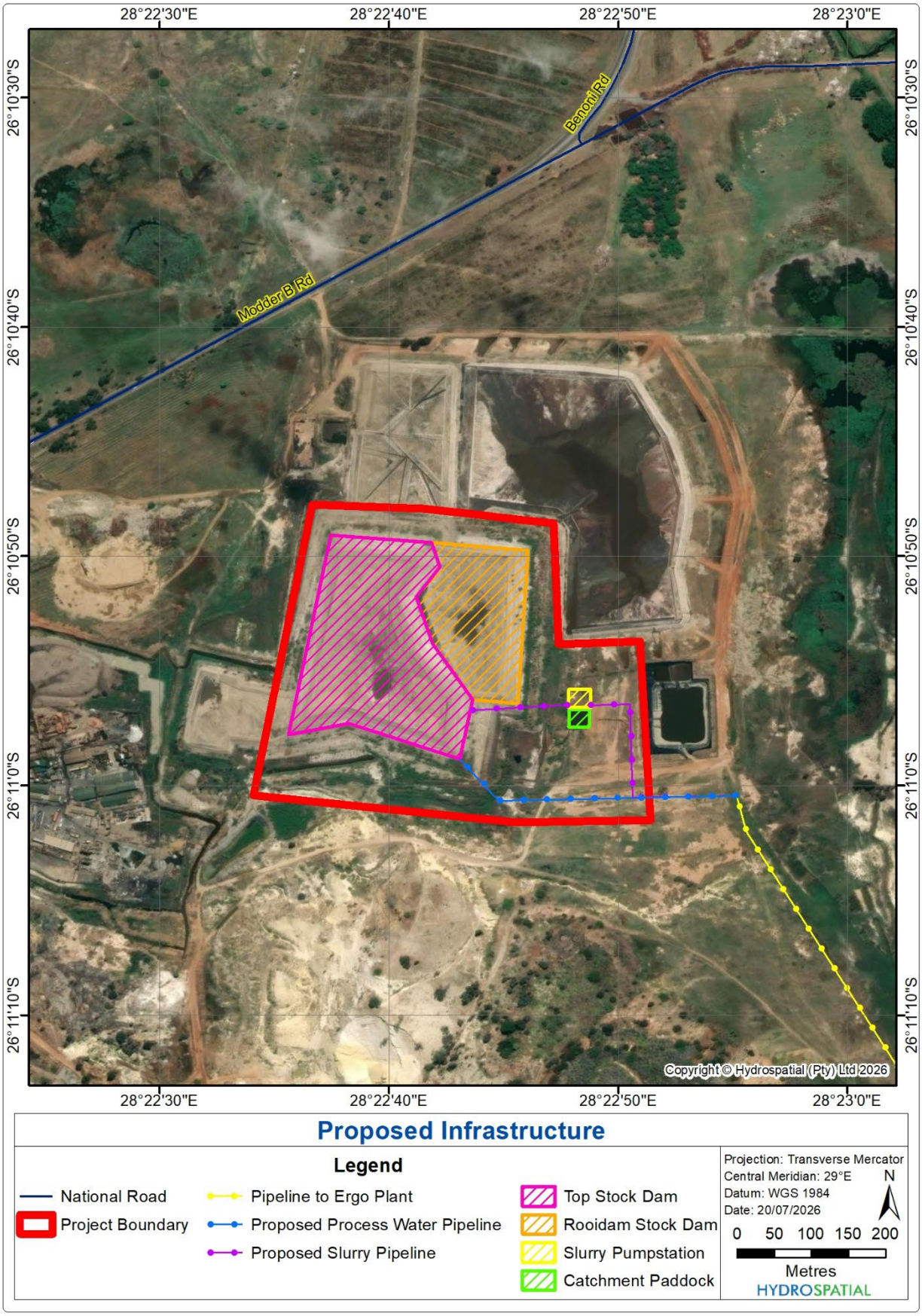


Figure 1-2: Proposed infrastructure layout

### 1.2.3 Land use

The project area is predominantly surrounded by mining areas, industrial areas, residential areas, railway infrastructure, and existing road networks. Most of the project area has been subject to significant disturbance due to past mining activities and urban infrastructure.

### 1.2.4 Access

The major access routes in the vicinity of Goldplat include the R51, which provides connectivity to the Modder Bee Road, leading to access to the Goldplat area.

Existing on-site access roads will be utilised.

### 1.2.5 Power and Water supply

Power supply for the reclamation activities will be sourced from Eskom and connected at the existing Goldplat plant.

Potable water will be sourced from the existing Goldplat plant.

Process water required for the reclamation activity will be sourced from the Ergo Plant and conveyed through a new process water pipeline to the project site for reuse in a closed-circuit system. The pipeline will follow existing servitudes / SRPs held by Ergo and in agreement with Ergo.

### 1.2.6 Life of Operation

The life of the proposed project is expected to be five years. An estimated maximum amount of 50 000 tons/month of slurry is expected to be pumped from Goldplat via a new pipeline to the Ergo Plant for beneficiation.

### 1.2.7 Rehabilitation

Once reclamation is completed, the areas will then be assessed for contamination (particularly in terms of radiation). Contaminated soils will be removed, and the land levelled to its original functioning topography levels. The resultant stock dam footprints may then be reused again as a future site for tailings storage or be rehabilitated.

## 1.3 Legal Requirements and Guidelines

The following key legislative requirements and guidelines are relevant to this study:

- National Water Act, 1998 (Act No. 36 of 1998) (NWA);
- Regulations on the Use of Water for Mining and Related Activities aimed at the Protection of Water Resources (published under Government Notice 704 (GN R704) in Government Gazette 20119, 4 June 1999);
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and associated Environmental Impact Assessment (EIA) 2014 regulations;
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and

- Department of Water and Sanitation (DWS) Best Practice Guideline (BPG) documents, namely:
  - BPG G1: Storm Water Management;
  - BPG G2: Water and Salt Balances;
  - BPG G3: Water Montoring Systems; and
  - BPG G4: Impact Prediction.

## 1.4 Site Investigation

A site investigation was undertaken on 22 July 2026. The purpose of the site investigation was to assess the hydrological characteristics of the area and to sample watercourses in the vicinity of the project.

## 1.5 Details of the Specialist

The study was undertaken by Andy Pirie, who is a senior hydrologist at Hydrospatial (Pty) Ltd. Andy graduated with a Master of Science (M.Sc.) in Water Resource Management (cum laude). He is registered as a Professional Natural Scientist (Pr.Sci.Nat) (registration number: 114988) in Water Resources Science with the South African Council for Natural Scientific Professions (SACNASP). Work experience includes rainfall – runoff modelling, floodline determinations, stormwater management plans, water and salt balance modelling, setup of water monitoring networks and programmes, analysis of surface water quality and quantity, and surface water specialist studies for environmental impact assessments and WULAs. He has worked on projects in South Africa, Cameroon, Senegal, Mali, Democratic Republic of the Congo, Botswana, Zambia and Namibia. His curriculum vitae is provided in Appendix A.

# 2 SCOPE OF WORK

The scope of work included the following:

- Description of the baseline (current) surface water hydrology in terms of water quality and quantity. The purpose of the baseline is to ensure that a thorough understanding of the pre-reclamation surface water conditions is provided;
- Development of a conceptual Stormwater Management Plan (SWMP) in accordance with the DWS Best Practice Guideline G1: Storm Water Management and GN R704 regulations[2]. The primary purpose of the SWMP is to ensure that clean (non-impacted water) and dirty water (mine-impacted water) are clearly separated in accordance with the above-mentioned guideline and regulations;
- Determination of the 1:100-year floodlines. According to GN R704 regulations, no mine infrastructure should be developed within the floodlines, unless exemption from GN R704 is obtained from the DWS;

[2] Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources; 4 June 1999

- Development of a water balance according to the DWS Best Practice Guideline G2: Water and Salt Balances. The water balance will provide the water volumes for the proposed project;
- An assessment of the potential surface water impacts and recommended mitigation measures; and
- Development of monitoring plans that can be used to monitor potential impacts resulting from the proposed project.

# 3 BASELINE HYDROLOGY

## 3.1 Climate

### 3.1.1 Rainfall

Rainfall data for the area was obtained from the Springs (RWB) rainfall station (station no. 0476736 W). The station is located 11.5 km south-east of the project. Patched rainfall data was obtained for the period of 1971 to 2003. The mean monthly rainfall is indicated in Figure 3-1. The area has a Mean Annual Precipitation (MAP) of 716 mm. Rainfall is highest over the months of October to March, and lowest over the months of April to September.

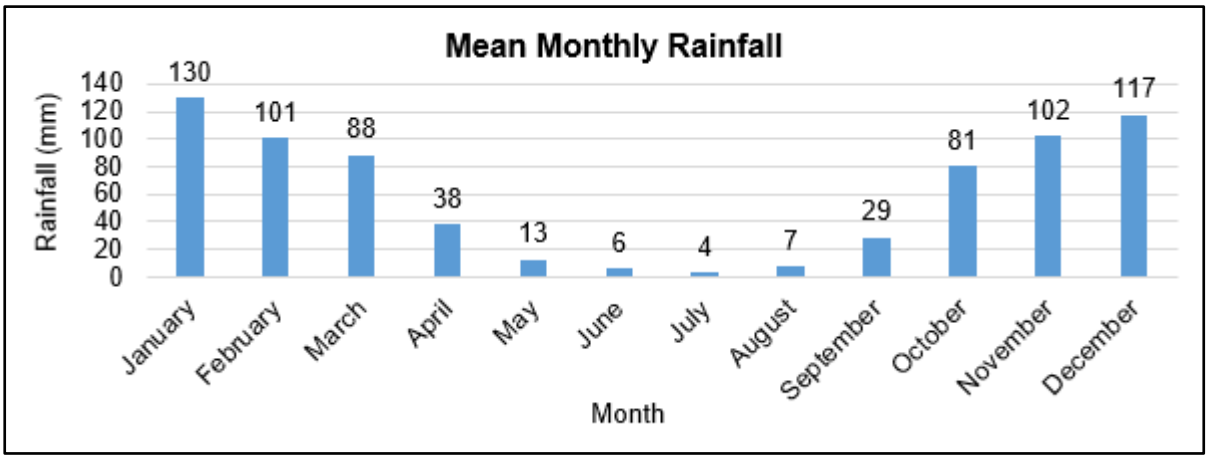


Figure 3-1: Mean monthly rainfall for the area

The storm rainfall depths for the centre position of the project area 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 3-1.

Table 3-1: Storm rainfall depths for the project 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 | 12 | 15 | 17 | 21 | 25 | 28 |
| **10 min** | 13 | 17 | 21 | 25 | 31 | 35 | 41 |
| **15 min** | 16 | 22 | 26 | 31 | 38 | 44 | 50 |

| 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 |
| **30 min** | 20 | 28 | 34 | 40 | 49 | 56 | 64 |
| **45 min** | 23 | 32 | 39 | 46 | 56 | 65 | 74 |
| **1 hr** | 26 | 36 | 43 | 51 | 62 | 72 | 83 |
| **1.5 hr** | 30 | 41 | 50 | 59 | 72 | 83 | 95 |
| **2 hr** | 33 | 46 | 55 | 65 | 80 | 92 | 106 |
| **4 hr** | 39 | 54 | 66 | 78 | 96 | 110 | 127 |
| **6 hr** | 44 | 61 | 73 | 87 | 106 | 123 | 141 |
| **8 hr** | 47 | 65 | 79 | 93 | 114 | 132 | 152 |
| **10 hr** | 50 | 69 | 84 | 99 | 121 | 140 | 161 |
| **12 hr** | 53 | 72 | 88 | 104 | 127 | 147 | 169 |
| **16 hr** | 57 | 78 | 94 | 112 | 137 | 158 | 182 |
| **20 hr** | 60 | 83 | 100 | 118 | 145 | 168 | 192 |
| **24 hr** | 63 | 87 | 105 | 124 | 152 | 176 | 202 |
| **1 day** | 54 | 75 | 91 | 108 | 132 | 152 | 175 |
| **2 day** | 67 | 93 | 112 | 133 | 163 | 188 | 215 |
| **3 day** | 76 | 105 | 126 | 150 | 184 | 212 | 243 |
| **4 day** | 83 | 114 | 138 | 163 | 200 | 231 | 265 |
| **5 day** | 88 | 122 | 147 | 174 | 214 | 247 | 283 |
| **6 day** | 93 | 128 | 155 | 184 | 225 | 260 | 299 |
| **7 day** | 97 | 134 | 163 | 192 | 236 | 272 | 313 |

### 3.1.2 Evaporation

Symons Pan (S-Pan) evaporation data for the area was obtained from the WR2012 study for quaternary catchment C21D. S-Pan evaporation measurements are not a true reflection of evaporation from natural open water bodies, as the water temperatures in the S-Pan are higher, resulting in higher evaporation rates. To convert S-Pan measurements to open water evaporation, monthly open water evaporation conversion factors were used, which were obtained from the WR2012 study. The adopted monthly evaporation for the project is indicated in Table 3-2. Evaporation is highest over the months of September to March, and lowest over the cooler months of April to August.

Table 3-2: Evaporation for the area

| Month | S-Pan Evaporation (mm) | Evaporation Factor | Open Water Evaporation (mm) |
|---|---|---|---|
| January | 185 | 0.84 | 155 |
| February | 153 | 0.88 | 135 |
| March | 143 | 0.88 | 126 |
| April | 108 | 0.88 | 95 |
| May | 88 | 0.87 | 77 |
| June | 71 | 0.85 | 60 |
| July | 77 | 0.83 | 64 |
| August | 111 | 0.81 | 90 |

| Month | S-Pan Evaporation (mm) | Evaporation Factor | Open Water Evaporation (mm) |
|---|---|---|---|
| September | 150 | 0.81 | 122 |
| October | 177 | 0.81 | 143 |
| November | 177 | 0.82 | 145 |
| December | 191 | 0.83 | 159 |
| **Total** | **1 631** | **N/A** | **1 370** |

## 3.2 Hydrological Setting

### 3.2.1 Regional Catchments and Drainage

The DWS has divided South Africa into primary, secondary, tertiary and quaternary catchments. Primary catchments are the largest defined catchments for South Africa, of which there are 22, and are assigned a letter ranging from A – X (excluding O). Secondary catchments are subdivisions of the primary catchments, and are the second largest catchments in South Africa, and are assigned the primary catchment letter within which they are located, and a number, e.g. A5 (secondary catchment 5 located within primary catchment A). Similarly, tertiary catchments are subdivisions of secondary catchments, and are represented, for example, by A53 (tertiary catchment 3 located within secondary catchment A5). Lastly, quaternary catchments are the smallest defined catchments and are assigned the tertiary catchment number, along with a quaternary catchment letter, e.g. A53D (quaternary catchment D located within tertiary catchment A53).

Further to the above, the DWS has divided South Africa into six Water Management Areas (WMAs). The six WMAs include the Limpopo-Olifants, Inkomati-Usuthu, Pongola-Mtamvuna, Vaal-Orange, Mzimvubu-Tsitsikamma, and Breede-Olifants.

The project is located in the Vaal-Orange WMA. The site infrastructure and majority of the pipeline route is located within quaternary catchment C21D, with the remainder of the pipeline route traversing C21E and a small portion of C22C (Figure 1-1). The project drains in an easterly direction towards a tributary of the Blesbokspruit. The Blesbokspruit flows in a southerly direction until its confluence with the Suikerbosrand River, 37 km south-west of the Ergo Plant. The Suikerbosrand River flows into the Vaal River near the town of Vereeniging.

### 3.2.2 Topography

Figure 3-2 indicates the topography of the area. Elevation varies from 1 660 metres above mean sea level (mamsl) near the Ergo Plant to 1 590 mamsl along the eastern side of the project boundary. The general topography of the area can be described as undulating with slopes less than 10 %. The only steep slopes (slopes in excess of 30 %) occur along the sides of the old mining dumps in the area.

### 3.2.3 Land Cover/Use

The land cover of the area is indicated on Figure 3-3. The area around the project boundary is dominated by mining and agricultural activities. The northern part of the pipeline route follows a wetland system which flows into the Alexander Dam. The middle section of the pipeline route traverses open grassland areas, whilst the southern section passes through built-up, industrial and residential areas.

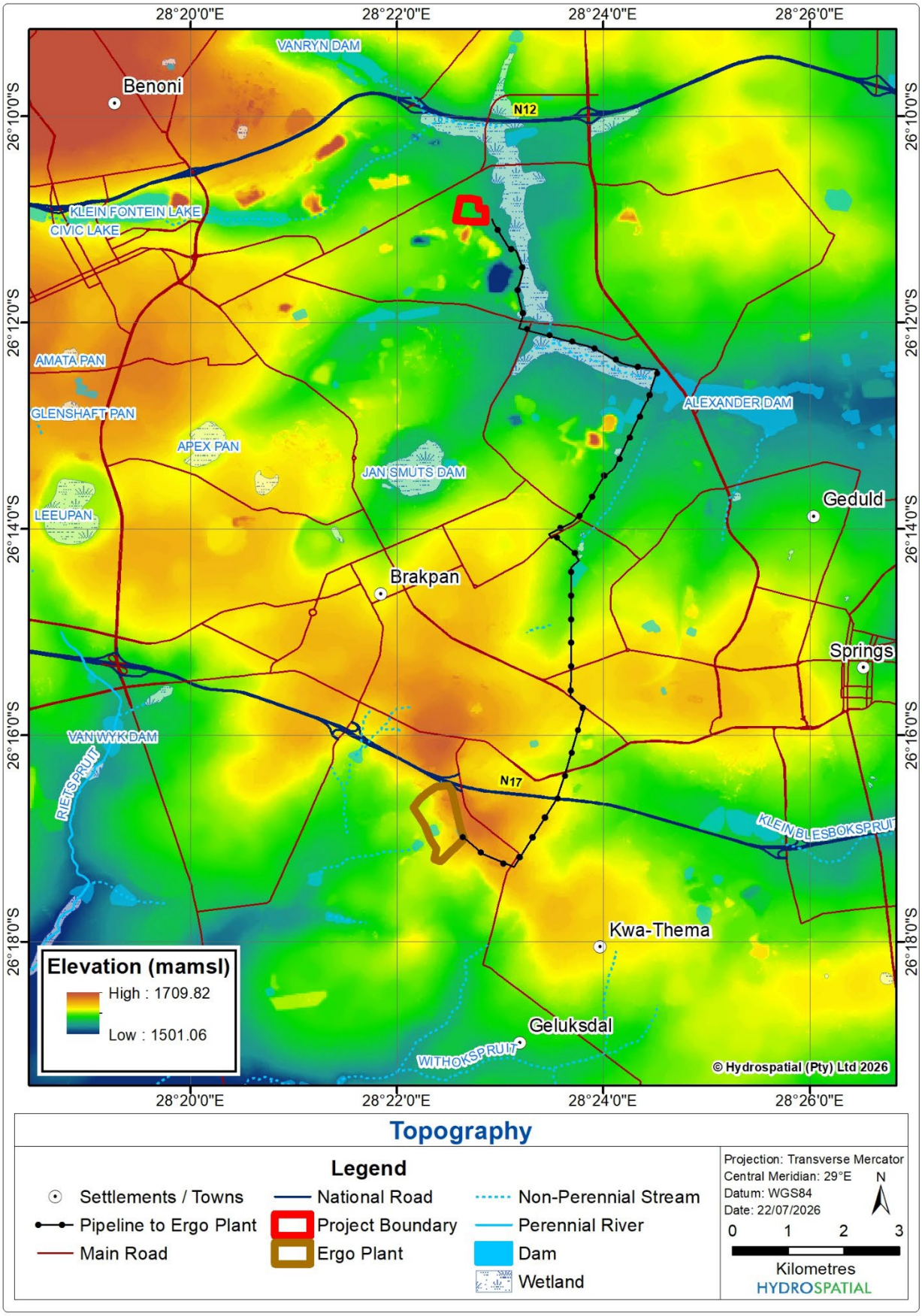


Figure 3-2: Topography

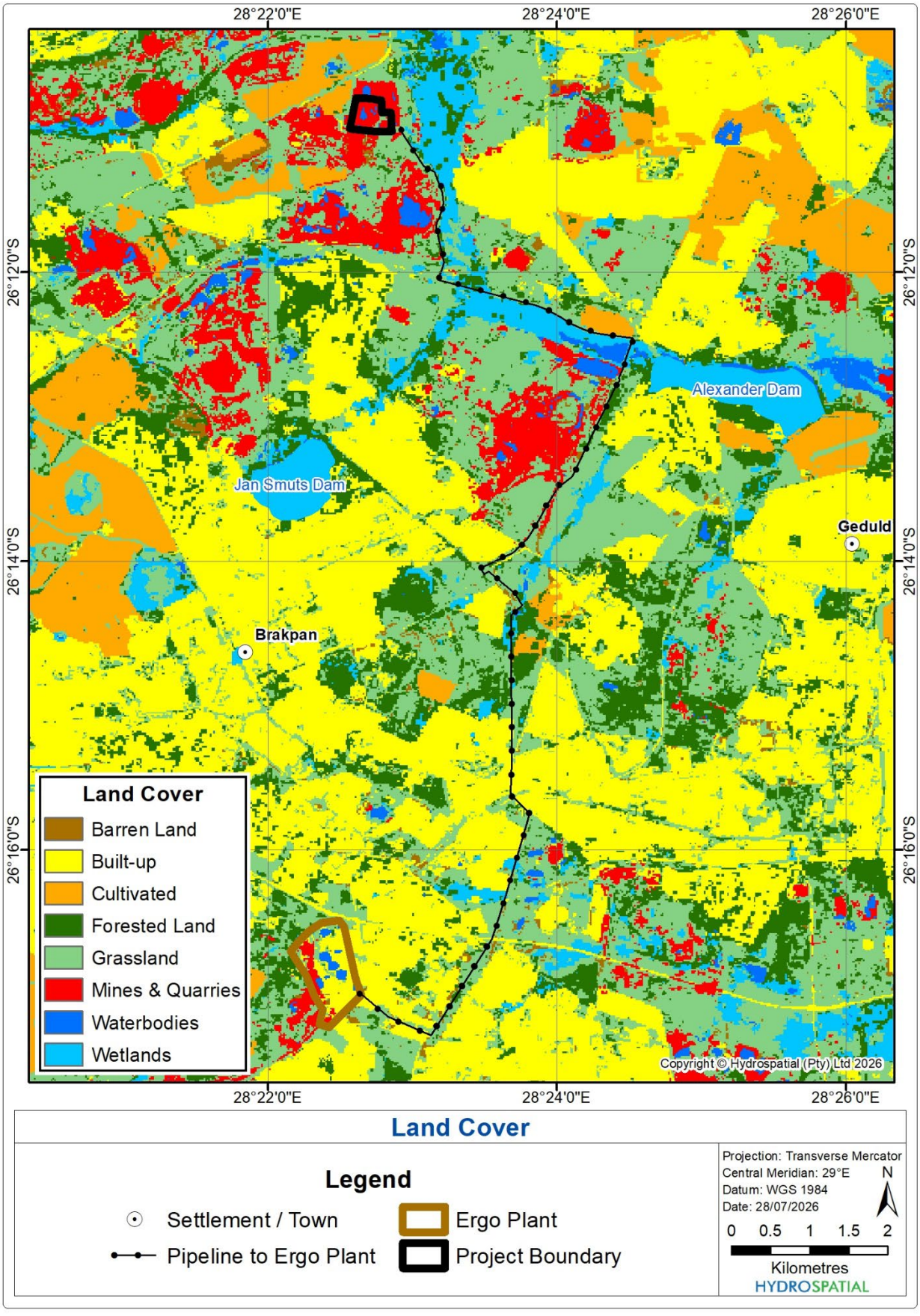


Figure 3-3: Land Cover

### 3.2.4 Soils

The Land Type data for South Africa was used to obtain the generalized soil patterns for the project area. Land Type data exists in the form of published 1:250 000 maps indicating delineated areas of similar terrain types, pedo-systems (uniform terrain and soil pattern) and climate (Land Type Survey Staff, 1972 - 2006). The project boundary and Ergo pipeline route are located within Land Type Ba1, which, according to the Land Type database, is dominated by Hutton and Mispah soil forms.

### 3.2.5 Geology

Gold-bearing reefs within the Witwatersrand sediments have been mined over a significant portion of the East Rand, and these operations have given rise to the mine dumps that are currently being reclaimed by Ergo.

The Witwatersrand strata are fairly shallow in the area. Structurally, the geological basin in this area is marked by prominent folding, and a number of major faults transect the area, notably the Vogels, Jeffreys and Grootvlei tear faults. These strike east-west. The gold-bearing conglomerates outcrop in Nigel. The Witwatersrand rocks are entirely overlain by younger strata, including the Transvaal and Karoo Supergroups.

The area is underlain by sandstone, shale and coal seams of the Vryheid Formation of the Ecca Group, Karoo Supergroup. The area is characterised by the intrusion of interconnected diabase sills, most significantly the Green Sill. This sill is present at a depth of approximately 60 m below the surface and is considered laterally extensive in the area. It dips sub-parallel to the base of the Black Reef Formation. The intrusion of the sills is thought to result in the development of fractures and weathered rock, creating contact-zone localised aquifers. The sills are, however, considered impermeable.

Transvaal Supergroup formations, predominantly dolomite and quartzite, are found below the Vryheid Formations. The Chuniespoort sediments alternate between chert-rich and chert-poor dolomite. The chert-poor Oaktree Formation is adjacent to the Black Reef quartzite, followed by the chert-rich Monte-Christo Formation; then the Lyttleton, Eccles, and lastly the Frisco Formations. The geological structure of the dolomitic rocks is expected to be karstic due to the erosion and dissolution of the carbonate rocks along joints and fractures. This process has resulted in substantial water-storage potential and therefore the dolomite aquifer is considered a significant water resource, exploited extensively for domestic and agricultural usage. The Transvaal Supergroup is extensively developed but largely covered by Karoo strata. The Transvaal formations are only exposed along river courses, especially the Blesbokspruit.

The Black Reef Formation is composed of quartzite, conglomerate, grit and shale, with the whole sequence approximately 30 m in thickness.

### 3.2.6 Groundwater

According to the Goldplat monitoring data, the average groundwater levels measured at boreholes GP2 and GP3, which are located on the east and west sides of the stock dams, respectively, are approximately 5 metres below ground level (mbgl).

### 3.2.7 Floodlines

A 1:100 year floodline determination was undertaken as part of the Surface Water Study for the Proposed Reclamation of the 5L23 Tailings Storage Facility (Hydrospatial, 2022) and was used in this study. The 1:100-year floodline for the proposed infrastructure at the Goldplat site is shown on Figure 3-4, whilst Figure 3-5 shows the floodline for the pipeline route to the Ergo Plant.

## 3.3 Surface Water Runoff

The proposed infrastructure at the Goldplat site and the majority of the pipeline route are located in quaternary catchment C21D. According to the WR2012 study, the simulated Mean Annual Runoff (MAR) at the outlet of C21D, between October 2004 and September 2010, was 51.6 million cubic metres (mcm). The naturalised MAR, which is the runoff under natural virgin catchment conditions (i.e. no man-made land uses or activities), over the same period, was 27 mcm. Quaternary catchment C21D therefore produces almost double the runoff than it should under natural catchment conditions. This is due to the impermeable urban nature of the catchment as well as large effluent discharges into the catchment.

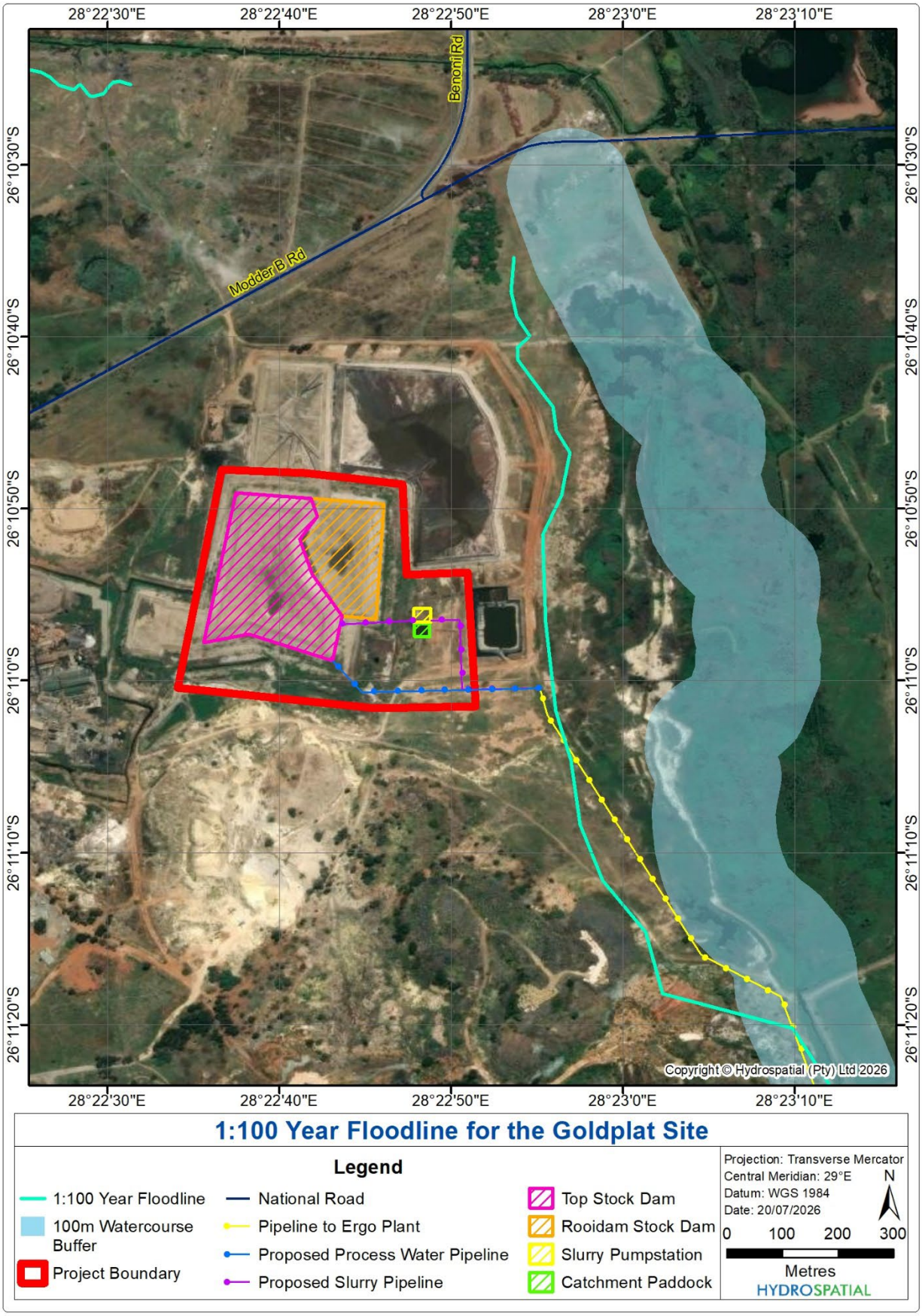


Figure 3-4: 1:100-year floodline for the proposed infrastructure at the Goldplat site

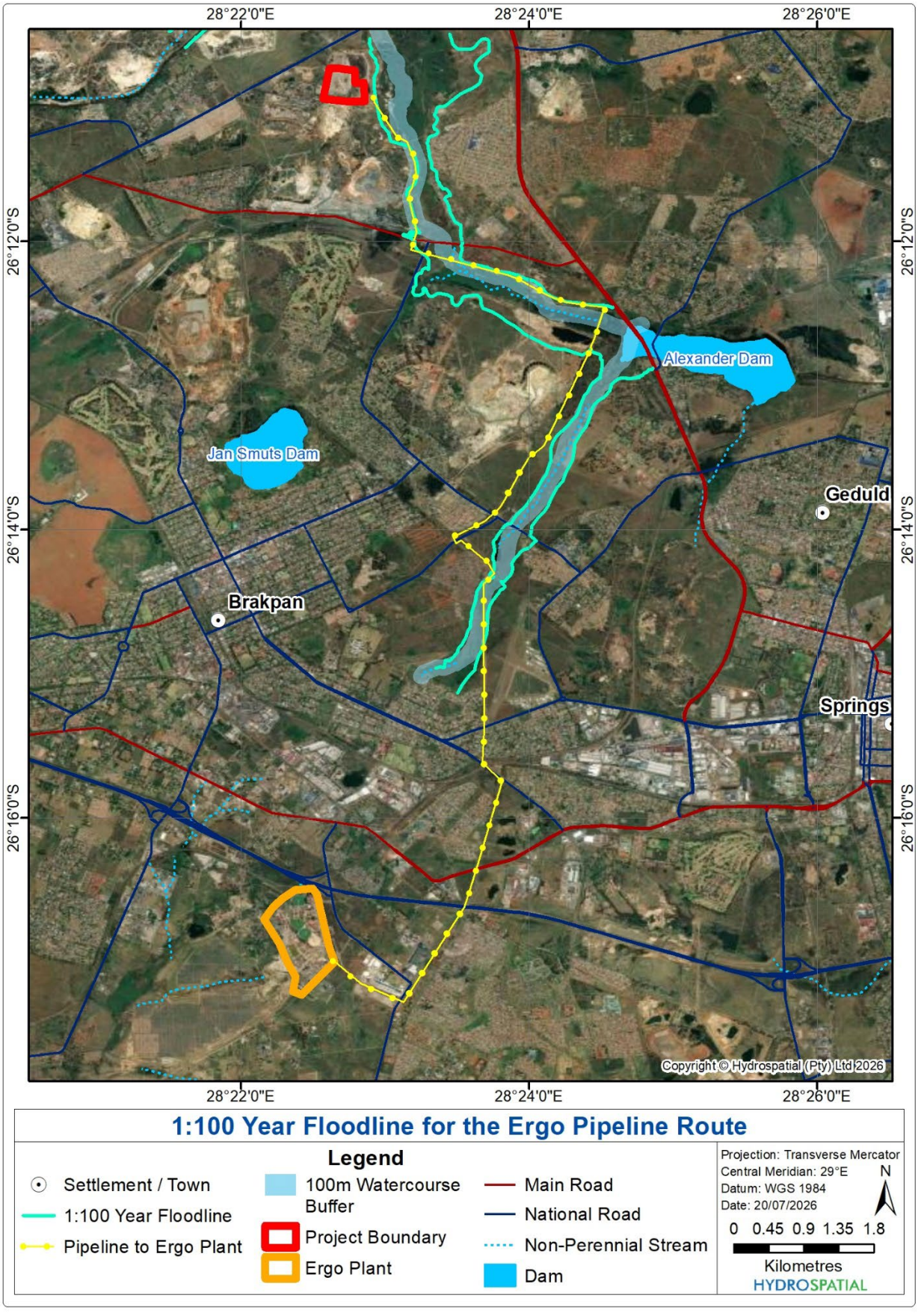


Figure 3-5: 1:100-year floodline for the pipeline route to the Ergo Plant

## 3.4 Surface Water Quality

### 3.4.1 Data Sources

The following data sources were used to describe the water quality of the project and surrounding area:

- Water quality sampling undertaken on the site visit on 22 July 2026 (laboratory certificate provided in Appendix B);
- Water quality sampling undertaken as part of the groundwater study by Irene Lea Environmental and Hydrogeology on 8 July 2026; and
- Monthly water quality monitoring undertaken as part of the Goldplat WUL conditions.

### 3.4.2 Sampling Locations

The sampling locations are summarised in Table 3-3 and are indicated on Figure 3-6.

### 3.4.3 Guideline Limits

The water quality results were compared to the Blesbokspruit catchment guideline limits and the South African National Standard (SANS) 241:2015 Drinking Water Quality limits. The guideline limits are described below.

#### *3.4.3.1 Blesbokspruit Catchment Guideline Limits*

The Blesbokspruit catchment guideline limits are specified as follows:

- **Ideal** – this is the range that results should ideally fall within;
- **Acceptable** – results that fall within this range are acceptable but not ideal;
- **Tolerable** – results that fall within this range are tolerable; and
- **Unacceptable** – results that fall within this range are unacceptable.

Results exceeding the Blesbokspruit catchment tolerable and unacceptable limits, are coloured in yellow and red respectively in Table 3-4 to Table 3-7.

#### *3.4.3.2 SANS 241:2015*

SANS 241:2015 is generally used for water quality comparison purposes, albeit providing stringent limits that are required for drinking water purposes. SANS 241:2015 was used where there were no limits specified by the Blesbokspruit catchment guideline limits. The limits provided in SANS 241:2015 are separated into the following risks:

- Acute health: Parameter that poses immediate unacceptable health risk if consumed with water at concentration values exceeding the specified limit;
- Aesthetic: Parameter that taints water with respect to taste, odour and colour, and that does not pose an unacceptable health risk if present at concentration values exceeding the specified limit;

- Chronic health: Parameter that poses an unacceptable health risk if ingested over an extended period if present at concentration values exceeding the specified limit; and
- Operational: Parameter that is essential for assessing the efficient operation of treatment systems and risks to infrastructure.

Results exceeding the SANS 241:2015 limits are highlighted in orange Table 3-4.

Table 3-3: Details of the surface water sampling locations

| Sampling Location | Description | Sampling Record | Latitude* | Longitude* |
|---|---|---|---|---|
| SW1 | Sample taken by Hydrospatial upstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Upstream) | Once off | -26.174439 | 28.383721 |
| SW2 | Sample taken by Hydrospatial downstream of the project on a tributary of the Blesbokspruit (similar location as BBspruit Downstream) | Once off | -26.200188 | 28.39012 |
| Stream1 | Sample taken by the groundwater specialist on a stream draining from an adjacent 3rd party dump | Once off | -26.183505 | 28.379379 |
| Toe1 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.181709 | 28.37977 |
| Toe2 | Sample taken by the groundwater specialist at the toe seepage from Goldplat stock dams | Once off | -26.182599 | 28.379645 |
| BBspruit Upstream | Goldplat monitoring point upstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.17458 | 28.38358 |
| BBspruit Downstream | Goldplat monitoring point downstream of the project on a tributary of the Blesbokspruit | Monthly sampling from July 2022 – April 2026 | -26.200174 | 28.39007 |
| RWD | Goldplat monitoring point at the Return Water Dam (RWD), which receives seepage and runoff from the Goldplat stock dams | Monthly sampling from July 2022 – April 2026 | -26.182716 | 28.381353 |

*Decimal degrees, geographic coordinate system

Figure 3-6: Surface water quality sampling locations

### 3.4.4 Results and Discussion

The following provides a summary of the surface water quality presented in Table 3-4 to Table 3-7:

- pH levels were slightly below the Blesbokspruit catchment guideline limit of 6.5 at BBspruit Upstream and Downstream on several occasions. At Stream1 and generally at the Return Water Dam (RWD), the pH levels were high exceeding the limit;
- Electrical Conductivity (EC), which provides an indication of the dissolved salts in water, exceeded the limit at BBspruit Upstream and Downstream between July 2022 and April 2024, and then significantly decreased up until 2026. It is unknown what may have resulted in the significant decrease, or whether the results were perhaps captured incorrectly. EC at SW1 and SW2 were within the limit, however, the seepage water from the Goldplat stock dams at Toe1 and Toe2, as well as the stream emanating from the neighbouring dump at Stream1, were well above the limit;
- High regular exceedances of chloride, sulphate and sodium were recorded at Toe1, Toe2, Stream1 and RWD;
- Nitrate exceeded the limit at Toe1, Toe2 as well as the RWD on a regular basis;
- Ammonium was also regularly exceeded at BBspruit Upstream and Downstream and RWD, but also at Toe1, Toe2 and Stream1;
- Fluoride exceeded the limits at Toe1 and Stream1, but also regularly at RWD;
- Iron was elevated at Stream1 and also at the RWD on many occasions;
- Manganese exceeded the limit at Toe1 and Toe2;
- High concentrations of nickel and cobalt occurred at Toe1, Toe2 and Stream1;
- Uranium exceeded the limit at Toe2 and Stream1; and
- Total Suspended Solids (TSS) were mostly within the limit at BBspruit Upstream and Downstream.

In summary, the water quality of the tributary of the Blesbokspruit only exceeded ammonium and EC on a regular basis, whilst the other parameters were mostly within the guideline limits. The seepage water from the Goldplat stock dams at Toe1 and Toe2, the RWD, as well as the stream emanating from the neighbouring dump at Stream1, were found to contain high dissolved salts, heavy metals as well as uranium. The pH levels at these sampling points, however, were found not to be acidic.

Table 3-4: Surface water quality results from the surface water and groundwater study site visits

| Parameter | Units | Blesbokspruit Catchment Guideline Limits | | | | SANS 241:2015 Drinking Quality Limits | | SW1 | SW2 | Toe1 | Toe2 | Stream1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ideal | Acceptable | Tolerable | Unacceptable | Risk | Limit | Jul-26 | Jul-26 | Jul-26 | Jul-26 | Jul-26 |
| pH | pH Units | 6.5 - 8.5 | --- | --- | < 6.5; >8.5 | Operational | ≥ 5 to ≤ 9.7 | 8.18 | 8.01 | 7.53 | 7.96 | 10.2 |
| Electrical Conductivity (EC) | mS/m | <45 | 45 - 70 | 70 - 120 | > 120 | Aesthetic | ≤ 170 | 38 | 54.7 | 1124 | 1293 | 841 |
| Total Dissolved Solids (TDS) | mg/ℓ | --- | --- | --- | --- | Aesthetic | ≤ 1 200 | 219 | 317 | 9372 | 10434 | 6226 |
| Total Alkalinity | mg $CaCO_3$/ℓ | --- | --- | --- | --- | --- | --- | 94.1 | 104 | 277 | 245 | 717 |
| Chloride (Cl) | mg/ℓ | < 80 | 80 - 150 | 150 - 200 | > 200 | Aesthetic | ≤ 300 | 34.3 | 63.2 | 761 | 880 | 1416 |
| Sulphate ($SO_4$) | mg/ℓ | < 150 | 150 - 300 | 300 - 500 | > 500 | Acute health | ≤ 500 | 46.7 | 73.6 | 5490 | 6637 | 1420 |
| Nitrate ($NO_3$) as N | mg/ℓ | < 0.5 | 0.5 - 3 | 3 - 6 | > 6 | Acute health | ≤ 11 | 0.22 | 0.199 | 6.77 | 22.1 | <0.194 |
| Ammonium ($NH_4$) as N | mg/ℓ | < 0.1 | 0.1 - 1.5 | 1.5 - 5.0 | > 5.0 | --- | --- | 0.045 | 0.084 | 119 | 99.6 | 43.1 |
| Orthophosphate ($PO_4$) as P | mg/ℓ | < 0.2 | 0.2 - 0.4 | 0.4 - 0.6 | > 0.6 | --- | --- | <0.009 | 0.03 | <0.009 | 0.02 | <0.009 |
| Fluoride (F) | mg/ℓ | < 0.19 | 0.19 - 0.7 | 0.7 - 1 | > 1 | Chronic health | ≤ 1.5 | <0.263 | <0.263 | 0.964 | 0.539 | 1.02 |
| Calcium (Ca) | mg/ℓ | --- | --- | --- | --- | --- | --- | 33.9 | 36 | 519 | 521 | 20.7 |
| Magnesium (Mg) | mg/ℓ | < 8 | 8 - 30 | 30 - 70 | > 70 | --- | --- | 13.3 | 15.3 | 28.2 | 52.6 | 18.9 |
| Sodium (Na) | mg/ℓ | < 70 | 70 - 100 | 100 - 150 | > 150 | Aesthetic | ≤ 200 | 24.7 | 51.8 | 2290 | 2749 | 1948 |
| Potassium (K) | mg/ℓ | --- | --- | --- | --- | --- | --- | 7.56 | 12.2 | 83.8 | 84 | 22.9 |
| Aluminium (Al) | mg/ℓ | --- | < 0.3 | 0.3 - 0.5 | > 0.5 | Operational | ≤ 0.3 | 0.085 | 0.084 | <0.003 | <0.003 | 0.228 |
| Iron (Fe) | mg/ℓ | < 0.1 | 0.1 - 0.5 | 0.5 - 1.0 | > 1 | Chronic health | ≤ 2 | <0.004 | <0.004 | 0.103 | 0.22 | 12.9 |
| Manganese (Mn) | mg/ℓ | < 0.2 | 0.2 - 0.5 | 0.5 - 1 | > 1 | Chronic health | ≤ 0.4 | 0.005 | 0.008 | 2.18 | 1.19 | 0.075 |
| Chromium (Cr) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.05 | <0.01 | <0.01 | --- | --- | --- |
| Copper (Cu) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 2 | 0.004 | 0.025 | <0.003 | <0.003 | 0.489 |
| Nickel (Ni) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.07 | <0.007 | <0.007 | 0.26 | 0.175 | 17.2 |
| Zinc (Zn) | mg/ℓ | --- | --- | --- | --- | Aesthetic | ≤ 5 | 0.011 | <0.006 | --- | --- | --- |
| Cobalt (Co) | mg/ℓ | --- | --- | --- | --- | --- | --- | <0.003 | <0.003 | 19 | 15.6 | 1.17 |
| Cadmium (Cd) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.003 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Lead (Pb) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.01 | <0.004 | <0.004 | <0.004 | <0.004 | 0.01 |
| Total Suspended Solids (TSS) | mg/ℓ | < 20 | 20 - 30 | 30 - 55 | > 55 | --- | --- | <4.5 | <4.5 | --- | --- | --- |
| Dissolved Uranium (U) | mg/ℓ | --- | --- | --- | --- | Chronic health | ≤ 0.03 | <0.015 | <0.015 | <0.015 | 1.9 | 0.238 |

Table 3-5: Goldplat monitoring results for BBspruit Upstream

| BBspruit Upstream | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | **Ca** | **Mg** | **Na** | **$SO_4$** | **$NO_3$** | **Cl** | **F** | **Fe** | **Mn** | **$NH_3$** | **$NH_4$** | **pH** | **EC** | **T.Alk** | **TDS** | **TSS** |
| **Blesbokspruit Unacceptable Limit** | **-** | **>70** | **>150** | **>500** | **>6** | **>200** | **>1** | **>1** | **>1** | **-** | **>5** | **<6.5; >8.5** | **>120** | **-** | **-** | **>55** |
| 08/07/2022 | 28.92 | 12.67 | 27 | 24 | 1.23 | 26.4 | 0.08 | 0.201 | <0.01 | 1.2 | - | 7.03 | 372 | 89.5 | 224 | 12 |
| 12/08/2022 | 33.78 | 16.74 | 31 | 72 | 1.69 | 18.4 | 0.22 | 0.009 | 0.017 | 1.07 | - | 8.03 | 412 | 94.5 | 258 | 8 |
| 09/09/2022 | 34.3 | 10.77 | 39 | 65 | 2.9 | 105.6 | 0.43 | 0.388 | 0.05 | 3.93 | - | 7.5 | 458 | 107.9 | 254 | 16 |
| 13/10/2022 | 28.53 | 24.88 | 89 | 50 | 2.94 | 57 | 1.19 | 0.334 | 0.575 | 11.6 | - | 7.22 | 799 | 236.6 | 405 | 31 |
| 18/11/2022 | 21.42 | 14.14 | 17 | 41 | 2.64 | 34.4 | 0.38 | 0.08 | 0.08 | 1.63 | - | 7.58 | 302 | 64.3 | 219 | 16 |
| 16/01/2023 | 23.56 | 15.72 | 15 | 15 | 1.87 | 15.9 | <0.01 | 0.18 | 0.05 | 1.56 | - | 6.91 | 260 | 72.7 | 166 | 11 |
| 16/02/2023 | 31.09 | 8.71 | 14 | 17 | 1.73 | 12.7 | 0.28 | 0.14 | 0.04 | 1.1 | - | 7.19 | 337 | 83.7 | 211 | 16 |
| 16/03/2023 | 26.38 | 8.41 | 19 | 47 | 2.36 | 34.1 | 0.34 | 0.31 | 0.02 | 1.1 | - | 6.62 | 307 | 74.2 | 211 | 4 |
| 21/04/2023 | 27.25 | 13.25 | 23 | 45 | 3.44 | 26.2 | 0.35 | 0.27 | 0.04 | 1.41 | - | 8.13 | 374 | 91.4 | 258 | 4 |
| 26/05/2023 | 28.55 | 15.76 | 26 | 38 | 1.58 | 12 | 0.47 | 0.12 | 0.02 | 1.08 | - | 8.03 | 403 | 93.5 | 268 | 6 |
| 26/06/2023 | 24.77 | 21.1 | 21 | 32 | 2.03 | 8.2 | 0.34 | 0.13 | 0.01 | 1.53 | - | 6.49 | 426 | 94.4 | 296 | 0 |
| 19/07/2023 | 34.99 | 11.89 | 27 | 261 | 2.65 | 92.4 | 0.41 | 0.09 | 0.03 | 1.25 | - | 6.94 | 395 | 93.2 | 275 | 11 |
| 31/08/2023 | 42.97 | 9.85 | 32 | 47 | 3.92 | 106.9 | 0.54 | 0.05 | 0.02 | 1.56 | - | 8.04 | 460 | 104.1 | 317 | 12 |
| 28/09/2023 | 37.8 | 14.16 | 35 | 74 | 3.23 | 39.5 | 0.44 | 0.06 | 0.01 | 1.61 | - | 8.08 | 507 | 117.8 | 349 | 26 |
| 16/10/2023 | 36.56 | 10.46 | 35 | 40 | 2.83 | 39 | 0.95 | 0.16 | 0.03 | 1.57 | - | 8.4 | 502 | 128.4 | 483 | 4 |
| 10/11/2023 | 30.25 | 8.08 | 24 | 27 | 3.15 | 37.6 | 0.47 | 0.01 | 0.01 | 1.33 | - | 6.9 | 363 | 98.1 | 275 | 10 |
| 18/12/2023 | 24.44 | 9.63 | 25 | 22 | 6.67 | 38.9 | 0.39 | 0.03 | <0.01 | 4.76 | - | 8.35 | 365 | 101.6 | 247 | 9 |
| 22/01/2024 | 21.78 | 6.07 | 23 | 26 | 1.91 | 28.5 | 0.04 | 0.16 | <0.01 | 8.29 | - | 7.02 | 383 | 117.4 | 282 | 19 |
| 27/02/2024 | 20.8 | 9.4 | 23 | 40 | 2.66 | 22.8 | 0.36 | 0.18 | 0.17 | 5.67 | - | 6.72 | 319 | 96.3 | 251 | 15 |
| 18/03/2024 | 11.8 | 18.73 | 36 | 28 | 4.43 | 44.4 | 0.37 | 0.57 | 0.16 | 18.69 | - | 6.65 | 499 | 165 | 354 | 24 |
| 17/04/2024 | - | - | - | - | 2.86 | - | - | - | - | 5.59 | 5.92 | 6.41 | 345 | 92.6 | - | 14 |
| 21/05/2024 | - | - | - | - | 7.16 | - | - | - | - | 15.25 | 0 | 6.49 | 0.513 | 172.1 | - | 49 |
| 18/06/2024 | - | - | - | - | 2.67 | - | - | - | - | 23.1 | 108.57 | 6.69 | 0.582 | 184.1 | - | 45 |
| 15/07/2024 | - | - | - | - | 2.26 | - | - | - | - | 23 | 0 | 6.3 | 0.615 | 202.5 | - | 49 |
| 19/08/2024 | - | - | - | - | 1.41 | - | - | - | - | 26.73 | 125.62 | 6.7 | 0.596 | 186.8 | - | 94 |
| 04/09/2024 | - | - | - | - | 3.35 | - | - | - | - | 3.99 | 22.8 | 6.3 | 0.44 | 107.4 | - | 11 |
| 15/10/2024 | - | - | - | - | 2.57 | - | - | - | - | 42.06 | 197.69 | 6.68 | 0.68 | 229.6 | - | 212 |
| 15/11/2024 | - | - | - | - | 1.29 | - | - | - | - | 1.78 | 8.34 | 6.63 | 0.53 | 150 | - | 24 |
| 05/12/2024 | - | - | - | - | 2.25 | - | - | - | - | 49.86 | 234.32 | 6.62 | 0.8 | 280.6 | - | 346 |
| 22/01/2025 | - | - | - | - | 2.58 | - | - | - | - | 2.8 | 16 | 7.84 | 0.28 | 80.9 | - | 28 |
| 27/02/2025 | - | - | - | - | 2.17 | - | - | - | - | 1.62 | 7.6 | 6.12 | 0.24 | 61.4 | - | 7 |
| 18/03/2025 | - | - | - | - | 1.67 | - | - | - | - | 1.18 | 5.54 | 6.19 | 0.27 | 70.29 | - | 7 |
| 15/04/2025 | - | - | - | - | 1.25 | - | - | - | - | 1.58 | 7.43 | 7.63 | 0.29 | 75.3 | - | 2 |
| 20/05/2025 | - | - | - | - | 1.83 | - | - | - | - | 1.82 | 8.57 | 5.77 | 0.3 | 74.4 | - | 12 |
| 20/06/2025 | - | - | - | - | 2.23 | - | - | - | - | 2.78 | 13.09 | 6.51 | 0.38 | 90.2 | - | 6 |
| 18/07/2025 | - | - | - | - | 2.12 | - | - | - | - | 2.57 | 12.06 | 8.55 | 0.39 | 91.9 | - | 7 |
| 22/08/2025 | - | - | - | - | 2.69 | - | - | - | - | 21.32 | 100.19 | 7.61 | 0.4 | 91.3 | - | 1 |
| 19/09/2025 | - | - | - | - | 2.94 | - | - | - | - | 2.72 | 12.8 | 8.44 | 0.53 | 129.2 | - | 0 |
| 29/10/2025 | - | - | - | - | 3.02 | - | - | - | - | 4.75 | 22.35 | 7.99 | 0.504 | 132.8 | - | 18 |
| 15/11/2025 | - | - | - | - | 3.04 | - | - | - | - | 2.41 | 11.32 | 7.62 | 0.52 | 166 | - | 8 |
| 03/12/2025 | - | - | - | - | 1.38 | - | - | - | - | 1.67 | 7.83 | 7.58 | 0.44 | 129.5 | - | 10 |
| 28/01/2026 | - | - | - | - | 3.65 | - | - | - | - | 5.54 | 26.06 | 10.38 | 0.4 | 121.3 | - | 24 |
| 23/02/2026 | - | - | - | - | 2.14 | - | - | - | - | 2.42 | 11.37 | 8 | 0.26 | 80.6 | - | 7 |
| 24/03/2026 | - | - | - | - | 3.02 | - | - | - | - | 2.37 | 11.14 | 6.5 | 0.24 | 68.75 | - | 4 |
| 21/04/2026 | - | - | - | - | 3.12 | - | - | - | - | 3.17 | 14.92 | 6.39 | 0.29 | 197 | - | 6 |

Table 3-6: Goldplat monitoring results for BBspruit Downstream

| BBspruit Downstream | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | **Ca** | **Mg** | **Na** | **SO4** | **$NO_3$** | **Cl** | **F** | **Fe** | **Mn** | **$NH_3$** | **$NH_4$** | **pH** | **EC** | **T.Alk** | **TDS** | **TSS** |
| **Blesbokspruit Unacceptable Limit** | **-** | **>70** | **>150** | **>500** | **>6** | **>200** | **>1** | **>1** | **>1** | **-** | **>5** | **<6.5; >8.5** | **>120** | **-** | **-** | **>55** |
| 08/07/2022 | 43.08 | 12.93 | 45 | 46 | 2.15 | 36.1 | 0.21 | 0.099 | 0.004 | 1.15 | - | 6.93 | 497 | 109.5 | 310 | 171 |
| 12/08/2022 | 54.14 | 7.45 | 53 | 74 | 1.29 | 34 | 0.24 | 0.165 | 0.018 | 3.032 | - | 7.15 | 531 | 120.3 | 353 | 24 |
| 09/09/2022 | 33 | 18.32 | 59 | 53 | 2.69 | 86.4 | 0.12 | 0.137 | 0.07 | 29.78 | - | 7 | 538 | 138.4 | 253 | 15 |
| 13/10/2022 | 37.87 | 32.14 | 71 | 32 | 2.4 | 42.7 | 1.43 | 0.212 | 0.799 | 1.39 | - | 7.26 | 611 | 199.8 | 360 | 7 |
| 18/11/2022 | 28.01 | 17.08 | 26 | 41 | 2.8 | 19.9 | 0.23 | 0.03 | 0.04 | 1.4 | - | 6.82 | 343 | 87.6 | 280 | 19 |
| 16/01/2023 | 26.53 | 17.7 | 22 | 19 | 2.19 | 18.8 | 0.06 | 0.08 | 0.08 | 1.25 | - | 6.94 | 311 | 85.1 | 319 | 5 |
| 16/02/2023 | 28.87 | 4.03 | 21 | 18 | 1.73 | 11.7 | 0.25 | 0.16 | 0.04 | 1.26 | - | 7.16 | 311 | 83.3 | 233 | 9 |
| 16/03/2023 | 35.99 | 6.41 | 32 | 28 | 3.11 | 24.8 | 0.28 | 0.01 | 0.02 | 2.04 | - | 7.04 | 385 | 108.5 | 265 | 4 |
| 21/04/2023 | 30.14 | 17.26 | 38 | 51 | 3.44 | 27.1 | 0.28 | 0.06 | 0.06 | 2.5 | - | 7.06 | 469 | 110.5 | 323 | 4 |
| 26/05/2023 | 34.37 | 6.18 | 38 | 48 | 2.85 | 12 | 0.43 | 0.05 | 0.02 | 1.5 | - | 6.4 | 428 | 98.7 | 305 | 6 |
| 26/06/2023 | 32.97 | 19.08 | 42 | 49 | 3.12 | 22.1 | 0.41 | 0.06 | 0.03 | 1.7 | - | 6.35 | 507 | 98.7 | 351 | 0 |
| 19/07/2023 | 33.14 | 67.77 | 48 | 319 | 4.29 | 92.7 | 0.4 | 0.02 | 0.02 | 7.96 | - | 6.39 | 510 | 98.4 | 351 | 13 |
| 31/08/2023 | 44.64 | 22.17 | 60 | 38 | 2.98 | 28 | 0.36 | 0.02 | 0.01 | 1.58 | - | 7.56 | 602 | 153.9 | 415 | 17 |
| 28/09/2023 | 38.03 | 14.08 | 75 | 80 | 2.99 | 54.1 | 0.33 | <0.01 | 0.03 | 2.28 | - | 7.02 | 673 | 179.9 | 466 | 20 |
| 16/10/2023 | 32.46 | 18.87 | 67 | 18 | 2.83 | 45.8 | 0.87 | 0.1 | 0.26 | 2.13 | - | 7.26 | 595 | 183.8 | 513 | 8 |
| 10/11/2023 | 37.71 | 8.11 | 34 | 43 | 2.83 | 33.9 | 0.54 | <0.01 | 0.02 | 0.78 | - | 6.92 | 447 | 99.3 | 329 | 8 |
| 18/12/2023 | 27.21 | 0.04 | 46 | 13 | 7.14 | 57.7 | 0.39 | <0.01 | <0.01 | 7.94 | - | 8.3 | 497 | 145.8 | 345 | 16 |
| 22/01/2024 | 21.33 | 6.98 | 27 | 24 | 2.71 | 26.4 | 0.04 | 0.07 | <0.01 | 3.03 | - | 6.94 | 346 | 98.4 | 265 | 11 |
| 27/02/2024 | 25.46 | 10.45 | 29 | 38 | 2.97 | 25.9 | 0.48 | 0.02 | 0.21 | 8.15 | - | 7.3 | 397 | 126.4 | 277 | 9 |
| 18/03/2024 | 35.29 | 12 | 48 | 15 | 3.28 | 53.2 | 0.56 | 0.08 | 0.02 | 14.88 | - | 7.23 | 513 | 177.1 | 380 | 6 |
| 17/04/2024 | - | - | - | - | 3.01 | - | - | - | - | 8.3 | 8.8 | 6.21 | 466 | 149.3 | - | 8 |
| 21/05/2024 | - | - | - | - | 1.24 | - | - | - | - | 9.22 | 0 | 6.5 | | 170.9 | - | 10 |
| 18/06/2024 | - | - | - | - | 2.86 | - | - | - | - | 18.93 | 0 | 7.61 | | 200.8 | - | 7 |
| 15/07/2024 | - | - | - | - | 3.56 | - | - | - | - | 18.14 | 0 | 6.94 | 0.652 | 201.4 | - | 10 |
| 19/08/2024 | - | - | - | - | 2.19 | - | - | - | - | 24.08 | 113.16 | 7.04 | 0.671 | 218.8 | - | 9 |
| 04/09/2024 | - | - | - | - | 3.03 | - | - | - | - | 17.86 | 102.07 | 6.5 | 0.63 | 167.8 | - | 6 |
| 15/10/2024 | - | - | - | - | 5.95 | - | - | - | - | 6.26 | 29.43 | 6.74 | 0.65 | 157 | - | 14 |
| 15/11/2024 | - | - | - | - | 2.44 | - | - | - | - | 16.57 | 77.9 | 7.1 | 0.65 | 204.2 | - | 7 |
| 05/12/2024 | - | - | - | - | 2.89 | - | - | - | - | 11.43 | 53.72 | 7.25 | 0.67 | 184.8 | - | 4 |
| 22/01/2025 | - | - | - | - | 3.28 | - | - | - | - | 3.5 | 20 | 8 | 0.33 | 93.2 | - | 9 |
| 27/02/2025 | - | - | - | - | 2.37 | - | - | - | - | 2.23 | 10.46 | 6.36 | 0.31 | 80.2 | - | 8 |
| 18/03/2025 | - | - | - | - | 2.33 | - | - | - | - | 1.82 | 8.57 | 6.24 | 0.36 | 74.3 | - | 5 |
| 15/04/2025 | - | - | - | - | 2 | - | - | - | - | 2.38 | 11.2 | 7.41 | 0.38 | 87.1 | - | <0.01 |
| 20/05/2025 | - | - | - | - | 2 | - | - | - | - | 1.82 | 8.57 | 6.09 | 0.51 | 86.9 | - | 7 |
| 20/06/2025 | - | - | - | - | 4.57 | - | - | - | - | 5.56 | 26.212 | 6.29 | 0.53 | 98 | - | 4 |
| 18/07/2025 | - | - | - | - | 2.12 | - | - | - | - | 1.84 | 8.63 | 7.99 | 0.55 | 100.8 | - | 12 |
| 22/08/2025 | - | - | - | - | 3.51 | - | - | - | - | 22.74 | 106.87 | 7.46 | 0.55 | 99.4 | - | 1 |
| 19/09/2025 | - | - | - | - | 3.63 | - | - | - | - | 5.95 | 27.95 | 7.7 | 0.58 | 169.2 | - | 0 |
| 29/10/2025 | - | - | - | - | 3.3 | - | - | - | - | 2.89 | 13.6 | 7.91 | 0.561 | 154 | - | 5 |
| 15/11/2025 | - | - | - | - | 2.28 | - | - | - | - | 1.95 | 9.14 | 7.57 | 0.51 | 172 | - | 2 |
| 03/12/2025 | - | - | - | - | 1.98 | - | - | - | - | 3.42 | 16.06 | 7.68 | 0.49 | 137.2 | - | 7 |
| 28/01/2026 | - | - | - | - | 2.43 | - | - | - | - | 2.59 | 12.17 | 7.7 | 3.97 | 125.1 | - | 12 |
| 23/02/2026 | - | - | - | - | 3.36 | - | - | - | - | 3.62 | 17.03 | 7.94 | 1.02 | 122 | - | 24 |
| 24/03/2026 | - | - | - | - | 2.67 | - | - | - | - | 2.97 | 13.95 | 6.65 | 0.25 | 72.56 | - | 4 |
| 21/04/2026 | - | - | - | - | 3.12 | - | - | - | - | 2.41 | 11.32 | 6.7 | 0.33 | 145 | - | <0.01 |

Table 3-7: Goldplat monitoring results for RWD

| RWD | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sampling Date** | **Ca** | **Mg** | **Na** | **$SO_4$** | **$NO_3$** | **Cl** | **F** | **Fe** | **Mn** | **$NH_3$** | **$NH_4$** | **pH** | **EC** | **T.Alk** | **TDS** |
| **Blesbokspruit Unacceptable Limit** | **-** | **>70** | **>150** | **>500** | **>6** | **>200** | **>1** | **>1** | **>1** | **-** | **>5** | **<6.5; >8.5** | **>120** | **-** | **-** |
| 08/07/2022 | 151.2 | 32.9 | 1170 | 1104 | 6.91 | 576.73 | 1.11 | 3 | 0.082 | 40.94 | - | 8.87 | 5410 | 323 | 4039 |
| 12/08/2022 | 72.36 | 27.94 | 1620 | 1123 | 6.65 | 829.55 | 3.11 | 12.49 | 0.217 | 43.57 | - | 8.5 | 7120 | 274.1 | 5461 |
| 09/09/2022 | 10.49 | 1.4 | 2400 | 1887 | 10.13 | 1154.92 | 0.69 | 90.5 | 0.036 | 1.24 | - | 10.18 | 1020 | 1643.9 | 8170 |
| 13/10/2022 | 88.72 | 1.33 | 1390 | 1537 | 6.15 | 867.06 | 1.62 | 20.38 | 0.107 | 31.84 | - | 8.99 | 6540 | 224.6 | 5028 |
| 18/11/2022 | 117.86 | 24.25 | 470 | 649 | 3.73 | 218.08 | 0.85 | 1.02 | 0.05 | 19.29 | - | 8.64 | 2950 | 145.4 | 1630 |
| 16/01/2023 | 77.06 | 64.93 | 730 | 1054 | 3.29 | 665.6 | 0.8 | 0.78 | 0.06 | 26.06 | - | 8.55 | 4290 | 237.5 | 3406 |
| 16/02/2023 | 69.2 | 512.45 | 930 | 951 | 3.28 | 371.17 | 0.99 | 2.37 | 0.03 | 24.5 | - | 8.75 | 4550 | 262.9 | 2486 |
| 16/03/2023 | 95.42 | 450.63 | 1090 | 1269 | 18.5 | 246.6 | 1.58 | 0.87 | 0.01 | 33.45 | - | 8.68 | 3356 | 281.1 | 2345 |
| 21/04/2023 | 98.84 | 254.75 | 1170 | 1559 | 4.69 | 245.4 | 1.64 | 1.74 | 0.02 | 41.88 | - | 8.95 | 4134 | 384.1 | 2876 |
| 26/05/2023 | 30.98 | 43.44 | 1270 | 1211 | 3.64 | 240 | 0.71 | 0.75 | 0.41 | 33.69 | - | 9.01 | 5960 | 424 | 3454 |
| 26/06/2023 | 15.44 | 25.35 | 1650 | 652 | 4.34 | 182.2 | 1.53 | 4.29 | 0.03 | 29.3 | - | 9.41 | 5413 | 690.6 | 373 |
| 19/07/2023 | 48.06 | 10.38 | 1600 | 1251 | 5.93 | 221.74 | 1.66 | 9.22 | 0.03 | 31.53 | - | 9.18 | 5514 | 426.8 | 3851 |
| 31/08/2023 | 11.28 | 11.42 | 1800 | 1375 | 8.15 | 523.4 | 1.24 | 11.25 | 0.05 | 38.88 | - | 9.23 | 6394 | 157.9 | 4435 |
| 28/09/2023 | 127.5 | 194.97 | 2000 | 1955 | 4.88 | 1261.2 | 1.73 | 0.78 | 0.02 | 58.97 | - | 8.62 | 5988 | 469 | 4131 |
| 16/10/2023 | 17.62 | 215.48 | 2100 | 1993 | 7.64 | 1844.8 | 1.31 | 34.3 | 0.04 | 44.33 | - | 9.06 | 7680 | 592.6 | 5159 |
| 10/11/2023 | 198.2 | 45.96 | 980 | 1440 | 3.3 | 607.8 | 1.49 | 0.48 | 0.04 | 40.73 | - | 8.39 | 5590 | 193.7 | 2964 |
| 18/12/2023 | 251.3 | 918.72 | 1210 | 1619 | 8.1 | 1415.8 | 2.15 | 0.06 | 0.01 | 47.94 | - | 8.53 | 4702 | 296.4 | 3314 |
| 22/01/2024 | 236.71 | 54.61 | 1100 | 1830 | 5.42 | 867.4 | 1.46 | 0.13 | 0.04 | 40.04 | - | 8.39 | 6090 | 241.3 | 3081 |
| 27/02/2024 | 194.57 | 495.74 | 2180 | 1748 | 10.33 | 1758.8 | 1.46 | 26.4 | <0.01 | 51.77 | - | 10.45 | 8910 | 1530.8 | 5929 |
| 18/03/2024 | 154.85 | 25.86 | 1660 | 1409 | 5.11 | 1209.2 | 1.72 | 0.32 | 0.01 | 70.48 | - | 8.49 | 8090 | 303.3 | 4131 |
| 17/04/2024 | 212.2 | 256.06 | 840 | 1163 | 4.6 | 424.8 | - | - | - | 39.65 | 41.98 | 8.7 | 3890 | 191.7 | - |
| 21/05/2024 | 97.32 | 38.7 | 1690 | 1358 | 2.78 | 1759.1 | - | - | - | 70.28 | 0 | 8.44 | 6.059 | 247.2 | - |
| 18/06/2024 | 391.83 | 807.43 | 1480 | 1787 | 8.34 | 1334.5 | - | - | - | 31.44 | 147.77 | 8.76 | 5.631 | 288.4 | - |
| 15/07/2024 | 519.44 | 68.72 | 1240 | 1766 | 6.15 | 1548.1 | - | - | - | 25.43 | 0 | 8.27 | 4.972 | 222.9 | - |
| 19/08/2024 | 464.62 | 29.86 | 1910 | 2508 | 7.55 | 2663.4 | - | - | - | 3.04 | 14.29 | 8.32 | 6.851 | 311.7 | - |
| 04/09/2024 | 247.2 | 178.43 | 1550 | 2121 | 10.65 | 3655 | - | - | - | 31.17 | 178.14 | 8.27 | 8.41 | 223.3 | - |
| 15/10/2024 | 550.4 | 11.12 | 1450 | 2150 | 12.88 | 76.68 | - | - | - | 45.82 | 215.35 | 8.07 | 8.23 | 209.6 | - |
| 15/11/2024 | 392.34 | 77.74 | 113 | 1670 | 9.08 | 1249.5 | - | - | - | 33.04 | 155.28 | 8.1 | 6.84 | 184.2 | - |
| 05/12/2024 | 182.16 | 119.73 | 1540 | 2281 | 8.04 | 1146.2 | - | - | - | 71.16 | 334.45 | 8.2 | 9.32 | 265.1 | - |
| 22/01/2025 | 370.46 | 564.28 | 800 | 884 | 9.21 | 284 | - | - | - | 35 | 20 | 8.36 | 4.56 | 181.7 | - |
| 27/02/2025 | 374.51 | 37.78 | 680 | 1443 | 4.63 | 285.8 | - | - | - | 51.94 | 244.1 | 8.33 | 3.95 | 197.7 | - |
| 18/03/2025 | 479.21 | 20.83 | 570 | 1368 | 4.33 | 263.1 | - | - | - | 51.08 | 240.1 | 8.48 | 3.79 | 140.7 | - |
| 15/04/2025 | 464.4 | 500.67 | 620 | 1609 | 4.47 | 320.8 | - | - | - | 60.22 | 283.02 | 8.9 | 4.25 | 175.5 | - |
| 20/05/2025 | 426.44 | 77.09 | 700 | 1446 | 5.64 | 332.2 | - | - | - | 62.65 | 294.45 | 8.28 | 4.58 | 191.3 | - |
| 20/06/2025 | 241.76 | 131.19 | 1190 | 1719 | 9.72 | 1709 | - | - | - | 83.34 | 391.72 | 8.2 | 6.03 | 203.7 | - |
| 18/07/2025 | 415.26 | 51.01 | 1430 | 1871 | 6.32 | 1337.6 | - | - | - | 82.98 | 390.01 | 8.72 | 6.45 | 215.4 | - |
| 22/08/2025 | 250.48 | 73.68 | 1470 | 1878 | 6.47 | 2770.3 | - | - | - | 120.85 | 567.98 | 8.53 | 6.12 | 167.6 | - |
| 19/09/2025 | 547.12 | 45.79 | 1630 | 2024 | 10.29 | 1753.4 | - | - | - | 80.55 | 378.57 | 8.28 | 9.21 | 249.7 | - |
| 29/10/2025 | 377.49 | 98.83 | 1420 | 1857 | 13.7 | 1630.5 | - | - | - | 92.37 | 434.13 | 8.88 | 8.35 | 321.29 | - |
| 15/11/2025 | 312.26 | 106.78 | 1170 | 1595 | 8.66 | 766.3 | - | - | - | 77.36 | 363.6 | 8.76 | 5.54 | 318 | - |
| 03/12/2025 | 287.74 | 49.44 | 1240 | 1697 | 5.85 | 811.6 | - | - | - | 84.44 | 396.86 | 8.82 | 5.9 | 302.4 | - |
| 28/01/2026 | 407.9 | 77.53 | 1250 | 1732 | 6.24 | 962.3 | - | - | - | 78.37 | 368.34 | 8.63 | 7.14 | 254.6 | - |
| 23/02/2026 | 300 | 396 | 1150 | 1681 | 4.86 | 842.6 | - | - | - | 88.76 | 417.15 | 8 | 7.18 | 198.7 | - |
| 24/03/2026 | 20.42 | 30.81 | 15 | 20 | 2.9 | 19.5 | - | - | - | 10.82 | 50.87 | 6.72 | 0.27 | 81.85 | - |
| 21/04/2026 | 92 | 472 | 1130 | 1284 | 6.54 | 4137.8 | - | - | - | 76.06 | 357.49 | 8.08 | 6.81 | 385 | - |

# 4 CONCEPTUAL STORMWATER MANAGEMENT PLAN

The purpose of the conceptual Stormwater Management Plan (SWMP) is to ensure that clean and dirty water are adequately separated by diverting clean water away from dirty areas and ensuring that dirty water from the operation is captured, contained, and managed appropriately in accordance with GN R704 regulations and the DWS BPG G1: Storm Water Management.

## 4.1 Terminology

The following definitions are relevant to the SWMP:

- **Activity:** Any mining-related process on the mine including the operation of washing plants, mineral processing facilities, mineral refineries and extraction plants; the operation and the use of mineral loading and off-loading zones, transport facilities and mineral storage yards, whether situated at the mine or not; in which any substance is stockpiled, stored, accumulated, dumped, disposed of or transported;
- **Clean area:** This refers to any area at or near a mine or activity, which is not impacted by mining activities, but has the potential to become contaminated if not managed appropriately;
- **Clean water system:** This includes any dam, other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of clean unpolluted water;
- **Dam:** This includes any return water dam, settling dam, tailings dam, evaporation dam, catchment or barrier dam and any other form of impoundment used for the storage of unpolluted water or water containing waste (i.e. contains polluted water);
- **Dirty area:** This refers to any area at a mine or activity which causes, has caused or is likely to cause pollution of a water resource (i.e. generate polluted water);
- **Dirty water system:** This includes any dam, other form of impoundment, canal, works, pipeline, residue deposit and any other structure or facility constructed for the retention or conveyance of water containing waste; and
- **Watercourse:** This is defined in the NWA as -
  - 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.

## 4.2 Design Philosophy

The following design philosophy was adopted to guide the development of the SWMP, and is based on GN R704 and the DWS Best Practice Guideline (BPG) G1: Storm Water Management:

- Confine or divert any unpolluted water to a clean water system, away from a dirty area;
- Runoff from dirty areas must be captured, contained and managed appropriately;
- Clean and dirty water systems must be designed and constructed to prevent cross-contamination;
- Dirty water must, as far as possible, be recycled and reused;
- Clean and dirty water systems must convey/contain runoff from the 1:50 year storm event, and should not lie within the 100-year floodline or within a horizontal distance of 100 m from any watercourse, whichever is the greater of the two; and
- Appropriate maintenance and management of stormwater-related infrastructure should be ensured at all times.

## 4.3 Assumptions and Limitations

The following are assumptions and limitations for the conceptual SWMP:

- The working area i.e., the active area at the stock dams where hydraulic reclamation is taking place, was estimated to be 5% of the stock dams footprint area at any time and would be the only area contributing runoff to the slurry collection sump, as the remaining area would be sectioned off into paddock compartments to contain runoff, as described under section 4.6.2; and
- The SWMP is conceptual. A detailed SWMP should be designed based on the concept design prior to construction.

## 4.4 Clean and Dirty Areas

Dirty areas include the entire footprint area of the stock dams, the slurry pumpstation and the catchment paddock.

The areas surrounding the stock dams are also dirty areas managed by Goldplat.

## 4.5 Existing Stormwater Measures

According to Goldplat, runoff and seepage from the stock dams report to the RWD. Pumps are located in low-lying areas on the western and north-western side of the stock dams to pump any accumulation of water in those areas to the plant for use as process water.

## 4.6 Proposed Stormwater Measures

The proposed SWMP is indicated on Figure 4-1. The SWMP has been designed as a closed system (i.e. no discharge of dirty water runoff to the surrounding environment). Stormwater measures proposed to separate clean and dirty water areas are discussed below.

### 4.6.1 Berms

A berm is proposed to be constructed around the stock dams. The berm will ensure that the stock dams dirty footprint area is contained and that no runoff reports to the surrounding environment. The berm will further ensure that all surrounding runoff is diverted away from the stock dams. It is further proposed that a berm is constructed around the slurry pumpstation and catchment paddock to ensure that any spills or overflows will be contained. The proposed berms should be vegetated with natural grass species.

### 4.6.2 Stock Dam Paddocks

It is proposed that the stock dam's footprint area is sectioned off into compartments referred to as paddocks. The paddocks will ensure that dirty runoff from the stock dams is contained within the dirty footprint area at the site. The paddock walls should be constructed to be no less than 1.5 m in height, which is higher than the 1:50-year storm event depth, including the depth of an average year of rainfall. It should, as far as possible, be ensured that the floor of the paddocks is flat, or shaped inwards towards the centre of the paddock compartment. This will ensure that water does not congregate along the downslope wall of the paddock, which could lead to overflows.

### 4.6.3 Slurry Sump

All slurry generated from hydraulic reclamation will report to the slurry sump before entering the slurry pipeline to the pumpstation. The slurry sump has been sized under section 5.7 to contain runoff from the wet-scenario water balance, including runoff from the 1:50-year, 24-hour storm event from the working area. The slurry pipeline to the pumpstation will be fitted with a valve which can be closed during high rainfall events (as well as during maintenance), to ensure that all stormwater is contained on top of the stock dams.

### 4.6.4 Catchment Paddock

A lined catchment paddock will be constructed adjacent to the slurry pumpstation. The purpose of the catchment paddock is to contain any spills from the slurry pumpstation, as well as if maintenance needs to be done. As discussed above, under high rainfall events, stormwater will be managed within the stock dam's footprint area and will not report to the pumpstation. The catchment paddock should therefore be sized to contain the slurry in the pipeline from the slurry sump to the pumpstation, the volume of slurry at any given time at the pumpstation, as well as the 1:50-year 24-hour runoff from the pumpstation. Based on these parameters, the conceptual estimated size of the catchment paddock should be 1 162 $m^3$ and is provided in Table 4-1.

Table 4-1: Conceptual sizing of the catchment paddock

| Parameter | Volume ($m^3$) |
|---|---|
| Rainfall onto catchment paddock (1:50 year, 24-hour storm event) | 72.6 |
| Runoff from slurry pumpstation (1:50 year, 24-hour storm event) | 82 |
| Slurry in pipeline between slurry sump and pumpstation | 7 |
| Slurry in tanks at pumpstation (assumed) | 1 000 |
| **Total** | **1 162** |

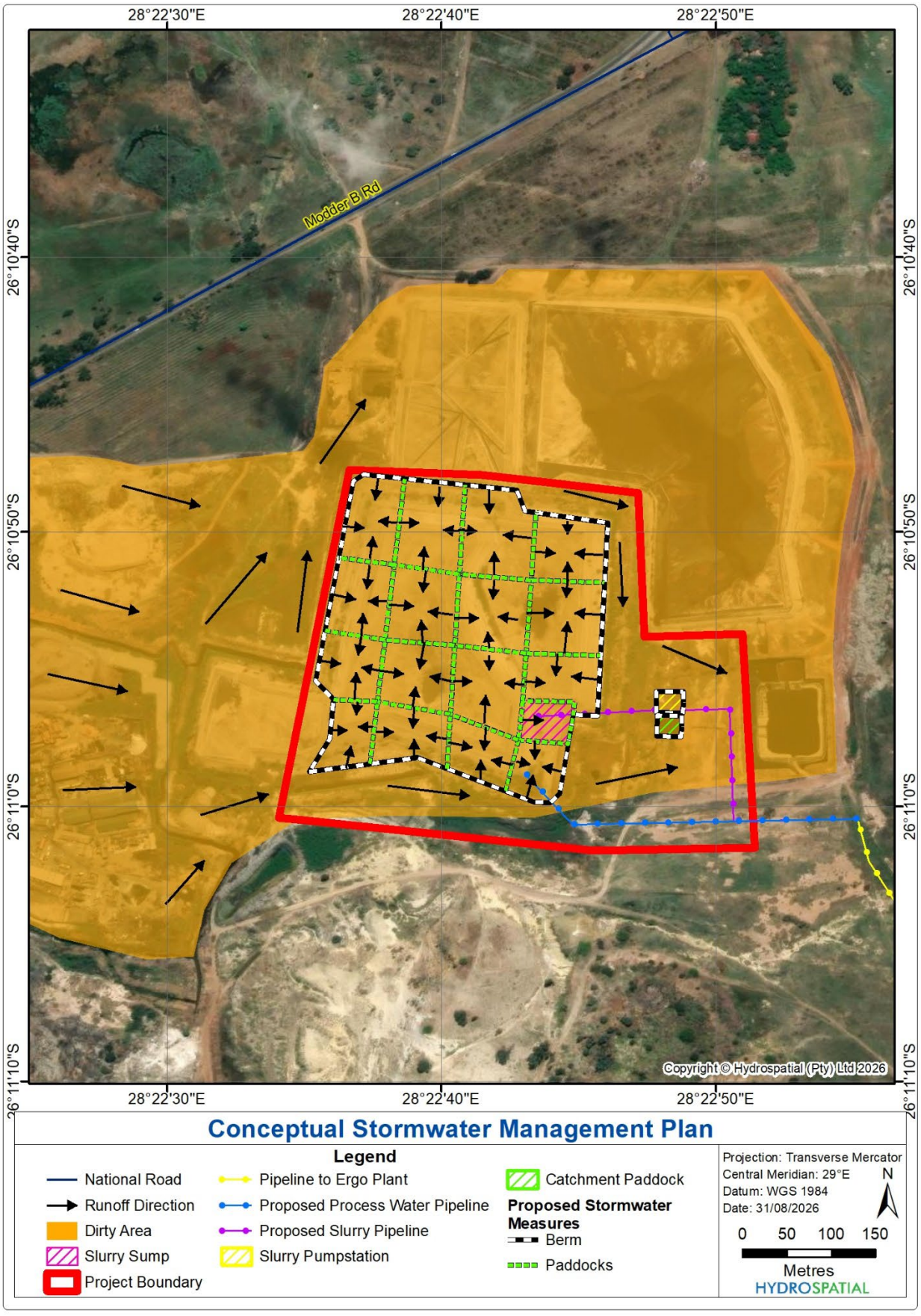


Figure 4-1: Proposed conceptual stormwater management plan

## 4.7 Recommendations

The following is recommended:

- The proposed SWMP is continuously revised as mining progresses, to ensure compliance with GN R704 regulations, which will prevent any unnecessary spills;
- The proposed SWMP is implemented prior to the commencement of mining; and
- The proposed stormwater measures are monitored and maintained on a continuous basis, as per section 7.2.

# 5 WATER BALANCE

A monthly water balance was setup in Microsoft Excel spreadsheet format, to estimate the volumes of water in the reclamation circuit. The water balance has been setup to simulate the average yearly, average dry, and average wet season volumes. This section details the water balance, which has been prepared in accordance with the Best Practice Guideline G2: Water and Salt Balances.

## 5.1 Objectives

The objectives of the water balance included the following:

- Estimate the monthly water requirements for hydraulic reclamation;
- Estimate the monthly runoff volumes from the working or active area of the stock dams;
- Estimate the monthly volumes of water that would be pumped to the plant; and
- Estimate the required storage capacities of the slurry collection sump.

## 5.2 Water Balance Components

The water balance components include the following:

- Water inflows include:
  - Runoff from rainfall from the working area;
  - Runoff from the high-pressure water cannons/monitors; and
  - Potable water supply from municipal sources.
- Water losses include:
  - Evaporation and seepage; and
  - Water in slurry pumped to the plant.

## 5.3 Hydraulic Reclamation Water Requirements

According to the project description provided by Kongiwe, 50 000 tons/month of slurry will be pumped to the Ergo Plant. Assuming that 1 $m^3$ of water is required to reclaim 1 ton of the stock dam's material, and factoring in assumed water losses (evaporation, seepage and

ponding) of approximately 20% that occur during hydraulic reclamation, then an estimated 62 500 $m^3$/month of water will be required.

## 5.4 Assumptions and Limitations

The water balance is based on the following assumptions:

- Calculations are based on the values, assumptions, and data sources in Table 5-1;
- The working area, i.e. the active area at the stock dams where hydraulic reclamation is taking place, was estimated to be 5% of the stock dams footprint area. It is assumed that the SWMP will be implemented and that the remaining area of the dump will therefore not contribute runoff to the slurry collection sump;
- Estimated runoff coefficients were fixed for all months of the year;
- It has been assumed that 80% of the monthly water used for hydraulic reclamation would run off as slurry and that 20% would be lost (evaporation, ponding and seepage);
- It has been assumed that 50% of the average monthly rainfall will run off to the slurry sump;
- The wet season scenario is the average volumes for the three wettest months (November, December and January), whilst the dry season scenario is the average volumes for the three driest months (June, July and August). The average yearly scenario is the average volumes over a 12-month period;
- Potable water will be sourced from the current Goldplat plant and was therefore not included in the water balance calculations;
- No water is needed for sanitation purposes as chemical toilets will be used; and
- Any dust suppression requirements were not included in the water balance calculations.

## 5.5 Input Parameters

The parameters and assumptions/sources used in the water balance calculations are provided in Table 5-1.

Table 5-1: Parameters and assumptions/sources used in the water balance calculations

| Parameter | Value | Units | Assumption/Source |
|---|---|---|---|
| Stock dams area | 84 731 | m² | Dirty area of dump measured from proposed SWMP |
| Stock dams working area | 4 237 | m² | Assumed to be 5% of dirty area |
| Slurry collection sump area | 2 369 | m² | Assumed |
| Working area rainfall-runoff coefficient | 0.5 | - | Assumed 50% of monthly rainfall runs off from the dirty areas to slurry sump |

| Parameter | Value | Units | Assumption/Source |
|---|---|---|---|
| Reclamation water runoff coefficient | 0.8 | - | Assumed 80% of water used for reclamation runs off as slurry. 20% losses |
| Slurry pumped to Ergo Plant | 50 000 | tons/month | Project description provided by Kongiwe |
| Monthly water volume required for hydraulic reclamation | 62 500 | $m^3$/month | Calculated based on 1$m^3$ of water required to reclaim 1 ton of tailings material |

## 5.6 Water Balance Results

The average yearly, average wet-season, and average dry-season scenario water balance for the Goldplat stock dams is indicated in Figure 5-1.

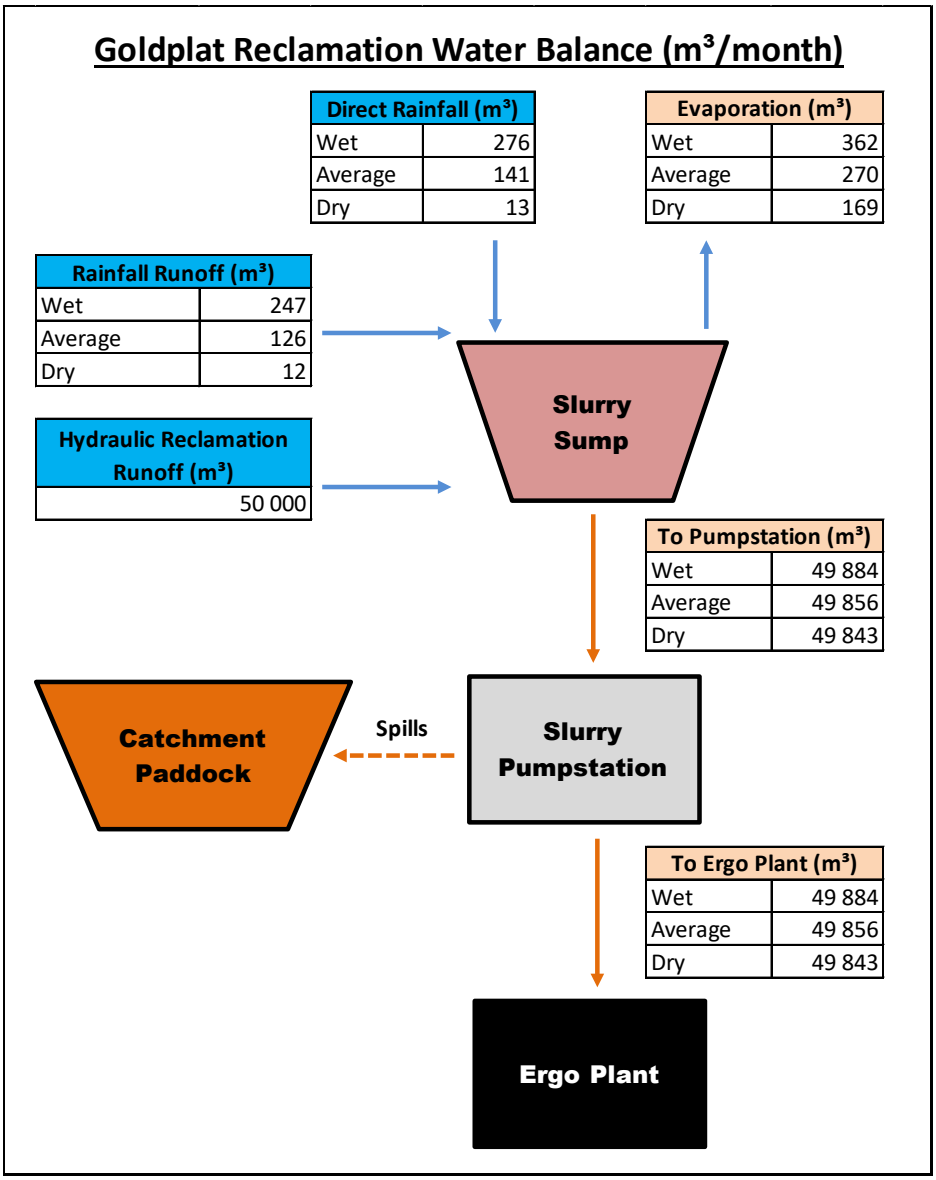


Figure 5-1: Monthly water balance for the reclamation of the stock dams

## 5.7 Slurry Collection Sump Size

The slurry collection sump was sized to contain runoff from the wet-scenario water balance, including runoff from the 1:50-year, 24-hour storm event from the working area. The 1:50-year runoff was calculated using the SCS method. The proposed conceptual sump dimensions are provided in Table 5-2.

Table 5-2: Proposed slurry collection sump size

| Storage Capacity ($m^3$) | Surface Area ($m^2$) | Depth (m) |
|---|---|---|
| 2 004 | 2 369 | 0.85 |

# 6 SURFACE WATER IMPACT ASSESSMENT

## 6.1 Project Activities Assessed

The following key activities are likely to occur during the different phases of the project, and are assessed in the impact assessment:

### 6.1.1 Construction Phase

- Site clearance and the construction of minor infrastructure.

### 6.1.2 Operational Phase

- Hydraulic reclamation activities.

### 6.1.3 Closure and Rehabilitation Phase

- Rehabilitation activities.

## 6.2 Methodology

The impact significance rating process serves to highlight the critical impacts requiring consideration in the management and approval process. The impact significance rating system is presented in Table 6-1, Table 6-2 and Table 6-3, and involves three parts:

- **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/population, and duration;
- **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.

These are discussed in further detail below.

### 6.2.1 Part A: Defining Consequence in Terms of Magnitude, Duration and Spatial Scale

Table 6-1 is used to determine the impact consequence characteristics for magnitude, spatial scale/population and duration.

Table 6-1: Consequence rating definitions

| IMPACT CHARACTERISTICS | DEFINITION | CRITERIA |
|---|---|---|
| **Magnitude** | Major - | Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded |
| | Moderate - | Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded |
| | Minor - | Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded |
| | Minor + | Minor improvement; change not measurable; or threshold never exceeded |
| | Moderate + | Moderate improvement; within or better than the threshold; or no observed reaction |
| | Major + | Substantial improvement; within or better than the threshold; or favourable publicity |
| **Spatial scale or population** | Site or local | Site-specific or confined to the immediate project area |
| | Regional | May be defined in various ways, e.g. cadastral, catchment, topographic |
| | National/ International | Nationally or beyond |
| **Duration** | Short term | Up to 18 months. |
| | Medium term | 18 months to 5 years |
| | Long term | Longer than 5 years |

### 6.2.2 Part B: Determining the Consequence Rating

Once the impact consequence characteristics have been determined from Table 6-1, they are applied to Table 6-2 to obtain the consequence rating.

Table 6-2: Consequence rating

| | | | SPATIAL SCALE/ POPULATION | | |
|---|---|---|---|---|---|
| | | | **Site or Local** | **Regional** | **National/ international** |
| **MAGNITUDE** | | | | | |
| **Minor** | **DURATION** | **Long term** | Medium | Medium | High |

| | | | SPATIAL SCALE/ POPULATION | | |
|---|---|---|---|---|---|
| | | | Site or Local | Regional | National/ international |
| | | Medium term | Low | Low | Medium |
| | | Short term | Low | Low | Medium |
| Moderate | DURATION | Long term | Medium | High | High |
| | | Medium term | Medium | Medium | High |
| | | Short term | Low | Medium | Medium |
| Major | DURATION | Long term | High | High | High |
| | | Medium term | Medium | Medium | High |
| | | Short term | Medium | Medium | High |

### 6.2.3 Part C: Determining Significance Rating

The probability of the impact occurring is assessed as either being definite, possible, or unlikely, and is selected in Table 6-3. The consequence rating determined from Table 6-2, is then used to obtain the significance of the impact in Table 6-3.

Table 6-3: Significance rating

| | | CONSEQUENCE | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| PROBABILITY (of exposure to impacts) | Definite | Medium | Medium | High |
| | Possible | Low | Medium | High |
| | Unlikely | Low | Low | Medium |

The significance rating of the impact is determined prior to mitigation (without mitigation), as well as after mitigation measures have been implemented.

## 6.3 Impact Assessment and Mitigation

### 6.3.1 Construction Phase

During the construction phase, site preparation will take place, which may result in an alteration of the topography. The construction phase is likely to be less than 2 years. The activities and impacts that are likely to occur during the construction phase are summarised in Table 6-4.

Table 6-4: Summary of activities and impacts for the construction phase

| Activity | Impact Description |
|---|---|
| Site preparation and alteration to the topography. | Erosion and wash-off of exposed soils leading to siltation in down gradient watercourses. |

The ratings and proposed mitigation measures for the construction phase are provided in Table 6-5.

Table 6-5: Significance rating for the construction phase

| **NATURE OF IMPACT:** Site preparation exposing soils to water erosion that may lead to a deterioration in water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Short term | Short term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Moderate | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **Medium** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• None foreseen | | |
| **Mitigation measures**<br>• Clearance of vegetation must be limited as far as possible;<br>• Temporary erosion measures such as sediment nets should be employed around exposed working areas;<br>• The SWMP must be implemented as a first step during the construction phase; and<br>• Water quality monitoring must be implemented upstream and downstream of construction sites. | | |

### 6.3.2 Operational Phase

During the operational phase, hydraulic reclamation of the stock dams will take place. The operational phase will be approximately 5 years.

The mixing of water with the tailings material during hydraulic mining will add water and oxygen to the material, which could potentially result in acidic water, with leaching of metals and salts. Due to the close proximity of the stock dams to the stream to the east, it is of utmost importance that runoff from the operation is contained as recommended in the proposed SWMP.

Poor maintenance of stormwater infrastructure, such as the silting up of paddocks, as well as the erosion of berms, can result in spills from the operation. It is therefore important that stormwater infrastructure is regularly monitored and maintained.

The floodline determination indicated that the pipeline will be located within the 1:100-year flood extent at a number of locations along its route to the Ergo Plant. It is recommended that the pipeline is constructed in a suitable manner to withstand a 1:100-year flood.

The pipelines conveying slurry from the site to the Ergo Plant may potentially result in unforeseen spills. Where pipelines cross watercourses, it is proposed that these sections of the pipeline do not contain flanges that may result in leaks.

The activities and impacts that could potentially occur during the operational phase are summarised in Table 6-6.

Table 6-6: Summary of activities and impacts for the operational phase

| Activity | Impact Description |
|---|---|
| Uncontained runoff from the operational areas at the stock dams. | **Impact 1:** Runoff into the downslope watercourses impacting on water quality. |
| Poor maintenance of stormwater infrastructure. | **Impact 2:** Silted paddocks and channels as well as eroded berms which lead to spills into the downslope watercourses impacting water quality. |
| Flooding resulting in damage to the proposed pipeline between the site and Ergo Plant (due to the close proximity to watercourses). | **Impact 3:** Flooding resulting in damage of the pipelines may result in downstream water quality impacts. |
| Leaks from the proposed pipelines. | **Impact 4:** Leaks from the pipelines running off into down gradient watercourses impacting water quality. |

The ratings and proposed mitigation measures for the operational phase are indicated in Table 6-7 to Table 6-10.

Table 6-7: Significance rating of operational impact 1

| **NATURE OF IMPACT 1:** Uncontained runoff from the operational area at the stock dams running off into the downslope watercourses impacting water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Medium term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Moderate |

| **NATURE OF IMPACT 1:** Uncontained runoff from the operational area at the stock dams running off into the downslope watercourses impacting water quality | | |
|---|---|---|
| ***Probability*** *(Definite, Possible, Unlikely)* | Definite | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Medium** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| **Mitigation measures**<br>• Implementation of the proposed SWMP. It must be ensured that stormwater measures are designed, constructed, and operated to ensure that stormwater does not spill more than once in 50 years, in order to be compliant with GN R704 regulations; and<br>• Water quality monitoring must be implemented upstream and downstream of the mining activities. | | |

Table 6-8: Significance rating of operational impact 2

| **NATURE OF IMPACT 2:** Poor maintenance of stormwater infrastructure resulting in silted paddocks and eroded berms, leading to spills into the downslope watercourses impacting on water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Moderate |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Medium** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |

| **NATURE OF IMPACT 2:** Poor maintenance of stormwater infrastructure resulting in silted paddocks and eroded berms, leading to spills into the downslope watercourses impacting on water quality |
|---|
| **Residual impacts**<br>• None, as the impact will cease provided that rehabilitation is done appropriately. |
| **Mitigation measures**<br>• Implementation of the stormwater monitoring plan detailed in this report. |

Table 6-9: Significance rating of operational impact 3

| **NATURE OF IMPACT 3:** Flooding and damage of the proposed pipeline between the site and Ergo Plant resulting in spills and consequent downstream water quality issues | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Short term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| **Mitigation measures**<br>• Where the pipelines cross the floodline, it should be ensured that they are constructed in a suitable manner to handle a 1:100-year flood; and<br>• Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | | |

Table 6-10: Significance rating of operational impact 4

| **NATURE OF IMPACT 4:** Leaks from the proposed pipelines impacting on down gradient water quality | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Local | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• None, as the impact will cease provided that rehabilitation is done appropriately. | | |
| **Mitigation measures**<br>• Regular inspections and maintenance of the pipelines;<br>• Immediate containment of leaks, repair of the pipeline and clean-ups; and<br>• Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | | |

### 6.3.3 Closure and Rehabilitation Phase

As reclamation progresses to ground level, the stock dams footprint will continue to be sectioned off into paddocks. This will be a short-term measure to prevent contaminated runoff from flowing offsite. The area will be assessed for contamination (particularly in terms of radiation). Contaminated soil will be removed and backfilled with uncontaminated soil. The land will be levelled to its original functioning topography. The land will then be made available to the landowner to use at their discretion.

The activities and impacts that are likely to occur during the closure and rehabilitation phase are summarised in Table 6-11.

Table 6-11: Summary of activities and impacts for the closure phase

| Activity | Impact Description |
|---|---|
| Exposure of potentially contaminated soils during the closure and rehabilitation phase once the dumps have been removed. | Erosion and wash-off of contaminated soils resulting in water quality issues in the surrounding watercourses. |

The ratings and proposed mitigation measures for the closure and rehabilitation phase are indicated in Table 6-12.

Table 6-12: Significance rating of closure impact 1

| **NATURE OF IMPACT:** Erosion and wash-off of potentially exposed contaminated soils resulting in water quality issues in the surrounding watercourses | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Possible |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or No) | No | |
| **Can impacts be enhanced:** (Yes or No) | Yes | |
| **Residual impacts**<br>• Possible, unless potential spills are rehabilitated. | | |
| **Mitigation measures**<br>• Runoff must be contained onsite through the implementation of paddocks until any contaminated soils are removed;<br>• Once contaminated soils are removed, the area should be backfilled with uncontaminated soils, and levelled to its original functioning topography; and<br>• Water quality monitoring must continue upstream and downstream until the site has been fully rehabilitated. | | |

### 6.3.4 Post Closure Phase

Should rehabilitation be successfully implemented, then it is unlikely that any negative impacts will occur during the post-closure phase. The removal of the stock dams is likely to result in a long-term positive impact on the surrounding watercourses, provided that rehabilitation is successfully implemented.

## 6.4 Cumulative Impacts

Cumulative impacts are impacts that result from the incremental impact of the proposed activities on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

The project is located in a catchment that is highly impacted by mining, urban and industrial activities. The implementation of a sound SWMP is crucial to contain contaminated runoff from the operational area. The monitoring and maintenance of the implemented SWMP is of utmost importance to ensure that spillages into the downslope watercourses do not occur. The removal of the stock dams and the implementation of a rehabilitation plan that ensures that the area is free-draining could enhance the catchment water quality. Should the above not be done, then in the long term, the proposed project has the potential to cumulatively add to the already deteriorated water quality within the Blesbokspruit catchment.

The cumulative impact of the proposed project on the surface water quality of the catchment is rated in Table 6-13.

Table 6-13: Cumulative impact rating for surface water quality

| **NATURE OF IMPACT:** Should dirty water runoff not be contained and an appropriate rehabilitation plan for the area not be undertaken and successfully implemented, then the proposed project has the potential to add cumulatively to the already deteriorated surface water quality of the catchment | | |
|---|---|---|
| | **Impact Rating without Mitigation** | **Impact Rating with Mitigation** |
| ***Extent*** *(Local, Regional, International)* | Regional | Local |
| ***Duration*** *(Short term, Medium term, Long term)* | Long term | Medium term |
| ***Magnitude*** *(Major, Moderate, Minor)* | Major | Minor |
| ***Probability*** *(Definite, Possible, Unlikely)* | Possible | Unlikely |
| ***Calculated Significance Rating (Low, Medium, High)*** | **High** | **Low** |
| **Impact Status: (**positive or negative) | Negative | Negative |
| **Reversibility: (**Reversible or Irreversible) | Irreversible | |
| **Irreplaceable loss of resources:** (Yes or | No | |

| | |
|---|---|
| **NATURE OF IMPACT:** Should dirty water runoff not be contained and an appropriate rehabilitation plan for the area not be undertaken and successfully implemented, then the proposed project has the potential to add cumulatively to the already deteriorated surface water quality of the catchment | |
| No) | |
| **Can impacts be enhanced:** (Yes or No) | Yes |
| **Residual impacts**<br>• None, provided that the tailings material is removed, and appropriate rehabilitation is undertaken. | |
| **Mitigation measures**<br>• Effective stormwater management that captures and contains all site runoff as proposed in this report, and in accordance with GN R704 regulations;<br>• Removal of all tailings material and successful rehabilitation of the area to a free-draining area; and<br>• Water quality monitoring upstream and downstream of the proposed project until rehabilitation is successfully completed. | |

## 6.5 Impact Summary Table

The impacts and mitigation measures are summarised in Table 6-14.

Table 6-14: Summary of the potential surface water impacts and proposed mitigation measures

| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| **Construction Phase** | | | | | | | | | | | | | |
| 1 | Site preparation and alteration to the topography. | Erosion and wash-off of exposed soils leading to siltation in down gradient watercourses. | *Moderate -* | *Short Term < 18 months* | *Regional* | *Possible* | Medium | • Clearance of vegetation must be limited as far as possible;<br>•Temporary erosion measures such as sediment nets should be employed around exposed working areas;<br>• The SWMP must be implemented as a first step during the construction phase; and<br>• Water quality sampling must be implemented upstream and downstream of construction sites. | *Minor -* | *Short Term < 18 months* | *Site or Local* | *Possible* | Low |
| **Operational Phase** | | | | | | | | | | | | | |
| 1 | Uncontained runoff from the operational area at the stock dams. | Runoff into the downslope watercourses impacting on water quality. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Implementation of the proposed SWMP. It must be ensured that stormwater measures are designed, constructed and operated to ensure that stormwater does not spill more than once in 50 years, to be compliant with GN R704 regulations; and<br>• Water quality monitoring must continue upstream and downstream of the proposed project. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Possible* | Medium |
| 2 | Poor maintenance of stormwater infrastructure. | Silted paddocks and eroded berms can lead to spills in the downslope watercourses. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Implementation of the stormwater monitoring plan detailed in this report. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Possible* | Medium |

| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| 3 | Flooding resulting in damage to the proposed pipeline to the Ergo Plant (due to the close proximity to watercourses). | Flooding resulting in damage to the pipelines may result in downstream water quality impacts. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | •Where the proposed pipelines cross watercourses, they should be constructed in such a manner so as to be able to handle a 1:100-year flood; and<br>•Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | *Minor -* | *Short Term < 18 months* | *Site or Local* | *Possible* | Low |
| 4 | Leaks from the proposed pipelines. | Leaks running off into down gradient watercourses, impacting water quality. | *Major -* | *Long Term > 5 years* | *Local* | *Possible* | High | • Regular inspections and maintenance of the pipelines;<br>• Immediate containment of leaks, repair of the pipeline and clean-ups; and<br>• Pipeline flanges tend to be weak spots and should be avoided where the pipelines are in close proximity or cross watercourses. | *Minor -* | *Medium Term > 18 months < 5 years* | *Site or Local* | *Possible* | Low |
| Closure & Rehabilitation Phase | | | | | | | | | | | | | |
| 1 | Exposure of potentially contaminated soils during the closure and rehabilitation phase once the stock dams have been removed. | Erosion and wash-off of contaminated soils resulting in water quality issues in the surrounding watercourses. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Runoff must be contained onsite through the implementation of paddocks until contaminated soils are removed;<br>• Once contaminated soils are removed, the area must be backfilled with uncontaminated soils, and levelled to its original functioning topography; and<br>• Water quality monitoring must continue upstream and downstream until the site has been fully rehabilitated. | *Minor -* | *Medium Term > 18 months < 5 years* | *Site or Local* | *Possible* | Low |

| Impact No. | Activity | Impact Description | BEFORE MITIGATION | | | | | Mitigation measures / Recommendations | AFTER MITIGATION | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE | | Magnitude | Duration | Spatial Scale | Probability | SIGNIFICANCE |
| **Cumulative Impacts** | | | | | | | | | | | | | |
| 1 | Unsuccessful containment of dirty water runoff from the operation as well as unsuccessful rehabilitation | The proposed project has the potential to cumulatively impact the already deteriorated surface water quality of the catchment. | *Major -* | *Long Term > 5 years* | *Regional* | *Possible* | High | • Effective stormwater management that captures and contains all site runoff as proposed in this report, and in accordance with GN R704 regulations;<br>• Removal of all tailings material and successful rehabilitation of the area to a free-draining area; and<br>• Water quality monitoring upstream and downstream of the proposed project until rehabilitation is successfully completed. | *Moderate -* | *Long Term > 5 years* | *Site or Local* | *Unlikely* | Low |

# 7 MONITORING PLANS

## 7.1 Surface Water Quality

A surface water quality monitoring programme is essential as a management tool to detect negative water quality impacts as they arise and to ensure that the necessary mitigation measures are implemented. It is recommended that the sampling locations BBSpruit Upstream and BBspruit Downstream continue to be monitored on a monthly basis. Water quality sampling of seepage water emanating from the stock dams indicated that the water contained elevated levels of EC, chloride, sulphate, nitrate, ammonium, fluoride, iron, manganese, nickel, cobalt, lead and uranium. It is recommended that these parameters form part of the monitoring programme.

Water quality sampling should be done in accordance with the DWS Best Practice Guideline G3: Water Monitoring Systems. Samples must be kept cool (+-4°C) and out of direct sunlight and should be transported immediately to an accredited laboratory for water quality analysis within 24 hours of sampling. The impacts on water quality should be determined by comparing the monitoring results against the Blesbokspruit catchment guideline limits and SANS 241:2015, and importantly against previous results, to determine any deviations in trends over time. If the trend analysis indicates any deviations from the baseline monitoring, in terms of deteriorating water quality, then an immediate investigation must be undertaken to determine whether the mine may be responsible. If responsible, urgent action must be undertaken to implement mitigation measures to prevent further contamination.

Reporting should be done on a monthly basis (or as recommended by the DWS). It is recommended that monitoring reports include trend analyses. It is further recommended that the water quality from the upstream monitoring point (BBspruit Upstream) is compared to the downstream (BBSpruit Downstream) monitoring point.

## 7.2 Stormwater Infrastructure

Water infrastructure (paddocks, trenches, berms and slurry sumps) should be monitored on a monthly basis during the dry season, and on a weekly basis during the wet season. They should further be monitored immediately after any large storm events. Should blockages, silted-up structures, or breaches occur, immediate action should be undertaken to remove debris and repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received prior to inspection;
- Photographs of blockages, silted-up structures or breaches witnessed;
- What action was undertaken to fix issues, and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be kept ready and supplied to the DWS when requested, or as part of the WUL conditions.

# 8 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the most important aspect to prevent negative impacts from a surface water perspective, is to ensure that a sound SWMP is implemented prior to the commencement of mining activities, in accordance with the conditions stipulated in GN R704. Monitoring and maintenance of stormwater measures is of utmost importance and should be conducted as outlined in this report. Furthermore, water quality monitoring must continue upstream and downstream of the proposed project. The removal of the stock dams is expected to have a positive long-term impact on the surrounding watercourses, provided that rehabilitation is successfully undertaken.

The following is recommended:

- The proposed pipelines must run within the approved pipeline servitude route. Where the pipelines cross the floodline, it should be ensured that they are constructed in a suitable manner to handle a 1:100-year flood;
- The SWMP is implemented, and all conditions specified in GN R704 are taken into account;
- The impact mitigation measures are implemented; and
- The monitoring plans are implemented.

Should the above recommendations be implemented, then from a surface water hydrological perspective, the project can commence.

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# APPENDIX A: CURRICULUM VITAE

# APPENDIX B: WATER QUALITY LABORATORY CERTIFICATE

# Appendix B: Groundwater Assessment

Can be accessed here: https://kongiwe.com/projects/

IRENE LEA ENVIRONMENTAL & HYDROGEOLOGY

## KONGIWE ENVIRONMENTAL (PTY) LTD

# GOLDPLAT RECLAMATION PROJECT
# INTEGRATED WATER USE LICENCE APPLICATION

## GEOHYDROLOGICAL SPECIALIST REPORT

# FINAL REPORT

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**Report No** iLEH-KON GPL-GW 03-26

September 2026

## PROJECT DETAILS

| PROJECT: | Goldplat Reclamation Project Integrated Water Use Licence Application |
|---|---|
| **Report Title:** | Geohydrological Specialist Report |
| **Client:** | Kongiwe Environmental (Pty) Ltd |
| **Client Contact** | Phumla Mngwengwe |
| **Project Number** | ILEH-KON GPL-GW 03-26 |
| **Date Submitted** | 17 September 2026 |
| **Author** | Irene Lea M. Sc. *Pri. Sci. Nat* |

## INDEMNITY AND CONDITIONS RELATING TO THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on assessment techniques, which are limited by information available, time and budgetary constraints relevant to the type and level of investigation undertaken, and Irene Lea Environmental and Hydrogeology cc reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research, monitoring and further work in this field pertaining to the investigation.

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Irene Lea M.Sc. Pr. Sci. Nat

17 September 2026

# EXECUTIVE SUMMARY

## Background

A geohydrological specialist study was completed based on the existing dataset and the outcome of a July 2026 hydrocensus for an application for an Integrated Water Use License Application (IWULA) by Goldplat Recovery (Pty) Ltd (Goldplat), to reclaim gold-bearing tailings from their Top and Rooidam Stock Dams (the Goldplat Reclamation Project). The project will be completed over a period of five years. Tailings will be reclaimed through hydraulic methods, which is a water-based reclamation process. Process water will be sourced from Ergo Mining (Pty) Ltd (Ergo), who will process the Goldplat tailings at their existing and authorised Ergo Plant. Potable water will be sourced from the adjacent Goldplat Plant. Once tailings reclamation is completed, the area will be assessed for contamination, specifically for radiation, after which contaminated soils will be removed and the footprint will be levelled. The reclaimed footprint may be used for future tailings deposition.

The project is located 7km east of Benoni, Ekurhuleni. It is located approximately 200m west of the Blesbokspruit and its wetlands, which forms part of the C21D quaternary catchment of the Vaal-Orange Water Management Area.

The project is located on outcropping shales of the Vryheid Formation and diamictite of the Dwyka Formation of the Karoo Supergroup, which is estimated to be 10 - 30m thick in this area. The Karoo sediments are underlain by dolomites of the Transvaal Supergroup. The dolomites are underlain by quartzites and gold reefs of the Witwatersrand Supergroup. In this area, the South Reef was historically mined at a depth of 100 - 240m below surface. The historical South Reef workings are located northeast of the Goldplat Reclamation Project. The Top and Rooidam Stock Dams are undermined by a single South Reef drive, estimated to be 320-360m below surface.

An assessment of the Goldplat water quality monitoring programme indicates that the pH of water found in the project area is neutral to alkaline. Only one sample had an average pH level of below 7 units, but however remained above 6 units. The outcome of a geochemical assessment completed in 2021 confirms that the risk of acidification is low and that the main lithologies are non-acid generating.

The main Karoo-type aquifers present in the project area form in the upper weathered zone and the underlying fractured rock. The unfractured rock matrix has a low permeability and does not transmit groundwater significantly. The results of aquifer tests completed on two Goldplat boreholes confirm that the permeability of the Karoo shales and diamictite is low. The aquifers present are classified as minor that are moderately vulnerable. The presence of various sources of contamination associated with historical gold mining will however pose a threat to the aquifers.

At the Top and Rooidam Stock Dams, the average depth to groundwater that indicate shallow conditions is 3.8m below surface and the average depth to deeper groundwater is 10.4m. There is a strong correlation between topographical and groundwater level elevations in the Goldplat monitoring boreholes, which suggests that groundwater flow follows the topography and discharges to the local watercourses. There is no evidence that groundwater levels in the project area are lowered by dewatering of the historical gold mining underground workings. Groundwater flow from the Top and Rooidam Stock Dams is in an easterly to northeasterly direction towards the Blesbokspruit at a gradient of approximately 1:40. Groundwater levels fluctuate seasonally as a result of the recharge of rainwater by between 1 and 5m. Groundwater levels near the Blesbokspruit increase seasonally due to flooding of the wetlands.

An assessment of the Goldplat monitoring database indicate that sulphate, cobalt, nickel and uranium are indicator elements for toe seepage from the stock dams to be reclaimed. Of these elements, only sulphate is included in the existing monitoring programme. For this reason, sulphate is considered the indicator element for the impact assessment. The quality of the toe seepage and the stream draining from the adjacent TSF towards Goldplat is poor, with elevated metals and salts.

Of specific concern are elements that exceed chronic and acute health limits in terms of the South African Drinking Water Standards. These include iron, lead, manganese, nickel, total chrome, uranium, nitrate, nitrite and sulphate. The groundwater sampled from one of the hydrocensus boreholes located upgradient of the project, is generally fit for use, with the exception of slightly elevated ammonium concentrations. Groundwater flow from the Goldplat Reclamation Project is not towards the two hydrocensus borehole identified northwest of the project.

The existing dataset, including geohydrological information made available by Goldplat, was used to construct a conceptual geohydrological model for the project area. The conceptual model, including the estimated level of flooding in the historical gold mining areas, was used to construct a numerical model for the project. The source term used during simulations was developed from the Goldplat monitoring database, the 2026 hydrocensus results and the 2021 geochemical study completed for the site. Potential sources of contamination to groundwater in the project area include historical tailings deposition, the Top and Rooidam Stock Dams, the other Goldplat TSFs, the existing lined return water dam (RWD), an existing unlined dirty water dam, the Goldplat Plant, and the proposed catchment paddock that will be constructed as part of the project. The 2021 geochemical study indicates that the Goldplat TSFs contain a high percentage of clay, which will control and reduce the volume of seepage that could infiltrate to the underlying aquifers. Potential pathways and receptors for contamination associated with the project were considered as part of the impact assessment.

The geohydrological impact assessment was completed with the aid of the numerical groundwater flow and contaminant transport model. The results of model calibration indicate that the calibration criteria set for the project were met. The model is therefore considered suitable to complete the impact assessment with the available dataset. The outcome of the assessment indicates that the model is sensitive to large fluctuations in the permeability of the permeability and specific yield of the Karoo aquifer as well as the rate of recharge to the Blesbokspruit alluvium and wetlands. Model calibration and confidence levels can be improved once additional monitoring information becomes available from the project. Model verification should therefore be undertaken once mining starts and the groundwater monitoring programme results are available.

The calibrated model was used to complete the impact assessment for the project. During simulations, the Reclamation Project components and timing were assessed at the hand of two scenarios:

- The no project option.
- Reclamation and rehabilitation of the Top and Rooidam Stock Dams.

**Key findings**

The outcome of the impact assessment confirms that it is difficult to absolutely distinguish between impacts associated with the Goldplat Reclamation Project and historical impacts and continuing impacts associated groundwater pollution sources not associated with Goldplat. Historical impacts will continue to affect groundwater quality due to slow groundwater flow through low-permeability aquifers. The two private boreholes located northwest of the project area will not be affected by tailings reclamation activities. The following is generally concluded from the impact assessment completed:

- **Anticipated impacts immediately downgradient of the proposed Reclamation Project:**
  - During the operational phase, the zone of impact of unacceptable quality in terms of the Blesbokspruit water quality objectives is not expected to reach the Blesbokspruit and its wetlands. The zone of impact in terms of unacceptable health risks is expected to remain largely over the Goldplat stock dam and tailings footprint areas.
  - Sulphate concentrations are expected to gradually increase post-closure in the long-term to between 1550 and 1750 mg/l in the long-term for the scenarios tested. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the Top and Rooidam Stock Dams unfit for use.

- The No Project outcome is expected to result in the most significant impact, with sulphate concentrations rising to above 1700mg/l and an increasing trendline. This suggests that sulphate concentration are expected to continue to increase at the position until it approximates the source concentration.
- If the Top and Rooidam Stock Dam Reclamation Project is implemented, sulphate concentrations will increase in the medium term, but are expected to plateau and reduce in the long-term, once the impact of source removal is evident. Due to the fact that the aquifers are low-yielding and groundwater flow is slow, this is likely to occur more than 50 years after closure of the site.

- **Potential impacts associated with the surrounding Goldplat TSFs:**
  - The impact of the Reclamation Project is not expected to significantly change sulphate concentrations at the surrounding TSFs due to the fact that these will remain in situ for the scenarios tested. Sulphate concentrations are expected to increase to above 3300mg/l at the East TSF. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the TSF unfit for use at this position.
  - Reclamation and rehabilitation of the Top and Rooidam Stock Dams are however expected to have the best outcome in terms of sulphate concentrations at this monitoring position but will not reduce sulphate concentrations to within acceptable levels.
  - The surrounding Goldplat and other third party TSFs will continue to impact on groundwater quality, regardless of the reclamation scenario tested.
- **Potential impacts in the downstream Blesbokspruit wetlands:**
  - The outcome of the impact assessment is an estimation of the impacts of the Goldplat Reclamation Project. It is noted that sulphate concentrations in the wetlands downgradient of the project are currently elevated above 500mg/l, which is the Blesbokspruit unacceptable water quality standard. The source of this contamination is not clearly understood, as groundwater in the upstream Goldplat borehole (GP2) is of better quality at present (<300mg/l).
  - Simulations suggests that impacts associated with the Goldplat project are not expected to increase sulphate concentrations in the wetlands to above 300mg/l in future. This means that sulphate concentrations are likely to remain below the ideal water quality objective for the Blesbokspruit.
  - The No Project option is anticipated to result in the highest sulphate concentration at this location with an increasing trendline. Tailings reclamation and rehabilitation of the footprint is likely to result an improved outcome, with sulphate concentrations reducing with time at this location. It is however noted that the two scenarios have similar impacts on the wetlands.

**Specific recommendations**

- Based on the outcome of the assessment, the preferred option from a groundwater perspective is reclamation of the Top and Rooidam Stock Dams and rehabilitation of the footprint.
- The design, development and management of the Top and Rooidam Stock Dam Reclamation Project must consider the outcome of the geohydrological impact assessment. Specific focus must be placed on reducing the risk of acid mine drainage, to isolate potential contamination and to minimise the infiltration of poor quality leachate to the underlying aquifers.
- A comprehensive groundwater management plan was developed based on the outcome of the groundwater impact assessment. The objective of the management plan is to reduce and/or eliminate adverse impacts on aquifers and watercourses downgradient of the reclamation area. The groundwater management plan includes the following components:
  - An over-arching management plan focussed on good house-keeping measures at the mine.
  - Measures to address impacts on groundwater quality.
  - An acid mine drainage management plan from a groundwater perspective.
  - Incorporation of the results of this study into the detailed reclamation and rehabilitation plans.
  - Post closure groundwater management measures.

- The study was used to augment the existing Goldplat groundwater monitoring programme to ensure the outcome of the assessment is considered and incorporated. This programme includes the existing Goldplat monitoring boreholes, the proposed catchment paddock and private boreholes.
- The monitoring programme is geared to record water level and quality trends, to improve the understanding of the aquifer characteristics, to check the accuracy of predicted impacts, to trigger groundwater management actions in the event of adverse impacts recorded and to be used to improve mine management practices and procedures to protect groundwater.
- Should the monitoring triggering-response criteria presented in this report be exceeded, a specific action plan is prescribed to inform affected parties and remediate impacts.

**Reasoned opinion**

It is the opinion of the professional geohydrologist that the reclamation and footprint rehabilitation of the Goldplat Top and Rooidam Stock Dams can be authorised, provided that all tailings are reclaimed to soil level; and that sound surface water / storm water management measures are put in place and maintained throughout the life of the project. No ponding must be allowed over the reclaimed footprint. In the short term there could be water quality impacts (increased salts and metal concentrations) during tailings reclamation. The risk of this impact must be controlled through the implementation of the groundwater management measures presented in this report and confirmed through a dedicated groundwater monitoring programme in existing monitoring boreholes. Potential impacts associated with future alternative use of the reclaimed footprint have been assessed to a lower level of confidence in this report and must be updated once detailed plans and designs are available. Analysis of all monitoring information must be considered as part of an updated risk assessment to be completed as part the closure application for the Goldplat Operations. Overall, the project is expected to deliver a long-term positive impact on groundwater quality after tailings reclamation, and the resultant footprints are carefully rehabilitated.

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## LIST OF ACRONYMS USED

| | |
|---|---|
| AMD | Acid Mine Drainage |
| BBS | Blesbokspruit |
| BH | Borehole |
| BPG | Best Practice Guideline |
| CGS | Council for Geoscience |
| DTM | Digital Terrain Model |
| DWS | Department of Water and Sanitation |
| DWAF | Former Department of Water Affairs and Forestry |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| Ergo | Ergo Mining (Pty) Ltd |
| Goldplat | Goldplat Recovery (Pty) Ltd |
| IAP | Interested and Affected Party |
| iLEH | Irene Lea Environmental and Hydrogeology |
| IWULA | Integrated Water Use License Application |
| K | Hydraulic conductivity (unit: m/d) |
| LOM | Life of Mine |
| LOW | Limit of Weathering |
| mamsl | Metres above mean sea level |
| MAP | Mean Annual Precipitation |
| MAE | Mean Annual Evaporation |
| mbgl | Metres below ground level |
| NA | Not applicable |
| NWA | National Water Act (Act No. 36 of 1998) |
| PCD | Pollution Control Dam |
| ROM | Run of Mine |
| RWD | Return Water Dam |
| S | Storage coefficient (-) |
| $S_y$ | Specific yield (-) |
| SANS | South African National Standards |
| SANAS | South African National Accreditation System |
| SWL | Static Water Level |
| T | Transmissivity (unit: $m^2/d$) |
| TC | Total Concentration |
| TDS | Total Dissolved Solids (mg/l) |
| TSF | Tailings Storage Facility |
| WQO | Water Quality Objectives |
| WUL | Water Use Licence |

# 1 INTRODUCTION

## 1.1 Specialist details and declaration of independence

The project was finalised by Irene Lea Environmental and Hydrogeology (iLEH). Irene Lea has 34 years' experience in the field of mine water management. She has an M.Sc. in Geohydrology and is a registered Professional Natural Scientist. Her focus includes numerical groundwater flow and contaminant transport modelling, integrated water and waste management strategies, water and salt balances, water conservation and demand management plans, groundwater risk assessment for contaminated land studies, the water-related components of due diligence assessments, rehabilitation and closure projects and the development of groundwater components of environmental management programmes. She has successfully completed projects over a broad range of fields locally and abroad, including mining, mineral processing, chemical industries, waste disposal, transport, agriculture and power generation. .

I, Irene Melville Lea, declare that

- I act as the independent Geohydrologist practitioner for 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 hydrogeological impact assessments, 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not;
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a hydrogeological practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.
- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

CONTACT PERSON: Irene Lea (Contact details: 083 447 8377; irene@ileh.co.za)

SIGNATURE:

## 1.2 Project description

Goldplat Recovery (Pty) Ltd (Goldplat) is in the process of applying for a water use license (WUL) to reclaim and reprocess the Top and Rooidam Stock Dams, with the objective of recovering residual gold (Kongiwe, 2026). Other Goldplat tailings storage facilities (TSF) will remain in situ. The project is located in Benoni, Gauteng.

The Goldplat Recovery Plant has been operational for over 30 years (Aquatox, 2020). The Aquatox reports are included in Appendix 1 for ease of reference. Please note that the resolution of some of this source material is of low quality. The Plant was previously operated by Consolidated Modderfontein and Gravelotte Mines. The Plant uses processes such as roasting in a rotary kiln, crushing, milling, thickening, flotation, gravity concentrators, leaching, carbon in leach, elution and smelting of bullion. Tailings from the Plant is deposited on a number of facilities, including the Top and Rooidam Stock Dams, East TSF, Plant TSF and Emergency Paddock, as indicated on Figure 1.

High-grade gold-bearing material is left on the Stock Dams to oxidise, a process which enhances an overall gold recovery rate (Aquatox, 2020).

The reclamation will be achieved using the hydraulic reclamation method, which is a water-based process. High-pressured water monitoring will be used to erode the sides of the stock dams compartments. The process water mixes with unconsolidated material to form a slurry, which is fed under gravity to a sump where detritus will be removed and the screened slurry is conveyed to a pump station from where it is conveyed through a new pipeline to an existing Ergo Mining (Pty) Ltd (Ergo) Plant for reprocessing. Approximately 50 000 tonnes of slurry will be pumped per month to the Ergo Plant. Process water to be used during reclamation will be sourced from the Ergo Plant through the same pipeline route. Potable water will be sourced from the existing Goldplat Plant.

The following infrastructure will have significance to the geohydrological impact assessment and is addressed in this report in addition to the overall impacts associated with reclamation of the stock dams:

- Reclamation infrastructure:
    - Slurry sump
- Stormwater management infrastructure:
    - Lined catchment paddocks

The life of the project is expected to be five years. Once reclamation is completed, the area will be assessed for contamination, especially in terms of radiation. Contaminated soils will be removed and the area will be levelled to its original functioning topographical levels. The reclaimed footprints may be used for future tailings deposition.

The project is located in an area that was historically mined for gold. A portion of the historical South Reef underground workings are located approximately 600m west of the Goldplat project. The Goldplat TSFs are underlain by a single South Reef drive at a depth of more than 300m. Several historical gold TSFs are located in the vicinity of the Goldplat project, as indicated on Figure 1. These include the 5L23 TSF located 800m northwest of the Top and Rooidam Stock Dams. Ergo Mining (Pty) Ltd is in the process of obtaining environmental permission to reclaim tailings from this TSF. The pipeline from the 5L23 to the Ergo Brakpan Gold Plant will be accessed by Goldplat to convey tailings for processing.

This report represents the geohydrological impact assessment which will be incorporated into the Water Use Licence (WUL) application by Kongiwe Environmental (Pty) Ltd (Kongiwe). The groundwater specialist study will be incorporated into an Integrated Water and Waste Management Plan (IWWMP), which will be submitted as part of the Integrated Water Use License Application. (IWULA).

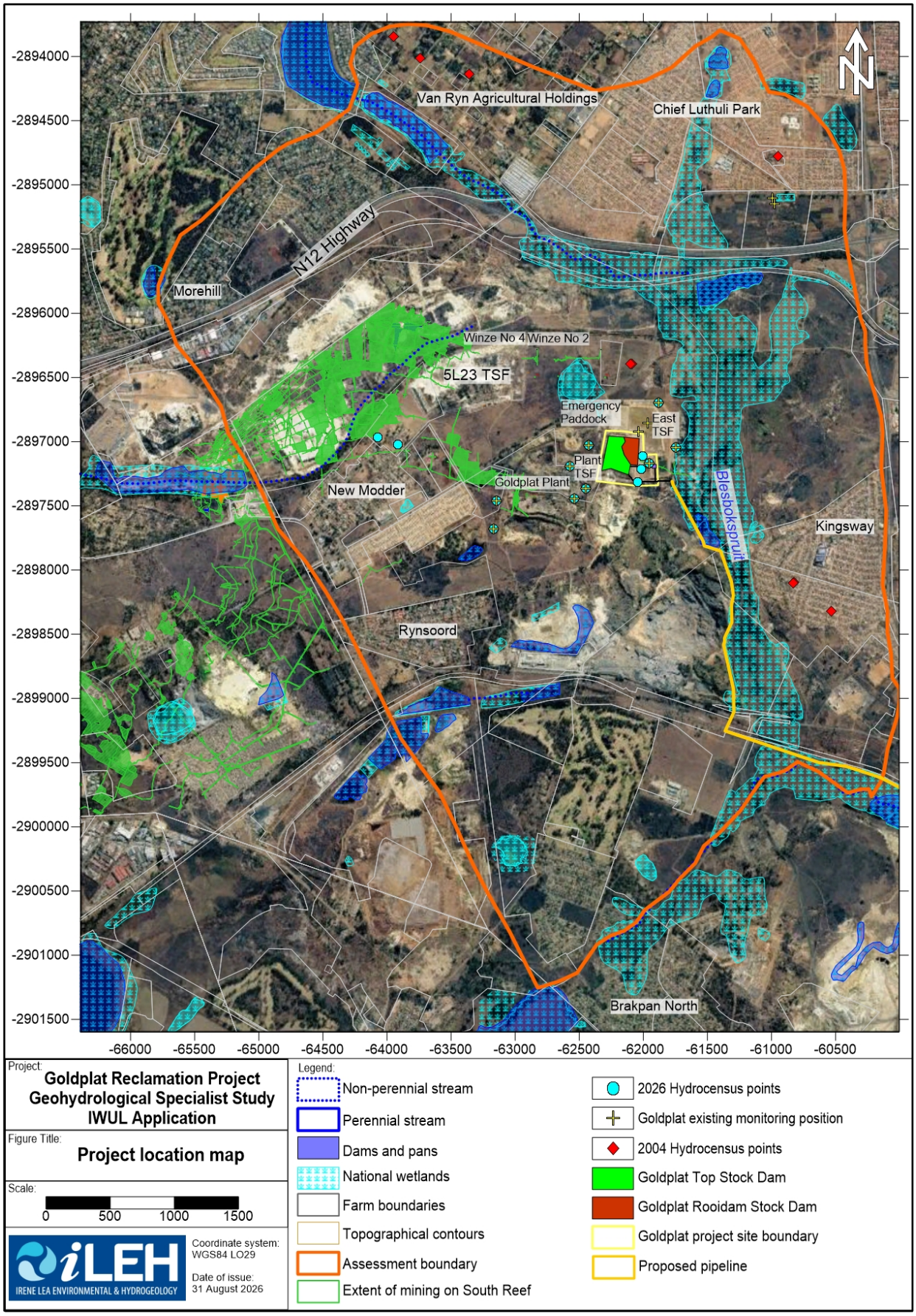



**Figure 1 Project location map**

### 1.3 Geographical setting

The project is located approximately 7 kilometres (km) east of the Benoni CBD within the City of Ekurhuleni (CoE) Metropolitan Municipality. Access is gained from the Modder Bee Road to the west, the R51 is to the east and the N12 to the north.

The residential suburb of New Modder is situated to the west of the project and the residential suburb of Rynsoord is situated to the southwest of the project. The process water and slurry pipelines run from Goldplat and extend all the way to the Ergo Plant in Brakpan. These run past residential areas, open areas, wetlands and industrial areas.

The project is situated on undulating ground approximately 200m west of wetlands associated with the Blesbokspruit, as indicated in Figure 1. Over the footprint area, the topography dips in a northerly and northeasterly direction towards these watercourses at elevations of between 1602 and 1612 mamsl.

The Goldplat Reclamation Project falls in the C21D quaternary catchment of the Blesbokspruit, which forms part of the Vaal Water Management Area (WMA:5). The main drainage for the greater area is the Blesbokspruit and is located approximately 500m to the east of Rooidam Stock Dam. Surface water from the Goldplat Reclamation Project will drain in easterly towards the Blesbokspruit.

### 1.4 Climate and rainfall

The Mean Annual Precipitation (MAP) for the C21D quaternary catchment is 698mm/a, according to the WR2012 database for the Upper Vaal Catchment. The Mean Annual Evaporation (MAE) for the C2A rainfall zone is 1625 mm (Zone 12A). Precipitation occurs in the form of showers and thunderstorms, with the highest rainfall occurring from December to March. The winter months are dry with the combined rainfall between May and August making up only 6% of the MAP.

**Table 1 Catchment rainfall and evaporation information**

| Quaternary catchment | C21D |
|---|---|
| Rainfall (mm/a) | 698 |
| Evaporation (mm/a) | 1625 |
| Runoff (mcm) | 13.5 |

# 2 SCOPE OF WORK

The scope of work for the hydrogeological specialist study is as follows:

- Construct a conceptual hydrogeological model based on the fieldwork made available.
- Use the conceptual hydrogeological model to construct a numerical groundwater model for the sub-catchment in which the project is situated. The project sub-catchment will be discretized into a model grid and time steps will be allocated. Error criteria for heads and the model water balance will be set.
- The available field data will be used to calibrate the numerical model. This will involve demonstrating that the model is capable of reproducing field-measured groundwater levels (heads), which are the calibration values. Calibration will be achieved when a set of parameters, boundary conditions and stresses are found that produce simulated heads that match field-measured data. This is an important step in the modelling project as it will ensure that model results are reliable.

- A sensitivity analysis will be performed on the aquifer parameters used during simulations. The purpose of the sensitivity analysis is to quantify the uncertainty in the calibrated model caused by uncertainty in the estimates of aquifer parameters, stresses and boundary conditions.
- Once the model has been calibrated, it will be used to undertake impact prediction simulations to comply with EIA regulations. The modelling scenarios are designed to meet the objectives of the overall project.
- The results of the numerical modelling project will be used to develop a groundwater management and monitoring programme for the project.

# 3 METHODOLOGY

## 3.1 Desk study

A desktop study was completed with information made available for the project, including fieldwork results, the details of which are discussed below. The list of documents assessed is presented in the references at the end of this report. All information that was used during the assessment is summarised in the report.

## 3.2 Alternatives considered

No project alternatives are included in Kongiwe (2026). As part of this assessment, the No Project Option as well as the option to deposit tailings on the reclaimed footprints in future will be evaluated from a groundwater perspective.

## 3.3 Report format

This report is compiled based on the requirements of GNR 267 of the National Water Act (Act 36 of 1998) (NWA). The report format is also based on the requirements of the Department of Water and Sanitation (DWS) Best Practice Guideline (BPG) G4 (2008).

## 3.4 Hydrocensus

A hydrocensus and site walk over was conducted during July 2026. The survey included the Goldplat Recovery TSFs and Plant area as well as the adjacent properties and concentrated on identifying existing private boreholes and groundwater use. The existing Goldplat monitoring boreholes were included in the hydrocensus.

The hydrocensus points visited are indicted on Figure 2. During the hydrocensus the following information was collected for each site:

- Borehole position (X, Y, Z-coordinates);
- Information relating to equipment installed;
- Borehole construction details;
- Borehole yield – if known by the landowner;
- Groundwater level, if possible; and
- Current use.
- A groundwater sample were collected in one accessible hydrocensus borehole. Due to the fact that Goldplat maintains an extensive groundwater monitoring programme, resampling of their boreholes was not undertaken.

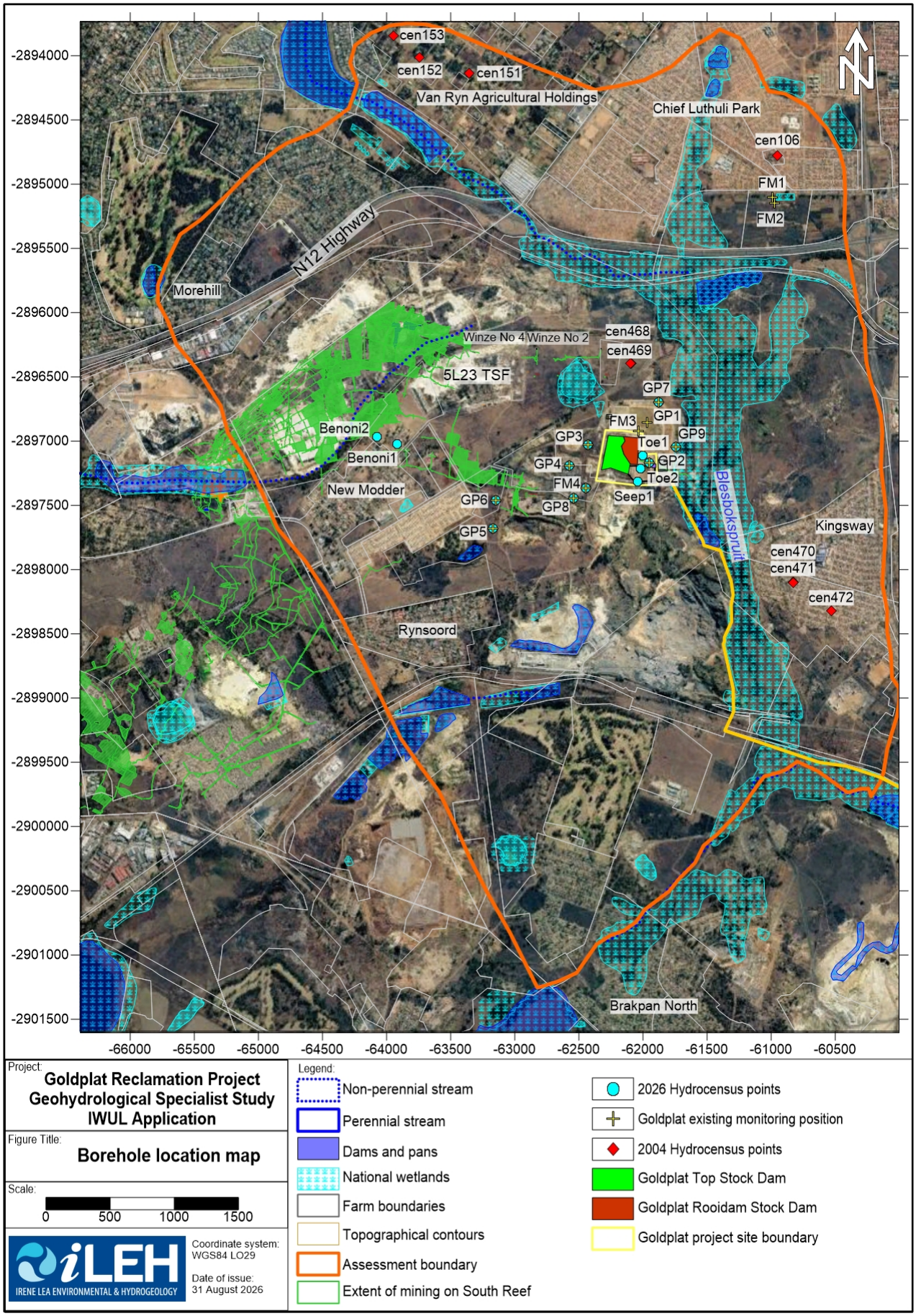



**Figure 2 Borehole location map**

**Table 2 2026 Hydrocensus borehole information**

| New Sample ID | Description | Decimal degrees | | Elevation (mamsl) | Groundwater Level (mbgl) | Groundwater Elevation (mamsl) | Depth (mbgl) |
|---|---|---|---|---|---|---|---|
| | | Latitude | Longitude | | | | |
| **Goldplat monitoring boreholes** | | | | | | | |
| FM4 | Float Borehole | -26.18397˚ | 28.37503˚ | 1613 | 10,2 | 1602,8 | 54 |
| GP2 | Borehole behind slime dam to right | -26.18223˚ | 28.38026˚ | 1600 | 3,9 | 1596,1 | 30 |
| GP3 | Borehole behind kiln woodchips, left of slime dam | -26.18095˚ | 28.37554˚ | 1609 | 4,4 | 1604,6 | 29,4 |
| GP4 | Borehole inside Plant behind kiln | -26.18244˚ | 28.37408˚ | 1613 | 2,1 | 1610,9 | 10,9 |
| GP5 | Borehole behind GP6 | -26.18680˚ | 28.36811˚ | 1620 | 11,1 | 1608,9 | 23 |
| GP6 | Borehole behind petrol station | -26.18482˚ | 28.36837˚ | 1620 | 8,4 | 1611,6 | 17,9 |
| GP7 | Borehole between TSF expansion and wetland | -26,17800° | 28,38100° | 1597 | 11,9 | 1585,1 | 35 |
| GP8 | Borehole between neighboring operations. | -26.18466° | 28.37441° | 1615 | 3,3 | 1611,7 | 35 |
| GP9 | Borehole between RWD and Wetland | -26.18112° | 28.38236° | 1594 | 1,6 | 1592,4 | 20 |
| **Private boreholes** | | | | | | | |
| Benoni1 | BH to northwest | -26.18081° | 28.36061° | 1618 | 10,39 | 1607,3 | unknown |
| Benoni2 | BH to northwest | -26.18029° | 28.35904° | 1615 | 7,12 | 1607,6 | unknown |

Two private boreholes were identified on neighbouring properties during the hydrocensus, indicated as boreholes Benoni 1 and Benoni 2 on Figure 2. One borehole is fitted with a submersible pump, but is not in use. The other borehole is also not in use. A third borehole is present on the property, but is filled with rocks, sand and waste and is not accessible.

Goldplat currently have 11 boreholes on their property, of which nine are monitored on a monthly basis in terms of groundwater levels and quality. Goldplat does not use these boreholes for groundwater abstraction.

A summary of the hydrocensus points included in the 2026 hydrocensus is presented in Table 2. All coordinates were taken with a hand-held Garmin GPS (Global Positioning System) (WGS84). The construction and depth information of the private boreholes were not available.

### 3.5 Additional fieldwork undertaken as part of this report

The geohydrological specialist study was completed using the existing Goldplat groundwater specialist studies and monitoring results, the outcome of a hydrocensus completed by iLEH in July 2026 and the analysis of water samples taken during the hydrocensus to characterise ambient groundwater quality as well as potential sources to contamination. These are discussed in more detail below.

No other fieldwork was completed for the project.

### 3.6 Groundwater modelling

A detailed description of the methodology used to complete the groundwater modelling for the project is presented later in this report.

### 3.7 Groundwater availability assessment

The former DWAF published 1:500 000 scale hydrogeological map borehole yield classification is summarised below. The map considers all available data, including blow yields. The general distribution of borehole yield on the published maps indicate the following:

- Karoo-type sandstone and shale form intergranular and fractured aquifers that are low yielding with borehole yield <0.5l/s.
- Wtiwatersrand quartzites, lavas and shale form fractured aquifers with borehole yields varying between 0,5 and 2 l/s.

Based on the outcome of the 2026 hydrocensus it is concluded that no groundwater is abstracted in the immediate vicinity of the Goldplat project.

### 3.8 Date and season of the investigation

The hydrocensus was completed during July 2026 during the dry season in Gauteng. The Goldplat monitoring dataset covers the period August 2022 to April 2026, which spans wet and dry seasons over almost three years.

## 4 PREVAILING GROUNDWATER CONDITIONS

### 4.1 Geology

The Goldplat project is underlain by sedimentary deposits of the Karoo Supergroup. These comprise Vryheid Formation interbedded shales, sandstones, mudstones and clays underlain by Dwyka tillite, as indicated on Figure 3. The Vryheid Formation overlies the Dwyka tillite, diamictite and shale gradationally and comprises predominantly clastic sediments. In the project area, the thickness of the Karoo sediments vary between 10 – 30m, according to feedback received from GoldOne, who operates gold mines in the area.

The Karoo sediments are unconformably underlain by dolomites of the Transvaal Supergroup. A pocket of Malmani dolomite underlain by Black Reef is situated approximately 1km southeast of the Top and Rooidam Stock Dams. In this area, the dolomite contains lenses of chert. The dolomites in this area are reported to extend to a depth of not more than 100m. The Black Reef consists of a carbonaceous shale, dark quartzite, dark grit and small pebble conglomerates, which seldom exceed 4m in thickness.

The Karoo and Transvaal Supergroup sediments rest unconformably on the Witwatersrand Supergroup formations, which dip steeply in the area. Turfontein Subgroup argillaceous to clean quartzites and conglomerates contain the Kimberley Reef. Johannesburg Subgroup is predominantly a quartzite sequence with a 30 – 75m thick lava horizon on the bottom contact. The Main Reef Leader was deposited at the bottom contact of the Johannesburg Subgroup. The South Reef, situated approximately 130m above the Main Reef is also present in the project area. The Jeppestown Subgroup shales underly the Johannesburg Subgroup formations.

### 4.1.1 Extent of undermining

The extent of undermining on South Reef level was made available by GoldOne. The closest underground workings to the Goldplat TSFs are on the South Reef level, which is situated approximately 130m above the Main Reef stratigraphically and dips steeply in this area.

The extent of the South Reef workings relative to the Top and Rooidam Stock Dam footprints is indicated on Figure 3. Two winzes used to gain access to the South Reef workings are located on northwest of the Goldplat project. These are referred to as Winze No 4 and Winze No 2, located approximately 900m to the northwest of the project. The locations of these winzes are shown on Figure 3. These winzes are constructed along the sub-outcrop of the South Reef and are expected to dip steeply to the gold-bearing reefs. The South Reef underground workings are located mainly to the northwest. The workings are estimated to be between 100 and 240m below surface. The Goldplat TSFs are underlain by a single South Reef drive that was developed out of a cross cut from the Main Reef workings. This drive is located approximately 320 – 360m below surface.

Extensive underground workings at Main Reef Level are present in this area. As mentioned, the Main Reef is located approximately 130m below South Reef stratigraphically. The undermining on Main Reef Level is therefore estimated to be 230 to 370m below surface in this area.

## 4.2 Acid generation capacity

In the context of the project, the potential source of acid mine drainage is the exposure of sulphide-rich minerals to oxygen and water. The resultant oxidation reaction forms an acid which in turn increases the salinity and metal concentration in the affected water.

To assess this risk, a comparison between Total Dissolved Solid (TDS) concentration and pH in the Goldplat monitoring database and in the hydrocensus water quality results is presented in Figure 4. Also indicated in Figure 4 are the SANS241:2015 Drinking Water Standards for pH and TDS as reference. The Goldplat monitoring data represents the average value for the monitoring period made available (November 2011 to April 2026), as presented in Table 3.

pH levels in the water samples indicate neutral to alkaline conditions. Only one sample (FM4) has a slightly acidic pH, but remained above 6 units. This sample is taken from a float borehole located in the Goldplat Plant area and is not associated with the Top and Rooidam Stock Dams. The two TSF toe seepage samples (TOE1 and 2), taken from the Top and Rooidam Stock Dams, have a neutral to alkaline pH. The stream draining from an adjacent TSF located south of the Top and Rooidam Stock Dams (Stream1) has a very alkaline pH (>10).

Alkaline pH conditions are most likely attributed to the addition of lime during the gold cyanide leaching process in the Plant. Lime is added to keep cyanide in solution and to prevent the formation of cyanide gas during gold treatment. Alkaline pH conditions can also be the result of geochemical reactions, for example hydrolysis of silicate minerals, which produces bicarbonate.

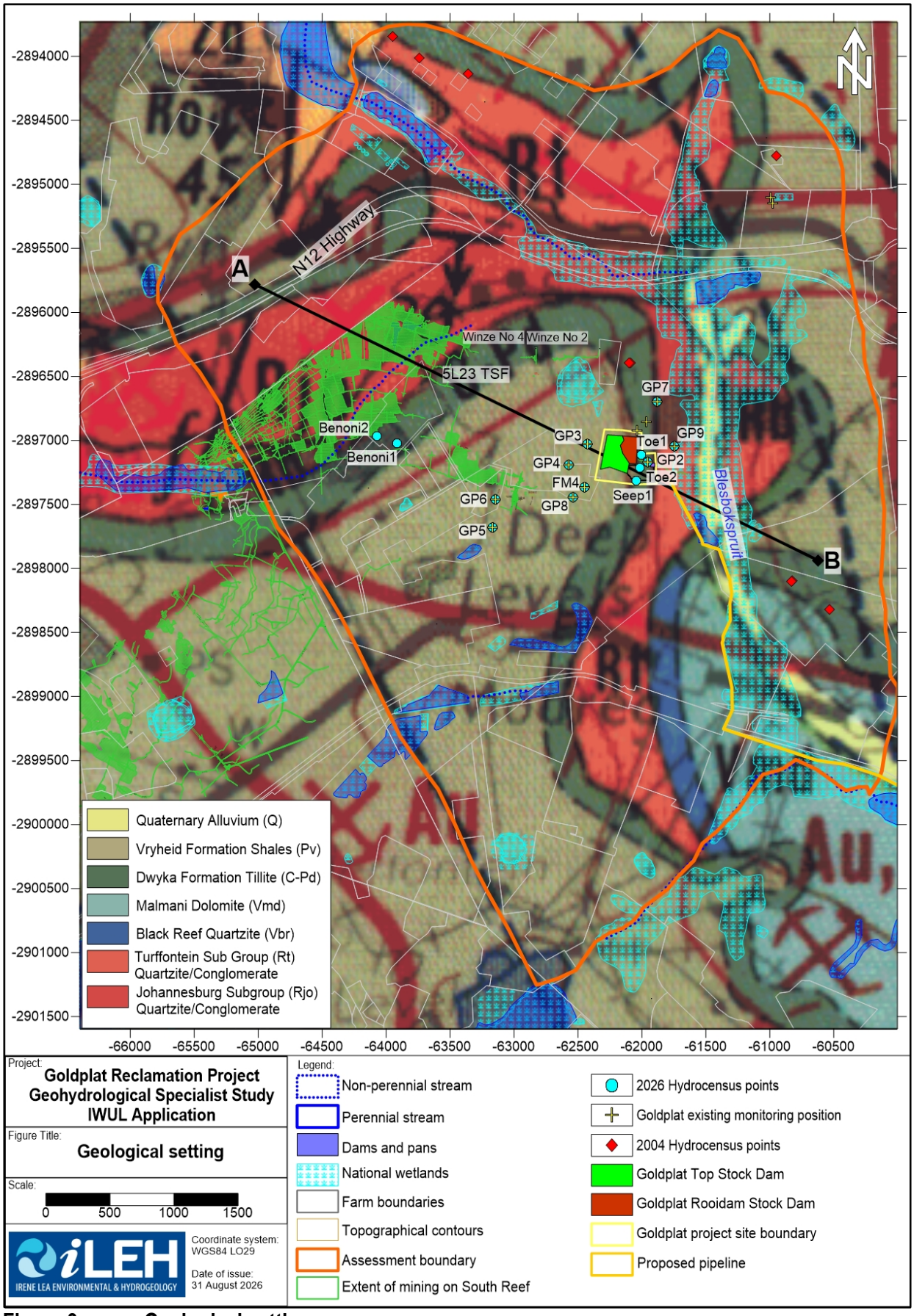



**Figure 3 Geological setting**

**Table 3 pH and TDS concentration in process, surface and groundwater**

| Monitoring position | pH | TDS (mg/l |
|---|---|---|
| Blesbokspruit Downstream | 7,08 | 335 |
| Blesbokspruit Upstream | 7,23 | 280 |
| Goldplat RWD | 8,62 | 3 813 |
| Goldplat Slime RWD | 8,31 | 2 413 |
| FM4 | 6,22 | 2 132 |
| GP2 | 8,78 | 987 |
| GP3 | 9,00 | 972 |
| GP4 | 7,52 | 2 657 |
| GP5 | 7,06 | 120 |
| GP6 | 7,24 | 246 |
| GP7 | 8,06 | 1086 |
| GP8 | 7,31 | 2401 |
| GP9 | 6,69 | 1537 |
| Toe1 | 7,53 | 9 372 |
| Toe2 | 7,96 | 10 434 |
| Stream1 | 10,20 | 6 226 |
| Benoni1 | 9,17 | 188 |

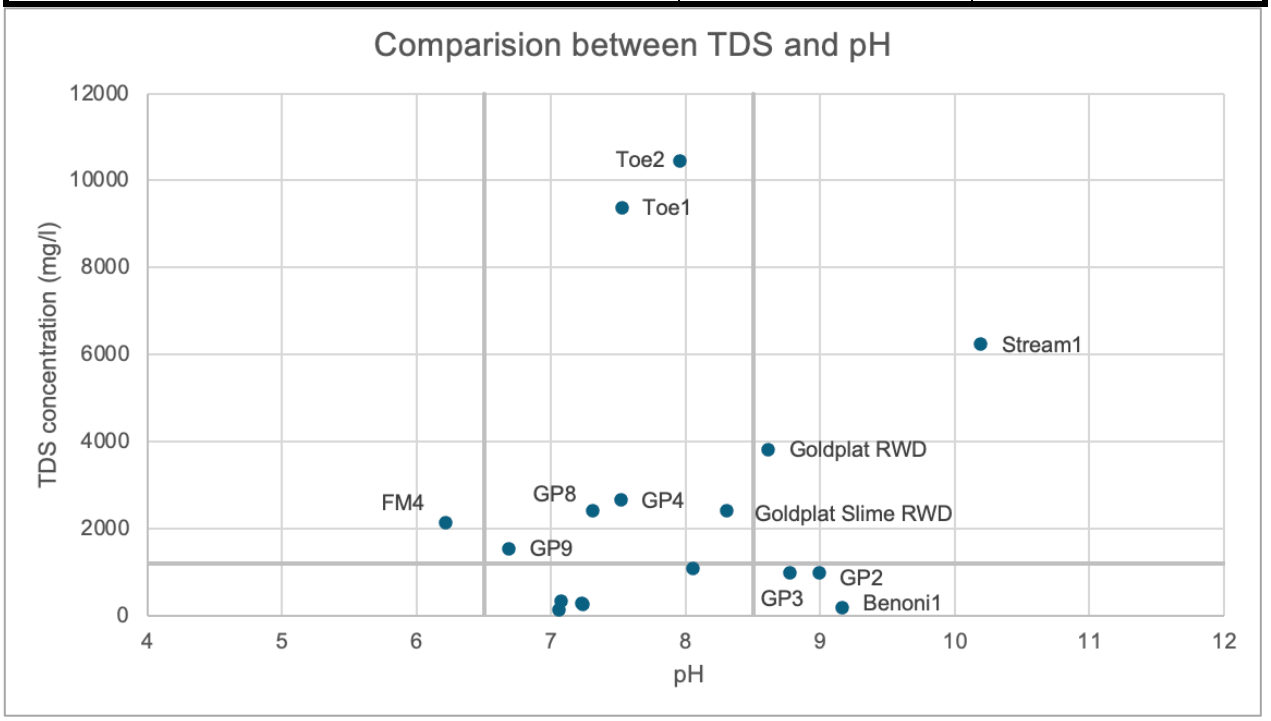



**Figure 4 Comparison between pH and EC in groundwater samples**

TDS concentrations provides an indication of the amount of inorganic salts dissolved in the water samples. As such, it provides a good indication of the salinity or the extent to which water is impacted by historical and current activities in this area. It is shown that the historical impact of the TSFs has resulted in elevated salinity in the toe seepage (>9000mg/l), return water (Goldplat RWD and Goldplat Slime RWD, >2000mg/l) and impacted groundwater (FM4, GP8 and GP4). The monitoring boreholes with elevated salinity are located in the Goldplat Plant area. Borehole GP2, located down gradient of the Top and Rooidam Stock Dams, have a TDS concentration below 1200mg/l, which is the South African drinking water upper water quality target (SANS241:2015). It is noted that borehole GP2 has a pH of around 9 units.

Acid base accounting and net acid generation potential of the tailings material on the Top and Rooidam Stock Dams was completed and assessed by Aquatox (2021). This report is presented in Appendix 1 for ease of reference. The results of the study indicate that the chemical analysis of leachates of the waste show no evidence of harmful acid mine drainage (AMD).

The major lithologies present are classified as non-acid generating and the lithologies are not significantly enriched with respect to other trace elements. This outcome is in line with the analysis of the water samples discussed above, which indicates neutral to alkaline pH conditions.

The study further indicates that the tailings material contains ferrihydrites, which show that AMD was present. The high clay content of the tailings however, inhibits the flow of water and by implication the migration of a pollution plume from the tailings. This outcome will be tested as part of the geohydrological assessment presented in the 2026 report. Aquatox indicates that tailings that are permanently submerged and saturated will be less prone to AMD. Tailings that are unsaturated are more likely to produce AMD. The study concludes that it is prohibitively difficult to quantify the degree or volume of AMD formation, due to the lack of knowledge concerning the controlling factor required for AMD formation.

## 4.3 Hydrogeology

### 4.3.1 Unsaturated zone

No information is currently available to characterise the unsaturated zone. It is however noted that the depth to groundwater in boreholes in the immediate vicinity of the Top and Rooidam Stock Dams is shallow, varying between 1.6 and 4.4m. The shallowest groundwater level of 1.6m was recorded in GP1, a historical borehole (now destroyed) located north of the TSFs and close to the wetlands of the Blesbokspruit. The groundwater level in borehole GP2 located east and downgradient of the TSFs is 3.9m below surface. This information suggests that the unsaturated zone underneath and adjacent to the TSFs is narrow and probably less than 4m thick on average.

### 4.3.2 Saturated zone

Various aquifer types are found in the region, including:

- Weathered, intergranular and fractured aquifers: The Ecca Group of the Karoo Supergroup present aquifers that have a combination of loose unconsolidated/weathered material overlaying hard rock shales and sandstones, in which fractures, fissures or joints potentially hold water. The Top and Rooidam Stock Dams are located on outcrops of the Vryheid Formation Shales and Dwyka Tillite, as discussed earlier. The Karoo strata are susceptible to preferential weathering relative to the Transvaal and Witwatersrand strata. These weathered zones form minor aquifers with low borehole yields. The groundwater potential yield of the Vryheid Formation is generally below 1 l/s. The Dwyka tillites are generally not well developed aquifers. According to a study by AGES (2006) localised perched aquifers occur on the weathered and solid bedrock contact zones in the area. The perched aquifer typically forms on low permeable clays and hardpan ferricrete. The Central Rand Group formations form clay-rich weathered shale and quartzite in this area. The weathered material has a yellow, red or brown colour depending on its mineral composition. The limit of weathering in the Central Rand Group sediments varies between 6 and 30m, with an average depth of weathering of around 15m. The shallow groundwater level conditions are indicative of the surface water – groundwater interaction in this area. Shallow groundwater near the Blesbokspruit confirms that groundwater discharges to the stream and into the associated wetlands. The yield of the weathered aquifer is however very low as mentioned.
- Alluvium material deposited in the floodplain of the Blesbokspruit is likely to form local perched aquifers that are associated with stream flow as well as groundwater discharge to the streams.
- Fractured aquifers: The deeper Ecca, Dwyka and Black Reef quartzite result in hard rock aquifers where water is stored in and moves through fractures. These aquifers are typically low yielding. The Dwyka tillites are generally not well developed aquifers. Higher groundwater yields are however often present along the contact zone between fractured Karoo aquifers and the Dwyka tillite.

- Unfractured rock matrix has a low permeability and does not transmit groundwater significantly. The recharge to the Witwatersrand outcrop is considered negligible due to the limited presence of the outcrop and the limited periods of excessive flooding along the upper reaches of the Blesbokspruit, where the outcrop does occur.

### 4.3.3 Presence of boreholes

As discussed earlier, Goldplat is maintaining a groundwater monitoring programme in nine existing monitoring boreholes, details of which are presented in Table 4. The locations of these boreholes are indicated on Figure 2. The depth of monitoring varies between 11 and 54m. Four of the boreholes monitored are located in the vicinity of the Top and Rooidam Stock Dams, namely GP2, GP3 and GP7. Borehole GP1 was historically located in the East TSF footprint, but was destroyed during tailings deposition. It does however function as a useful observation point from a groundwater impact assessment perspective. The rest of the boreholes are located in the Goldplat Plant.

Boreholes FM1 - 3 were abandoned or lost during tailings deposition (Aquatox, 2020).

**Table 4 Existing Goldplat monitoring boreholes**

| Sample ID | Description | Decimal degrees | | Depth (m) |
|---|---|---|---|---|
| | | Latitude | Longitude | |
| FM4 | Float Borehole | -26.18397˚ | 28.37503˚ | 54 |
| GP2 | Borehole behind slime dam to right | -26.18223˚ | 28.38026˚ | 30 |
| GP3 | Borehole behind kiln woodchips, left of slime dam | -26.18095˚ | 28.37554˚ | 29 |
| GP4 | Borehole inside Plant behind kiln | -26.18244˚ | 28.37408˚ | 11 |
| GP5 | Borehole behind GP6 | -26.18680˚ | 28.36811˚ | 23 |
| GP6 | Borehole behind petrol station | -26.18482˚ | 28.36837˚ | 18 |
| GP7 | Borehole between TSF expansion and wetland | -26.17800° | 28.38100° | 35 |
| GP8 | Borehole between neighbouring operations. | -26.18466° | 28.37441° | 35 |
| GP9 | Borehole between RWD and Wetland | -26.18112° | 28.38236° | 20 |

In addition to the Goldplat monitoring boreholes and the 2026 hydrocensus points, iLEH has also considered data from a hydrocensus completed in 2005 by the Council for Geoscience. Although this is old data, the groundwater level information was considered as part of aquifer conceptualisation for the Dwyka tillites, assuming a low level of confidence. The information used is presented in Table 5.

**Table 5 Council for Geoscience 2005 hydrocensus data**

| X-Coordinate | Y-Coordinate | Borehole ID | Elevation (mamsl) | Groundwater level (m) | Static water level (mamsl) | BH Depth (m) |
|---|---|---|---|---|---|---|
| WGTM 29 Coordinate system | | | | | | |
| -62090 | -2896394 | cen468 | 1603 | 10 | 1593,0 | - |
| -62098 | -2896395 | cen469 | 1603 | 10 | 1593,0 | - |

### 4.3.4 Hydraulic conductivity and transmissivity of the aquifers

Aquatox (2020) completed a 4-hour constant discharge and recovery test on borehole FM4. A short-duration test was conducted on borehole FM3. The results of the tests are summarised in Table 6. The results indicate that the Karoo-type aquifers are low-yielding with low permeabilities (K-value) in the boreholes tested.

**Table 6 Summary of aquifer parameters obtained from field data**

| BH ID | Pumping rate (l/s) | Displacement (m) | Drawdown (m) | Test duration (min) | K-Value (m/d) |
|---|---|---|---|---|---|
| FM4 | 0.26 | - | 46.88 | 314 | 1.16E-2 (Cooper Jacob) |
| FM3 | - | 0.95 | - | 20 | 4.6E-3 (Bouwer-Rice) |

Regional aquifer parameters are also available from AGES (2006). The aquifers present in the sub-catchment in which the project is situated and as delineated by the groundwater model boundary, are listed in Table 7.

**Table 7 Aquifer parameters used to conceptualise the aquifers (after AGES, 2006)**

| Aquifer | Horizontal permeability (m/d) | Vertical permeability (m/d) | Recharge rate (% of MAP) | Comment on aquifer conditions |
|---|---|---|---|---|
| Shallow perched aquifer | Alluvium: 0,26 | Alluvium: 5E-5 | Alluvium: 15% | Alluvium: enhanced aquifer |
| Shallow weathered aquifer | Wits sediments: 2E-9 | Wits sediments: 5E-5 | Wits sediments: 3% | Wits sediments: poor aquifer |
| Fractured rock aquifer | Wits sediments: 2E-9 | Wits sediments: 2E-9 | | Wits sediments: poor aquifer |

## 4.4 Groundwater levels

Groundwater level measurements from the 2026 hydrocensus dataset were used to assess groundwater flow patterns. The information is presented in Table 2. The following factors influence groundwater flow patterns in this area:

- The topography and the position of water bodies. An analysis of the relationship between topographical and groundwater level elevations indicates a strong correlation (>97%) for both shallow and deeper groundwater levels. This is relationship is indicated in Figure 5. This confirms that groundwater flow patterns follow the topography and drains towards local water bodies. Groundwater is therefore expected to discharge to local rivers, streams and wetlands as baseflow.
- The average depth to groundwater in the boreholes that indicate shallow conditions is 3.8m below surface. In boreholes that indicate deeper water levels, the average depth to groundwater is 10.4m.
- The underground water level in the East Rand Basin is controlled through pumping from the Grootvlei No 3 shaft, situated approximately 13km southeast project. According to information made available by GoldOne, the underground water level is estimated to be around 120m below the groundwater levels measured in hydrocensus boreholes. Due to the fact that there is a strong correlation between topography and groundwater level elevation, the dataset suggests that underground dewatering does not impact significantly or perhaps at all on groundwater flow in the Goldplat area.

The groundwater level fluctuation information presented in Figure 6 indicates a general decline in groundwater levels around the Top and Rooidam Stock Dams in GP2, GP3 and GP7 between 2022 and 2023. Groundwater levels have risen between 2025 and 2026 in these boreholes. Groundwater levels fluctuate by between 1 and 5m between due to the recharge or rainwater during the wet season and a decline in groundwater levels in the dry season. The depth to groundwater in these boreholes varies between 4 and 12m below surface at present.

The groundwater level in borehole GP9, located on the edge of the Blesbokspruit wetlands, has risen steadily from 2023 to 2026. Seasonal fluctuations are also notable, which suggests that groundwater level rise is probably associated with flooding in the Blesbokspruit into the wetlands during the wet season. The depth to groundwater in GP9 currently fluctuates between 1 and 2m below surface. These shallow groundwater level conditions in the wetland confirms that groundwater discharges to the watercourse, especially during the rainy season.

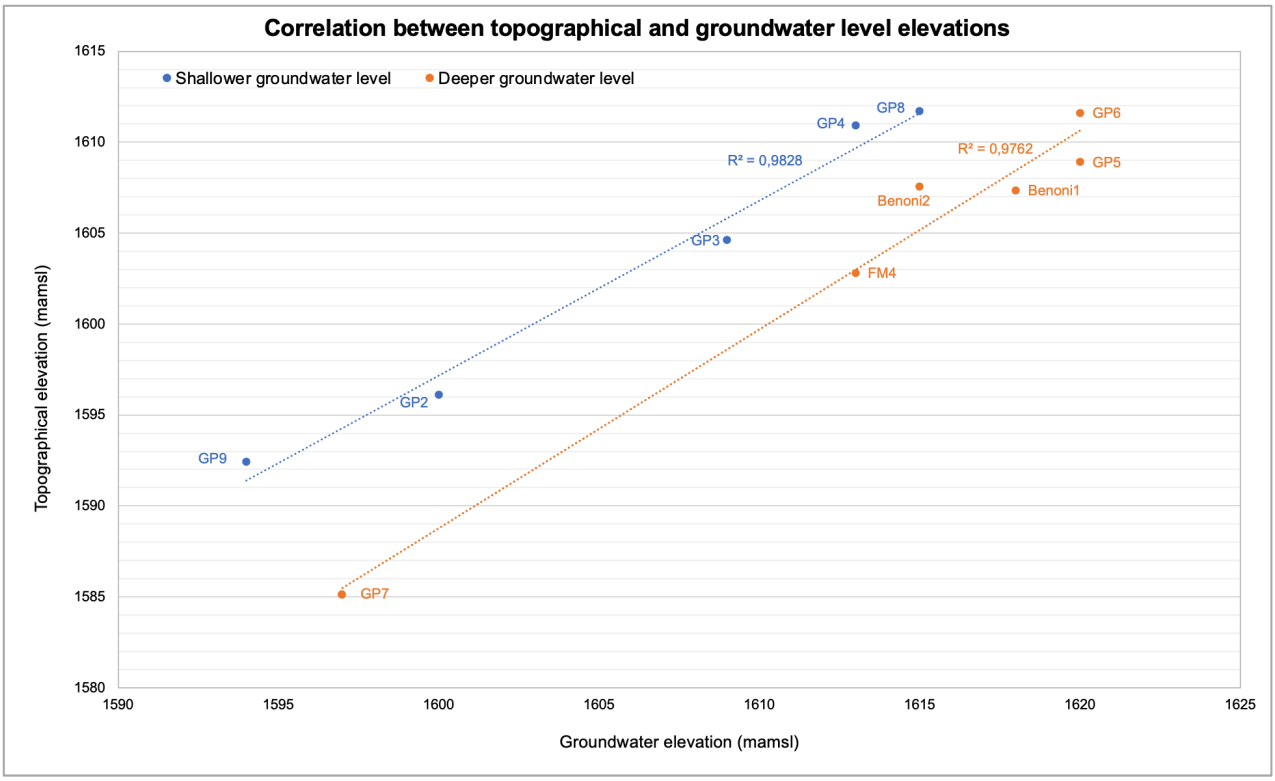



**Figure 5 Correlation between measured groundwater and topographical elevations**

Goldplat includes groundwater level measurements in their monitoring programme. Data for the boreholes in the immediate vicinity of the Top and Rooidam Stock Dams are presented in Figure 6, including GP2, GP3, GP7 and GP9.

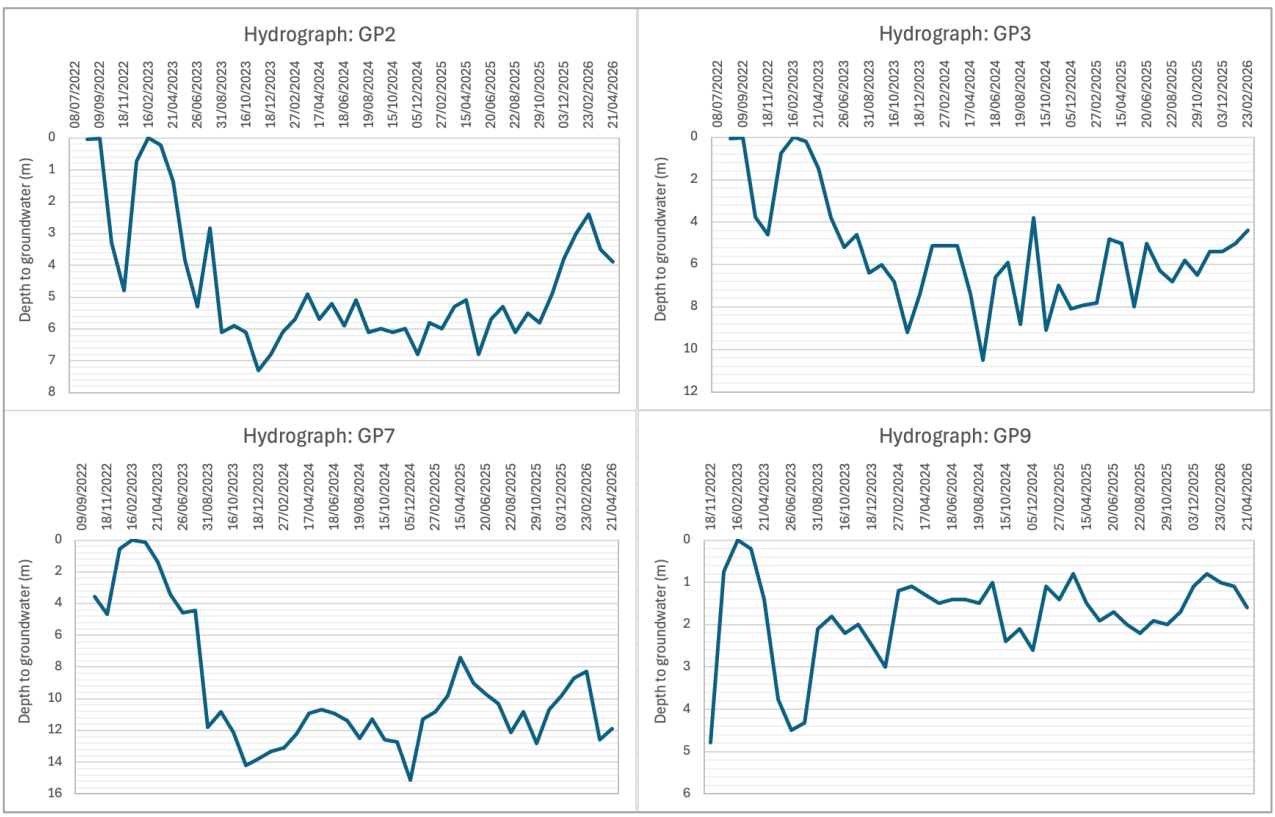



**Figure 6 Groundwater level fluctuations in boreholes near the TSFs**

Groundwater flow contours were generated with the 2026 hydrocensus data. The shallow and deeper groundwater level trends are presented separately in the groundwater flow contour map presented in Figure 7. The data confirms that groundwater flow is generally in an easterly to northeasterly direction towards the Blesbokspruit at a flow gradient of 0,025 (1:40).

This confirms that groundwater from the Goldplat Top and Rooidam Stock Dams flows towards the Blesbokspruit and its wetlands. As indicated above, the groundwater will discharge to the streams and wetlands as baseflow. The rate at which this takes place is difficult to assess without data from shallow an deep monitoring boreholes located adjacent to the stream.

Regionally, groundwater flow is from the Goldplat Plant in a northwesterly direction towards the two hydrocensus boreholes Benoni1 and Benoni2. Groundwater flow from the Top and Rooidam Stock Dams is however not towards these private boreholes.

## 4.5 Groundwater potential contaminants

The risk to groundwater contamination is associated with potential sources of groundwater contamination. In this instance, water quality data obtained from the toe seepage collected from the Top and Rooidam Stock Dams and the stream draining from the adjacent TSF (not owned by Goldplat) was used to identify potential contaminants associated with these sources. The results are presented in Figure 8 and summarised in Table 8.

The information presented in Figure 8 indicates that sulphate is the dominant ion in the Goldplat toe seepage samples taken. Sulphate concentrations in the toe seepage vary between 5 500 and 6 800 mg/l. Sodium is the dominant macro element in seepage from the adjacent TSF.

In terms of trace elements, cobalt is the indicator element for the toe seepage from the Goldplat TSFs and iron and nickel are the indicator elements for the adjacent TSF. Cobalt concentrations in the Goldplat toe seepage vary between 15 and 16mg/l. It is noteworthy that approximately 2mg/l of uranium is present in the Toe2.

A comparison of the toe seepage and stream qualities is presented with the Goldplat monitoring data in Table 8. pH levels are also indicated as a reference. The Goldplat monitoring data represents average concentrations for the monitoring period (June 2022 to April 2026). Monitoring of iron concentrations in the Goldplat return water dams (RWD) was stopped in March 2024. No data is available for 2026. Goldplat also does not include cobalt or uranium in their monitoring programme. This prevents the assessment of all the indicator elements identified in the return water.

The information presented in Table 8 indicates that sulphate in all the potential sources of groundwater contamination exceeds the Blesbokspruit Water Quality Objective of 500mg/l significantly. The highest concentrations are associated with the toe seepage from the Top and Rooidam Stock Dams. Elevated iron concentrations are not reported for the toe seepage, only for the return water.

**Table 8 Comparison of indicator element concentrations**

| Element | Blesbokspruit Catchment WQO | Toe1 (Rooidam) | Toe2 (Top) | Stream 1 | Goldplat RWD | Goldplat Slime RWD |
|---|---|---|---|---|---|---|
| pH | 6.5 - 8.5 | 7,73 | 7,96 | 10,2 | 8,62 | 8,31 |
| Sulphate (mg/l) | 150 - 500 | 5 490 | 6 637 | 1 420 | 1 523 | 1 155 |
| Sodium (mg/l) | 70 - 150 | 2 290 | 2 749 | 1 948 | 1 262 | 838 |
| Iron (mg/l) | 0.1 - 1 | 0,1 | 0,2 | 12,9 | 11,0 | 3,4 |
| Manganese (mg/l) | 0.1 - 1 | 2,18 | 1,19 | 0,075 | 0,07 | 0,90 |
| Cobalt (mg/l) | NS | 19,0 | 15,6 | 1,2 | NA | NA |
| Nickel (mg/l) | NS | 0,3 | 0,2 | 17,2 | NA | NA |
| Uranium (mg/l) | NS | 0,02 | 1,90 | 0,24 | NA | NA |

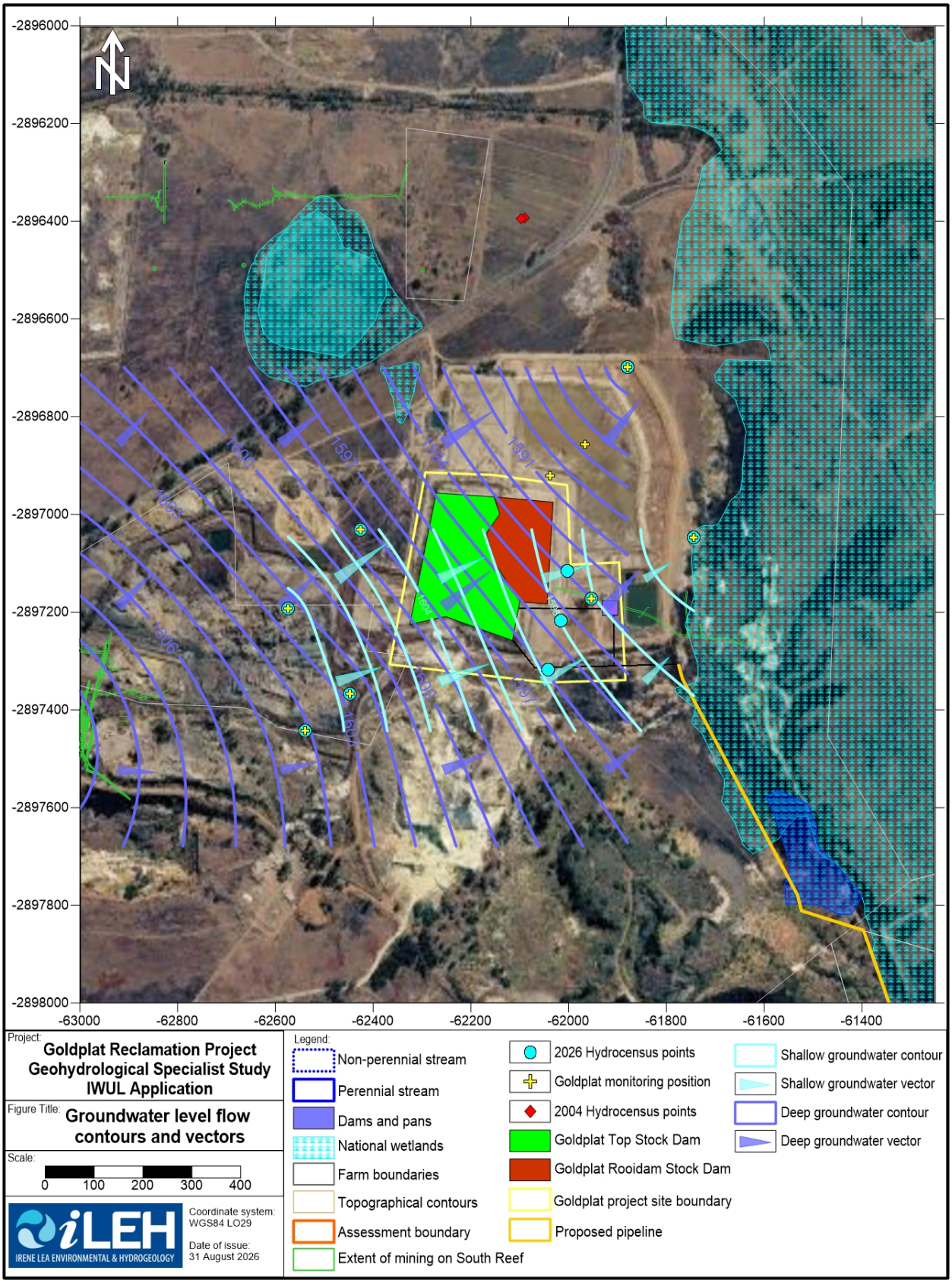
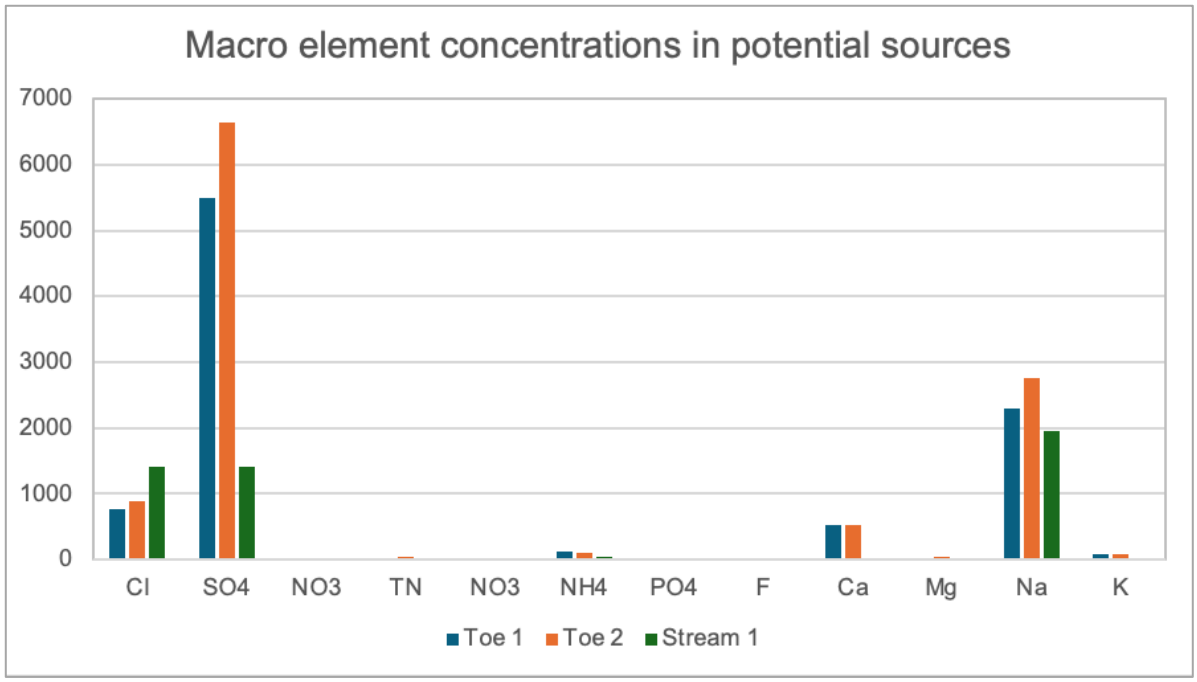



**Figure 7 Estimated groundwater flow patterns**



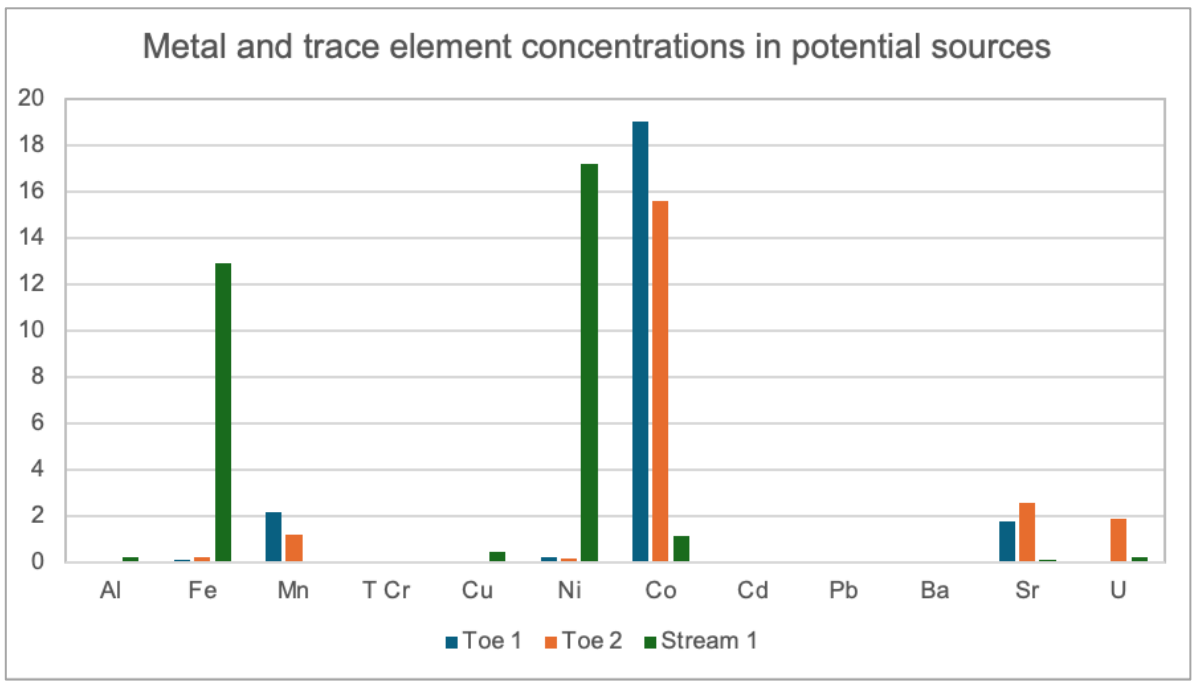




**Figure 8 Comparison of macro and trace elements in seepage from TSFs**

Based on the assessment presented above and the available monitoring dataset, the impact assessment presented in this report will be completed at the hand of sulphate as an indicator element. It is however recommended that the Goldplat monitoring is expanded to include cobalt, nickel and uranium. This is discussed in more detail below. The outcome of the expanded monitoring dataset must be used to confirm whether or not additional impact prediction simulations are required for the indicator metals for the Top and Rooidam Stock Dams.

## 4.6 Groundwater quality

Four groundwater samples were taken during the July 2026 hydrocensus for chemical analysis at Aquatico Laboratory, a SANAS accredited laboratory. These samples include:

- Benoni1 – property directly west of 5L23 and the borehole that was accessible for sampling. The borehole currently not in use.
- Toe1 – Toe drain sample from Rooidam Stock Dam.
- Toe2 – Toe drain sample from Top Stock Dam.
- Stream1 – local unlined surface drainage flowing along the southern boundary of the project area. This stream originates from an adjacent TSF that is not owned by Goldplat.

The Benoni1 sample was taken using a single valve decontaminated bailer. The other three were taken as grab samples. Sterilised 500ml sample bottles were used and filled to the top during sampling. Samples were stored and transported to the laboratory in a cooler box.

As indicated in the SANS241:2015 Drinking Water Standards, the following elements may pose health risks. Acute health risks relate to an immediate and unacceptable health risk whereas chronic health risks pose an unacceptable risk if ingested over an extended period. Aesthetic impacts relate to taints with respect to taste, odour and colour and does not pose an unacceptable health risk. Operational impacts relate to efficient operation of treatment systems and risk to infrastructure.

- Chronic Health Limit Exceedances:
    - Iron – sample from Stream 1.
    - Lead – sample from Stream 1.
    - Manganese – samples from Toe drain 1 and Toe drain 2.
    - Nickel – samples from Stream 1, Toe drain 1 and Toe drain 2.
    - Total Chrome – sample from Toe drain 1.
    - Uranium – samples from Stream 1 and Toe drain 2.
- Acute Health Limit Exceedances:
    - Nitrate – sample from Toe drain 2.
    - Nitrite – samples from Toe drain 1 and Toe drain 2.
    - Sulphate - Toe drain 1 and 2 and Stream 1
- Aesthetic / Operational effects:
    - Ammonium – all 4 samples.
    - Chloride – samples from Stream 1, Toe drain 1 and Toe drain 2.
    - Electrical Conductivity – samples from Stream 1, Toe drain 1 and Toe drain 2.
    - pH – Stream 1.
    - Sodium – samples from Stream 1, Toe drain 1 and Toe drain 2.
    - TDS – samples from Stream 1, Toe drain 1 and Toe drain 2.
    - Total Hardness – samples from Stream 1, Toe drain 1 and Toe drain 2.

Groundwater sampled from private borehole Benoni1 is generally fit for use and complies with the SANS241:2015 Drinking Water Standards, with the exception of Ammonium, which slightly exceeds the aesthetic limit. At the concentrations present the groundwater may have slight taste and odour problems. Impacts on this borehole are unrelated to the Goldplat Top and Rooidam Stock Dams, as the latter are down gradient of the borehole and groundwater from the Goldplat project does not flow towards this borehole.

**Table 9 2026 Hydrocensus groundwater quality results**

| Parameter | Unit | SANS241 Standard Limits | | DWS Drinking Standards | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
|---|---|---|---|---|---|---|---|---|
| Ammonium | mg N/ℓ | Aesthetic ≤1.5 | | | 119 | 99,6 | 43,1 | 1,97 |
| Chloride | mg Cl/ℓ | Aesthetic ≤300 | | | 761 | 880 | 1416 | 53,6 |
| Aluminium | mg Al/ℓ | ≤0.3 | | | <0,003 | <0,003 | 0,228 | 0,006 |
| Cadmium | mg Cd/ℓ | | Chronic health ≤0.003 | | <0,002 | <0,002 | <0,002 | <0,002 |
| Calcium | mg Ca/ℓ | | | No health. Scaling intensifies from 32mg/L | 519 | 521 | 20,7 | 8,98 |
| Copper | mg Cu/ℓ | | Chronic health ≤2 | | <0,003 | <0,003 | 0,489 | <0,003 |
| Iron | mg Fe/ℓ | Aesthetic ≤0.3 | Chronic health ≤2 | | 0,103 | 0,22 | 12,9 | <0,004 |
| Lead | mg Pb/ℓ | | Chronic health ≤0.01 | | <0,004 | <0,004 | 0,01 | <0,004 |
| Magnesium | mg Mg/ℓ | | | Diarrhoea and scaling issues from 70mg/L | 28,2 | 52,6 | 18,9 | 11,3 |
| Manganese | mg Mn/ℓ | Aesthetic ≤0.1 | Chronic health ≤0.4 | | 2,18 | 1,19 | 0,075 | 0,015 |
| Nickel | mg Ni/ℓ | | Chronic health ≤0.07 | | 0,26 | 0,175 | 17,2 | <0,007 |
| Total Chrome | mg/ℓ | | Chronic health ≤0.05 | | 0,05 | 0,03 | <0,01 | <0,01 |
| Barium | mg/ℓ | | Chronic health ≤0.7 | | 0,043 | 0,06 | <0,002 | 0,015 |
| Strontium | | | | | 1,8 | 2,57 | 0,111 | 0,052 |
| Uranium | | | Chronic health ≤0.03 | | <0,015 | 1,9 | 0,238 | <0,015 |
| Electrical Conductivity at 25°C | mS/m | Aesthetic ≤170 | | | 1124 | 1293 | 841 | 26,1 |
| Fluoride | mg/ℓ | | Chronic health ≤1.5 | | 0,964 | 0,539 | 1,02 | <0,263 |
| Nitrate | mg/ℓ | | Acute health ≤11 | | 6,77 | 22,1 | <0,194 | <0,194 |
| Nitrite | mg/ℓ | | Acute health ≤0.9 | | 5,09 | 12,6 | 0,347 | 0,152 |
| Total Oxidized Nitrogen | mg/ℓ | | | | 11,9 | 34,7 | 0,363 | 0,253 |
| Total Nitrogen | mg/ℓ | | | | 174 | 201 | 108 | 2,22 |
| Total Kjeldahl Nitrogen | mg/ℓ | | | | 162 | 166 | 107 | 1,97 |
| pH at 25°C | | ≥5 < ≤9.7 | | | 7,53 | 7,96 | 10,2 | 9,17 |
| Potassium | mg K/ℓ | | | No aesthetic or health effects below 50mg/L | 83,8 | 84 | 22,9 | 3,78 |
| Sodium | mg Na/ℓ | Aesthetic ≤200 | | | 2290 | 2749 | 1948 | 15,8 |
| Sulphate | mg $SO_4$/ℓ | Aesthetic ≤250 | Acute health ≤500 | | 5490 | 6637 | 1420 | 4,04 |

| Parameter | Unit | SANS241 Standard Limits | | DWS Drinking Standards | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
|---|---|---|---|---|---|---|---|---|
| Total Alkalinity | mg $CaCO_3/\ell$ | | | | 277 | 245 | 717 | 34 |
| Bicarbonate alkalinity | mg $CaCO_3/\ell$ | | | | 277 | 243 | 285 | 29,2 |
| Total Dissolved Solids | mg/ℓ | Aesthetic ≤1200 | | | 9372 | 10434 | 6226 | 188 |
| Total Hardness | mg $CaCO_3/\ell$ | 60–120 mg/l, moderately hard | 120–180 mg/l, hard | more than 180 mg/l, very hard | 1412 | 1518 | 130 | 69 |
| Orthophosphate ($PO_4$) as P | mg/ℓ | | | | <0,009 | 0,016 | <0,009 | <0,009 |
| Cobalt | mg/ℓ | | | | 19 | 15,6 | 1,17 | <0,003 |

Water seeping from the Goldplat Top and Rooidam Stock Dams is not suitable for use. The stream flowing towards the project area from the adjacent TSF is also not suitable for use. Health risks associated with the chronic and acute health exceedances (indicated in red in Table 8) are presented in Table 10 (DWAF, 1996).

**Table 10 Health risks associated with significantly elevated elements**

| Element | Unacceptable concentration range (mg/l) | Associate health risks |
|---|---|---|
| Iron | 10 - 30 | Severe aesthetic effects (taste) and effects on plumbing (slimy coatings). Slight iron overload possible in some individuals. Chronic health effects in young children and sensitive individuals occur in the range of 10 - 20mg/l and occasional acute effects towards the upper end of this range |
| Lead | 0.01 - 0.05 | No danger of any adverse health effects except for a slight risk of behavioural changes and possibly neurological impairment if exposure is not minimised. |
| Manganese | 2 - 5 | Extreme staining, likely to be aesthetically unacceptable to a large proportion of users. No health effects |
| Nickel | Not specified | Not specified |
| Total Chrome | 0.05 - 1 | Possible risk of induction of gastrointestinal cancer following long-term exposure |
| Uranium | >1.42 | Increasing cancer risk in long-term. Increasing risk of renal damage in short-term. |
| Nitrate and Nitrite | >20 | Methemoglobinemia occurs in infants. Occurrence of mucous membrane irritation in adults |
| Sulphate | >1000 | Diarrhoea in all individuals. User-adaptation does not occur. Very strong salty and bitter taste. |

A detailed discussion on the Goldplat monitoring dataset falls outside the scope of this report. Average concentrations for selected elements considered in this impact assessment are presented in Table 11. Concentrations marked in red exceed the Blesbokspruit Water Quality Objective (WQO) (unacceptable concentration). Total dissolved solid (TDS) concentrations that exceed the SANS241:2015* standard is also indicated in red.

**Table 11 Average Goldplat water quality for selected elements**

| Average monitoring concentrations | pH | TDS (mg/l) | $SO_4$ (mg/l) | Fe (mg/l) | Mn (mg/l) |
|---|---|---|---|---|---|
| **Blesbokspruit WQO** | **6.5 - 8.5** | **1200*** | **150 - 500** | **0.1 - 1** | **0.5 - 1** |
| Blesbokspruit Downstream | 7,08 | 335 | 52 | 0,08 | 0,10 |
| Blesbokspruit Upstream | 7,23 | 280 | 51 | 0,17 | 0,08 |
| Goldplat RWD | 8,62 | 3 813 | 1 523 | 11,06 | 0,07 |
| Goldplat Slime RWD | 8,31 | 2 413 | 1 155 | 3,43 | 0,90 |
| FM4 | 6,22 | 2 132 | 1 181 | 0,16 | 21,62 |
| GP2 | 8,78 | 987 | 293 | 0,23 | 0,14 |
| GP3 | 9,00 | 972 | 241 | 0,06 | 0,02 |
| GP4 | 7,52 | 2 657 | 440 | 0,13 | 19,00 |
| GP5 | 7,06 | 120 | 14 | 0,23 | 0,10 |
| GP6 | 7,24 | 246 | 58 | 0,10 | 0,08 |
| GP7 | 8,06 | 1 086 | 479 | 4,02 | 1,56 |
| GP8 | 7,31 | 2 401 | 1 119 | 0,19 | 80,82 |
| GP9 | 6,69 | 1 537 | 889 | 0,22 | 4,62 |

As discussed earlier, the pH of the surface, process and groundwater is generally neutral to alkaline, with the exception of borehole FM4, which has a slightly acidic pH. The water is further saline with elevated TDS concentrations, except for boreholes GP5 and GP6 located outside and upgradient of the Goldplat Plant. Sulphate concentrations in the return water exceeds 1000mg/l, but is generally low in the monitoring boreholes, with the exception of boreholes GP8 and GP9. Sulphate concentrations in groundwater downgradient of the Top and Rooidam Stock Dams in boreholes GP2 and GP3 is below 300mg/l on average. This suggests that historical tailings deposition and the Goldplat activities do not significantly impact on groundwater in the immediate vicinity of the project.

Only iron and manganese are currently included in the Goldplat monitoring programme. Elevated iron concentrations are recorded in the return water, but not significantly so in groundwater downgradient of the Top and Rooidam Stock Dams. Borehole GP7 located north and upgradient of the project area also has elevated iron concentrations. Some areas in the Goldplat Plant have significantly increased manganese concentrations in groundwater, for example boreholes FM4, GP4 and GP8. These boreholes and sources of manganese contamination are however upgradient of the Top and Rooidam Stock Dams. Borehole GP7, with elevated manganese concentrations, is located northeast and also upgradient of the project. Borehole GP9 is located downgradient of the project area and shows elevated manganese concentrations. This borehole is located on the edge of the Blesbokspruit wetland. It is unclear what the source of manganese contamination is in this position, as the return water has low concentrations of manganese.

The Blesbokspruit upstream and downstream of the TSFs is not significantly affected and water quality complies with the WQO for the elements indicated.

A Piper Diagram was prepared using the complete groundwater monitoring dataset (Goldplat and 2026 hydrocensus) and is presented in Figure 9. These diagrams are used to plot the equivalent concentrations of several elements in order to characterise the types of water in the study area according to hydrogeological facies and the dominant cation and ion concentrations. The results indicate that the groundwater quality generally does not plot in the recently-recharged magnesium-bicarbonate dominant quadrant (left). The groundwater is generally calcium-sulphate (top quadrant) and sodium-chloride (right quadrant) dominant. This is indicative of saline conditions as well as gypsum weathering. This outcome is in line with the discussion above.

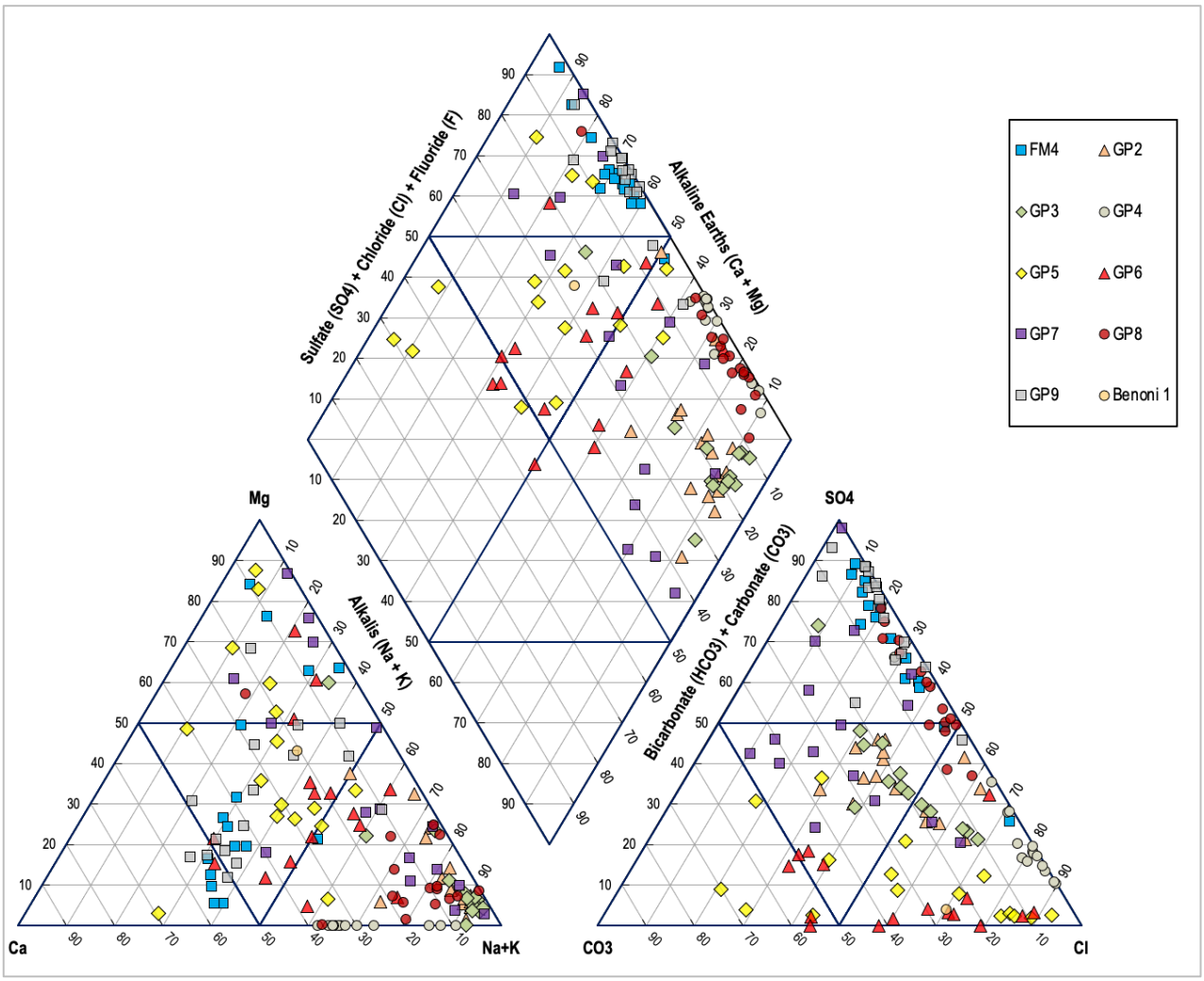



**Figure 9 Piper Diagram of the complete dataset**

### 4.7 Wetland water quality

Aquatox (2020) provided the results of a surface water sample taken from a wetland downgradient of the site. The outcome indicates that water in the wetland was slightly acidic (pH of 6.19) and had elevated sulphate (609mg/l), iron 5.29mg/l) and manganese (3.1mg/l).

## 5 AQUIFER CHARACTERISATION AND VULNERABILITY

Based on aquifer classification methodology and regions published in the Aquifer Classification Map Series of South Africa (DWS, 2012), the aquifers present in the project area are minor aquifers with low yields and variable quality. It is however noted that groundwater is often the sole source of water available to local users and for this reason, should be protected. Ambient groundwater quality associated with the Karoo sediments are generally acceptable for potable use except where mining activities have affected groundwater quality.

The aquifers fall in a moderately vulnerable category, which means they are vulnerable to some pollutants in the long-term when these are continuously discharged or leached. The presence of various sources of contamination associated with historical gold mining will however pose a threat to the aquifers. Overall, the aquifers presented are ranked with a medium susceptibility to the impacts of pollutants. Based on the information above, as well as the methodology described by Parsons (1995), the aquifer protection classification is rated as medium.

This is due to the fact that groundwater is often the only water resource available to farmers and that groundwater can been impacted by regional mining activities.

# 6 CONCEPTUAL HYDROGEOLOGICAL MODEL

The available information discussed above was used to construct a conceptual model of the aquifers present in the project area. The conceptual model forms the basis of the numerical groundwater model constructed and calibrated to complete the impact assessment for this project.

A schematic cross section through the project area is presented in Figure 10. The location of the cross section is indicated on Figure 3. The figure demonstrates the locations and extent of the various geological formations that are present. It is shown that the Goldplat Top and Rooidam Stockpile footprints are underlain by Vryheid Formation shales and Dwyka Tillite. The extent of the Karoo sediments is limited and is expected to extend to depths of 20 – 50m below surface. The groundwater table rests in the Karoo sediments, as indicated by information gathered during the hydrocensus. The Karoo sediments are underlain by Malmani Dolomite and Black Reef, which are located deeper under the footprints.

The Karoo sediments and dolomites are regionally underlain by quartzites, shales and conglomerates of the Witwatersrand Supergroup, including the Johannesburg Subgroup. The South Reef is located within the Johannesburg Subgroup, as indicated. The reef dips steeply and is mined at depths of between 100 and 240m northwest of the Goldplat project.

The level of flooding in the East Rand Basin is also indicated on the cross section. Available groundwater level data indicates that groundwater levels at the Goldplat project are not lowered due to deep underground gold mine dewatering.

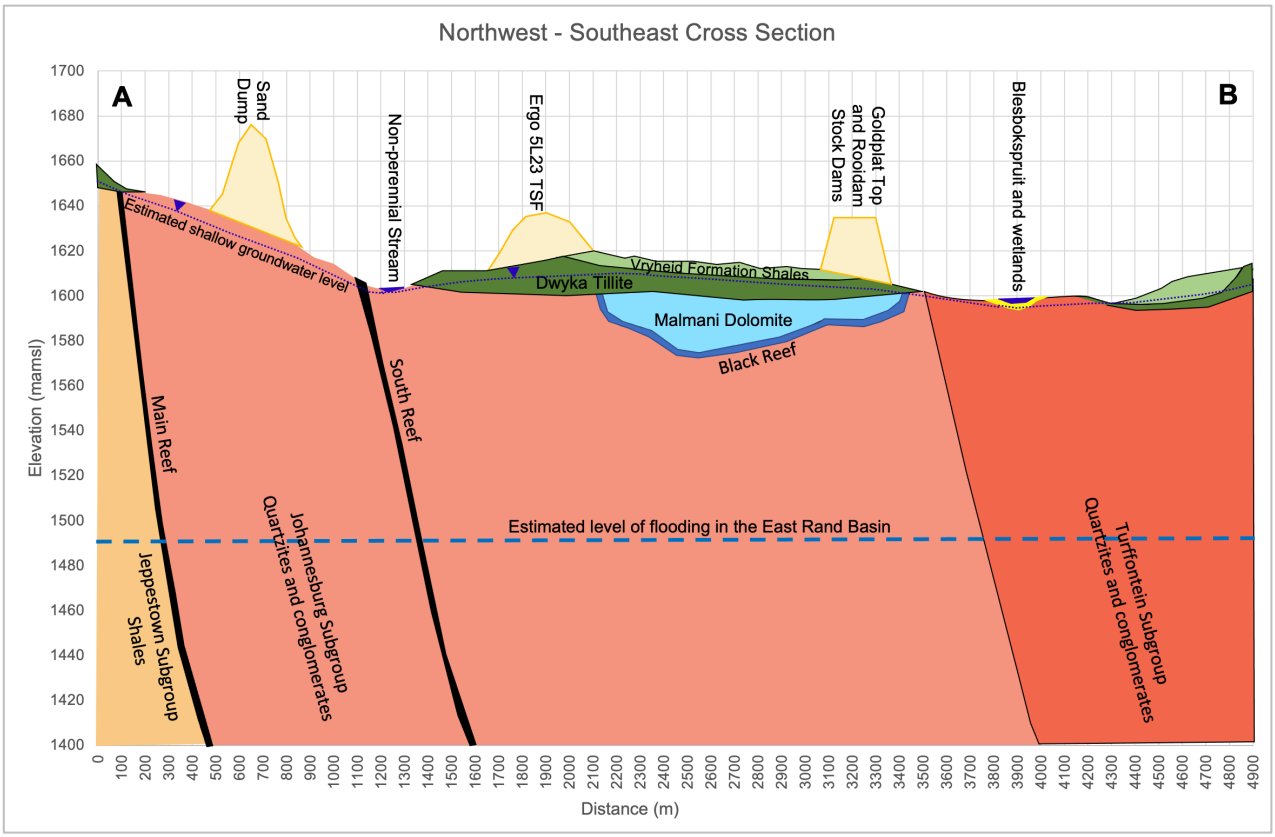



**Figure 10 Schematic cross section through the project area**

# 7 SOURCE TERM

## 7.1 Geochemistry

Four samples were taken from the Top and Rooidam Stock Dams for geochemical analysis as part of a 2021 geochemical study (Aquatox, 2021). This report is presented in Appendix 1 for ease of reference. The results indicate the tailings mainly consist of quartz and clay minerals as was subjected to oxidation of iron-rich sulphides and intense weathering. The results further indicate that the tailings have elevated iron concentrations and slightly elevated calcium due to the presence of carbonate minerals. Less than 3% of sulphate minerals in the form of gypsum are present and small proportions of ferrihydite minerals were present in the samples studied. The high clay content in the tailings is expected to act as an efficient low or even non-permeable layer that would contain water and prevent it from leaching into the underlying aquifers.

Distilled water leach test results indicate slightly elevated arsenic, boron, antimony and cyanide concentrations. Total (whole rock) concentrations of arsenic, boron, barium, copper, manganese, nickel, lead, antimony, zinc, fluoride and cyanide were slightly elevated in the samples.

The outcome of the assessment indicates that potentially leachable concentrations of trace elements from the tailings are generally low and below their respective drinking water guideline values. Based on total (whole rock) concentrations, the tailings material is classified as a Type 3 waste, but the concentrations are not considered to be significantly enriched and a risk-based approach to assessing the potential impacts arising from the tailings to the groundwater resources should be adopted. This requirement will be addressed for the Top and Rooidam Stock Dams as part of the 2026 study.

In addition to the geochemical study, a hydrogeological study was completed in 2020 (Aquatox, 2020). As part of this work, water quality data was provided for the Goldplat Plant area. While the Plant is not the focus of this study, it is included in the assessment to evaluate cumulative impacts on groundwater quality. Water quality for the float mill, Plant feed and Plant tailings were considered. Other water qualities provided in Aquatox (2020) are for water contained in tanks, which should not impact on groundwater quality. The information, presented in graphs, indicate that sulphate concentrations varied between 1 000 and 10 000mg/l on average in these feeds. during 2015. Iron concentrations varied between 1 and 100mg/l over the same period.

## 7.2 Seepage quality

The groundwater impact assessment will be completed using sulphate as an indicator element, as discussed above. Sulphate concentrations in seepage associated with each source identified for the project is listed in Table 12. These concentrations are based on the existing water monitoring dataset and the 2021 geochemistry.

As discussed earlier, it is important to expand the Goldplat monitoring data to include a wider range of metals, including cobalt, nickel and uranium. The Top and Rooidam Stock Dams are not a source of iron and not a significant source of manganese, which are the two metals monitored by Goldplat. The need to revise the source term used in this assessment must be evaluated once additional metal concentrations are available.

It is assumed that the East and Plant TSFs and the Emergency Paddock leachate quality is similar to the measured Rooidam Stock Dam leachate quality. It is also assumed that the material deposited on the adjacent TSFs and Emergency Paddock is of a similar clay content compared to the Top and Rooidam Stock Dams.

The return water dam (RWD) is lined. The barrier type or construction details are not currently available. It is however assumed that the dam is lined with a Class C barrier for the purpose of this assessment. These liners are not considered impermeable and small volumes of leachate are likely to seep from the dams over time. The extent to which this can occur was estimated based on work completed by Rowe (2012). The quality of the liner installation affects the rate at which leachate could seep from the dam. For a well installed facility, the liner transmissivity may be around $2x10^{-8}$m/s. Under these conditions, the life of the liner is estimated to be around 65 years. The RWD will be demolished and rehabilitated and the end of life of the Goldplat operations. Impacts of long-term liner failure are therefore not applicable to this assessment. These conditions were considered in the impact assessment completed.

The unlined dirty water dam located immediately east of the Rooidam Stock Dam and upgradient of borehole GP2 was included during simulations, based on the quality of Stream1, which drains into this dam.

The Slime RWD is a tank located in the Goldplat Plant area. Although water quality for this dam was considered as part of the water quality assessment, it is not considered a source of groundwater contamination for this assessment.

**Table 12 Source term: Leachate quality**

| Potential source | Sulphate concentration (mg/l) |
|---|---|
| Existing lined RWD | 1 600 |
| Top Stock Dam | 6 700 |
| Rooidam Stock Dam | 5 500 |
| Proposed catchment paddock | 1 600 |
| East TSF | 5 500 |
| Emergency Paddock | 5 500 |
| Plant TSF | 5 500 |
| Unlined dirty water dam | 1 500 |
| Goldplat Plant area (diffused source) | 1 000 |
| Adjacent TSF (Stream1) | 1 500 |
| Regional TSFs | 2 000 |
| Ambient quality | 5 |

## 7.3 Operational seepage volume

The groundwater quality monitoring dataset indicates that sulphate concentrations in groundwater in the immediate vicinity of the Top and Rooidam Stock Dams are not significantly elevated. This suggests that the volume of seepage available for infiltration from the TSFs is low and that low aquifer permeability limits the spread of contamination from the dams.

This is in line with the conclusions of the 2021 geochemistry study completed by Aquatox, which found that the high clay content in the tailings act as an efficient low or even non-permeable layer that contains seepage and prevents it from leaching into the underlying aquifers.

The operational seepage volume will be calculated during numerical modelling, using the existing groundwater monitoring data as calibration points.

# 8 POTENTIAL PATHWAYS AND RECEPTORS

Based on the available dataset, the following aquifer pathways are identified for the project:

- Vertical flow through the unsaturated soil horizon from the tailings reclamation areas to the underlying weathered and fractured rock aquifers
- Vertical and horizontal flow through the weathered aquifer the tailings reclamation areas. It is noted that the contact between fresh and weathered rock is considered a preferential flow path to groundwater.
- Preferential flow along the alluvium associated with the Blesbokspruit, once the potential plumes reach this area.
- Preferential flow in the dolomitic aquifer associated with the Malmani dolomite, once the potential plumes reach the dolomites. This can only be achieved through vertical seepage to the underlying dolomites.
- It is noted that the formations of the Witwatersrand Supergroup are not aquifers, but rather aquitards. Groundwater will therefore not flow preferentially in these sediments.

The following receptors were identified:

- Private boreholes identified during the hydrocensus. The two boreholes identified are however located upgradient of the Top and Rooidam Stock Dams.
- The Blesbokspruit and its tributaries down gradient of the project areas. Groundwater is expected to contribute to river and baseflow, specifically during the wet season when groundwater levels are expected to rise above the base of the streams as a result of the recharge of rainwater.
- The wetlands associated with the Blesbokspruit and its alluvium. Shallow groundwater is expected to contribute to the maintenance of these wetlands, especially during the dry season, when river water levels may be lowered.

The potential pathways and receptors are summarised in Table 13.

**Table 13 Pathways and receptors**

| Pathways | Receptors |
|---|---|
| Runoff | Private boreholes identified during the hydrocensus |
| Seepage | Blesbokspruit and its tributaries |
| Alluvium associated with the Blesbokspruit | Wetlands associated with the Blesbokspruit |
| Fractures, faults, joints and bedding planes in the upper fractured rock aquifer. | The dolomitic aquifer, but unlikely based on groundwater flow patterns |
| The dolomitic aquifer, but unlikely based on groundwater flow patterns | |

# 9 KEY ASSUMPTIONS AND LITERATURE-BASED DATA INPUTS

The numerical modelling used to complete the impact prediction for the project is based on the following assumptions:

- The geometry of the aquifers present were inferred from published geological maps (1:250 000 East Rand).
- Aquifer conceptualisation was completed with the fieldwork dataset obtained from the available Goldplat dataset.
- Aquifer parameters or borehole construction details were not available for the hydrocensus boreholes. Aquifer parameter data were therefore inferred from work done on two boreholes on site (Aquatox, 2020) and from literature (AGES, 2006).
- The source characterisation for the project is based on groundwater and process water quality data obtained from hydrocensus points and from the Goldplat dataset.
- Potential leakage from the RWD was calculated using work published by Rowe (2012), in the absence of specific design and water balance details for the dam. It was assumed that the RWD is lined with a Class C barrier that was well installed. It was assumed that the RWD will be demolished and removed at closure of Goldplat Plant.
- The Top and Rooidam Stock Dams are unlined, but contain a high percentage of clay in the tailings material, which controls the volume of leachate available for seepage to the aquifers. The volume of seepage is not known, but will be estimated during model calibration.
- There is currently no information available to characterise the timeline of the historical underground mining and tailings deposition in the project areas. For this reason, assumptions had to be made of the operational phase of the historical TSFs. This information is considered tentative and should be revised if more specific information becomes available.
- The extent, depth and timing of underground mining is not well understood. For the purpose of the simulations, it will be assumed that underground mining is restricted to the extent of mining of the South Reef, as provided by GoldOne. The Top and Rooidam Stock Dams are not significantly undermined.
- Only advective transport of contaminants was simulated. Assumptions made regarding advection, are discussed below. While it is acknowledged that attenuation will take place in the soils, there is currently insufficient information available to quantify the extent to which this takes place. As such, simulations are based on the precautionary principle and take the worst-case scenario into consideration.
- The extent of the numerical model is based on natural groundwater barriers, as discussed below.

# 10 GROUNDWATER MODELLING

## 10.1 Numerical Modelling Objectives

The objectives of the numerical modelling presented in this report are based on the requirements of the water use licence application requirements. The following objectives are therefore reported:

- Estimate the impact of the proposed Top and Rooidam Stock Dam Reclamation Project during the construction and operational phases of the project on groundwater quality. No significant impacts on groundwater levels are expected.
- Predict the long-term impact of the project on groundwater quality post closure and rehabilitation. The following scenarios will be tested:

  - The No Project Option during which the Top and Rooidam Stock Dams will remain in situ in future.
  - Reclamation of the Top and Rooidam Stock Dams and rehabilitation of the footprint areas.
- Develop a groundwater monitoring programme, based on the outcome of the impact prediction study.
- Develop a groundwater management programme geared at reducing the impacts on groundwater quality identified.

## 10.2 Model Construction

The numerical modelling was undertaken according to accepted industry principles and standards, including the South African Department of Water and Sanitation's Best Practice Guideline for Impact Prediction (DWS BPG G4, 2008).

The numerical model for the project was constructed using MODFLOW and MT3DS. MODFLOW is a modular three-dimensional groundwater flow model and MT3DS is a modular three-dimensional solute transport model published by the United States Geological Survey. MODFLOW and MT3DS use finite difference discretization and flow codes to solve the governing equations. MODFLOW and MT3DS are a widely used simulation codes, which are well documented. MODFLOW is used to simulate groundwater flow rate and direction. MT3DS is superimposed on the MODFLOW simulation results and is used to predict the rate and direction of contaminant movement in the aquifers.

The positions where rivers and streams exit the model area were simulated as a constant head boundaries. The eastern and western model boundaries were included as no-flow boundaries, based on estimated groundwater flow lines. The northern and southern model boundaries were simulated as general head boundaries. The assessment area is indicated on Figure 1.

Perennial rivers, streams and wetlands inside the model boundary were simulated with discrete cells.

In order to accommodate the large area over which simulations will be undertaken, the model area was refined into block cells of 10 x 10m around the project areas and the model grid size was gradually increased away from this area of interest to 100 x 100m. The finer grid allowed more detailed simulations around the areas of interest.

Three layers were included in the model. The upper layer presents the TSFs, the upper weathered Karoo aquifer and the alluvium associated with the Blesbokspruit. This layer is included to facilitate a more accurate simulation of the wetlands, rivers and streams included in the model. The second layer represents the weathered Karoo and dolomitic aquifers. The deeper fractured rock aquifers are simulated in the third layer. The upper layer was simulated as an unconfined aquifer. This layer was allowed to vary between confined and unconfined conditions, depending on water level fluctuations.

All units used during simulations were presented in metres (length) and days (time).

## 10.3 Groundwater elevation and gradient

The July 2026 measured groundwater water levels in hydrocensus boreholes were used to calibrate the model for this assessment. The groundwater elevations and gradient for this dataset are discussed above.

Hydrographs in the Goldplat boreholes could not be used during calibration as on-site rainfall data was not available for the project.

## 10.4 Conceptual groundwater model

The parameters that will be used during groundwater modelling, as derived from field data, the Goldplat dataset and assumed or obtained from literature, as discussed above. These will be used as a starting point during model calibration for this phase of the project and will be adjusted to minimise the model calibration error, as discussed below.

## 10.5 Numerical model

### 10.5.1 Model input files and integration

The conceptual model discussed above was used to construct the numerical model for the project area. The geometry of the numerical model is based on the conceptualisation of the aquifers and on the regional geology. The geological formations are included as discrete zones in the model.

The topographical surface was interpolated from the Digital Terrain Model (DTM) (i.e. the surface topography) and incorporated into the model to ensure that the elevations of the drains used to simulate the streams reflect the topography.

The top of the upper layer of the model was simulated with the surface contours for the project, which were obtained from the DTM for the catchment.

The initial water levels in the model layers of the model were kriged from available information.

During contaminant transport modelling it was assumed that horizontal and vertical transverse dispersivity is 0.01. The effective molecular diffusion coefficient is 8,64E-5 $m^2/d$ and that the longitudinal dispersivity is 90m. The latter was calculated using the empirical equation developed by Neuman (1990) for an average travel distance of 1000m.

No chemical reaction was taken into consideration during simulations.

The timelines considered during modelling are presented in Table 14. No detailed information is available to accurately reflect historical tailings deposition and reclamation. Some of the dates are therefore assumptions. These are indicated with an asterix (*). It is understood that the Goldplat Plant does not have a traditional life of mine, as it processes mining by-products and waste materials instead of a single depleting deposit. For the purpose of simulations, it is assumed that the Plant will be operational for 10 years after reclamation of the Top and Rooidam Stock Dams is completed.

**Table 14 Assumed timeline used during simulations**

| Simulation period | Start date | End date | Time (years) | Description |
|---|---|---|---|---|
| 1 | 1930* | 1995* | 65 | Historical operational phase of regional TSFs |
| 2 | 1996* | 2026 | 30 | GoldPlat Plant operation, historical TSF dormant phase |
| 3 | 2027 | 2032 | 5 | Top and Rooidam reclamation phase |
| 4 | 2033 | 2043 | 10 | Estimated remainder of life of Goldplat Plant |
| 5 | 2044 | 2046 | 2 | Rehabilitation and closure |
| 6 | 2047 | 2112 | 65 | Long-term simulation |
| 7 | 2113 | 2148 | 35 | Long-term simulation |

## 10.6 Calibration results

Calibration of a numerical model refers to the demonstration that the model is capable of reproducing field-measured data, which are the calibration values. Calibration is achieved when a set of parameters, boundary conditions, source terms and stresses are found that produce simulated heads and concentrations that match field measured data within the calibration criteria set for the project. This is an important step in the modelling project, which ensures that model results are reliable.

Calibration was completed with groundwater level measurements in boreholes visited during the 2026 hydrocensus. The calibration criteria set for the project are presented in Table 15.

**Table 15 Calibration criteria**

| Requirement | Acceptability criteria | Compliance |
|---|---|---|
| Model convergence | Maximum change in head of 0,001m | Complied with (see discussion below) |
| Water balance | Difference between inflow and outflow <1% | Complied with (see discussion below) |
| Root Mean Square Error | <5m for targets | Complied with (see discussion below) |
| Calibration error | At least 80% of targets with <5m error between simulated and measured head | Complied with (see discussion below) |

The calibration criteria take the impacts of historical mine dewatering on groundwater levels into consideration. As discussed earlier, the extent, depth and timing of the historical dewatering are not well understood. This uncertainty affects the outcome of the calibration process.

The results of the calibration process are presented in Table 16 and Figure 11. It is shown that the calibration error (the difference between measured and simulated head) is less than 5m for all but 2 of the groundwater levels measured. This provides a calibration error target of 86%, which complies with the calibration criteria. The calibration error is scattered evenly around the line of perfect fit in Figure 10, which means the model does not under- or over-estimate groundwater levels. The root mean square error, which provides an indication of the goodness of fit during calibration, is 2.87m, which is within the acceptable criteria limit of 5m.

The water balance error calculated with the numerical model is 0.1%, which also complies with the acceptable calibration criteria set.

Factors that influence the calibration process and results include the following:

- Errors in the coordinates and elevations recorded for the boreholes. The coordinates for the hydrocensus boreholes were recorded with a hand-held GPS.
- The absence of borehole logs with which to characterise the aquifer conditions that groundwater levels in the hydrocensus and Goldplat monitoring boreholes represent. This hampers the understanding of the geology that governs groundwater level depth. The aquifer conceptualisation was therefore based on the regional geological map.

- As mentioned earlier in this report, the modelling code assumes a continuous porous medium, which means that the aquifers are simulated using average parameters. This does not allow for local variations in permeability that affect groundwater levels in the aquifers. Discrete zones were however included for geological contact zones.

Model calibration can be improved once additional monitoring information becomes available from the proposed monitoring programme. Model recalibration and verification can be undertaken with this data. Groundwater monitoring requirements are discussed later in this report.

**Table 16 Calibration results**

| Calibration point | Simulated head (mamsl) | Measured head (mamsl) | Residual (m) |
|---|---|---|---|
| BENONI1 | 1609,286 | 1607,2 | 2,09 |
| BENONI2 | 1607,019 | 1607,6 | -0,58 |
| CEN468 | 1593,972 | 1593 | 0,97 |
| CEN469 | 1594,125 | 1593 | 1,13 |
| GP8 | 1609,859 | 1611,7 | -1,84 |
| GP4 | 1607,195 | 1610,9 | -3,71 |
| GP2 | 1596,355 | 1596,1 | 0,26 |
| GP3 | 1604,027 | 1604,6 | -0,57 |
| GP9 | 1592,41 | 1592,4 | 0,01 |
| FM4 | 1608,741 | 1602,8 | 5,94 |
| GP7 | 1591,377 | 1585,1 | 6,28 |
| GP5 | 1611,73 | 1608,9 | 2,83 |
| GP6 | 1611,829 | 1611,6 | 0,23 |

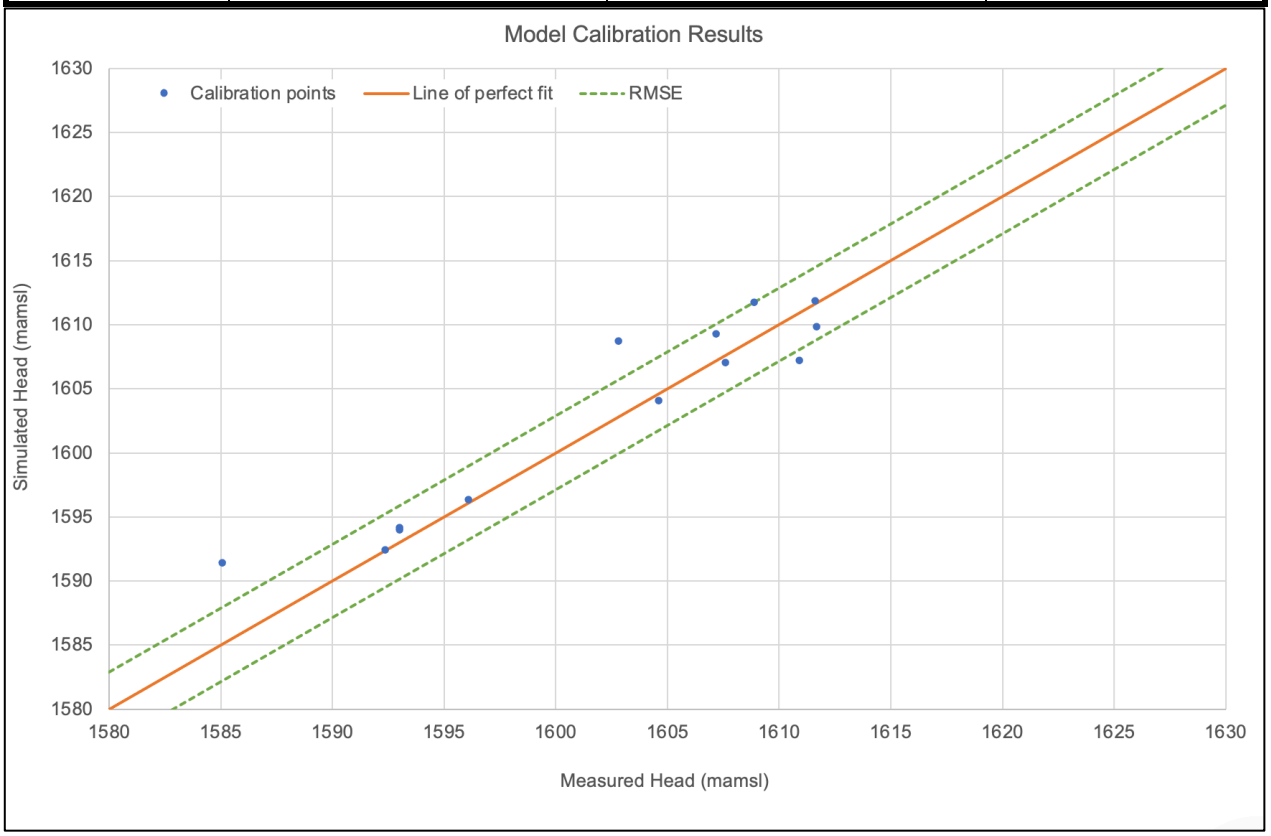



**Figure 11 Calibration results**

### 10.6.1 Model sensitivity

A sensitivity analysis was completed on the model. The purpose of the sensitivity analysis is to quantify the uncertainty in the calibrated model caused by uncertainty in the estimates of aquifer parameters, stresses and boundary conditions. The level of heterogeneity of the aquifer material can never be accurately measured with field data. The uncertainty of the impact of heterogeneity on simulations is therefore assessed as part of the sensitivity analysis.

The results of a sensitivity analysis can be used to identify data gaps and to plan for additional fieldwork, including monitoring requirements, once the modelling has been completed.

The comparative sensitivity for the parameters included during calibration is presented in Figure 12. The comparative sensitivity provides an indication of how sensitive the model is to changes in each parameter, compared to the other parameters tested. A low value indicates a low sensitivity and a high value a high sensitivity. The results indicate the following:

- The model is sensitive to changes in the permeability and specific yield of the weathered Karoo aquifer.
- The model is also sensitive to variations in the rate of recharge to the alluvium associated with the Blesbokspruit and its wetlands.

As discussed in the calibration section above, model sensitivity can be addressed through additional calibration with groundwater monitoring data that will become available from the operations once the monitoring programme is implemented.

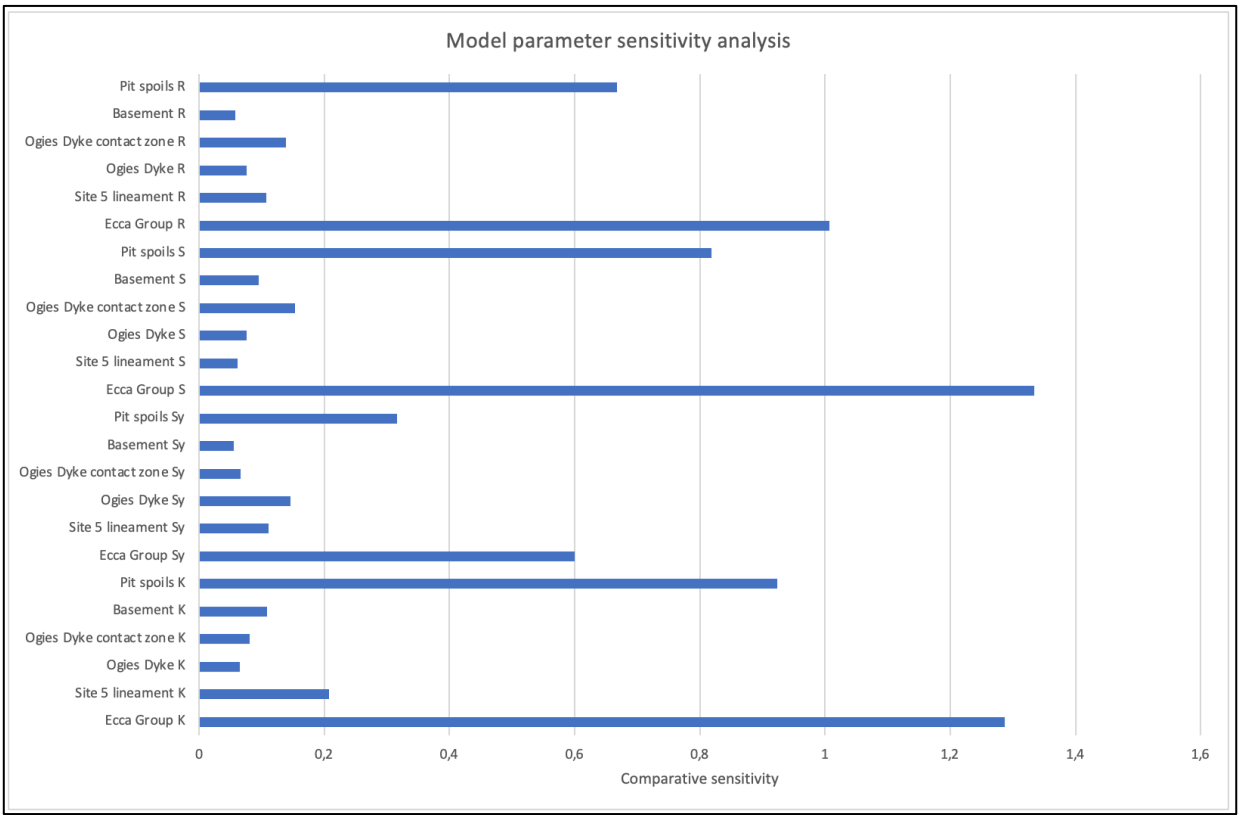



**Figure 12 Sensitivity analysis**

### 10.6.2 Assessment of uncertainties

The accuracy of the modelling project depends on the quality of the input data and the available information. Even with an unchanging environment, impacts are difficult to predict with absolute certainty. Predictions were undertaken with the calibrated flow model, which is a simplified version of reality. The model represents a tool that can be used to assess the impact of the proposed tailings reclamation activities on the aquifers and to identify data gaps. The calibration error is discussed above and is acceptable within the limitations of the study. The model should be updated and verified with site-specific monitoring information, when it becomes available. Calibration against hydrographs (groundwater level fluctuation with time) and on-site rainfall data will be of specific value in improving the current understanding of aquifer parameters. Uncertainties are approached conservatively, based on the precautionary principle, in order to ensure that the predictions and impact assessment in this report address the maximum potential impact of the proposed development. The uncertainties in the model include:

- **Uncertainties regarding aquifer conditions within the project area**: This understanding can be improved through the continuation of groundwater level and quality monitoring at the mine.
- **Uncertainties regarding borehole depth, construction and geology intersected**: This information is not available for the hydrocensus or Goldplat monitoring boreholes. For this reason, it was assumed that all hydrocensus boreholes target the fractured rock aquifer.
- **Uncertainties regarding the borehole elevations**: The elevations used during simulations were inferred from hand-held GPS measurements and inaccuracies may occur. It is however thought that the error in elevation will not exceed the calibration error of 5m.
- **Mathematical modelling uncertainties**: It is not possible with the available information to quantify the heterogeneity present in the aquifers simulated. For this reason, there are inherent uncertainties in the model. The level of confidence in the model can be improved with the incorporation of additional monitoring data.

The uncertainties listed above can be reduced or eliminated through continuation of the groundwater monitoring programme at the mine. It can further be reduced by integrating the results of the groundwater monitoring programme proposed in this study. This information can be used to improve aquifer parameter estimation and model calibration.

## 10.7 Results of the model

The results of the modelling are presented below.

# 11 GEOHYDROLOGICAL IMPACT ASSESSMENT

## 11.1 Preamble

The Goldplat Top and Rooidam Stock Dams are positioned on outcrops of sediments of the Vryheid Formation shales and Dwyka Tillite of the Karoo Supergroup. Aquifers associated with these formations are generally considered minor and low-yielding, typically with low permeabilities. This was confirmed from the results of aquifer tests completed by Aquatox (2020).

The source term presented earlier in this report and the assumed project timeline were applied during simulations.

The available groundwater level dataset suggests that regional underground gold mining activities have not impacted on groundwater levels in the vicinity of the Goldplat Top and Rooidam Stock Dams. Groundwater level trends in boreholes that indicate both shallow and deeper groundwater level conditions show a strong correlation with the topography.

Groundwater flow patterns at the TSF footprints are in an easterly to northeasterly direction towards the Blesbokspruit and its wetlands. Groundwater is further expected to discharge to the watercourses as baseflow, especially during the wet season, when flooding occurs in the wetlands. Potential contamination associated with the reclamation of the Top and Rooidam Stock Dams will therefore migrate in an easterly to northeasterly direction towards the stream and wetlands and potentially impact on the quality of the groundwater component of baseflow to the watercourses.

The rate at which potential contamination could seep from the TSFs to the underlying aquifer is expected to be low due to the presence of clay in the tailings material. This is based on the 2021 geochemical assessment completed by Aquatox. Groundwater monitoring results seem to suggest that this conclusion is accurate. Although elevated concentrations of sulphates are measured in seepage currently draining from the Top and Rooidam Stock Dams, sulphate concentrations in monitoring boreholes downgradient of the facility are comparatively low. Sulphate concentrations in these boreholes are probably also a reflection of the slow movement of plumes through the low-permeability aquifers present.

Due to the fact that no groundwater will be abstracted during tailings reclamation, impacts on groundwater levels are not expected to be significant during the operational phase of the project. For this reason, the impact assessment presented in this report focuses on operational and long-term impacts on groundwater quality.

The outcome of the simulations is presented as sulphate concentration contour maps that delineate the anticipated plumes for the three long-term scenarios to be tested. These are based on the source term discussed earlier. The following modelling scenarios will be considered as part of this assessment:

- **Scenario 1: Do nothing option**: this scenario tests the impact if the Top and Rooidam Stock Dams remain in situ in the long-term. The long-term impact of seepage from the unlined TSFs to the aquifers will be assessed as part of this scenario. It is assumed that the other Goldplat TSFs, namely the Plant and East TSFs and the Emergency Paddock, will remain in-situ in the long-term.
- **Scenario 2: Reclamation and rehabilitation option**: This scenario tests the impact if the Top and Rooidam Stock Dams are reclaimed and the footprint is rehabilitated. These TSFs will be fully removed in the long-term, but the other Goldplat TSFs (Plant and East TSF and Emergency Paddock) will remain in-situ in the long-term.

The extent of the impact contours is based on the Ideal (<150mg/l $SO_4$) and Unacceptable (>500mg/l $SO_4$) Water Quality Objectives for the Blesbokspruit, as detailed in Table 17. Significant impacts on groundwater are delineated by concentrations that exceed the limit for significant health risks (DWAF, 1996).

**Table 17 Applicable In-stream Water Quality Guidelines for the project**

| Element | Blesbokspruit Catchment Standards | | | | Limit for significant health risk in drinking water |
|---|---|---|---|---|---|
| | Ideal Background | Acceptable Management Target | Tolerable Interim Target | Unacceptable | |
| Sulphate | <150 | 150 – 300 | 300 - 500 | >500 | 1 000 |

## 11.2 Rehabilitation measures considered

For the rehabilitation of the project considered in Scenario 2, it was assumed that all tailings reclamation infrastructure will be demolished and removed. The soil will be shaped over rehabilitated areas to create a free-draining surface. It is noted that this rehabilitation scenario will not reverse the cumulative impact of other regional impacts like historical tailings deposition. For this reason, a residual impact will remain post-closure of the project in the long-term.

During simulations completed for Scenario 1, it is assumed the surrounding TSFs will remain in-situ post-closure.

It was further assumed that the Goldplat Plant will be demolished and rehabilitated upon closure. The outcome of the two scenarios takes the estimated long-term impact of Plant rehabilitation into consideration. This is a high-level assessment, based on the existing water monitoring data and the outcome of the 2021 geochemical assessment (Aquatox, 2021). A more detailed geohydrological assessment should be undertaken as part of the closure plan for the Plant area.

## 11.3 General outcome for all scenarios

The impact assessment results are presented as zones of impact on groundwater quality in the weathered aquifer. This represents the estimated worst-case scenario, as the weathered aquifer will be most at risk from potential impacts situated on the surface. The overall outcome of the simulations is summarised as follows:

- The plumes are delineated based on the water quality objectives (WQO) in Table 16.
- The cumulative impact of unlined TSFs surrounding the Goldplat Reclamation Project were included in all assessments made. Only TSFs located within the assessment area were considered. These impacts were conceptualised based on the experience of the author from similar projects in this immediate area. The assessment therefore takes the cumulative impact of historical tailings deposition in this area into consideration.
- Drainage from the TSF located south of the Goldplat Reclamation Project was characterised with water quality results for the Stream1 sample taken during the 2026 hydrocensus.
- Impacts associated with the Goldplat Plant area were included during simulations. A detailed assessment of the Plant falls outside the scope of this report.
- As there is no vertical barrier between the weathered aquifer/alluvium and the underlying shallow fractured rock aquifer, contamination from surface activities is expected to migrate to the underlying fracture aquifer.
- Potential groundwater contamination plumes from the Goldplat Reclamation Project will migrate in an easterly to northeasterly direction towards the Blesbokspruit and its wetlands. Potential contaminated groundwater is expected to discharge to the watercourses as part of baseflow.

- The volumes of contaminated groundwater that may reach the wetlands and Blesbokspruit cannot be accurately assessed without field-measured aquifer parameters from shallow and deep boreholes located in the floodline. It is likely that the groundwater component of baseflow to the Blesbokspruit will not exceed 10$m^3$/d over the affected area. The quality of the groundwater entering the stream as baseflow is discussed below and will vary depending on the prevailing conditions.
- The shape of the plumes is affected by the aquifer parameters as well as the calculated dispersion in the formations. Dispersion especially plays a role in the extent to which lower concentrations of sulphate would spread from the Goldplat Reclamation Project. Dispersion can account for the spread of contamination that is not necessarily driven by groundwater flow.
- The aquifers present underneath the TSFs have low permeabilities and therefore transmit groundwater very slowly.

## 11.4 Impact prediction

### 11.4.1 Impact at the end of the operational phase of tailings reclamation

The extent of the zones of impact on groundwater quality at the end of the operational phase for tailings reclamation is presented in Figure 13.

It is shown that the zone of impact of unacceptable quality in terms of the Blesbokspruit water quality objectives is not expected to reach the Blesbokspruit and its wetlands during the operational phase.

The zone of impact in terms of unacceptable health risks is expected to remain largely over the Goldplat tailings footprint areas.

The two private boreholes located northwest of the Reclamation Project will not be affected during the operational phase of the project.

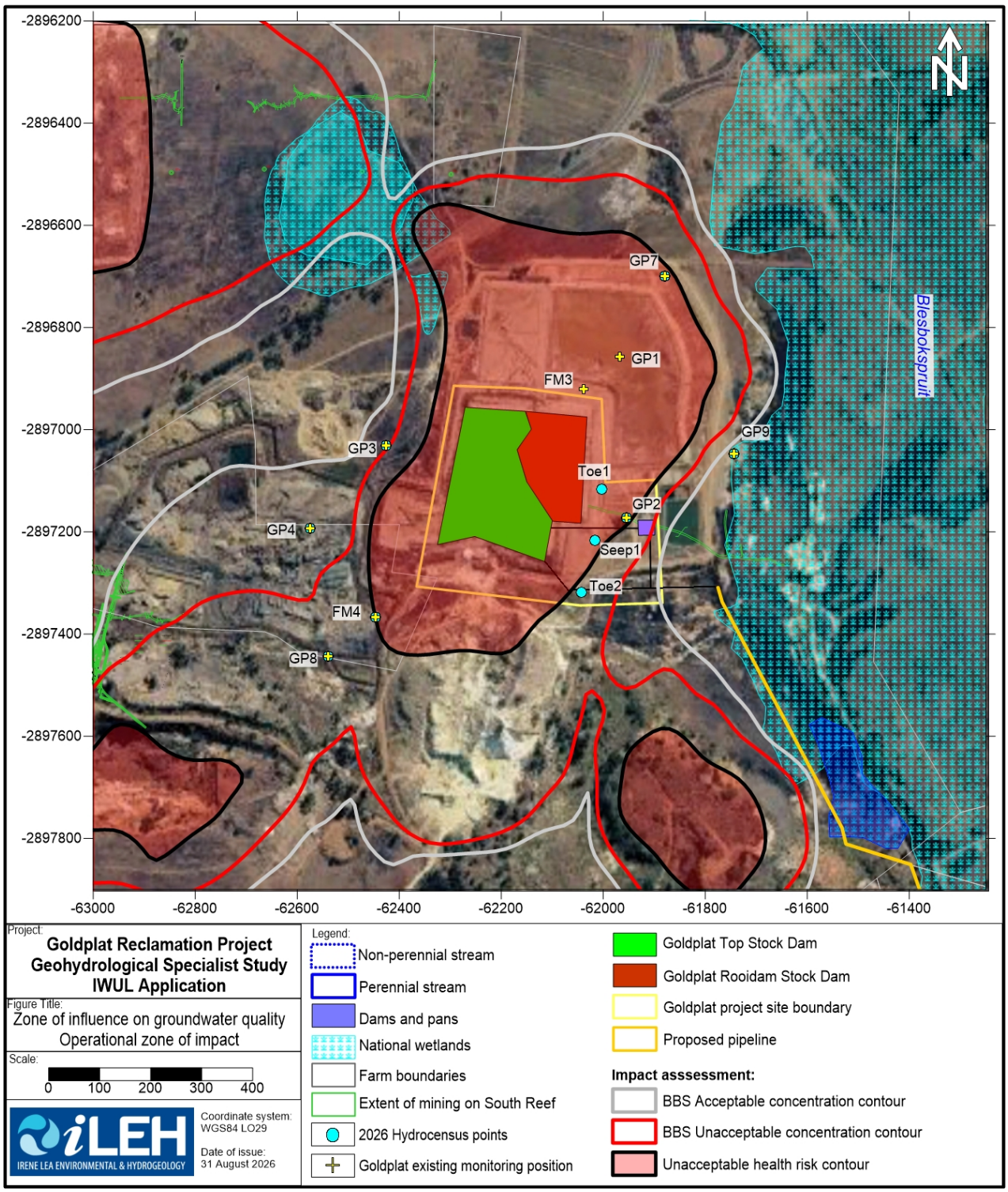



**Figure 13 Estimated operational zone of impact on groundwater quality**

### 11.4.2 Long-term Scenario 1 – No Project Pption

The outcome of the long-term impacts associated with the No Project Option is presented in Figure 14. With time, the extent of the zones of impact will increase and groundwater contamination plumes will migrate east towards the Blesbokspruit. Under the conditions of this scenario, the 500mg/l sulphate contour is expected to reach the Blesbokspruit, resulting in unacceptable impacts on the quality of groundwater baseflow to the watercourses.

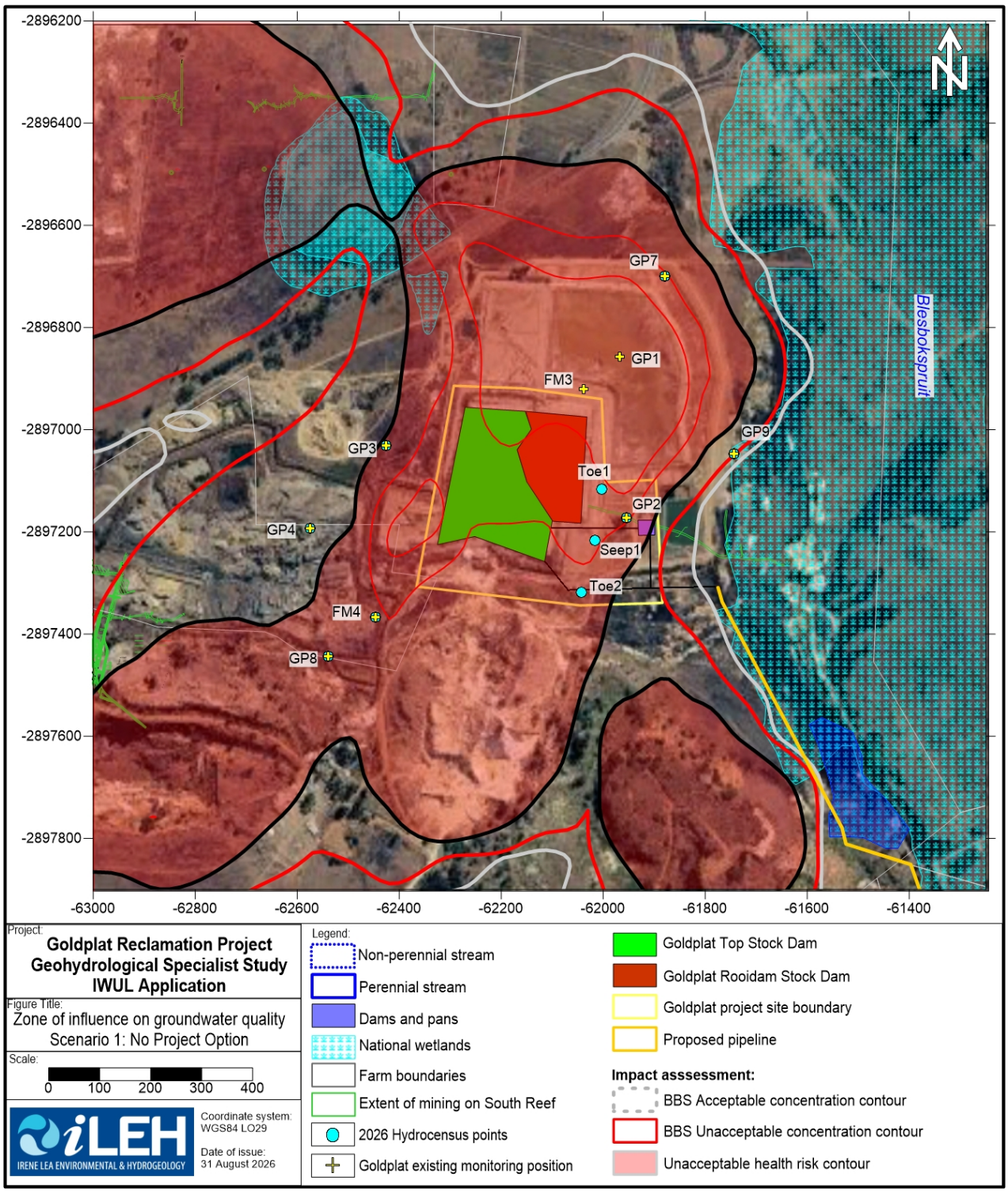



**Figure 14 Zone of impact on groundwater quality: No Project Option**

The zone of unacceptable health risks is also expected to increase to outside the TSF footprints, especially downgradient of the Goldplat TSFs that will remain in situ. This zone is not expected to reach the Blesbokspruit and its wetlands but may migrate to within 70m of the wetlands. As there are uncertainties regarding long-term plume movement, the risk of sulphate concentrations exceeding 1000mg/l in baseflow to the wetlands cannot be excluded from this outcome.

### 11.4.3 Long-term Scenario 2 – Reclamation and rehabilitation option

The outcome of the impact of tailings reclamation and rehabilitation of the Top and Rooidam Stock Dams on groundwater quality is presented in Figure 15.

The main benefit of this scenario is that the zones of impact reduce with time, specifically the unacceptable impacts. It must be noted that the extent of the plumes is similar to what is presented for the No Project Option above. This is due to the cumulative impact of historical tailings deposition as well as surrounding sources of contamination that will remain in situ. Due to the fact that the aquifers have low permeabilities, reversal of historical impacts will take a long time to manifest, if at all. This is applicable to all scenarios tested.

In the long-term, sulphate concentrations for this scenario in baseflow to the Blesbokspruit wetlands could also exceed 500mg/l, which is the unacceptable water quality standard for the stream. The frequency of this impact is however expected to reduce with time.

The zone of impact in terms of unacceptable health risks, delineated by the 1000mg/l sulphate contour is expected to recede compared to the outcome of Scenario 1, but not significantly so due to the reasons presented above. This is expected to reduce the risk of the frequency of unacceptable impacts on the baseflow to the Blesbokspruit, but the risk of sulphate concentrations exceeding 1000mg/l in the long-term entering the wetlands as baseflow cannot be excluded for this scenario.

## 11.5 Cumulative impacts

The anticipated cumulative impact of regional tailings deposition is considered for all scenarios presented above. In order to achieve this, the assumptions made for tailings leachate quality discussed earlier were used to simulate the other TSF within the project sub-catchment. During long-term simulations, it was assumed that these facilities would remain in-situ.

The outcome of the cumulative impacts is discussed above and below.

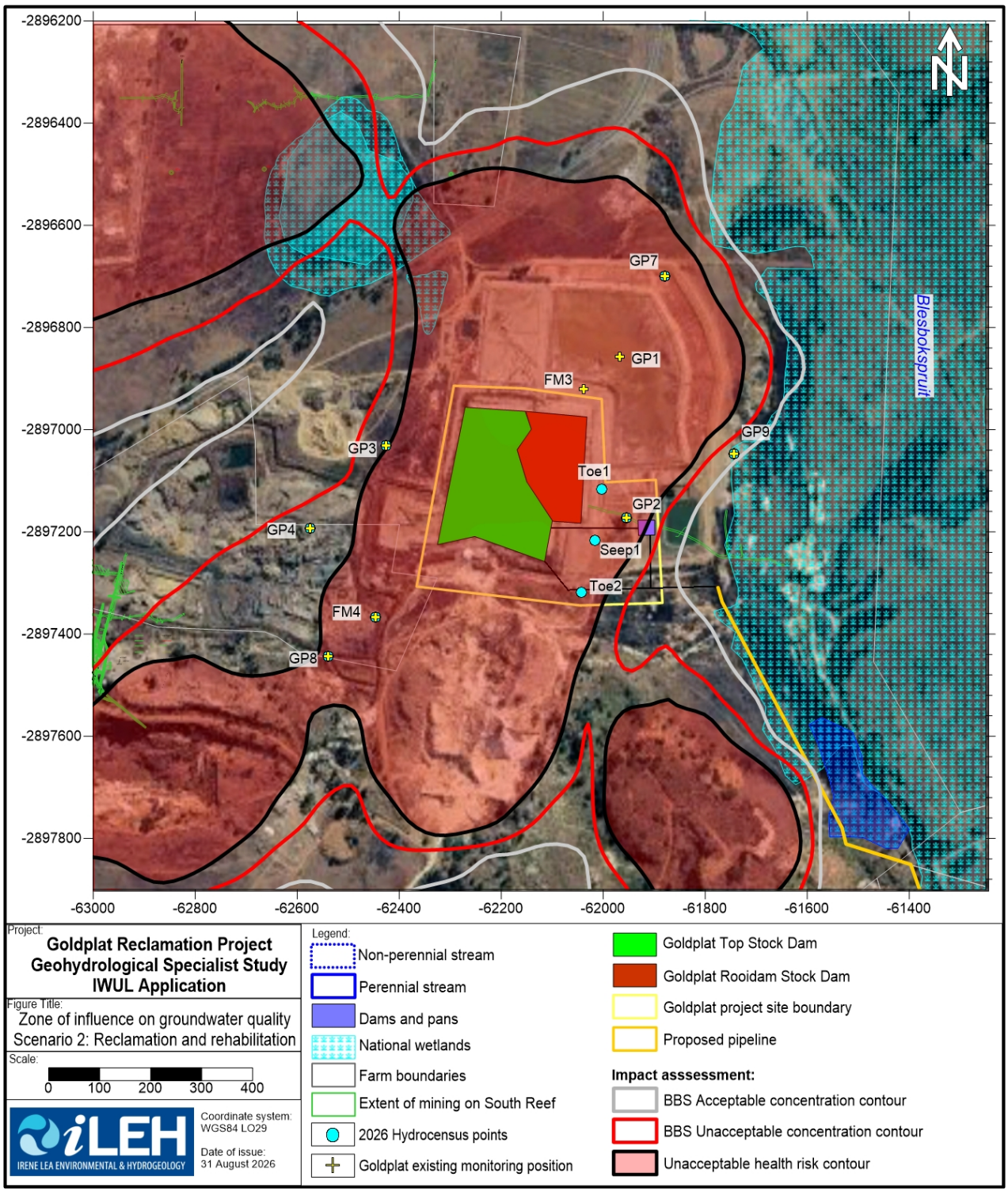


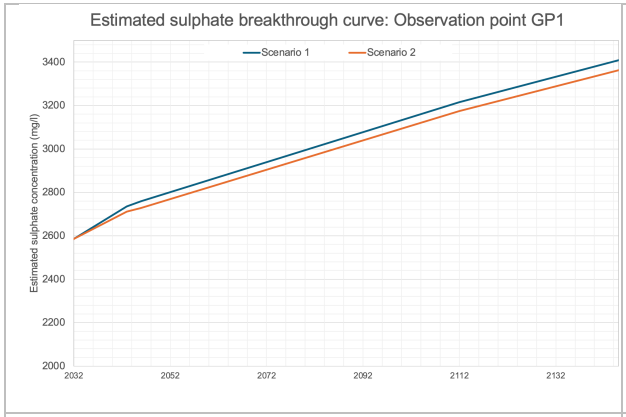

**Figure 15 Zone of impact on groundwater quality: Reclaim and Rehabilitate Option**

## 11.6 Summary of long-term impacts

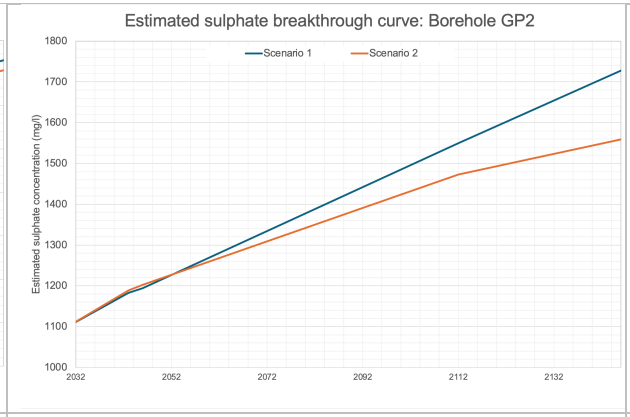
The outcome of the impact assessment is presented as sulphate breakthrough curves at strategic monitoring positions. These include groundwater quality at the East TSF (observation location GP1), which provides an indication of the impact of the surrounding Goldplat TSFs. The second monitoring position is down-gradient of the Top and Rooidam Stock Dams (GP2), which provides an indication of the anticipated impacts of the Goldplat Reclamation Project within a complex setting. It is acknowledged that groundwater quality at this monitoring location is affected by other sources not related to the Reclamation Project. It is difficult to absolutely distinguish between all impacts. The third monitoring point (GP9) is located downgradient of the Reclamation Project on the edge of the Blesbokspruit wetlands and provides an indication of the Reclamation Project on downstream watercourses.

The following is generally concluded from the information presented in Figure 16:

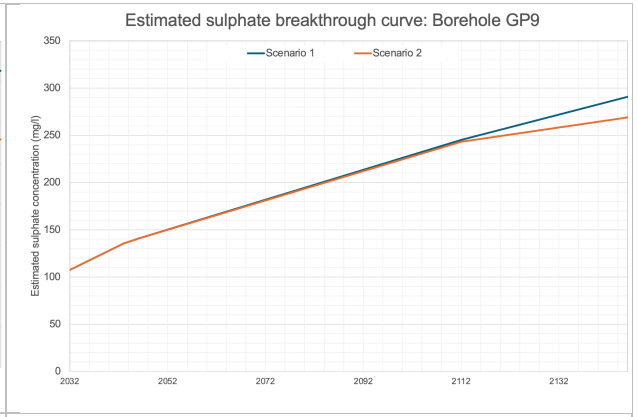
- Anticipated impacts immediately downgradient of the proposed Reclamation Project (GP2):
    - Sulphate concentrations are expected to gradually increase over time to between 1550 and 1750 mg/l in the long-term for the two scenarios tested. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the TSF unfit for use.
    - The No Project outcome is expected to result in the most significant impact, with sulphate concentrations rising to above 1700mg/l and an increasing trendline. This suggests that sulphate concentrations are expected to continue to increase at the position until it approximates the source concentration.
    - If the Top and Rooidam Stock Dam Reclamation Project is implemented, sulphate concentrations will increase with time, but is expected to plateau and reduce with time, once the effect of source removal is noted. Due to the fact that the aquifers are low-yielding and groundwater flow is slow, this is likely to take more than 50 years after closure of the site.
- Potential impacts associated with the surrounding Goldplat TSFs (observation location GP1):
    - The impact of the Reclamation Project is not expected to significantly change sulphate concentrations at the surrounding TSFs due to the fact that these will remain in situ for the scenarios tested. Sulphate concentrations are expected to increase to above 3300mg/l for all scenarios tested. This exceeds the 1000 mg/l health risk concentration for sulphate, which will make the groundwater immediately downgradient of the TSF unfit for use.
    - Reclamation and rehabilitation of the Top and Rooidam Stock Dams are however expected to have the best outcome in terms of sulphate concentrations at this monitoring position, but will not reduce sulphate concentrations to within acceptable levels.
    - The surrounding Goldplat and other third party TSFs will continue to impact on groundwater quality, regardless of the reclamation scenario tested.




Borehole located within the East TSF. Was lost previously. Indication of groundwater quality in surrounding Goldplat TSF




Borehole located downgradient of Top and Rooidam Stock Dams. Indication of long-term impacts of the proposed Reclamation Project




Borehole located down gradient of the Top and Rooidam Stock Dams adjacent to the Blesbokspruit wetlands. Indication of impact on downstream watercourses

**Figure 16 Sulphate breakthrough curves**

- Potential impacts in the downstream Blesbokspruit wetlands (GP9):
    - The information presented in Figure 15 is an estimation of the impacts of the Goldplat Reclamation Project. It is noted that sulphate concentrations in this location are currently elevated above 500mg/l, which is the Blesbokspruit unacceptable water quality standard. As discussed earlier, the source of this contamination is not clearly understood, as groundwater in the upstream Goldplat borehole GP2 is of better quality at present (<300mg/l).
    - Simulations suggests that impacts associated with the Goldplat project is not expected to increase sulphate concentrations to above 300mg/l in future. This means that sulphate concentrations are likely to remain below the ideal water quality objective for the Blesbokspruit.
    - The No Project option is anticipated to result in the highest sulphate concentration at this location with an increasing trendline. Tailings reclamation and rehabilitation of the footprint is likely to result in the best outcome, with sulphate concentrations reducing with time at this location. It is however noted that the scenarios have similar impacts on the wetlands.

## 11.7 Risk of decant

No risk of decant was flagged for this project.

# 12 GROUNDWATER MANAGEMENT PROGRAMME

Based on the outcome of the information presented in this report, a number of groundwater management measures are proposed for the project. These are detailed below.

## 12.1 Groundwater objectives and targets

The following objectives and targets are proposed for groundwater management at the operations:

- Implement a management plan aimed at reducing and/or eliminating adverse impacts on the receptors identified, including watercourses. The management plan must strive at achieving conditions comparable to the preferred alternative scenario presented in this report, which is reclamation of tailings from the Top and Rooidam Stock Dams and rehabilitation of the footprint without further tailings deposition.
- Track and record the progress of implementation of all groundwater management measures.
- Implement sufficient monitoring procedures to measure the effectiveness of groundwater management measures.
- Analyse the information obtained from all monitoring programmes against compliance targets to establish trends and to determine the need to trigger additional actions to reduce adverse impacts.
- Should the trends indicate adverse impacts on groundwater levels and/or quality, implement suitable measures within the shortest possible time to remediate and/or eliminate such adverse impacts identified.

## 12.2 Over-arching groundwater management measures

A number of broad over-arching groundwater management measures should be implemented by Goldplat for the project in order to minimise impacts on groundwater, as detailed in Table 18.

**Table 18 Over-arching groundwater management measures**

| Construction Phase |
|---|
| A dedicated groundwater monitoring network must be established. Details of this are presented below. |
| Make provision for sufficient groundwater level and quality monitoring budget to implement the groundwater monitoring programme, before the reclamation starts. |
| Hydrocensus boreholes located within 3km of the Top and Rooidam Stockpiles must be included in the monitoring programme, including Benoni1 and Benoni2. This information will form the basis for future assessments. |
| Develop effective surface runoff management plans to ensure that all dirty runoff is contained and reused as soon as possible. Avoid ponding of water over exposed areas. |
| Ensure that water control infrastructure and catchment paddocks are designed to contain all dirty water generated during the desilting to prevent overflows and spillages. |
| If tailings are to be redeposited on the reclaimed Top and Rooidam Stock Dams, the designs for this option must be completed as part of the planning phase of the project. Any changes to the impact assessment presented in this report must be updated.. |
| Implement sound house-keeping measures to prevent and clean spills, address leaks and undertake regular inspections. Ensure that the record-keeping procedure is in place and that instructions given are carried out. |
| Measure rainfall on site. |
| **Operational Phase** |
| Complete regular inspections of water control infrastructure and catchment paddocks, specifically noting incidences of overflow and leakage. If the latter is identified, measures must be taken to rectify immediately. |
| Maintain sound house-keeping measures to prevent spills and leaks. |
| Maintain the groundwater monitoring programme in boreholes. |
| Measure rainfall on site. |
| Record all groundwater-related complaints and deal with each complaint within the agreed upon timeframe. |

| Decommissioning and Closure Phase |
|---|
| Complete all rehabilitation to a satisfactory level, focussing specifically on creating free-draining rehabilitated surfaces where applicable. |
| Ensure that all tailings material is removed from the footprint. Soils must be tested to identify potential risks to groundwater contamination post closure. |
| If Goldplat intends to redeposit new tailings on the reclaimed Top and Rooidam Stock Pile footprints, the footprint barrier system must comply with legal requirements and/or be determined based on the outcome of a risk-based approach. The designs of this facility must be considered as part of a more detailed geohydrological impact assessment at this time if this scenario is opted for. |
| Continue with the groundwater monitoring period for a minimum of two years after completion of the rehabilitation. The continued need for groundwater monitoring will depend on the outcome of the final closure assessment. |

## 12.3 Specific groundwater management measures

The specific groundwater management measures presented below are aimed at reducing the risk of acid mine drainage, to isolate potential contamination and to minimise the infiltration of poor quality leachate to the underlying aquifers.

### 12.3.1 Measures to reduce impacts on groundwater availability

As no groundwater will be abstracted for use during tailings reclamation, impacts on groundwater levels during the operational phase are not considered significant. As such no specific groundwater management measures are required for impacts related to groundwater availability.

### 12.3.2 Measures to reduce impacts on groundwater quality

The following specific measures are recommended to minimise and/or eliminate the impacts on groundwater quality:

- In order to minimise negative long-term impacts associated with the project, it is important that tailings reclamation must be completed to soil level at the site. All tailings must be removed.
- No ponding must be allowed on exposed areas during or after reclamation. After rehabilitation, the footprint area must be made free-draining to minimise infiltration of water to the aquifers. This must be achieved through the development of a dedicated stormwater management plan for the rehabilitated footprint area.
- The stream of water draining from the TSF located south of the Goldplat Reclamation Project identified and sampled during the 2026 hydrocensus must not be allowed to enter the Goldplat area of responsibility. This water adds to the overall salt load in the Goldplat TSF complex as it drains into an unnamed and unlined dam located immediately east of the Rooidam Stock Dam adjacent to borehole GP2. The quality of this leachate is poor. It is saline with elevated concentrations of iron, lead, nickel, uranium and sulphate that could lead to health risks.
- A dedicated groundwater monitoring network must be established, as detailed below. This monitoring programme must include private boreholes identified during the hydrocensus.
- It is recommended that the groundwater monitoring programme must be expanded to include additional metals, specifically cobalt, nickel and uranium.
- Ensure that clean and dirty water is separated at the reclamation areas and that dirty water is contained in the dedicated catchment paddocks. The paddocks must be adequately sized to contain stormwater and to prevent dirty water runoff from leaving the area.
- All dirty water being captured from the reclamation areas should reused during tailings reclamation to prevent accumulation of excess water that could increase the risk of spills or overflows.

- Implement the necessary cutoff trenches and berms to prevent wash-in of additional silt and slimes from surrounding TSFs that will remain in situ.
- Any project changes considered following the completion of this geohydrological impact assessment must be assessed and included in the geohydrological impact assessment for the project.

### 12.3.3 Measures to reduce the risk of acid mine drainage

The following over-arching acid mine drainage (AMD) management strategies are recommended from a groundwater management perspective for the project. During tailings reclamation, focus must be placed on creating conditions that are not conducive to acid mine drainage. In this regard, the following specific management measures are recommended:

- Avoid leaving sulphide-rich material , like the tailings from the Stock Dams, exposed to oxygen and water for an extended period of time. The Reclamation Project must be completed to soil level in the 5-year life indicated. No areas of the Top and Rooidam Stock Dams may be left in situ at the end of the Reclamation Project. All tailings must be removed to soil level.
- The outcome of the 2021 geochemical assessment confirms that tailings that are unsaturated is more likely to produce acid mine drainage.
- Remove and/or ameliorate contaminated soils.
- Create free-draining surfaces during rehabilitation.
- Ensure that dirty areas are bunded until final rehabilitation is completed.
- Monitoring of water quality must be undertaken during the operational phase and must be used to confirm the outcome of this assessment, which indicates that water pH levels around the site are neutral to alkaline in nature. The current geochemical assessment (Aquatox, 2021) indicates the risk of acidification is low.
- Avoid stockpiling material containing metal sulphides for any extended period on the tailings footprint, unless waste classification is completed on the material according to the requirements of the NEMWA and a suitable barrier system is in place on the footprint of affected areas.
- If sulphide-rich material is to be left in-situ post closure, for example if tailings are to be redeposited on the reclaimed footprint, measures must be identified and put in place to reduce ingress of rainwater and oxygen into the tailings, especially post closure. The designs for this option must be completed during the planning phase. Any changes to the work presented in this report should be updated and re-evaluated at the hand of these designs.
- Divert dirty runoff to dedicated catchment paddocks until final rehabilitation is completed and clean runoff is confirmed from rehabilitated areas. Paddocks that will not be required for post-closure surface water management must be removed and rehabilitated once runoff is clean.

# 13 GROUNDWATER MONITORING PROGRAMME

The key objectives of the groundwater monitoring programme are to:

- Detect short and long-term groundwater level and quality trends;
- Recognise changes in groundwater quality and levels;
- Measure impacts and define mitigation measures; and
- Develop improved monitoring systems.

Groundwater monitoring must be undertaken to establish the extent of contamination in the shallow weathered and deeper fractured aquifers, during and after the reclamation activities.

## 13.1 Monitoring locations

The current Goldplat monitoring programme must be maintained throughout the life of the project and up to the closure of the Goldplat operations. Impacts associated with the project can be monitored using the existing groundwater monitoring borehole configuration, specifically in boreholes GP2 and GP9. Borehole GP2 is drilled to a depth of 30m and borehole GP9 to 20m, which is considered suitable to monitor surface sources of contamination to groundwater in these locations.

Monitoring in all other boreholes currently included in the Goldplat monitoring programme must be continued and maintained in addition to GP2 and GP9.

The two private boreholes identified during the 2026 hydrocensus are located upgradient of the Top and Rooidam Stock Dams. Groundwater flow from the proposed tailings reclamation areas are not towards the two private boreholes. Despite this, it is recommended that the boreholes are monitored on an annual basis to set a baseline.

The catchment paddock that will be used to manage runoff during reclamation must be included in the monitoring programme to evaluate operational water quality.

The proposed project monitoring locations are presented in Table 19.

**Table 19 Proposed dedicated monitoring programme: Monitoring locations**

| Monitoring ID | X Coordinate (WGTM 29) | Y Coordinate (WGTM 29) | Depth (m) | Purpose |
|---|---|---|---|---|
| GP2 | -26.18223˚ | 28.38026˚ | 30 | Monitor impacts immediately downgradient of the project |
| GP9 | -26.18112° | 28.38236° | 20 | Monitor impacts on the wetlands immediately downgradient of the project |
| Catchment paddock | As per the project designs | | - | Monitor operational water quality |
| Benoni1 | -26.18081° | 28.36061° | Unknown | Upgradient hydrocensus boreholes within a 3km radius, included to set a baseline |
| Benoni2 | -26.18029° | 28.35904° | Unknown | |

## 13.2 Monitoring requirements

Monitoring of groundwater levels in all the existing Goldplat monitoring boreholes must be maintained . This information is important to improve the understanding of water level fluctuations and groundwater level rise and fall in response to rainfall. This information will be interpreted at the hand of on-site rainfall figures and will be used to improve the conceptual understanding of the aquifers. In order to analyse this information accurately, daily rainfall must be monitored and recorded on site.

It is recommended that the two upgradient hydrocensus boreholes are monitored on an annual basis, including groundwater levels and a water sample for chemical analysis from Benoni1.

In order to keep continuity with the baseline information presented in this report, it is recommended that the elements listed in the Goldplat monitoring programme are maintained, but with the addition of cobalt, nickel and uranium in the proposed Reclamation Project monitoring positions. The addition of these metals in the analysis is based on the outcome of the sampling of toe seepage from the Top and Rooidam Stock Dams. These analyses indicated that cobalt, nickel and uranium are indicator elements for the project but are not currently included in the Goldplat monitoring programme. The monitoring requirements are presented in Table 20.

**Table 20 Monitoring requirements in all proposed monitoring positions**

| Monitoring parameter | Element for analysis | Monitoring frequency | Monitoring trigger-response criteria |
|---|---|---|---|
| Depth to groundwater level all Goldplat monitoring boreholes | Groundwater level | Monthly | Variations by more than 3m for 2 consecutive monitoring runs should be investigated. |
| Depth to groundwater level in hydrocensus boreholes Benoni1 and Benoni2 | Groundwater level | Annually | Variations by more than 3m for 2 consecutive monitoring runs should be investigated. |
| Water quality analysis in Goldplat boreholes GP2 and GP9 as well as the catchment paddock | All elements included the current Goldplat monitoring programme, plus cobalt, nickel and uranium | Monthly | Variations in concentrations by more than 15% for major cations and anions and more than 7% for metal concentrations for more than 2 consecutive monitoring runs should be investigated. Any result that exceed sspecified water quality objectives must be investigated when it occurs. |
| Water quality analysis in hydrocensus borehole Benoni1 | All elements included the current Goldplat monitoring programme, plus cobalt, nickel and uranium | Annually | Variations in concentrations by more than 15% for major cations and anions and more than 7% for metal concentrations for more than 2 consecutive monitoring runs should be investigated. Any result that exceeds specified water quality objectives must be investigated when it occurs. |
| Water quality analysis in all remaining Goldplat monitoring boreholes | All elements included the current Goldplat monitoring programme | Monthly, as per the current programme | As above |
| Rainfall | Rain depth (mm) | Daily on site | None |

The monitoring trigger-response criteria listed in Table 19 must be reviewed on an annual basis and updated, based on the outcome of the monitoring programme results. All monitoring information must be entered into a spreadsheet for record-keeping and analysis. Copies of the certificates of analysis must be kept on file for inspection. If significant exceedances are recorded during the monitoring programme, the following actions should be taken:

- Log the exceedances in the incident reporting system within 24-hours of it occurring.
- Undertake an investigation to identify causes of the exceedances.
- Implement the necessary remedial actions according to the outcome of the investigation and consultation with the affected parties.
- Report significant exceedances to the Environmental and General Managers as well as to the regulatory authority and track the incident until completion.

The results of the monitoring programme must be reported as part of the Goldplat internal water management process, where exceedances must be discussed and projects to resolve exceedances developed. Goldplat must further report the results of their groundwater monitoring programme to the Department of Water and Sanitation according to the requirements of its WUL.

# 14 POST CLOSURE MANAGEMENT

## 14.1 Remediation of physical activity

The preferred remediation strategy for the Plant is to remove all infrastructure at closure and the fully rehabilitate the footprint.

Soil samples must be taken once rehabilitation has been completed for leach tests. The outcome of these tests must be used to confirm long-term risk of contamination to groundwater quality presented in this report.

## 14.2 Remediation of storage facilities

It is specifically important to complete tailings reclamation and not to leave disturbed tailings material, open to oxygen and rainfall infiltration, in situ post closure. All tailings must be removed to soil level and contaminated material must be removed and disposed of in a responsible manner.

The rehabilitation of the reclaimed footprints must strive to generate free-draining surfaces that will result in dry and unsaturated post-closure conditions. If this is achieved, the risk of surface seepage to the aquifers from the footprint is minimised.

The final rehabilitation programme must consider all groundwater management measures presented in this report.

## 14.3 Remediation of environmental impacts

As discussed above.

## 14.4 Remediation of water resources impacts

The final rehabilitation programme must consider the outcome of this assessment and specifically include the groundwater management measures discussed above. If these measures are implemented effectively, remediation of water resources will not be required.

It is noted that several sources of contamination, not related to Goldplat, also impact on groundwater quality. These were considered during the impact prediction simulations. Goldplat can only remediate its footprint and thus reduce long-term impacts on groundwater resources. It cannot be held responsible for third-party impacts outside its area of responsibility.

## 14.5 Backfilling of pits

Not applicable.

# 15 REASONED OPINION

It is the opinion of the professional geohydrologist that the reclamation and footprint rehabilitation of the Goldplat Top and Rooidam Stock Dams can be authorised, provided that all tailings are reclaimed to soil level; and that sound surface water/storm water management measures are put in place and maintained throughout the life of the project. No ponding must be allowed over the reclaimed footprint. In the short term there could be water quality impacts (increased salts and metal concentrations) during tailings reclamation. The risk of this impact must be controlled through the implementation of the groundwater management measures presented in this report and confirmed through a dedicated groundwater monitoring programme in existing monitoring boreholes. Potential impacts associated with future alternative use of the reclaimed footprint have been assessed to a lower level of confidence in this report and must be updated once detailed plans and designs are available. Analysis of all monitoring information must be considered as part of an updated risk assessment to be completed as part of the closure application for the Goldplat operations. Overall, the project is expected to deliver a long-term positive impact on groundwater quality after tailings reclamation, and the resultant footprints are carefully rehabilitated.

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# APPENDIX 1 - AQUATOX REPORTS

## Hydrogeological and Contaminated Land Investigation

## Report

**Version – 3**

**October 2020**

**Goldplat Recovery Pty Ltd**

**Project Number: 082019**

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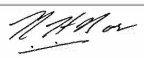
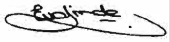
| Author | Dr R.H.Boer |  | October 2020 |
| Document Reviewer | Erika van der Linde |  | October 2020 |

**Hydrogeological and Contaminated Land Investigation**

**Report**

**Version – 3**

**October 2020**

Aquatox Consulting (Pty) Ltd

08-2019

## EXECUTIVE SUMMARY


### Introduction

Aquatox Consulting (Pty) Ltd (Atox) was appointed by Goldplat Recovery (Pty) Ltd to update the hydrogeological investigation and to establish the level of water contamination for a Recovery Plant in Benoni, Gauteng Province. The results for this investigation will form part of a water use license application.

The following basic steps were applied for the Scoping and EIA phase:

- A desktop study was conducted which included the analysis of data obtained from the National Department of Water and Sanitation's National Groundwater Archive (NGA) which were mapped for reporting purposes;
- Available specialist reports/data were obtained and were reviewed accordingly; and
- A 4 km hydrocensus of boreholes surrounding the site was conducted which included sampling of accessible boreholes to obtain baseline chemistry during 2016, the information was updated with a sampling program which included samples from 2018 and 2019.

An objective for this study is to identify the nature and extent of contamination from unsaturated and saturated zones underneath reclaimed gold-mine dumps (in respect of tailings dams) in order to infer their potential to pollute the near surface environment, ground and surface water, and to define the appropriate rehabilitation measures. No water is abstracted from bore holes for use or consumption in the plant.

### General Physiographical and Geological Description

The climate is semi-arid with a Mean Annual Precipitation (MAP) calculated at ~698mm. The closest river in the area is the Blesbokspruit. The main tributary of the Blesbokspruit flows from west to east, via a series of man-made cannals, lakes and dams. A number of closed and operating gold mines and mine rock dumps are situated adjacent to the wetland and riparian irrigation occurs along the Blesbokspruit

The recovery site is underlain by predominantly interbedded sandstone, mudstone, laminated siltstones, shale and carboniferous rock of the Vryheid Formation. The basement material consists of diamictite and shale of the Dwyka Formation. The sediments have been reworked resulting in carbonaceous shale and inclusions of coal.

### Hydrogeological Setting

### Water Quality Analysis

Overall boreholes showed elevated TDS values (>7,500 mg/L), sulphate (620 – 2560mg/L), sodium (107-391 mg/l), chloride (129-345 mg/l), calcium (86-198 mg/l), nitrate (~17mg/l) and ammonium (1.07-3.10 mg/l). Groundwater samples, as well as surface water samples, indicated the absence of any organic compounds.

Based on the comparison between down- and up-gradient groundwater samples, higher concentrations of inorganic chemical substances were noted in boreholes located on-site.

Water quality analyses from the newly drilled boreholes confirmed the potential for down gradient contamination. However, the latest data show spurious anomalies and could not be interpreted into an obvious groundwater flow pattern. Variation in measured values at a singles source would vary by two orders of magnitude over a time period of a quarter.

**Impact Assessment**

As the site is in the operational phase the impact assessment was conducted for the operational and closure phase. The impact assessment considered the potential impacts of the recovery operations on both groundwater and the wetland receptor.

The impact rating for the operational phase impacts on groundwater quality is medium. Due to the fact that contamination was identified within close proximity to the TSF a risk is posed to the downgradient sensitive receptor (wetland) should no mitigation measures be implemented.

The impact rating for the closure phase impacts on groundwater quality is high, if the TSF material is left unlined and not discarded according to regulation. The impact rating in the event that the TSF is reworked and discarded in the correct manner is a medium risk. The scenarios are also worst case where the contaminants are released and migrate into the groundwater. However, the latter scenarios would be controlled and monitored in order to prevent such spillage.

**Recommendations**

A Groundwater Management Plan is required to ensure that the facility does not impact negatively on groundwater levels and quality to unacceptable levels. To ensure that the groundwater environment is protected, monitoring of water quality and levels is required on an on-going basis.

It is recommended that data generated using the monitoring network, which have been extended downstream to the north, east and west of the TSF, be interpreted on a continuous basis in order to determine the preferential contaminant plume migration path.

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# 1 INTRODUCTION

GCS Water and Environmental Consultants (Pty) Ltd (GCS) was appointed by Ferret Mining and Environmental Services (Pty) Ltd to conduct a hydrogeological investigation and to establish the level of water contamination for a recovery plant in Benoni, Gauteng Province. The results for this investigation will form part of a water use license application. Very few specialist investigations appear to have been done to identify the status of the hydrogeological regime, the extent of contamination, preferential pathways and predictions regarding long-term migration.

# 2 SCOPE OF WORK

The following investigations were assessed during the hydrogeological and contaminated land study:

- Detailed desktop study (review of existing monitoring data over time);
- Groundwater sampling of existing monitoring boreholes;
- Short duration aquifer testing;
- Surface water sampling of nearby surface water bodies;
- Risk assessment describing the potential impact of the facility and its activities on the natural environment; and
- Compilation of a detailed hydrogeological report with detailed recommendations for monitoring and relevant information that can be included within the Water Use License Application.

# 3 METHODOLOGY

## 3.1 Desktop review

In order to conduct a high level desktop study for the site, any historical data from previous consultant reports, as well as public domain data that are available for the site area were reviewed. The data assessed, included:

- 2628 Geological map for Benoni, Gauteng
- National Groundwater Archive (NGA) and WARMS data for the site area;
- Water quality data available for the surrounding areas as obtained from the NGA and the client;
- The applicable 1:250 000 topographic maps and google satellite imagery; and
- All site-specific data made available to Atox by the client.

## 3.2 Hydrocensus

Hydrocensus investigations were undertaken in May 2016 for the site area and neighbouring properties. The purpose of the hydrocensus was to update the following applicable information:

- GPS coordinates and elevation of existing boreholes or springs;
- Water levels of the boreholes, where accessible;
- Estimated abstraction volumes, where provided;
- Any other information regarding the water reliability or quality;
- Identifying surface water bodies and usage; and
- Determine groundwater usage and identify groundwater users.

The hydrocensus data is discussed in Section 5.

## 3.3 Aquifer testing/Slug tests

Two boreholes (FM3 and FM4) on site were used to characterize the aquifer units present at this section of the recovery plant area. A constant discharge and recovery test were conducted on the borehole (FM4) for a maximum period of 4h. This was followed by recovery measurements, where the rebound of the borehole water level was recorded to at least 90% of the original water level. One short duration aquifer test was conducted on borehole (FM3), with a recovery test to 90% of the original water level.

The results of these tests were interpreted to obtain aquifer parameters (such as transmissivity). The data for the tests conducted on the respective boreholes are discussed in Section 5.2.

## 3.4 Groundwater & Surface Water Sampling

In total four (4) samples were collected which consisted of one (1) surface water and three (3) groundwater samples from the selected hydrocensus boreholes, during 2016. The samples were submitted to a SANS (South African National Accreditation System) accredited laboratory for analyses. The analysis was carried out in accordance with methods prescribed by and obtained from the South African Bureau of Standards (SABS), in terms of the Standards Act, Act 30 of 1982. The results were compared to the SANS (South African National Standards) 241:2011 Class 1 water quality standards for drinking water, DWA SAWQTV and AWQ standards.

- The laboratory analyses included:
- Major anion and cations;
- ICP metal scan; and
- pH, Total Dissolved Solids (TDS), Bicarbonates, Electrical Conductivity (EC), and Total Hardness.

During 2017 additional boreholes were drilled. Results from these sample positions were used to verify the status quo and update the groundwater report of 2016, i.e. GCS Report (2016).

## 3.5 Impact Assessment and Groundwater Management Plan

The results of the field investigation were interpreted in order to identify the impact of the site on the receiving environment, if any, as well as potential mitigation measures to minimise the impacts during the operational and closure for the recovery site.

The impacts, if any, were classified based on the following criteria:

- Probability – which is how likely the impact is to occur;
- Magnitude – how severe would the impact be should it occur;
- Scale – where will the impact occur; and
- Duration – How long the impact will be present.

The impact assessment results collated with the results of the field investigations for the site. A consolidated groundwater management plan for the site was developed for the operational and closure phase of the site. The impact assessment results and the groundwater management plan is discussed in Section 9.

# 4 SITE DETAILS

## 4.1 Locality

The Recovery plant is situated 6km east of the centre of Benoni (26km east of Johannesburg) and operates from a 22 hectare freehold site. The recovery plant (21.9ha) is situated on ptn 96 (a ptn of ptn 1) of the farm Modderfontein 76IR.

Tailings from the gold operations are deposited on a Tailings Storage Facility (TSF) situated in the north eastern corner of the processing property (Figure 4-1). The main body of the TSF (stock dam) is approximately 8.5ha in extent with a varying depth between 5 and 11.5m (AGM, 2016). The TSF is composed of tailings sediments emanating from the carbon in leach (CIL) processes undertaken by the recovery plant. The average size fraction of slimes is 75%-75µ. The tailings contain precious metals, and thus would be re-processed within the near future. The extension is planned north-east of the current stock dam. The tailings storage facility occurs on the footprint of the historic 5L24 dump.

## 4.2 Site History

The recovery plant has been active for more than 30 years. The location of the recovery plant, as indicated on the above map, is operating on the site previously owned and operated by the Consolidated Modderfontein Mines (Pty) Ltd and Gravelotte Mines Limited. The plant provides an economic method for mines to dispose of waste materials and adhering to a mine's environmental obligations. The recovery plant uses various processes such as roasting in a rotary kiln, crushing, milling, thickening, floatation, gravity concentrators, leaching, CIL, elution and smelting of bullion. Precious metals are recovered from the materials within a single process, but multiple processes are employed to maximise recovery. The TSF on the recovery site has anomalously high grades of Au, Ag and $U_3O_8$. The resource is separated into tailings slimes, emanating from the recovery operations since January 2003 (AGM, 2016). The TSF is still being deposited on, thus it comprises of a consolidated perimeter and a wet interior.

Tailings from the recovery plant is currently stored on a designed TSF with capacity for approximately another 5 years, however the company was requested by government to consider disposing of tailings into a defunct pit (7ha) in close proximity to the recovery plant.

Precious metals are usually recovered from materials within a single process. In some cases, there might be a second process that takes place months afterwards, for instance where the residue from processing very high-grade material is left to oxidise in a stock dam. This oxidation process enhances the overall recovery rate. The material that is processed at the recovery plant in Benoni is a composite of the following:

- Witwatersrand ore;
- High grade tailings/slimes;
- Vlei material;
- Fine carbon;
- Woodchips;
- Mill concentrates;
- Concrete mill foundations; and
- Waste grease.

**Figure 4-1. Site Locality Map.**

## 4.3 Topography and Drainage

The area is sited on a gently north east dipping topography at a general altitude of 1600 meters above mean sea level (mamsl). The ground culminates in a wetland area 500m to the north east. The regional drainage is toward the south.

## 4.4 Hydrology

The main tributary of the Blesbokspruit flows from west to east, via a series of man-made canals, lakes and dams. The canal then flows eastward through highly urbanized areas before flowing through an intensively mined area where there are a number of open pit mines along the river bank. In this area a number of mine rock dumps have been reclaimed, some of which were adjacent to or in the watercourse itself. The canal then joins the Blesbokspruit, which arises within agricultural holdings further to the north, and shortly thereafter it receives an average of 75 Ml/day partially treated underground water (van der Merwe and Lea, 2003) before flowing almost due south for about 30km. Within this stretch a large wetland dominated by reed beds and open shallow water extends for more than 20km. A number of closed and operating gold mines and mine rock dumps are situated adjacent to the wetland and riparian irrigation occurs along the Blesbokspruit (DWAF, 1999).

## 4.5 Climate and Rainfall

The greater part of the area is semi-arid and subject to variable rainfall and evaporation. The climate in Benoni is generally warm and temperate. Benoni normally receives about 698mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (5mm) in July and the highest (123mm) in January.

The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Benoni range from 15.4°C in June to 26°C in January. The region is the coldest during July when the mercury drops to 0.4°C on average during the night. The monthly variation of average rainfall for the area is shown in Figure 4-2.

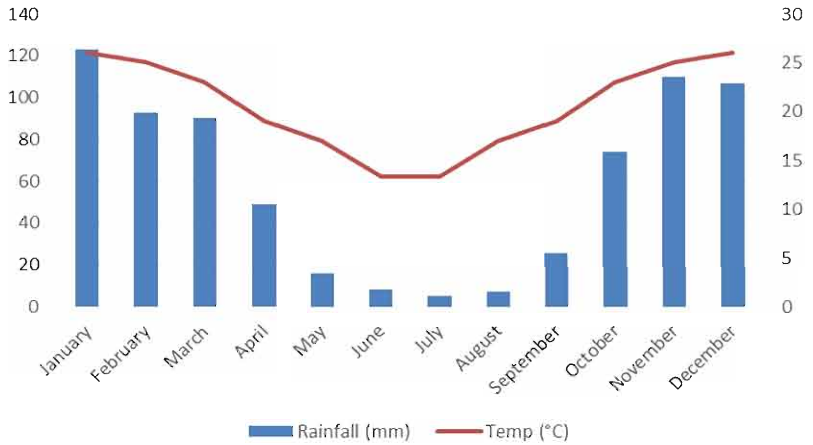


**Figure 4-2. Annual rainfall for Benoni (SSW, 2016).**

## 4.6 Land use

There are remnants of previous mining from the last century such as sand dumps up to 60m high (AGM, 2016) located to the northwest of the site. The little vegetation there is, comprises of grassland and minor scrub.

A neighbouring land survey was conducted for the site in order to prepare a list of adjacent land use as detailed in Table 4-1 below.

**Table 4-1. Neighbouring Land Use**

| Locality with regards to site | Land Use |
|---|---|
| **North** | Vacant land and sand dumps |
| **East** | Residential area |
| **South** | Recreational area (golf course) |
| **West** | Residential and vacant land |

## 4.7 General Geology

### *4.7.1 Regional Geology*

The Ecca Group comprises of sediments deposited in shallow marine and fluvial-deltaic environments with coal accumulated as peat in swamps and marshes associated with these environments.

The sandstone and coal layers are normally reasonable aquifers, while the shale trends to act as aquitards. Several layered aquifers perched on the relative impermeable shale are common in such sequences. The Dwyka

Formation comprises of consolidated glaciations (with high amounts of clay) and is normally considered to have impermeable qualities.

The generally horizontally disposed sediments of the Karoo Supergroup are typically undulating with a gentle regional dip to the south. The extent of the coal is largely controlled by the pre-Karoo topography. Dolerite/Diabase intrusions in the form of dykes and sills are present within the Ecca Group. The sills usually precede the dykes, with the latter being emplaced during a later period of tensional forces within the earth's crust. Tectonically, the Karoo sediments are practically undisturbed. Faults are rare. However, fractures are common in competent rocks such as sandstone and coal.

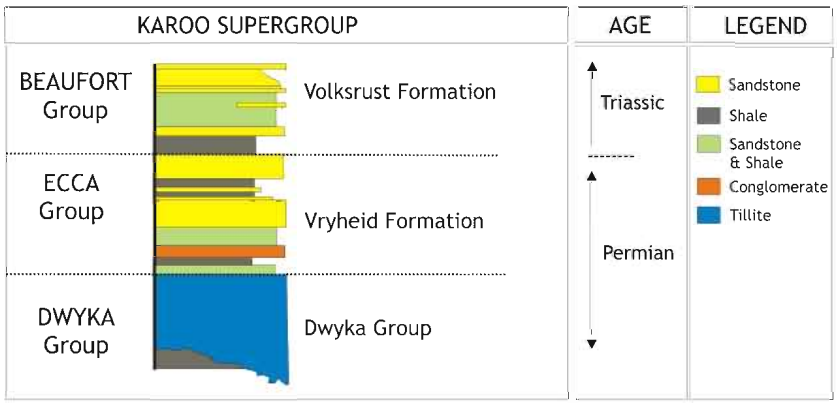


**Figure 4-3. Schematic Stratigraphy of the Ecca and Dwyka Group in South Africa.**

*4.7.2 Local geology*

According to the 1:250 000 geology map series 2628 East Rand (Council for Geoscience, 1986) the western section of the site is underlain by the Vryheid Formation of the Ecca Group (Karoo Supergroup) consisting of sandstone, shale and coal beds. The eastern section of the site is underlain by the Dwyka Formation of the Karoo Supergroup and consists of diamictite and shale (refer to Figure 4-4).

The Karoo Sediments at the Project site comprise of the Vryheid formation and consists predominantly of sandstone, laminated siltstones, shale and coal. Combinations of these rock types are often found in the form of interbedded siltstone, mudstone, and sandstone.

The underlying Dwyka Formation consist predominantly of diamictite and shale. The upper portion of the Dwyka Sediments may have been reworked, in which case carbonaceous shale and even inclusion of coal may be found.

The Recovery plant is surrounded by historic mine workings. The Gold mines actively abstracted gold from the Turffontein and Johannesburg conglomerates of the Central Rand Group (Witwatersrand Supergroup).

There are dolomitic outcrops (Malmani Formation) of the Chuniespoort Group east-west (800m) of the Recovery site. These dolomitic and chert lithologies within the Malmani Formation do not intersect the tailings storage facilities or the recovery plant structures. The site lies in between two dyke-like intrusions.

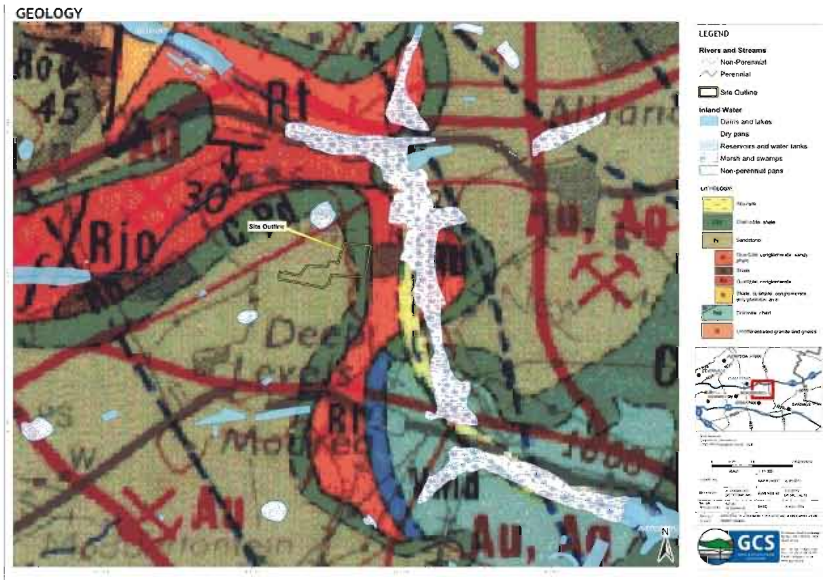


**Figure 4-4. Geology Map.**

## 4.8 Hydrogeological Setting

According to the 1:500 000 hydrogeological map series 2628 Johannesburg (Barnard and Baran, 1999) the site is underlain by an intergranular and fractured aquifer with borehole yields ranging from 0.1 to 0.5L/s. Groundwater occurrence is better developed along aquifers associated with sedimentary/igneous rock contact zones. The East Rand basin consists of interconnected underground gold mines that are separated from the Central basin by the unmined Boksburg gap area (Pulles *et al*, 2005). Two perennial pans are found towards the southwest of the recovery site.

According to Hodgson *et al*. (1998), three distinct superimposed groundwater systems are present within the occurring geology. They can be classified as the upper weathered Ecca aquifer, the fractured aquifers within the unweathered sediments of the Ecca Group and the aquifer below the Ecca Group sediments.

### *4.8.1 Shallow Weathered Ecca Aquifer*

The Ecca Group sediments are weathered to depths between 5 and 12 meter below ground level (mbgl) and often form a perched aquifer. This aquifer is recharged by rainfall and estimated to be between 1 and 3% of the annual rainfall. Rainfall that infiltrates into the weathered rock soon reaches an impermeable layer of shale underneath the weathered zone. The movement of groundwater on top of this shale is lateral and concur with the direction of the bedding plane and surface slope.

This aquifer is generally low-yielding (100 – 2000 ℓ/h) because of its insignificant thickness. The water quality can be attributed to the many years of dynamic groundwater flow through the weathered sediments. Leachable salts have been dissolved and it is the slow decomposition of clay particles which presently releases salts into the water.

### *4.8.2 Fractured Ecca Aquifer*

The pores within the Ecca Group sediments are too well cemented to allow any significant permeation of water. Groundwater movement is therefore along secondary structures, such as fractures, cracks and joints in the sediments. These structures are better developed in competent rocks such as sandstone. The chances of intersecting a water-bearing fracture by drilling decreases rapidly with depth. At depths deeper than 30m, water-bearing fractures with significant yield were observed to be spaced at 100m or greater.

In terms of water quality, the fractured Ecca Group aquifer always contains higher salt loads than the upper weathered aquifer. Although the sulphate, magnesium and calcium concentrations in the Ecca Group fractured aquifer are higher than that in the weathered zone, they are well within expected limits.

### *4.8.3 Pre-Karoo Aquifer*

Drilling in only a few instances has intersected the basement of the Karoo Supergroup which can be regarded as an insignificant aquifer due to:

- The great depth;

- Low yielding fractures;
- Elevated concentrations of fluoride associated with the granitic rocks; and
- Low recharge characteristics due to overlying impermeable Dwyka Formation.

## 4.9 Quaternary Catchment

Data from the relevant hydrogeological database including the Groundwater Resource Directed Measures (GRDM) was obtained from the Department of Water and Sanitation. The site area falls within quaternary catchment: C21D (refer to Table 4-2).

**Table 4-2. Summarized Quaternary Catchment Information (GRDM, 2010);**

| Quaternary Catchment | Total Area ($km^2$) | Recharge mm/a | Current use $Mm^3/a$ | Average Static water level (mbgl) | Rainfall mm/a |
|---|---|---|---|---|---|
| C21D | 445.8 | 36.1 | 6.32 | 16.7 | 698 |

### *4.9.1 Groundwater levels - National Groundwater Archive (NGA)*

No borehole information was derived from the National Groundwater Archive (NGA) for the area.

# 5 SITE HISTORY

## 5.1 Groundwater and Surface Water Quality Results

The monitoring information for surface and groundwater samples collected over a three-year period, was analysed and compared to SANS (2015), DWA SAWQTV and AWQ standards. These chemical analyses determine the quality of surface water bodies and groundwater resources currently at the recovery site. It also helps to identify a potential risk to the surrounding environment.

The results of the chemistry for the surface and groundwater samples taken on a monthly basis over a 3-year period was provided by the client. The sample locations are given in Table 5-1 for six (6) surface water and two (2) groundwater sample positions located on the recovery site.

**Table 5-1. Sample locations provided by the client**

| Sample ID | Description | Latitude | Longitude |
|---|---|---|---|
| FF | Float Feed (tank) | -26.18327° | 28.37454° |
| FT | Float Tails (tank) | -26.18395° | 28.37460° |
| GPA | Slime dam Borehole | -26.18000° | 28.37942° |
| GPB | Slime dam Return Water | -26.18298° | 28.37462° |

| | | | |
|---|---|---|---|
| GPC | Float Borehole | -26.18397° | 28.37503° |
| FM | Float Mill | -26.18378° | 28.37436° |
| PF | Plant Feed | -26.18303° | 28.37326° |
| PT | Plant Tails | -26.18373° | 28.37490° |
| FM4 | Float Borehole | -26.18397° | 28.37503° |
| GP1 | Borehole behind slime dam, behind FM3 to the left | -26.17943° | 28.38012° |
| GP2 | Borehole behind slime dam to the right | -26.18223° | 28.38026° |
| GP3 | Borehole behindkiln woodchips, left of slime dam | -26.18095° | 28.37554° |
| GP4 | Borehole inside plant behind kiln | -26.18244° | 28.37408° |
| GP5 | Borehole behind GP6 | -26.18680° | 28.36811° |
| GP6 | Borehole behind petrol station | -26.18482° | 28.36837° |

The borehole information analysed over a year showed an elevation in constituents' concentrations in the months June and July. The elevation in concentrations during these months are a direct result of the decrease in the amount of rainfall – constituents are concentrated. The constituents analysed from the monitoring boreholes exceeded chloride, sodium, and sulphate concentrations compared to the SANS 241:2015 standards.

## 5.2 Historical Groundwater Quality

Alkaline conditions (pH 9-12) were encountered in the groundwater samples collected form boreholes, GPC and GPA located at the recovery site, as presented in Figure 5-1. These highly alkaline pH values are attributes to the presence of buffer minerals that cause the increase in pH values and are not typically expected where sulphide-bearing minerals occur. The pH values reported over the year showed alkaline conditions prevailing within the two boreholes.

The highly mobile elements are present in easily soluble and exchangeable fractions. Due to the alkaline pH the mobility of some elements is reduced and will only become problematic when the pH becomes acidic.

The natural groundwater found in the fractured Ecca aquifer is saline. The elevated Cl and Na concentrations (2000mg/L and 800mg/L) can be derived from the natural saline conditions (Figure 5-2 and Figure 5-3).

The sulphate concentrations for both boreholes exceed the SANS 241:2015 standards over the entire year of monitoring. The fluctuations seen in the sulphate concentrations are also associated with the rainfall trend, during lower rainfall (June –July) the sulphate concentrations increase (Figure 5-4). Although the sulphate concentration decreases, the sulphate exceeds the allowed sulphate concentration for SANS 241:2015 standards.

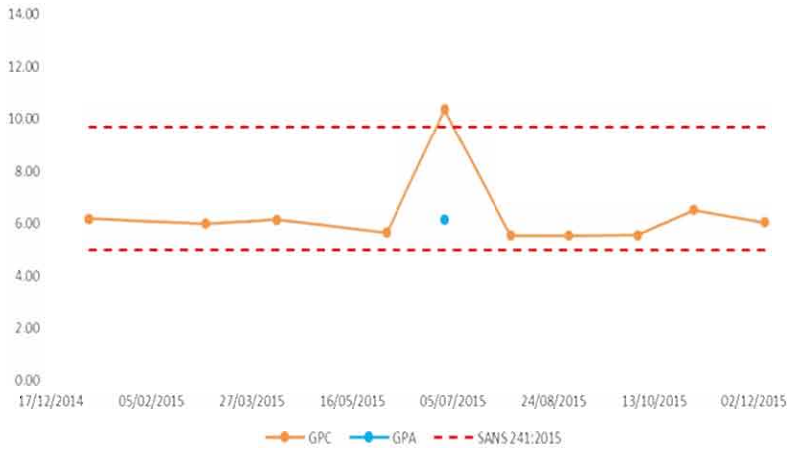


**Figure 5-1. pH over time for the groundwater samples taken on site.**

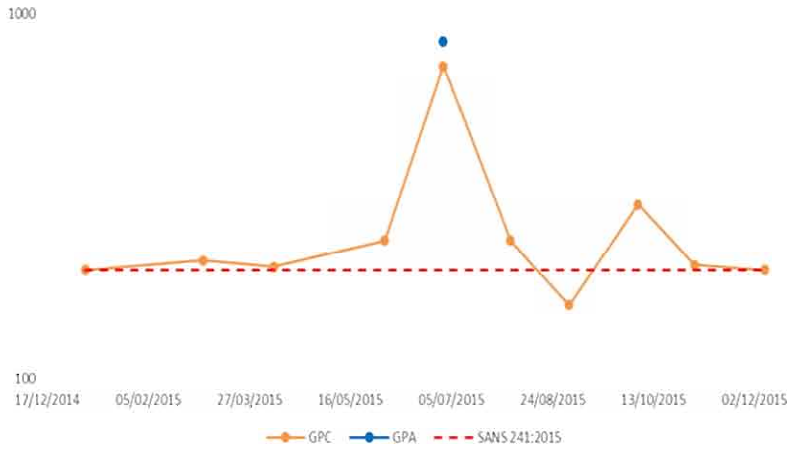


**Figure 5-2. Na over time for the groundwater samples taken on site**

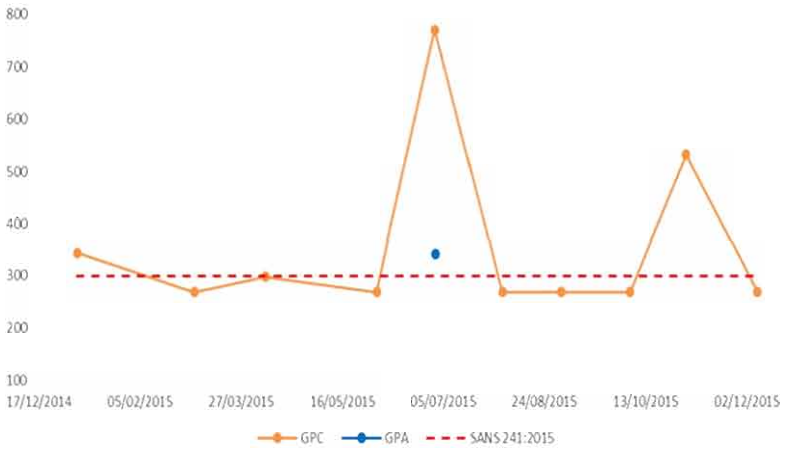


**Figure 5-3. Cl over time for the groundwater samples taken on site.**

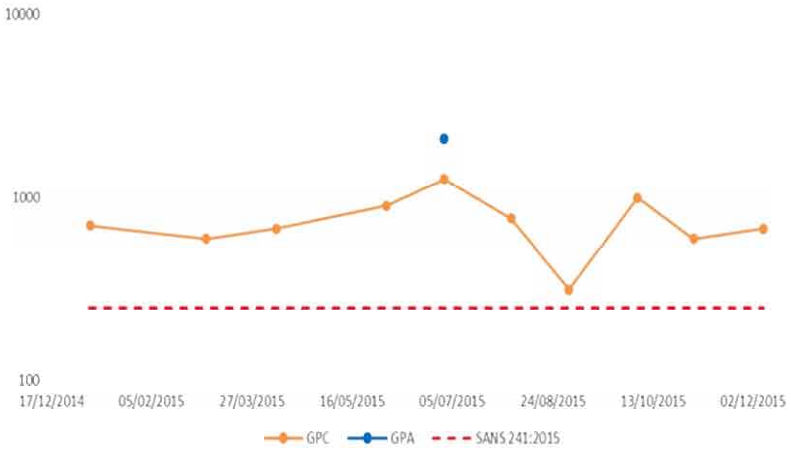


**Figure 5-4. $SO_4$ over time for the groundwater samples taken on site.**

### *5.2.1 Historical Surface Water Quality*

Near neutral to alkaline conditions (pH 8-13) were encountered in samples collected form float feed, float tailings, slime water return dam, plant feed, float mill and plant tails, see Figure 5-5. These pH values exceed the allowed SANS241:2015 standards (>10). The float mill and plant feed show pH values above 10 over the course of monitoring. The alkaline pH effects the mobility of some elements by reducing their mobility.

It is important to note that the natural groundwater found in the fractured Ecca aquifer is saline. The elevated Cl and Na concentrations can partly result from natural conditions and enhanced by the liberation methods used at the recovery plant (Figure 5-6 and Figure 5-7).

The sulphate concentrations for the surface water samples exceed the SANS 241:2015 standards for the allowed amount of sulphate in drinking water (Figure 5-8). Over the entire year of monitoring the values exceed the standard by an order of magnitude. The fluctuations seen in the sulphate concentrations are also associated with the rainfall trend, during lower rainfall (June –July) the sulphate concentrations increase. Although the sulphate concentration decreases, the sulphate concentrations still exceeds the allowed sulphate concentration for SANS 241:2015 standards. The exception noted is the plant tailings and float feed. The sulphate concentrations are lower within the float feed due to the material that is being processed or the lack of liberation for sulphate at this stage of recovery.

The iron concentrations do not exceed the SANS 241:2015 standards at the start of monitoring, with the exception of the float feed that exceeded the standard (2mg/L) from January to December 2015 (Figure 5-9). The surface water bodied started to exceed the SANS standard from April. The Fe concentrations incr;eased to 50 times that of the SANS standard.

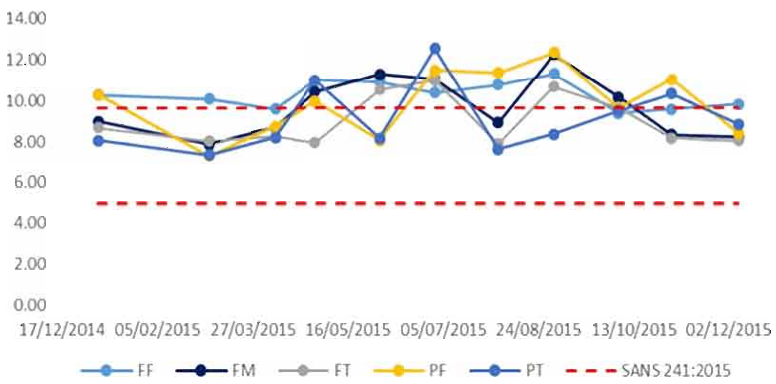


**Figure 5-5. pH over time for the surface water samples taken on site.**

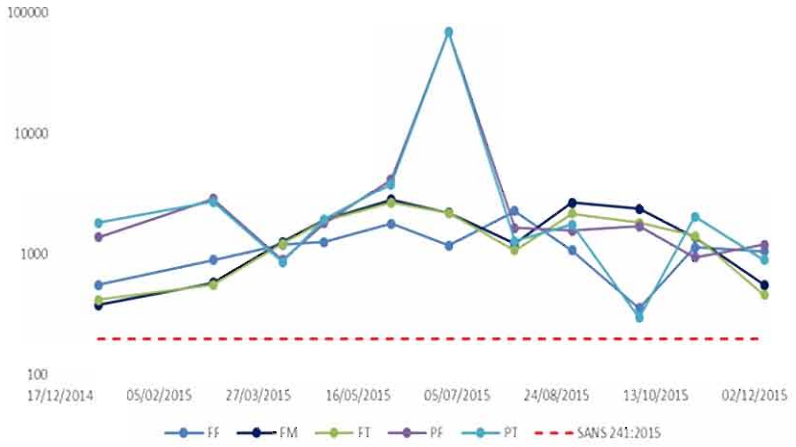


**Figure 5-6. Na over time for the surface water samples taken on site.**

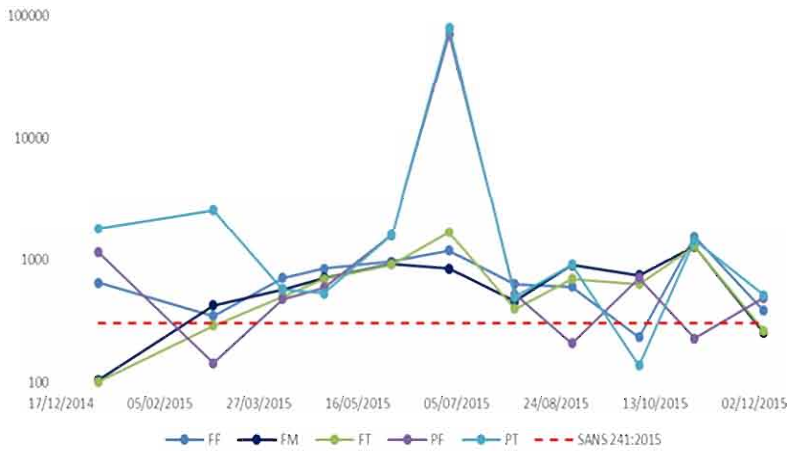


**Figure 5-7. Cl over time for the surface water samples taken on site.**

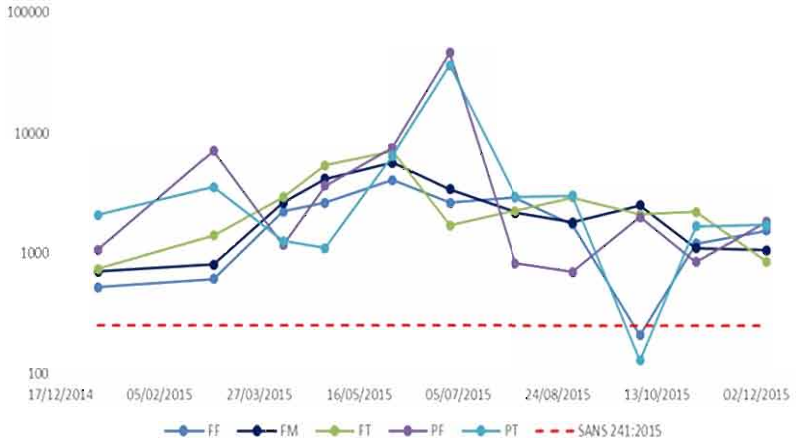


**Figure 5-8. $SO_4$ over time for the surface water samples taken on site.**

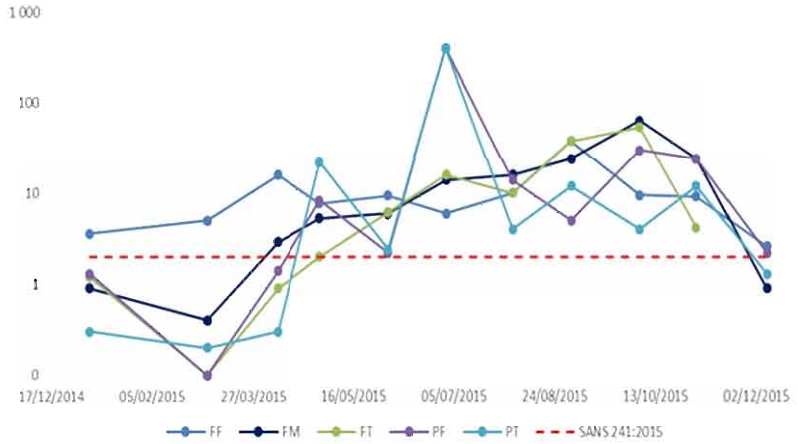


**Figure 5-9. Fe over time for the surface water samples taken on site.**

*5.2.2 Summary of historical surface and groundwater qualities*

The overall trend for the analysed parameters was similar. All constituents increased within the low rainfall period, between June and July. The groundwater quality beneath the investigated tailings dams is dominantly alkaline. High salt loads are reported in the groundwater (elevated Na and Cl concentrations). The groundwater quality improves due to the dilution effect of the constituents.

Sulphate in surface and groundwater often occur in combination with gold mining operations (pyrite oxidation) due to leachates from underground mines and/or seepage from tailings dams. The target water quality of sulphate ranges from 0-200 mg/l in waters for domestic use (DWAF, 1996). The sulphate concentrations in borehole waters close to tailings dams (distance approximately < 300 m) can easily exceed more than 5000 mg/l. It is important to ensure that these polluted boreholes are not used as drinking water supplies or for other domestic and agricultural uses.

Fe concentrations are dependent on the pH, Eh of suspended matter and the concentrations of other heavy metals. The target water quality for Fe for domestic use is given as < 0.1 mg/1 (DWAF, 1996). Where significant acidification of the waters occurs (pH < 3.5), the dissolved iron concentration can be to the order of several hundred mg/l, as a result of AMD (DWAF, 1996).

It is clear when compared to the SANS241:2015 drinking water standards that the analysed constituents exceed the allowed standards, which results in contamination plume downgradient from the tailing dams. Although a contamination plume can be identified the migration and the extent of the plume will warrant more monitoring boreholes downstream of the potential contaminant sources.

Boreholes FM3 and FM4 showed elevated sulphate (537-1151 mg/l), sodium (107-391 mg/l), chloride (129-345 mg/l), calcium (86-198 mg/l) and ammonium (1.07-3.10 mg/l). FM4 located next to the recovery equipment also had elevated nitrate concentrations (17.3 mg/l) exceeding the SANS standards of 11 mg/l. This will lead to downgradient contaminant migration.

Based on the comparison between down- and upgradient groundwater samples, higher concentrations of inorganics were noted in FM3 and FM4, located on-site. Groundwater samples FM1, FM3 and FM4 as well as surface water sample, S1 indicated the absence of any organic compounds.

# 6 FIELD SURVEY RESULTS

## 6.1 Hydrocensus

### *6.1.1 Groundwater*

Hydrocensus investigations were conducted on the 3rd and 25th of May 2016 for the site area and neighboring properties. The initial investigation was extended to a 4km radius. A summary of the hydrocensus can be seen in Table 6-1. A total of three (3) shallow water levels were measured that ranged from 4.20 to 10.68mbgl and at an average of 7.1mbgl. The locations of these hydrocensus points identified are presented in Figure 6-1. Data obtained during the hydrocensus are compiled in Appendix A.

**Table 6-1. Hydrocensus Borehole Details**

| BH ID | Farm Owner | S Coordinate | E Coordinate | Equipment | Use | Comments |
|---|---|---|---|---|---|---|
| FM1 | Abandoned | -26.163410° | 28.390172° | None | Not in use | The pump equipment might be stuck in the open borehole. |
| FM2 | Abandoned | -26.163870° | 28.390345° | None | Not in use | Borehole is covered. Located next to a dry dam. |

| | | | | | | |
|---|---|---|---|---|---|---|
| FM3 | Goldplat Recovery | -26.180000° | 28.379420° | None | Not in use | Borehole covered |
| FM4 | Goldplat Recovery | -26.183970° | 28.375030° | Pump fitted at 20m | Monitoring | Borehole equipped with pump. |

*Groundwater sample collected

Three (3) samples were submitted to UIS laboratories, a SANAS accredited laboratory, for analysis of major anions and cations, as well as selected metals. Groundwater sampling of FM1, FM3 and FM4 as well as field parameters were conducted on the 3rd and 25th of May 2016. The samples were labelled, preserved and kept cool prior to analysis.

The field parameters as measured on site are presented in Table 6-2. This included pH, EC (Electrical Conductivity), TDS (Total Dissolved Solids), temperature and ORP (Oxidation Reduction Potential) on the site.

**Table 6-2. Field parameters**

| BH ID | pH | EC (mS/m) | TDS (mg/l) | Temperature (°C) | ORP (mV) |
|---|---|---|---|---|---|
| FM1 | 8.54 | 147.6 | 1040 | 20.2 | - |
| FM3 | 8.64 | 225 | 1590 | 19.2 | 185 |
| FM4 | 6.03 | 247 | 1760 | 20.4 | 943 |

*Exceeding the SANS standards

The pH, EC and TDS readings recorded in FM1 were all compliant with the SANS 241-1:2015 drinking water standards (SABS, 2015). The EC and TDS values recorded in FM3 and FM4 exceeded the SANS standards. The positive ORP readings are indicative of an oxygen rich environment.

### *6.1.2 Sensitive Receptor Survey*

Sensitive areas (e.g. wetlands, streams etc.) were identified during hydrocensus conducted on the 3rd and 25th of May 2016. A wetland area was identified approximately 500m east of the site from which a water sample was collected (refer to Figure 6-1). The sample details are presented in Table 6-3.

**Table 6-3. Sensitive Receptor Details**

| BH ID | S Coordinate | E Coordinate | Comments |
|---|---|---|---|
| S1 | -26.177873° | 28.384331° | Open water body located upstream to the recovery sites' TSF. |

*Surface water sample collected

Water sampling of the wetland as well as field parameters were conducted on the 25th of May 2016. Th;e sample was labelled, preserved and kept cool prior to analysis. The field parameters as measured on site are presented in Table 6-2. This included pH, EC, TDS and temperature.

**Table 6-4. Field parameters**

| BH ID | pH | EC (mS/m) | TDS (mg/l) | Temperature (°C) |
|---|---|---|---|---|
| S1 | 8.47 | 128.3 | 1960 | 22.9 |

*Exceeding the SANS standards

The pH and EC values were compliant with the SANS 241-1:2015 drinking water standards (SABS, 2015), however the TDS value of 1960mg/l exceeded the SANS standard of 1200mg/l. The positive ORP reading is indicative of an oxygen rich environment.

;

**Figure 6-1. 2016 Hydrocensus Borehole and Wetland Locality Map.**

## 6.2 Aquifer Testing

Aquifer testing of monitoring boreholes, FM3 and FM4 were conducted on the 25th of May 2016. The objectives of the aquifer testing programme by means of constant rate and falling head tests were to identify the aquifer hydraulic characteristics of the geological formations. This information assisted in the calculation of travel times of pollutants and the risk of contamination. The results of the aquifer tests are summarised in Table 6-5 and Table 6-6.

### *6.2.1 Constant rate discharge test*

A constant rate (CR) and recovery test was conducted on monitoring borehole FM4 over a period of 314 minutes. The borehole was subjected to a 0.26l/s discharge rate over the 4 hour test. The maximum drawdown reached was approximately 47m from the available 49.32m. The transmissivity value was calculated at 0.57m²/d by the hydraulic conductivity and the thickness of the aquifer.

### *6.2.2 Falling head test*

A falling head test was conducted on FM3 over an approximate period of 20 minutes. The maximum displacement in the borehole was recorded at 0.95m.

**Table 6-5. Results from Constant Discharge Pumping Test**

| BH ID | Pumping rate (l/s | Drawdown (m) | Duration of test (min) | K-Value (m/day) | Method |
|---|---|---|---|---|---|
| FM4 | 0.26 | 46.88 | 314 | 1.16E-02 | Cooper Jacob (1946) |

**Table 6-6. Results from Falling Head Test**

| BH ID | Displacement (m) | Duration of test (min) | K-Value (m/day) | Method |
|---|---|---|---|---|
| FM3 | 0.95 | 20 | 4.6E-03 | Bouwer - Rice (1976) |

The estimated K-values indicate relatively slow movement for the aquifer tested boreholes FM3 and FM4. The slow movement is typically expected for the formations within the Karoo Supergroup. The aquifer data are compiled in Appendix B.

# 7 LABORATORY ANALYSIS

## 7.1 Groundwater Sampling & Analysis

### *7.1.1 Inorganics*

Water samples were collected from three boreholes (FM1, FM3 and FM4) and were transported to UIS laboratory located in Centurion. The laboratory results are presented in Appendix C. The inorganic laboratory results are presented in Table 7-1 for the water samples collected.

**Table 7-1. Laboratory Results - Inorganics**

| Parameter (mg/L) | SANS 241:2015 | Sampled Boreholes | | |
|---|---|---|---|---|
| | | FM1 | FM3 | FM4 |
| pH – Value at 25°C | **5-9.7** | 7.27 | 7.09 | 6.09 |
| Total Alkalinity as $CaCO_3$ | **NS** | <0.06 | <0.6 | <0.6 |
| Total Hardness as $CaCO_3$ | **NS** | 82 | 80 | 72 |
| Chloride as Cl | **<300** | 129.1 | 177.0 | 344.9 |
| Sulphate as $SO_4$ | **<500** | 536.5 | 1098.5 | 1150.9 |
| Ammonia as $NH_4$ | **NS** | 1.07 | 3.10 | 1.52 |
| Nitrate, $NO_3$ as N | **<11** | <0.45 | 17.3 | 5.5 |
| Nitrite, $NO_2$ | **<0.9** | <2 | 76.4 | 24.3 |
| Aluminium, Al | **NS** | 0.34 | 0.19 | 0.24 |
| Calcium, Ca | **NS** | 86.3 | 149.8 | 198.3 |
| Chromium, Cr | **0.05** | <0.05 | <0.05 | <0.05 |
| Copper, Cu | **2** | <0.05 | 0.29 | <0.05 |
| Iron, Fe | **2** | 12.32 | 0.77 | 3.06 |
| Potassium, K | **NS** | 13.2 | 15.8 | 12.9 |
| Magnesium, Mg | **NS** | 43.9 | 14.0 | 90.8 |
| Manganese, Mn | **0.5** | 1.42 | 1.97 | 2.41 |
| Sodium, Na | **<200** | 107.0 | 391.1 | 206.3 |
| Nickel, Ni | **<0.15** | <0.05 | 0.38 | 1.05 |
| Phosphorus, $PO_4$ | **NS** | <4 | <4 | <4 |
| Lead, Pb | **0.01** | <1 | <1 | <1 |

NS – No Standard

**FM1:** Sulphate, iron and manganese concentrations exceeded the SANS 251-1:2015 drinking water quality standards. This borehole is located 2km north east, upgradient of the TSF.

**FM3:** non-compliant sulphate, nitrate, nitrite, manganese, sodium and nickel concentrations were detected in FM3, located on the northern boundary of the TSF.

**FM4:** Non-compliant chloride, sulphate, nitrite, iron, manganese, sodium and nickel were detected in FM4 located in the eastern section of the site, south of the TSF.

*7.1.2 Organics*

As a preliminary screening process, to provide an indication of the degree of potential impact present, laboratory results have been compared against the following standards:

- The Aquatic Water Quality standard adapted from the Department of Environmental Affairs, May 2010 (Framework for the Management of Contaminated Land. Government Printer. Republic of South Africa). However, where published values were not available, values were obtained from United Kingdom Environmental Quality Standards for Salmonoid (2010); British Columbia Aquatic Guidelines (2006) and National Oceanic and Atmospheric Administration (2008) (refer to Table 7-2);
- In order to screen those compounds in soils and water where no relevant South African guidance or legislation exists, a Tier 1 lookup table, which is an excel spreadsheet used as a screening tool linked to the RISK (Risk Integrated Software for Clean-ups) software was used. A Tier 1 Look-up Table is used to identify chemicals and pathways that warrant further evaluation. It is generally understood that soil, groundwater, or air concentrations falling below the Look-Up Table values are not of concern.

The laboratory results obtained for groundwater for Volatile Petroleum Hydrocarbons (GRO, DRO and PAH) are presented in Table 7-2 for the boreholes which were sampled.

**Table 7-2. Laboratory Results - Organics**

| Determinant (µg/l) | Aquatic Water Quality | FM1 | FM3 | FM4 |
|---|---|---|---|---|
| **Gasoline Range Organics (GROs)** | | | | |
| **Benzene** | 30[ii] | <1 | <1 | <1 |
| **Toluene** | 50[ii] | <10 | <10 | <10 |
| **Ethyl Benzene** | 200[i] | <2 | <2 | <2 |
| **m,p-Xylene** | - | <2 | <2 | <2 |
| **o – Xylene** | 30[ii] | <2 | <2 | <2 |
| **1,3,5 Trimethylbenzene** | - | <2 | <2 | <2 |
| **1,2,4 Trimethylbenzene** | - | <2 | <2 | <2 |
| **Naphthalene** | 1.1[iii] | <2 | <2 | <2 |
| **Polycyclic Aromatic Compounds (PAH)** | | | | |
| **Acenaphthene** | - | <1 | <1 | <1 |
| **Acenaphthylene** | - | <1 | <1 | <1 |
| **Flourene** | - | <1 | <1 | <1 |
| **Phenanthrene** | - | <1 | <1 | <1 |
| **Anthracene** | - | <1 | <1 | <1 |
| **Fluoranthene** | - | <1 | <1 | <1 |
| **Pyrene** | 0.0025 | <1 | <1 | <1 |
| **C10** | - | <1 | <1 | <1 |
| **C11** | - | <1 | <1 | <1 |
| **C12** | - | <1 | <1 | <1 |
| **C13** | - | <1 | <1 | <1 |
| **C14** | - | <1 | <1 | <1 |
| **C15** | - | <1 | <1 | <1 |
| **C16** | - | <1 | <1 | <1 |
| **C17** | - | <1 | <1 | <1 |
| **C18** | - | <1 | <1 | <1 |

| Determinant (µg/l) | Aquatic Water Quality | FM1 | FM3 | FM4 |
|---|---|---|---|---|
| C19 | - | <1 | <1 | <1 |
| C20 | - | <1 | <1 | <1 |
| Volatile Organic Hydrocarbons (VOH) | | | | |
| MTBE | 3400 [i] | <5 | <5 | <5 |
| TAME | - | <5 | <5 | <5 |
| Estimated Total VPHs | | | | |
| Total VPHs Identified | - | <10 | <10 | <10 |
| Estimated VPHs Unidentified | - | <10 | <10 | <10 |
| Estimated Total VPHs | - | <10 | <10 | <10 |

No organic compounds were detected in the samples collected from the boreholes.

| Heterotrophic plate count | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 6 200 | 3 900 | 3 900 | 46 000 | No analysis |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 4 900 | 13 000 | 13 000 | 33 000 | |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 57 000 | | | |
| FM3 | -26.18000° | 28.37942° | 27 800 | 33 000 | 33 000 | 21 500 | |
| FM4 | -26.18397° | 28.37503° | 5 400 | 1 440 | 1 440 | 870 | |
| FT | -26.18395° | 28.37460° | 70 000 | | | | |
| GP1 | -26.17943° | 28.38012° | 220 000 | 327 000 | 32 700 | 340 000 | |
| GP2 | -26.18223° | 28.38026° | 6 800 | 62 000 | 62 000 | 1 340 000 | |
| GP3 | -26.18095° | 28.37554° | 174 000 | 16 500 | 16 500 | 980 000 | |
| GP4 | -26.18244° | 28.37408° | 680 000 | | 170 000 | 55 000 | |
| GP5 | -26.18680° | 28.36811° | | 400 000 | 400 000 | 16 800 | |
| GP6 | -26.18482° | 28.36837° | 180 000 | 51 000 | 51 000 | 68 000 | |
| GPB | -26.18298° | 28.37462° | | 6 100 | 16 500 | 380 | |
| PF | -26.18303° | 28.37326° | 340 | 310 | 310 | | |
| PT | -26.18373° | 28.37490° | 470 | 510 | 510 | | |
| DWAF 1996: Acceptable | | | 1 000 000 | 1 000 000 | 1 000 000 | 1 000 000 | 1 000 000 |

## 7.2 Surface Water Sampling & Analysis;

### *7.2.1 Inorganics*

A surface water sample was collected from a wetland downgradient of the site and were transported to UIS laboratory located in Centurion. The laboratory results are presented in Appendix C. The inorganic laboratory results are presented in Table 7-1 for the water sample collected.

**Table 7-3. Laboratory Results - Inorganics**

| Parameter (mg/L) | WQG – Aquatic Ecosystems (1996) | SANS 241:2015 | Surface sample |
|---|---|---|---|
| | | | S1 |
| pH – Value at 25°C | NS | 5-9.7 | 6.19 |
| Total Alkalinity as $CaCO_3$ | NS | NS | <0.6 |
| Total Hardness as $CaCO_3$ | NS | NS | 13 |
| Chloride as Cl | NS | <300 | 63.3 |
| Sulphate as $SO_4$ | NS | <500 | 608.7 |
| Ammonia as $NH_4$ | NS | NS | 3.48 |
| Nitrate, $NO_3$ as N | NS | <11 | <0.45 |
| Nitrite, $NO_2$ | NS | <0.9 | <2 |
| Aluminium, Al | 0.005 | NS | 0.08 |
| Calcium, Ca | NS | NS | 134.7 |
| Chromium, Cr | NS | 0.05 | <0.05 |
| Copper, Cu | 0.0003 | 2 | <0.05 |
| Iron, Fe | NS | 2 | 5.29 |
| Potassium, K | NS | NS | 19.5 |
| Magnesium, Mg | NS | NS | 29.3 |
| Manganese, Mn | 0.18 | 0.5 | 3.1 |
| Sodium, Na | NS | <200 | 52.8 |
| Nickel, Ni | NS | <0.15 | <0.05 |
| Phosphorus, $PO_4$ | NS | NS | <4 |
| Lead, Pb | 0.0002 | 0.01 | <1 |

NS – No Standard

**S1:** Non-compliant sulphate, iron and manganese were detected in the surface water sample collected. The aluminum concentration of 0.08mg/l detected exceeded the South African Water Quality Guidelines for Aquatic Ecosystems.

<include new up and down stream data>

#### *7.2.1.1 Organics*

As a preliminary screening process, to provide an indication of the degree of potential impact present, laboratory results have been compared against the following standards:

- The Aquatic Water Quality standard adapted from the Department of Environmental Affairs, May 2010 (Framework for the Management of Contaminated Land. Government Printer. Republic of South Africa). However, where published values were not available, values were obtained from United Kingdom Environmental Quality Standards for Salmonoid (2010); British Columbia Aquatic Guidelines (2006) and National Oceanic and Atmospheric Administration (2008) (refer to Table 7-4);

- In order to screen those compounds in soils and water where no relevant South African guidance or legislation exists, a Tier 1 lookup table, which is an excel spreadsheet used as a screening tool linked to the RISK (Risk Integrated Software for Clean-ups) software was used. A Tier 1 Look-up Table is used to identify chemicals and pathways that warrant further evaluation. It is generally understood that soil, groundwater, or air concentrations falling below the Look-Up Table values are not of concern.

The laboratory results obtained for groundwater for Volatile Petroleum Hydrocarbons (GRO, DRO and PAH) are presented in Table 7-2 for the wetland which was sampled.

**Table 7-4. Laboratory Results - Organics**

| Determinant (µg/l) | Aquatic Water Quality | SI1 |
|---|---|---|
| **Gasoline Range Organics (GROs)** | | |
| **Benzene** | 30[ii] | <1 |
| **Toluene** | 50[ii] | <10 |
| **Ethyl Benzene** | 200[i] | <2 |
| **m,p-Xylene** | - | <2 |
| **o – Xylene** | 30[ii] | <2 |
| **1,3,5 Trimethylbenzene** | - | <2 |
| **1,2,4 Trimethylbenzene** | - | <2 |
| **Naphthalene** | 1.1[iii] | <2 |
| **Polycyclic Aromatic Compounds (PAH)** | | |
| **Acenaphthene** | - | <1 |
| **Acenaphthylene** | - | <1 |
| **Flourene** | - | <1 |
| **Phenanthrene** | - | <1 |
| **Anthracene** | - | <1 |
| **Fluoranthene** | - | <1 |
| **Pyrene** | 0.0025 | <1 |
| **C10** | - | <1 |
| **C11** | - | <1 |
| **C12** | - | <1 |
| **C13** | - | <1 |
| **C14** | - | <1 |
| **C15** | - | <1 |
| **C16** | - | <1 |
| **C17** | - | <1 |
| **C18** | - | <1 |
| **C19** | - | <1 |
| **C20** | - | <1 |
| **Volatile Organic Hydrocarbons (VOH)** | | |
| **MTBE** | 3400[i] | <5 |
| **TAME** | - | <5 |
| **Estimated Total VPHs** | | |
| **Total VPHs Identified** | - | <10 |
| **Estimated VPHs Unidentified** | - | <10 |
| **Estimated Total VPHs** | - | <10 |

No organic compounds were detected in the sample collected from the wetland.

## 7.3 Recent Sampling and Aanlytical Data

A comparison between historic water quality results (Figure 7-1) and the more recently sampled borehole samples were conducted and is presented in the section below. In the historic water qualities it was shown that higher concentrations were noted in FM3 and FM4 located within the site, compared to the off-site borehole, FM1. Lower concentrations of chloride, sulphate, nitrate, nitrite, calcium and sodium were noted in the surface sample (S1) compared to FM3 and FM4.

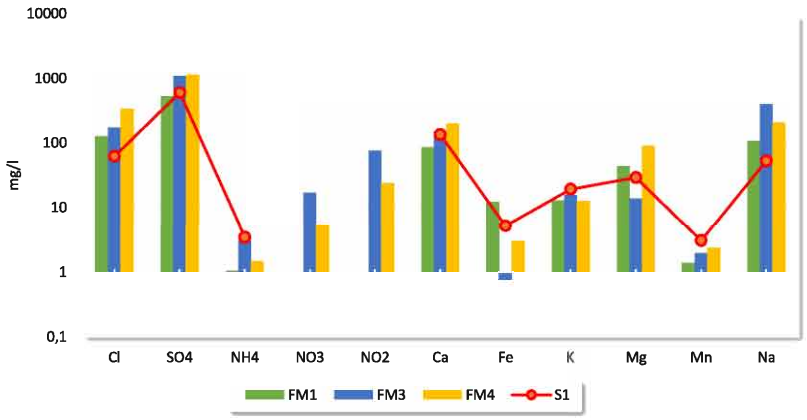


**Figure 7-1. Water Quality Graph.**

The newly drilled boreholes and a selection of surface sampling sites were identified and monitored for a one year period (i.e. August 2018 until July 2019). Table 16 below show the results of the latest water quality analyses. It is clear from the latter data that there is no consistent recognisable pattern that could be interpreted in terms of a geochemical process or other influence on the area. The spurious results of the data may vary with up to two orders of magnitude for the same sample locality or borehole, and within a single calendar month (see TDS results in Table 14). Such wide variations are not uncommon among parameters and could be recognised in the sulphate, as well as the calcium concentrations. However, the spurious results of the water quality seems to be a typical characteristic of all sampling sites. A few boreholes have shown less variability and include boreholes GP5 and GP6. In general, the water qualities are comparable to Acid Mine Drainage (AMD). The erratic values probably reflect variation in the source material. By implication, the management and rehabilitation of the contaminated sites and pollution source points should be conducted according to the accepted standard methods used to treat AMD.

**Table 7-5. Water quality analyses from boreholes and process water samples at Goldplat.**

| TDS (mg/l) | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 345 | 336 | 212 | 343 | 347 |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 270 | 259 | 170 | 212 | 473 |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | | | | |
| FM3 | -26.18000° | 28.37942° | | 7796 | 8177 | 7513 | 833.1 |
| FM4 | -26.18397° | 28.37503° | 2196 | 2206 | 2335 | 2145 | 2056 |
| FT | -26.18395° | 28.37460° | | | | | |
| GP1 | -26.17943° | 28.38012° | 2302 | 2023 | 1485 | 2135 | 2181 |
| GP2 | -26.18223° | 28.38026° | 2735 | 2571 | 638 | 2563 | 2415 |
| GP3 | -26.18095° | 28.37554° | 3518 | 3290 | 2506 | 2653 | 2240 |
| GP4 | -26.18244° | 28.37408° | 30.78 | | 2841 | 3411 | 3005 |
| GP5 | -26.18680° | 28.36811° | | | 115 | 92 | 69 |
| GP6 | -26.18482° | 28.36837° | 153 | 157 | 179 | 143 | 160 |
| GPB | -26.18298° | 28.37462° | | 6357 | 604 | 6148 | 2977 |
| PF | -26.18303° | 28.37326° | 10909 | 7629 | 439 | | 5035 |
| PT | -26.18373° | 28.37490° | 933 | 2950 | 288 | | 4809 |
| DWAF 1996: Class 1 | | | 450 | 450 | 450 | 450 | 450 |
| DWAF 1996: Class 2 | | | 1000 | 1000 | 1000 | 1000 | 1000 |
| DWAF 1996: Class 3 | | | 2400 | 2400 | 2400 | 2400 | 2400 |

| SO4 (mg/l) | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 59 | 57 | 13 | 52 | 42 |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 68 | 48 | 4 | 37 | 30 |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 1791 | | | |
| FM3 | -26.18000° | 28.37942° | 2560 | 1069 | 620 | 204.6 | 1918 |
| FM4 | -26.18397° | 28.37503° | 1015 | 813 | 490 | 534 | 852 |
| FT | -26.18395° | 28.37460° | 82 | 0 | 0 | 0 | 0 |
| GP1 | -26.17943° | 28.38012° | 1020 | 879 | 411 | 574 | 980 |
| GP2 | -26.18223° | 28.38026° | 1184 | 949 | 160 | 605 | 1007 |
| GP3 | -26.18095° | 28.37554° | 1416 | 1069 | 478 | 509 | 894 |
| GP4 | -26.18244° | 28.37408° | 1180 | 0 | 527 | 1348 | 1063 |
| GP5 | -26.18680° | 28.36811° | | 15 | 14 | 19 | 19 |
| GP6 | -26.18482° | 28.36837° | 61 | 26 | 16 | 16 | 29 |
| GPB | -26.18298° | 28.37462° | | 1710 | 74 | 1308 | 801 |
| PF | -26.18303° | 28.37326° | 1281 | 1285 | 49 | | 1025 |
| PT | -26.18373° | 28.37490° | 575 | 873 | 37 | | 1681 |
| DWAF 1996: Class 1 | | | 200 | 200 | 200 | 200 | 200 |
| DWAF 1996: Class 2 | | | 600 | 600 | 600 | 600 | 600 |
| DWAF 1996: Class 3 | | | 1200 | 1200 | 1200 | 1200 | 1200 |

| Iron (mg/l) | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 0.048 | <0,01 | 0.096 | 0.051 | <0,01 |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 0.123 | <0,01 | 0.105 | 0.154 | 0.182 |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 3.585 | | | |
| FM3 | -26.18000° | 28.37942° | 0.7 | 0.014 | 0.295 | 0.151 | 0.05 |
| FM4 | -26.18397° | 28.37503° | 0.23 | <0,01 | 0.324 | 0.139 | 2.77 |
| FT | -26.18395° | 28.37460° | 0.034 | | | | |
| GP1 | -26.17943° | 28.38012° | 0.074 | 0.235 | 0.073 | 0.078 | <0,01 |
| GP2 | -26.18223° | 28.38026° | 0.172 | 0.004 | 0.08 | 0.081 | <0,01 |
| GP3 | -26.18095° | 28.37554° | 0.166 | 0.223 | 0.139 | 0.123 | <0,01 |
| GP4 | -26.18244° | 28.37408° | 0.053 | | 0.119 | 0.095 | <0,01 |
| GP5 | -26.18680° | 28.36811° | | <0,01 | 0.312 | 0.07 | <0,01 |
| GP6 | -26.18482° | 28.36837° | 0.022 | 0.397 | 0.08 | 0.059 | <0,01 |
| GPB | -26.18298° | 28.37462° | | 11.05 | 0.719 | 19.65 | 11.43 |
| PF | -26.18303° | 28.37326° | 43.72 | 65.8 | 0.572 | | 19.03 |
| PT | -26.18373° | 28.37490° | 1.864 | 0.357 | 0.044 | | 3.55 |
| DWAF 1996: Class 1 | | | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| DWAF 1996: Class 2 | | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DWAF 1996: Class 3 | | | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |

| pH- value | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 6.84 | 7.46 | 7.38 | 6.72 | 8.00 |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 6.38 | 7.51 | 8.62 | 6.40 | 8.94 |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 7.79 | | | |
| FM3 | -26.18000° | 28.37942° | 7.18 | 7.09 | 7.38 | 7.15 | 8.18 |
| FM4 | -26.18397° | 28.37503° | 6.00 | 7.19 | 7.08 | 5.90 | 7.00 |
| FT | -26.18395° | 28.37460° | 8.21 | | | | |
| GP1 | -26.17943° | 28.38012° | 6.17 | 7.94 | 8.74 | 6.08 | 6.25 |
| GP2 | -26.18223° | 28.38026° | 5.99 | 6.63 | 9.09 | 6.31 | 7.54 |
| GP3 | -26.18095° | 28.37554° | 5.98 | 5.96 | 8.39 | 8.00 | 7.16 |
| GP4 | -26.18244° | 28.37408° | 7.34 | | 8.32 | 6.47 | 7.62 |
| GP5 | -26.18680° | 28.36811° | | 7.82 | 6.11 | 6.01 | 5.85 |
| GP6 | -26.18482° | 28.36837° | 7.58 | 7.93 | 8.08 | 6.16 | 6.98 |
| GPB | -26.18298° | 28.37462° | | 10.07 | 4.82 | 11.14 | 10.20 |
| PF | -26.18303° | 28.37326° | 11.93 | 11.30 | 8.49 | | 10.36 |
| PT | -26.18373° | 28.37490° | 11.52 | 9.59 | 7.84 | | 11.85 |
| Upper limit | | | 9 | 9 | 9 | 9 | 9 |
| Lower limit | | | 5 | 5 | 5 | 5 | 5 |

| Calcium (mg/l) | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 31.5 | 86.44 | 24 | 81.95 | 29.84 |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 40.33 | 87.61 | 23.74 | 26.95 | 34.15 |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 30.11 | | | |
| FM3 | -26.18000° | 28.37942° | 520.18 | 30.11 | 63.85 | 1367 | 485.27 |
| FM4 | -26.18397° | 28.37503° | 83 | 213.83 | 52.69 | 120.28 | 241.37 |
| FT | -26.18395° | 28.37460° | 2.14 | | | | |
| GP1 | -26.17943° | 28.38012° | 203.7 | 119.17 | 61.98 | 42.116 | 54.75 |
| GP2 | -26.18223° | 28.38026° | 266.01 | 191.17 | 10.44 | 220.028 | 123.69 |
| GP3 | -26.18095° | 28.37554° | 262.77 | 207.04 | 13.68 | 56.17 | 347.94 |
| GP4 | -26.18244° | 28.37408° | 93.18 | | 62.96 | 406.516 | 143.86 |
| GP5 | -26.18680° | 28.36811° | | 7.73 | 4.85 | 16.484 | 89.93 |
| GP6 | -26.18482° | 28.36837° | 16 | 9.68 | 34.91 | 38.26 | 26.96 |
| GPB | -26.18298° | 28.37462° | | 321.93 | 14.18 | 130.69 | 31.18 |
| PF | -26.18303° | 28.37326° | 3.28 | 28.84 | 19.65 | | 83.02 |
| PT | -26.18373° | 28.37490° | 149.53 | 191.25 | 47.19 | | 308.74 |
| DWAF 1996: Class 1 | | | 80 | 80 | 80 | 80 | 80 |
| DWAF 1996: Class 2 | | | 150 | 150 | 150 | 150 | 150 |
| DWAF 1996: Class 3 | | | 300 | 300 | 300 | 300 | 300 |

| Heterotrophic plate count | Latitude | Longitude | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
|---|---|---|---|---|---|---|---|
| B/BOK DOWNSTREAM | -26.200174° | 28.39007° | 6 200 | 3 900 | 3 900 | 46 000 | |
| B/BOK UPSTREAM | -26.17458° | 28.38358° | 4 900 | 13 000 | 13 000 | 33 000 | |
| FF | -26.18327° | 28.37454° | | | | | |
| FM | -26.18378° | 28.37436° | | 57 000 | | | |
| FM3 | -26.18000° | 28.37942° | 27 800 | 33 000 | 33 000 | 21 500 | |
| FM4 | -26.18397° | 28.37503° | 5 400 | 1 440 | 1 440 | 870 | |
| FT | -26.18395° | 28.37460° | 70 000 | | | | No analysis |
| GP1 | -26.17943° | 28.38012° | 220 000 | 327 000 | 32 700 | 340 000 | |
| GP2 | -26.18223° | 28.38026° | 6 800 | 62 000 | 62 000 | 1 340 000 | |
| GP3 | -26.18095° | 28.37554° | 174 000 | 16 500 | 16 500 | 980 000 | |
| GP4 | -26.18244° | 28.37408° | 680 000 | | 170 000 | 55 000 | |
| GP5 | -26.18680° | 28.36811° | | 400 000 | 400 000 | 16 800 | |
| GP6 | -26.18482° | 28.36837° | 180 000 | 51 000 | 51 000 | 68 000 | |
| GP8 | -26.18298° | 28.37462° | | 6 100 | 16 500 | 380 | |
| PF | -26.18303° | 28.37326° | 340 | 310 | 310 | | |
| PT | -26.18373° | 28.37490° | 470 | 510 | 510 | | |
| DWAF 1996: Acceptable | | | 1 000 000 | 1 000 000 | 1 000 000 | 1 000 000 | 1 000 000 |

**Figure 7-2. Layout of monitoring boreholes**

# 8 VULNERABILITY ASSESSMENT

## 8.1 Leaching of rocks in the unsaturated versus the saturated zone

The nature of potential effluent draining from rocks in the unsaturated zone, and that of rocks within the saturated zone, is characteristic. The question we need to answer is what will the geochemical signature (pollution potential) of this material be for the following scenarios:

- Material above the water table
- Material below the water table

A hypothetical scenario was sketched to evaluate and assess the potential impacts on water quality emanating from these two scenarios.

The presence of pyrite in stock material does not predetermine that processing of the material will produce significant acid mine drainage (AMD). The amount and nature of the pyrite present is an important factor, however. Rocks that formed in ancient freshwater environments are generally low in sulphur.

A second important factor is the particle size of the $FeS_2$. AMD production only becomes a serious problem when the grain size is about 0.25 µm in diameter in "framboidal" pyrite. This corresponds to a surface area of 4.8 $m^2/g$. Crystal sizes of 5 – 10 µm (5 µm = 0.24 $m^2/g$), show reduced AMD production and became unlikely to produce AMD when crystal sizes exceeded 400 µm. Particle sizes are usually small in marine rocks and become larger in lacustrine rocks. Mining and milling the rock to fine particle sizes vastly increases pyrite surface area and exposes the pyrite in waste piles to oxidation and weathering. Serious AMD release can result.

A third factor determining the risk of AMD is the proximity of carbonate rocks that can neutralize AMD acidity. Dolomitic rock from the Malmanie Formation is known to outcrop in the Modderfontein area.

Of basic importance when determining risk is the absolute and relative amounts of the exposed pyrite that occur above or below the water table. Above the water table, oxidation rates are usually catalysed by bacteria and can be very fast in fine-grained waste-rock piles. Rates in water-saturated waste materials or below the water table are generally much slower because of the unavailability of free oxygen.

## 8.2 Source-pathway–receptor approach

The results of the hydrogeology study were combined in order to construct a conceptual hydrogeological model for the site area. Data for the climatic, topographic, geological and hydrogeological environments were reviewed in order to quantify the interactions of the respective environments and present a unified conceptualization of the site hydrogeological setting.

A shallow aquifer occurs at the base of the Ecca sediments and upper weathered/fractured lithologies of the Vryheid Formation. It is our understanding that this aquifer is not utilized in the surrounding areas. The pores within the Ecca sediments are too well cemented to allow any significant permeation of water. Groundwater movement is therefore along secondary structures, such as fractures, cracks and joints in the sediments. These structures are better developed in competent rocks such as sandstone, hence the better water yielding properties of the latter rock type.

This aquifer is recharged by rainfall and estimated to be between 1-3 % of the annual rainfall. Rainfall that infiltrates into the weathered rock soon reaches an impermeable layer of shale underneath the weathered zone.

The groundwater flow direction for the site is mainly south to northeast towards a wetland. The ground culminates in a wetland area 500 m to the north east. Direct rainfall recharge for the site is limited due to the variable rainfall and evaporation at the site and rainfall (698 mm/a) with the regional drainage is toward the south.

## 8.3 Travel time calculation

Determining the contaminant travel time (from surface to the groundwater) allows for the assessment of the underlying vulnerable groundwater at the site. The longer the travel time the less the threat as the contaminants will be exposed to natural attenuation for longer. The travel time through the unsaturated zone to the aquifer can be calculated by using the formula:

$$Tt = di / (K / n)$$

Where

| | | |
|---|---|---|
| Tt | = | Travel time in days |
| d | = | Unsaturated thickness in m (4.5m) |
| i | = | Hydraulic gradient (dimensionless) (1 for vertical flow) |
| K | = | Hydraulic conductivity (m/day) |
| n | = | Porosity |

The travel time was calculated for FM4. The lithology of the boreholes consists of typical Karoo Supergroup (Ecca Group, Vryheid Formation) material. This includes weathered mudstone and sandstone with the static water level measured up to 10.68mbgl. Due to the depth of the boreholes on site the source of contamination would be at this depth and therefore considered negligible and not incorporated into the calculation.

Using recognised literature values for porosity and calculated hydraulic conductivity, the vertical travel time was then calculated based on ±10m weathered lithology as follows:

$$Tt_{(FM4)} = \frac{10m \times 1}{0.0116\ m/d\ /\ 0.01}$$

$$= 8.62\ days$$

Total travel time = 0.024 years

Travel time through the unsaturated zone was calculated to be ± 0.024 years.

The calculation is based on data obtained from the field tests as well as literature values. There is a level of uncertainty and inaccuracy assigned to the results based on the nature of the soil being disturbed which will affect the porosity values assigned.

The hydraulic gradient across the site was calculated based on the schematic diagram presented in Figure 8-1 below. The distance between the monitoring borehole (FM4) and the receptor (wetland) was calculated. The difference in elevation was estimated as 21m over a horizontal distance of 1000m. Hydraulic gradient therefore equates to 0.021.

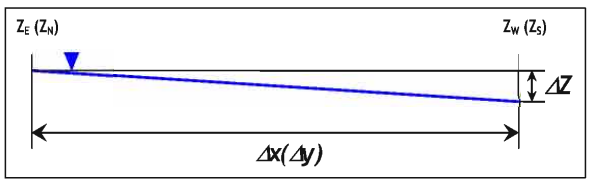


**Figure 8-1. Schematic depiction of horizontal hydraulic gradient calculation.**

$$Velocity_{FM3} = K \times i/n$$

$$= \frac{0.0046\text{m/d} \times 0.07}{0.1}$$

$$= 0.0322\text{m/d}$$

$Tt_{FM4}$ (Saturated unit) = Distance/velocity

= 15528 days (42.54 years)

$Velocity_{FM4}$ = K x i/n

$$= \frac{0.0116\text{m/d} \times 0.021}{0.1}$$

$$= 0.029\text{m/d}$$

$Tt_{FM4}$ (Saturated unit) = Distance/velocity

= 34483 days (94.47 years)

The travel time based on the slug and constant discharge test was determined as a worst-case scenario. The travel times over 1km and 500m was determined. The shortest worst-case calculation for the contaminant to move 500m will reach the wetland in 43 years.

Travel time for boreholes FM4 equals 0.029m/days (through the saturated zone) and therefore it will take approximately 95 years to reach the nearest receptor 1000m to the north east. The travel time for contaminants from borehole FM4 is longer as the distance is twice that of borehole FM3.

# 9 RISK ASSESSMENT

## 9.1 Significance Rating Scales

The potential environmental impacts associated with the project are evaluated according to its nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- ***Nature***: A brief written statement of the environmental aspect being impacted upon by a particular action or activity.

- ***Extent***: The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- ***Duration***: Indicates what the lifetime of the impact will be;
- ***Intensity***: Describes whether an impact is destructive or benign;
- ***Probability***: Describes the likelihood of an impact actually occurring; and
- ***Cumulative***: In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Table 9-1 provides the criteria upon which the rating of the impacts is determined.

**Table 9-1. Criteria to be used for the Rating of Impacts**

| CRITERIA | DESCRIPTION | | | |
|---|---|---|---|---|
| EXTENT | **National (4)** The whole of South Africa | **Regional (3)** Provincial and parts of neighbouring provinces | **Local (2)** Within a radius of 2 km of the construction site | **Site (1)** Within the construction site |
| DURATION | **Permanent (4)** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient | **Long-term (3)** The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-transitory | **Medium-term (2)** The impact will last for the period of the construction phase, where after it will be entirely negated | **Short-term (1)** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase |
| INTE;NSITY | **Very High (4)** Natural, cultural and social functions and processes are altered to extent that they permanently cease | **High (3)** Natural, cultural and social functions and processes are altered to extent that they temporarily cease | **Moderate (2)** Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way | **Low (1)** Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected |
| PROBABILTY OF OCCURANCE | **Definite (4)** Impact will certainly occur | **Highly Probable (3)** Most likely that the impact will occur | **Possible (2)** The impact may occur | **Improbable (1)** Likelihood of the impact materialising is very low |

Table 9-2 details the significance rating scale which is used to total the total number of points scored for each impact and indicates the level of significance of the impact.

**Table 9-2. The Significance Rating Scale**

| | |
|---|---|
| **Low impact (4 - 6 points)** | A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure. |
| **Medium impact (7 - 9 points)** | Mitigation is possible with additional design and construction inputs. |

| | |
|---|---|
| **High impact (10 - 12 points)** | The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment. |
| **Very high impact (13 - 16 points)** | Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw. |
| **Status** | Denotes the perceived effect of the impact on the affected area.;3 |
| **Positive (+)** | Beneficial impact. |
| **Negative (-)** | Deleterious or adverse impact. |
| **Neutral (/)** | Impact is neither beneficial nor adverse. |

## 9.2 Impact Assessment

Typically, the life of a recovery operation is comprised of three phases, each with their own unique environmental risks and impacts. The site is currently in the second phase (operational phase), thus the impact assessment was conducted from the operational phase onwards. The impact assessment considered the ;potential environmental impacts of the recovery operations on the groundwater quality.

The closure phase of the impact assessment looks at limiting the long-term liabilities that will be borne for future generations though both physical and chemical stability.

### *9.2.1 Phase 1 – Recovery Plant*

**Operational Phase**

During the operational phase of the Recovery plant the following potential impacts may result from the on-site activities:

- Potential contaminant plume movement from the recovery dumps and process plant discard (TSF); and
- Potential run-off from and site and surrounding area.

The impact rating for the operational phase impacts on groundwater quality is medium. Due to the fact that contamination was identified for the TSF, with a high magnitude and impact on the sensitive receptor located downstream of the TSF.

**Post closure**

During the post closure phase of the recovery site the following potential impacts may result from the on-site activities:

- Potential groundwater contamination and surface runoff at the TSF site is seen as both a high and medium risk area, this is dependent on the processing. Two scenarios are identified for the TSF on site;
- The potential groundwater contamination at the TSF is a high risk if left without lining and upstream from a wetland; and
- The potential groundwater contamination at the TSF is medium if the TSF is reworked and discarded according to waste regulations.

The impact rating for the closure phase impacts on groundwater quality is high, if the TSF material is left unlined and not discarded according to regulation. The impact rating in the event that the TSF is reworked and discarded in the correct manner is a medium risk. The scenarios are also worst case where the contaminants are released and migrate into the groundwater.

**Table 9-3. Operational Phase Impacts (Groundwater Quality);**

| POTENTIAL ENVIRONMENTAL IMPACT | APPLICABLE AREA | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | ACTION PLAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | D | S | P | TOTAL | STATUS | SP | | M | D | S | P | TOTAL | STATUS | SP | |
| GROUNDWATER | | | | | | | | | | | | | | | | | |
| Impact on groundwater quality (contamination) from discard & TSF | Goldplat Infrastructure Area: Waste dumps | 8 | 4 | 3 | 4 | 60 | - | M | Discard must be deposited and rehabilitated to reduce the volume of infiltration, Monitor groundwater quality quarterly to ensure that any plume migration beyond the Recovery site area is identified | 4 | 4 | 3 | 4 | 44 | - | M | Appoint a qualified groundwater specialist to undertake quarterly monitoring<br>Maintain/update centralised monitoring database (for surface water and groundwater) |
| Potential run-off from site and surrounding area. | Goldplat waste dumps and neighbouring historic mines | 6 | 4 | 3 | 4 | 52 | - | M | Prevent surface water run-off and erosion of waste dump material | 3 | 3 | 3 | 4 | 36 | - | M | Implement proper storm water drainage systems and treatment of potentially contaminated water<br>Implement erosion control measures |
| Water quantity reduction – potential abstraction of water from boreholes | Goldplat site | 1 | 2 | 1 | 1 | 4 | - | L | no abstraction of water from boreholes | 1 | 1 | 1 | 1 | 3 | | L | No mitigations required. |

**Table 9-4. Closure and Decommissioning Phase (Groundwater Quality)**

| POTENTIAL ENVIRONMENTAL IMPACT | APPLICABLE ESTIMA MINE AREA | ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION | | | | | | | RECOMMENDED MITIGATION MEASURES | ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION | | | | | | | ACTION PLAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | D | S | P | TOTAL | STATUS | SP | | M | D | S | P | TOTAL | STATUS | SP | |
| **GROUNDWATER** | | | | | | | | | | | | | | | | | |
| Groundwater quality: Infiltration through waste dumps unlined TSF | Goldplat Infrastructure Area: Waste dumps | 8 | 4 | 4 | 4 | 64 | - | H | Rehabilitation and vegetation of recovery footprint area to decrease infiltration water and oxygen to limit geochemical processes. | 4 | 4 | 3 | 4 | 44 | - | M | Place topsoil to allow optimum plant growth. |
| Groundwater quality: Infiltration through waste dumps reworked TSF | Goldplat Infrastructure Area: Waste dumps | 6 | 2 | 2 | 4 | 40 | - | M | Rehabilitation and vegetation of recovery footprint area to decrease infiltration water and oxygen to limit geochemical processes. | 4 | 4 | 3 | 4 | 44 | - | M | Place topsoil to allow optimum plant growth. |

# 10 PROPOSED GROUNDWATER MONITORING NETWORK

The groundwater monitoring network design should comply with the risk-based source-pathway -receptor principle. A groundwater-monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. Both the impact on water quality and water quantity should be catered for in the monitoring system. The boreholes in the network should cover as a minimum the contaminant sources, sensitive receptors and potential contaminant plumes.

Groundwater monitoring should be conducted to assess the following:

- The impact of dewatering on the surrounding aquifers. This will be achieved through monitoring of groundwater levels in the monitoring boreholes;
- Groundwater quality trends. This will be achieved through sampling of the groundwater in the boreholes at the prescribed frequency.

Groundwater monitoring should be undertaken to SANS and DWA requirement according to the schedule. The proposed monitoring network can be seen in Table 10-2. Following the operational phase it is recommended that the borehole monitoring network is reviewed and boreholes added if necessary.

This network complies with the above-mentioned criteria. It is envisaged that the frequency of monitoring remains on a quarterly basis. This is done in order to save costs.

## 10.1 Monitoring parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents).

Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sample position. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH decreases.

### *10.1.1 Full Analysis*

Physical Parameters:

- Groundwater levels

Chemical Parameters:

- Field measurements: pH, EC and TDS;

- Laboratory analyses: Anions and cations (Ca, Mg, Na, K, $NO_3$, $NH_4$, Cl, $SO_4$, F, Fe, Mn, Al, Cr & Alkalinity); Other parameters (pH, EC, TDS). An ICP metal scan can also be included; and
- Sewage related contaminants (*E.coli*, Faecal coliforms) in borehole in proximity to septic tanks or sewage plants.

*10.1.2 Abbreviated Analysis (Pollution Indicators)*

Physical Parameters:

- Groundwater levels

Chemical Parameters:

- Field measurements: pH, EC; and
- Laboratory analyses: Major anions and cations (Ca, Na, Fe, CN, Cl, $NO_3$, $SO_4$) and (EC)

Laboratory analysis techniques will comply with SANS guidelines. The groundwater monitoring database will be updated on a monthly basis as information becomes available. The database should be used to analyse the information and evaluate trends noted.

An annual compliance report should be compiled and submitted to the authorities for evaluation and comment. This report should be submitted annually for the operational and decommissioning phases as well as for two years after the operation at the recovery site ceases. The mine must develop a monitoring response protocol. This protocol will describe procedures in the event that groundwater monitoring information indicates what action is required.

A Groundwater Management Plan is required to ensure that the facility does not impact negatively on groundwater levels and quality to unacceptable levels. To ensure that the groundwater environment is protected, monitoring of water quality and levels is required on an on-going basis. The recommended monitoring includes groundwater level and groundwater quality monitoring as well as the visual inspection of the boreholes. If the monitoring data indicates the need for corrective action, the magnitude of the impact must be assessed by an appropriately qualified and experienced specialist and the necessary measures put forward based on the magnitude of the impact.

**Table 10-1. Water sampling positions**

| Water Samples | | | |
|---|---|---|---|
| New Sample ID | Description | GPS Co-ordinates | |
| | | Latitude | Longitude |
| **Surface water** | | | |
| B/BOK DOWNSTREAM | Blesbok Downstream | -26.200174° | 28.39007° |
| B/BOK UPSTREAM | Blesbok Upstream | -26.17458° | 28.38358° |
| GPB | Slime dam Return Water | -26.18298° | 28.37462° |
| FF | Float Feed (Process water) | -26.18327° | 28.37454° |
| FM | Float Mill (Process water) | -26.18378° | 28.37436° |
| FT | Float Tails (Process water) | -26.18395° | 28.37460° |
| PF | Plant Feed (Process water) | -26.18303° | 28.37326° |
| PT | Plant Tails (Process water) | -26.18373° | 28.37490° |
| **Ground water** | | | |
| FM3 | Slimedam_Borehole | -26.18000 | 28.37942 |
| FM4 | Float Borehole | -26.18397° | 28.37503° |
| GP1 | Borehole behind slime dam, behind FM3 to left | -26.17943° | 28.38012° |
| GP2 | Borehole behind slime dam to right | -26.18223° | 28.38026° |
| GP3 | Borehole behind kiln woodchips, left of slime dam | -26.18095° | 28.37554° |
| GP4 | Borehole inside plant behind kiln | -26.18244° | 28.37408° |
| GP5 | Borehole behind GP6 | -26.18680° | 28.36811° |
| GP6 | Borehole behind petrol station | -26.18482° | 28.36837° |

**Table 10-2. Monitoring Schedule for the Recovery plant site**

| Borehole ID | Co-ordinates, WGS 84 | | Frequency of Monitoring | Current Borehole Use | Analysis |
|---|---|---|---|---|---|
| | S | E | | | |
| **GP1** | -26.179433° | 28.380124° | Quarterly | Drilled 2017 Monitoring BH | By SANAS accredited laboratory, Data to electronic database, Reported to DWS as per WUL requirements |
| **GP2** | -26.182162° | 28.380284° | Quarterly | Drilled 2017 Monitoring BH | |
| **GP3** | -26.181070° | 28.375023° | Quarterly | Drilled 2017 Monitoring BH | |
| **GP4** | -26.182248° | 28.373966° | Quarterly | Drilled 2017 Monitoring BH | |
| **FM3** | -26.180010° | 28.379330° | Monthly | Not in use | |
| **FM4** | -26.184030° | 28.375070° | Monthly | Equipped with pump but not in use | |
| **GP7** | -26,178000 | 28,381000 | Quarterly | Proposed East from extension TSF (to replace GP1 and FM3) | |

The additional monitoring borehole locations were selected based on on-site conditions and neighbouring land use. These boreholes are placed downgradient of potential contamination sources. The positions of the proposed monitoring boreholes need to be verified by a geophysical survey to ensure the contaminant plume will be detected. The proposed monitoring borehole locations are presented in Figure 10-1.

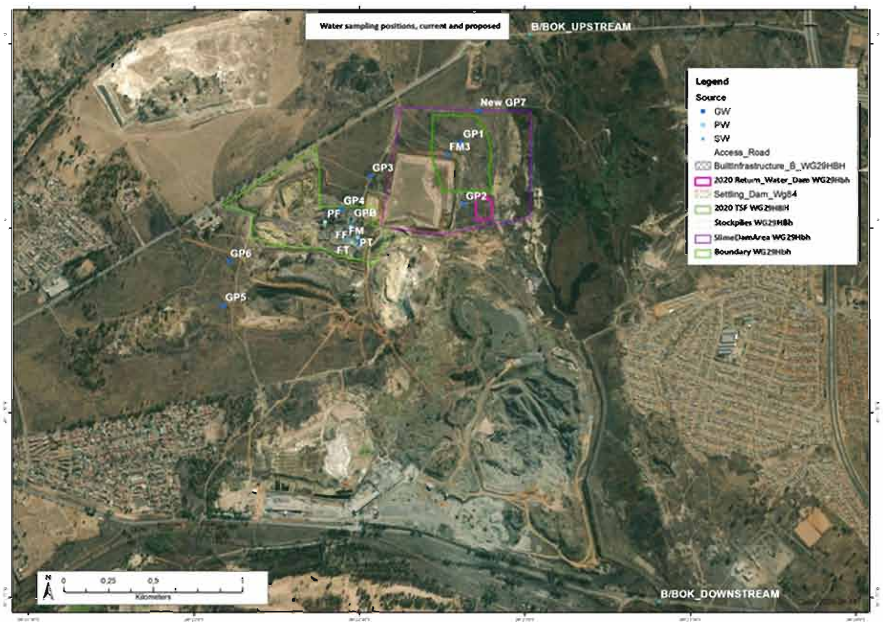


**Figure 10-1. Monitoring Borehole Locality Map.**

# 11 GAP ANALYSIS

The investigation identified the following shortfalls:

- Humidity cell tests or customized leach tests need to be done on the lithology found at the site to accurately predict contaminant movement into the groundwater;
- Geophysics should be done downstream of the TSF and wetland. This method operates on the conductivities of materials, the elevated salts would be more conductive and thus the plume migration path would be better delineated; and
- Due to the placement of the proposed TSF extension covering three monitoring boreholes it is proposed that additional monitoring boreholes are drilled based on a geophysical investigation to be performed. The correct placing of the monitoring borehole would indicate the possibility of contamination .

# 12 CONCLUSIONS AND RECOMMENDATIONS

Elevated concentrations of sulphate, sodium, chloride and iron were observed over the monitoring period and exceeded the SANS standards. The historic data trend showed that elevated concentrations are higher during lower rainfall. The elevated sulphate values are directly associated with pollution from the recovery methods and the residue dumps as well as run-off from surrounding historic mines. These patterns could not be confirmed during the latest sampling exercises. The concentrations of pollutants at the various sample sites were erratic and showed no consistency with changing seasonal conditions, rainfall or any other activity on site.

The impact significance for the operational and closure phase for the time was medium, due to regional potential contamination from the TSF site.

The following recommendations are made:

In the past only boreholes FM3 and FM4 were available for plume/source monitoring. A number of boreholes have been added since. It is recommended that the monitoring network be extended, as proposed in Section 10, downstream to the north, east and west of the tailings storage facility. The siting of these boreholes should be performed using geophysical techniques to determine the preferential contaminant plume migration path.

- A monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources;
- Material from the TSF should be submitted for geochemical analysis to determine the leachability, acid generation capacity and contamination potential of the material; and
- Due to the various reactions that can occur within the lithologies it is recommended that humidity test cells or leach testing be done to identify the potential contaminants rate and movement time. This can also assist in the way that the reworked TSF material will be discarded.

# 13 REFERENCES

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## APPENDIX A- LABORATORY CERTIFICATE

MEETSETECH LABORATORY SERVICES
818 EVA ROAD, FAIRLEADS BENONI, 1512
Website: www.meetsetech.com
Tel: 0119681648 / 0634459647 Fax: 0865870322
Engela Erasmus 0822530462 Rosheen Marx 0834a35693
Email: meetset@telkomsa.com ; meetsetech@gmail.com

## Certificate of Analysis

| | | | |
|---|---|---|---|
| Client: | Jonathan / Stewart | Invoice No: | 9886 |
| Company: | Goldplat Recovery | Certificate No: | Goldplat01062017 |
| Address: | Corner Vermont & New Modder Roads | Date sample received: | 01/06/2017 |
| | Modder Bee, Benoni, 1500 | Certificate Date: | 01/06/2017 |
| Tel No: | 0114231202/374 0835539210 | Day: | Thursday |
| Email: | Jonathan.Hynd@goldplat.com | | |

| | | | |
|---|---|---|---|
| **Date Analysed:** | 01/06/2017 | 01/06/2017 | 01/06/2017 |
| **Sample Number:** | 6 | 7 | 8 |
| **Sample name:** | Water | Water | Water |
| **Sample date and time:** | no info | no info | no info |
| **Lab Number:** | 64949 | 64950 | 64951 |
| **Sample Description:** | Water | Water | Water |
| **Sample container:** | 2L container | 2L container | 2L container |

PARAMETERS FOR EFFLUENT MUNICIPALITY SANITATION BY LAWS DISCHARGE (LAN1895, PG304 OF AUGUST 2004), SECTION 35

| Parameters | Recommended Limit | Maximum Allowable Limit | Methods | Test Result Upstream B/Bok | Test Result Downstream B/Bok | Test Result GPA |
|---|---|---|---|---|---|---|
| Ph units | 5.5 | 7.5 | | 9.09 | 7.83 | 7.07 |
| Total Hardness (CaCo3)mg/l | n/s | 650 | | 78 | 142 | 122 |
| Calcium (CaCO3) mg/l | n/s | 200 | | 5.6 | 11.2 | 11.2 |
| Total Dissived Solids (as TDS) | n/s | n/s | | 115 | 319 | 272 |
| Nitrates (as N) mg/l | n/s | 10 | | 1 | 2.7 | 1 |
| Ammonia (as N) mg/l | n/s | 2 | | 1.4 | 1.7 | 0.8 |
| Iron (as Fe) mg/l | n/s | 1 | | 0.2 | 0.3 | 0.3 |
| Chlorides (as Cl) mg/l | n/s | 600 | | 14 | 77 | 49 |
| Sulphates (as SO4) mg/l | n/s | 600 | | 20 | 40 | 45 |
| Fluorides (as F) mg/l | n/s | 1.5 | | 0.22 | 0.27 | 0.26 |
| Turbidity ftu mg/l | n/s | n/s | | 1 | 2 | 1 |
| Conductivity (ys/cm) | n/s | 250 | | 99 | 371 | 305 |
| Sulphides mg/l | n/s | n/s | | 0.097 | 0.003 | 0.005 |
| Acidity mg/l | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Total (M) Alkalinity mg/l | n/s | n/s | | 51 | 91 | 90 |
| Sodium as Na mg/l | n/s | 400 | | 8 | 51 | 40 |
| Calcium Hardness as Ca02 mg/l | n/s | 200 | | 14 | 28 | 28 |
| Cadmium | n/s | 0.02 | | <0.01 | <0.01 | <0.01 |
| Chromium | n/s | 0.2 | | <0.01 | <0.01 | 0.1 |
| Copper | n/s | 1 | | 0.1 | <0.01 | <0.01 |
| Lead | n/s | 0.1 | | <0.01 | <0.01 | <0.01 |
| Manganese | n/s | 1 | | <0.01 | <0.01 | <0.01 |
| Mercury | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Magnesium Hardness as Mg mg/l | n/s | 100 | | 15.4 | 27.4 | 22.6 |
| Zinc | n/s | 5 | | <0.01 | <0.01 | <0.01 |
| Total Suspendid solids | n/s | 10 | | 110 | 18 | 47 |
| Chemical oxygen demand | n/s | 30 | | 16.32 | 34.68 | 53.04 |
| Cations | n/s | | | 1.9008 | 5.0425 | 4.1694 |
| Anions | n/s | | | 1.9033 | 5.0172 | 4.19 |
| % Difference | n/s | 5 | | 0.13 | 0.5 | 0.49 |
| Calculated TDS | n/s | n/s | | 120 | 324 | 277 |
| Nitrites as N02 mg/l | n/s | 10 | | <0.01 | <0.01 | <0.01 |
| Arsenic mg/l | n/s | nil | | <0.01 | <0.01 | <0.01 |
| Aluminium mg/l | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Bicarbonate mg/l | n/s | n/s | | 51 | 91 | 90 |
| Carbonate | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Cobolt | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Cyanide mg/l | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Heterotrophic plate count | n/s | n/s | | 670 | 11300 | 0 |
| Nickel as Ni mg/l | n/s | n/s | | <0.01 | <0.01 | <0.01 |
| Phosphate as P mg/l | n/s | n/s | | 0.95 | 9.35 | 2.16 |
| Potassium mg/l | n/s | n/s | | 4 | 8 | 6 |
| Total organic carbon mg/l | n/s | n/s | | 32.58 | 29.63 | 21.6 |
| Total Phosphorus mg/l | n/s | n/s | | 2.5 | 14.5 | 3.3 |

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Data captured by: Rosheen Marx Report Signitory.

MEETSE TECH LABORATORY

ETSETECH LABORATORY SERVICES — Tel: 0119683648 / 0844639947 — Fax: 0865870322

EVA ROAD, FAIRLEADS, BENONI, 1512 — Engela Erasmus 0822539462 — Rosheen Marx 0834635691

site: www.meetsetech.com — Email: meetse@mafrica.com / meetsetech2@gmail.com

## Certificate of Analysis

| | | | |
|---|---|---|---|
| ent: | Jonathan / Stewart | Invoice No: | 9912 |
| mpany: | Goldplat Recovery | Certificate No: | Goldplat03072017 |
| dress: | Corner Vermont & New Modder Roads | Date sample received: | 03/07/2017 |
| | Modder Rec, Benoni, 1500 | Certificate Date: | 03/07/2017 |
| No: | 0114231202/3/4 0835539210 | Day: | Monday |
| ail: | Jonathan.Hynd@goldplat.com | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| te Analysed: | | | | | | | | 03/07/2017 | 03/07/2017 | 03/07/2017 |
| mple Number: | | | | | | | | 1 | 2 | 3 |
| mple name: | | | | | | | | Water | Water | Water |
| mple date and time: | | | | | | | | no info | no info | no info |
| e Number: | | | | | | | | 64991 | 64992 | 64993 |
| mple Description: | | | | | | | | Water | Water | Water |
| mple container: | | | | | | | | 2L container | 2L container | 2L container |
| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result FF 3/3* | *Test Result FF 1/3* | *Test Result PT 2/3* |
| | pH units | 6.0-9.0 | 6.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | | 9.93 | 7.64 | 9.72 |
| ,S | mg/dm3 | n/s | n/s | n/s | n/s | - | | 2994 | 2232 | 6076 |
| lorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | | 340 | 671 | 679 |
| phates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | | 1750 | 1100 | 2250 |
| lcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 121.3 | 158.2 | 29.5 |
| dium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | | 780 | 670 | 1720 |
| n (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | | 7.4 | 0.6 | 10.7 |
| alt (Co) | mg/dm3 | - | - | - | - | n/s | | 4.1 | 1.6 | 4.2 |
| per (Cu) | mg/dm3 | - | | - | - | 1 | | 59 | 4.9 | 59 |
| al Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 117.51 | 106.65 | 230.09 |
| olved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 250.83 | 108.63 | 237.00 |
| erotrophic Plate Count | cfu/1ml | - | - | - | - | n/s | | 1340 | 12830000 | 33000 |
| diable Cyanide (CN) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | | 3.1 | 8.9 | 10.3 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | | 3.1 | 8.9 | 10.3 |
| uride as F | mg/dm3 | - | - | - | - | - | | 2.3 | 2.1 | 3.25 |
| al Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | | 39.0 | 29.0 | 17.0 |

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ON THE LIMIT

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a captured by: Rosheen Marx — Report Signitory: Engela Erasmus

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Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@afrika.com / meetsetech@gmail.com

# Certificate of Analysis

icnt: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 9930
Certificate No: Goldplat04082017
Date sample received: 04/08/2017
Certificate Date: 04/08/2017
Day: Friday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 04/08/2017 | 04/08/2017 | 04/08/2017 | 04/08/2017 | 04/08/2017 | 04/08/2017 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **b Number:** | | | | | | | | 65049 | 65050 | 65051 | 65052 | 65053 | 65054 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result PF*** | ***Test Result PT*** | ***Test Result GPA*** | ***Test Result B/B UP*** | ***Test Result B/B DOWN*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | | MTLSQ-WI-001.00 | *11.77* | *8.70* | *8.15* | *8.65* | *7.60* | *7.27* |
| *).S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | | SANASZ11:2005 | *1799* | *4812* | *4033* | *2928* | *257* | *313* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | | MTLSQ-WI-002.00 | *230* | *743* | *467* | *448* | *71* | *62* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANASZ310:2005 | *250* | *1625* | *1800* | *875* | *100* | *100* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | | | *186* | *198* | *510* | *102* | *37* | *32* |
| *dium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6240:2010 | *450* | *1190* | *640* | *720* | *260* | *600* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS6207:2010 | *1.4* | *1.7* | *0.6* | *1.1* | *<0.01* | *<0.01* |
| *olt (Co)* | *mg/dm3* | - | | | - | *n/s* | SANS6170:2010 | *2.7* | *3.8* | *1.5* | *2.4* | *<0.01* | *<0.01* |
| *per (Cu)* | *mg/dm3* | - | | - | - | *1* | SANS5263:2010 | *59* | *54* | *22* | *40* | *<0.01* | *<0.01* |
| *al Organic Carbon* | *mg/dm3* | - | - | | - | *<0.50* | | *203.03* | *214.88* | *108.23* | *150.89* | *0.79* | *30.81* |
| *solved Organic Carbon* | *mg/dm3* | - | - | | | *53.2* | | *206.98* | *210.14* | *91.64* | *140.62* | *7.90* | *11.06* |
| *erotophic Plate Count* | *cfu/1ml* | | - | - | - | *n/s* | DUTY@DRCLD PMSO | *1500* | *1780000* | *3110000* | *1720000* | *520* | *8400* |
| *illable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *8.0* | *8.4* | *3.31* | *6.4* | *1.55* | *2.32* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *8.0* | *8.4* | *3.31* | *6.4* | *1.55* | *2.32* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ-WI-005.00 | *5* | *4.6* | *4.65* | *4.25* | *2.8* | *2.75* |
| *al Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS5663:2010 | *74.0* | *121.0* | *96.0* | *34.0* | *2.0* | *1.0* |

*R MEETSE - TECH LABORATORY SERVICES*

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UNDER THE LIMIT
ON THE LIMIT

a captured by: Rosheen Marx

Report Signitory: Engela Erasmus

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bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

| | | | |
|---|---|---|---|
| ient: | Jonathan / Stewart | Invoice No: | 9953 |
| mpany: | Goldplat Recovery | Certificate No: | Goldplat01092017 |
| dress: | Corner Vermont & New Modder Roads | Date sample received: | 01/09/2017 |
| | Modder Bec, Benoni, 1500 | Certificate Date: | 01/09/2017 |
| l No: | 0114231202/3/4 0835539210 | Day: | Friday |
| nail: | Jonathan.Hynd@goldplat.com | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 01/09/2017 | 01/09/2017 | 01/09/2017 | 01/09/2017 | 01/09/2017 | 01/09/2017 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **b Number:** | | | | | | | | 65099 | 65100 | 65101 | 65102 | 65103 | 65104 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result PF*** | ***Test Result PT*** | ***Test Result GPA*** | ***Test Result B/B UP*** | ***Test Result B/B DOWN*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSQ-WI-001.00 | *11.92* | *11.38* | *9.02* | *11.31* | *8.14* | *7.14* |
| *).S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANAS6210:2005 | *18375* | *6913* | *5580* | *9536* | *378* | *406* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTLSQ-WI-002.00 | *1168.78* | *894.6* | *756* | *1007.19* | *66.75* | *71.98* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANAS6310:2005 | *3875* | *1300* | *3400* | *1550* | *60* | *55* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *480* | *315* | *299* | *368* | *38.89* | *27.67* |
| *dium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6450:2010 | *4700* | *2100* | *1290* | *2100* | *65* | *65* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS5207:2010 | *380.0* | *45.0* | *10.2* | *44.0* | *0.7* | *0.1* |
| *bolt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *6.3* | *3* | *3.4* | *3.1* | *<0.01* | *<0.01* |
| *pper (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS5203:2010 | *39* | *28* | *18* | *28* | *<0.01* | *<0.01* |
| *tal Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *265.76* | *128.38* | *110.11* | *123.44* | *2.96* | *2.96* |
| *solved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *262.72* | *124.43* | *101.71* | *126.40* | *38.51* | *51.35* |
| *terotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OUTSOURCED EMSL | *19* | *360* | *741000* | *360* | *11200* | *5000* |
| *ailable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *55.1* | *24.4* | *4.87* | *24.1* | *2.18* | *1.01* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *55.1* | *24.4* | *4.87* | *24.1* | *2.18* | *1.01* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ-WI-005.00 | *14.25* | *5.5* | *2.75* | *2.75* | *0.31* | *0.25* |
| *tal Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS6049:2010 | *1.5* | *51.0* | *570.0* | *35.0* | *2.0* | *135.0* |

*R MEETSE · TECH LABORATORY SERVICES*

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ON THE LIMIT

ta captured by: Rosheen Marx Report Signitory: Engela Erasmus

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Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetsc@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 9970
Certificate No: Goldplat04102017
Date sample received: 04/09/2017
Certificate Date: 04/09/2017
Day: Wednesday

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 04/09/2017 | 04/09/2017 | 04/09/2017 | 04/09/2017 | 04/09/2017 | 04/09/2017 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **e Number:** | | | | | | | | 65113 | 65114 | 65115 | 65116 | 65117 | 65118 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result PF*** | ***Test Result PT*** | ***Test Result GPC*** | ***Test Result B/B UP*** | ***Test Result B/B DOWN*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSQ WI-001 00 | *11.43* | *12.05* | *8.78* | *7.19* | *7.92* | *8.09* |
| *.S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANS6213:2005 | *4225* | *780* | *4779* | *2278* | *410* | *339* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTLSQ-WI-002 00 | *236* | *508* | *167* | *274* | *69* | *59* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANS6310:2005 | *540* | *720* | *40* | *3200* | *160* | *160* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *491* | *242* | *21* | *223* | *28* | *27* |
| *ilium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6050:2010 | *860* | *1380* | *85* | *240* | *72* | *69* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS 207 2010 | *3.6* | *8.9* | *0.5* | *0.3* | *0.1* | *<0.01* |
| *olt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *2.3* | *2.4* | *0.1* | *0.4* | *<0.01* | *<0.01* |
| *per (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS5203:2010 | *39* | *31* | *1.7* | *0.1* | *<0.01* | *<0.01* |
| *al Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *122.45* | *130.35* | *19.75* | *17.78* | *37.53* | *8.49* |
| *solved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *125.41* | *129.36* | *29.63* | *18.76* | *36.54* | *18.76* |
| *erotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OUTSOURCED EMSS | *1* | *1700* | *47000* | *10300* | *48000* | *35000* |
| *ilable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *17.7* | *9.9* | *2.01* | *6.0* | *1.34* | *1.01* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *17.7* | *9.9* | *2.01* | *6.0* | *1.34* | *1.01* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ WI-005.00 | *14.25* | *5.5* | *2.75* | *2.75* | *0.31* | *0.25* |
| *al Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS6049:2010 | *1.0* | *1.1* | *0.3* | *0.1* | *0.4* | *0.1* |

*R MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT
UNDER THE LIMIT
ON THE LIMIT

a captured by: Rosheen Marx

Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
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Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetsc@iafrica.com / meetsetech@gmail.com

## Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10003
Certificate No: Goldplat31102017
Date sample received: 31/10/2017
Certificate Date: 31/10/2017
Day: Tuesday

| | | |
|---|---|---|
| **te Analysed:** | 31/10/2017 | 31/10/2017 |
| **mple Number:** | 13 | 14 |
| **mple name:** | Water | Water |
| **mple date and time:** | no info | no info |
| **o Number:** | 65159 | 65160 |
| **mple Description:** | Water | Water |
| **mple container:** | 2L container | 2L container |

| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result GPH* | *Test Result GPI* |
|---|---|---|---|---|---|---|---|---|---|
| | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSO-WI-001.00 | 6.19 | 6.63 |
| .S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANAS5211:2005 | 3778 | 3278 |
| lorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSO-WI-002.00 | 247 | 268 |
| lphates (SO4 -2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANAS6231:2005 | 2250 | 2000 |
| lcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 622 | 299 |
| dium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6059:2010 | 410 | 540 |
| n (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207:2010 | 0.2 | 0.1 |
| balt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 1 | 0.6 |
| pper (Cu) | mg/dm3 | - | - | - | - | 1 | SANS5203:2010 | <0.01 | 0.1 |
| tal Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 8.89 | 10.86 |
| solved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 19.75 | 23.70 |
| terotophic Plate Count | cfu/1ml | - | - | - | - | n/s | OPINOIDOOD RM83 | 510000 | 162000 |
| ailable Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 1.3 | 1.2 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 1.3 | 1.2 |
| uride as F | mg/dm3 | - | - | - | - | - | MTLSO-WI-005.00 | 0.4 | 0.25 |
| tal Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6059:2010 | 282.0 | 129.0 |

R MEETSE - TECH LABORATORY SERVICES

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx

Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
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Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

## Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
l No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10003
Certificate No: Goldplat31102017
Date sample received: 31/10/2017
Certificate Date: 31/10/2017
Day: Tuesday

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 |
| **mple Number:** | | | | | | | | 7 | 8 | 9 | 10 | 11 | 12 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **b Number:** | | | | | | | | 65153 | 65154 | 65155 | 65156 | 65157 | 65158 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result GPB*** | ***Test Result GPC*** | ***Test Result GPD*** | ***Test Result GPE*** | ***Test Result GPF*** | ***Test Result GPG*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | - | MTLSQ-WI-001-00 | ***11.11*** | ***6.13*** | ***6.21*** | ***6.93*** | ***5.85*** | ***5.91*** |
| ***).S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANS5213:2005 | ***5871*** | ***2145*** | ***3134*** | ***204*** | ***153*** | ***3139*** |
| ***lorides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | - | MTLSQ-WI-002-00 | ***662*** | ***272*** | ***481*** | ***12*** | ***12*** | ***126*** |
| ***lphates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANS6310:2005 | ***2725*** | ***1250*** | ***650*** | ***150*** | ***100*** | ***800*** |
| ***lcium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | | | ***3*** | ***246*** | ***216*** | ***13*** | ***11*** | ***592*** |
| ***dium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | | SANS6050:2016 | ***2010*** | ***230*** | ***560*** | ***40*** | ***17*** | ***240*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS5207:2010 | ***21.0*** | ***0.1*** | ***0.6*** | ***0.1*** | ***0.2*** | ***0.2*** |
| ***balt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6470:2010 | ***3.3*** | ***0.6*** | ***0.6*** | ***<0.01*** | ***<0.01*** | ***0.2*** |
| ***pper (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS6203:2010 | ***32*** | ***0.8*** | ***0.1*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***tal Organic Carbon*** | ***mg/dm3*** | | - | - | - | ***<0.50*** | | ***130.91*** | ***17.78*** | ***21.74*** | ***1.78*** | ***18.77*** | ***33.95*** |
| ***solved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***128.44*** | ***13.83*** | ***12.84*** | ***<0.01*** | ***0.91*** | ***12.84*** |
| ***terotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | (ISETSOURCED RMRS) | ***1390*** | ***47000*** | ***1900000*** | ***420000*** | ***640000*** | ***62000*** |
| ***ilable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***19.7*** | ***2.9*** | ***3.13*** | ***1.8*** | ***1.56*** | ***1.12*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***19.7*** | ***2.9*** | ***3.13*** | ***1.8*** | ***1.56*** | ***1.12*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSQ-WI-005-00 | ***3.85*** | ***0.05*** | ***0.45*** | ***0.11*** | ***0.23*** | ***0.15*** |
| ***tal Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6049:2010 | ***262.0*** | ***200.0*** | ***346.0*** | ***303.0*** | ***604.0*** | ***124.0*** |

***R MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
site: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetsec@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

nt: Jonathan / Stewart
npany: Goldplat Recovery
lress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10003
Certificate No: Goldplat31102017
Date sample received: 31/10/2017
Certificate Date: 31/10/2017
Day: Tuesday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **e Analysed:** | | | | | | | | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 | 31/10/2017 |
| **nple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **nple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **nple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **Number:** | | | | | | | | 65147 | 65148 | 65149 | 65150 | 65151 | 65152 |
| **nple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **nple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | - | MTLSO-WI-001-00 | ***FF*** | ***PT*** | ***PF*** | ***B/B UP*** | ***B/B DOWN*** | ***GPA*** |
| ***.S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANAS5213 2005 | ***10.50*** | ***11.74*** | ***8.52*** | ***7.85*** | ***7.18*** | ***6.43*** |
| ***orides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | - | MTLSO-WI-002-00 | ***3329*** | ***3507*** | ***4106*** | ***208*** | ***211*** | ***2557*** |
| ***phates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANAS6310:2005 | ***232*** | ***315*** | ***368*** | ***18*** | ***18*** | ***221*** |
| ***cium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | - | | ***1875*** | ***1500*** | ***1750*** | ***100*** | ***100*** | ***650*** |
| ***ium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | | SANS6058:2010 | ***326*** | ***588*** | ***257*** | ***28*** | ***28*** | ***171*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS5807 2010 | ***610*** | ***600*** | ***950*** | ***28*** | ***54*** | ***350*** |
| ***olt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6170:2010 | ***6.3*** | ***2.5*** | ***5.1*** | ***0.1*** | ***0.1*** | ***0.4*** |
| ***per (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS5203:2010 | ***4.5*** | ***1.9*** | ***3.8*** | ***<0.01*** | ***<0.01*** | ***0.6*** |
| ***al Organic Carbon*** | ***mg/dm3*** | - | - | | - | ***<0.50*** | | ***59*** | ***10.3*** | ***27*** | ***<0.01*** | ***0.1*** | ***0.5*** |
| ***solved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***235.14*** | ***247.00*** | ***132.39*** | ***7.90*** | ***21.74*** | ***8.89*** |
| ***erotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | OUTSOURCED RM83 | ***227.13*** | ***116.58*** | ***119.55*** | ***18.77*** | ***9.88*** | ***11.86*** |
| ***ilable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***52*** | ***920*** | ***2530000*** | ***157000*** | ***281000*** | ***1320000*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***8.1*** | ***5.8*** | ***5.78*** | ***16.4*** | ***5.34*** | ***3.59*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSO-WI-005-00 | ***8.1*** | ***5.8*** | ***5.78*** | ***16.4*** | ***5.34*** | ***3.59*** |
| ***al Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6049:2010 | ***1.05*** | ***1.5*** | ***0.7*** | ***0.3*** | ***0.2*** | ***0.15*** |
| | | | | | | | | ***92.0*** | ***126.0*** | ***46.0*** | ***1.0*** | ***2.0*** | ***488.0*** |

***MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
osite: www.meetsetech.com
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# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ıail: Jonathan.Hynd@goldplat.com

Invoice No: 10033
Certificate No: GP28112017
Date sample received: 28/11/2017
Certificate Date: 28/11/2017
Day: Tuesday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **ɔ Number:** | | | | | | | | 65191 | 65192 | 65193 | 65194 | 65195 | 65196 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result FM*** | ***Test Result FT*** | ***Test Result PF*** | ***Test Result PT*** | ***Test Result BB BOWN*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | | MTLSO-WI-003.00 | ***9.69*** | ***7.98*** | ***8.00*** | ***8.72*** | ***11.70*** | ***7.15*** |
| ***).S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANAS-213-2005 | ***5347*** | ***4009*** | ***4626*** | ***3186*** | ***3484*** | ***311*** |
| ***lorides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | | MTLSO-WI-004.00 | ***345*** | ***314*** | ***365*** | ***329*** | ***228*** | ***10*** |
| ***(p)hates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANS6A91-2005 | ***1250*** | ***1100*** | ***1350*** | ***1025*** | ***1200*** | ***625*** |
| ***lcium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | - | | ***596*** | ***291*** | ***325*** | ***217*** | ***648*** | ***38*** |
| ***dium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | - | SANS 6C9:2010 | ***820*** | ***860*** | ***990*** | ***830*** | ***450*** | ***42*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS 6707:2010 | ***22.0*** | ***0.9*** | ***0.3*** | ***8.0*** | ***2.1*** | ***0.2*** |
| ***balt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6170:2010 | ***4.8*** | ***1.8*** | ***1.6*** | ***3*** | ***1.4*** | ***<0.01*** |
| ***pper (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS 893:2010 | ***72*** | ***2*** | ***0.4*** | ***21*** | ***5.9*** | ***<0.01*** |
| ***tal Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***<0.50*** | | ***237.00*** | ***70.11*** | ***77.03*** | ***169.00*** | ***111.00*** | ***9.88*** |
| ***ssolved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***233.06*** | ***84.93*** | ***71.10*** | ***171.83*** | ***92.83*** | ***3.95*** |
| ***terotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | OUTSOURCED-EM84 | ***855000*** | ***6270000*** | ***442200*** | ***3430000*** | ***5800*** | ***102000*** |
| ***ilable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***11.4*** | ***5.2*** | ***11.42*** | ***7.8*** | ***4.03*** | ***1.12*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***11.4*** | ***5.2*** | ***11.42*** | ***7.8*** | ***4.03*** | ***1.12*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSO-WI-005.00 | ***2.7*** | ***2.5*** | ***2.45*** | ***2.15*** | ***2.1*** | ***1.4*** |
| ***al Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6049:2010 | ***56.0*** | ***31.0*** | ***40.0*** | ***105.0*** | ***254.0*** | ***9.0*** |

***R MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
osite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

## Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10033
Certificate No: GP28112017
Date sample received: 28/11/2017
Certificate Date: 28/11/2017
Day: Tuesday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 |
| **mple Number:** | | | | | | | | 7 | 8 | 9 | 10 | 11 | 12 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **o Number:** | | | | | | | | 65197 | 65198 | 65199 | 65200 | 65201 | 65202 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result BB UP* | *Test Result GPA* | *Test Result GPB* | *Test Result GPC* | *Test Result GPD* | *Test Result GPE* |
| | *pH units* | *5.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSQ WI 001.00 | *7.17* | *6.61* | *8.62* | *6.27* | *6.31* | *6.89* |
| *.S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANS/211:2005 | *207* | *3361* | *3202* | *2478* | *3201* | *291* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTLSQ WI 002.00 | *10* | *277* | *300* | *288* | *514* | *21* | |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANS/E-HB:2005 | *60* | *1325* | *1000* | *725* | *1075* | *200* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *25.4* | *298.6* | *195.5* | *234.3* | *204.3* | *13.9* |
| *dium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS/203:2010 | *26* | *580* | *830* | *219* | *610* | *33* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS/207:2010 | *0.1* | *0.8* | *7.9* | *<0.01* | *19.0* | *0.1* |
| *balt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS/170:2010 | *<0.01* | *0.6* | *2.9* | *0.5* | *0.5* | *<0.01* |
| *pper (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS/206:2010 | *<0.01* | *<0.01* | *21* | *<0.01* | *<0.01* | *<0.01* |
| *tal Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *23.70* | *7.90* | *186.00* | *13.83* | *39.50* | *31.60* |
| *solved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *15.80* | *17.78* | *158.00* | *11.85* | *35.56* | *25.68* |
| *terotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OTHSOIBRCD 1SBSO | *93000* | *164000* | *5073000* | *6000* | *1090000* | *2240000* |
| *ilable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *2.2* | *2.0* | *7.16* | *2.0* | *1.34* | *2.69* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *2.2* | *2.0* | *7.16* | *2.0* | *1.34* | *2.69* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ WI 005.00 | *0.37* | *1.8* | *2* | *1.25* | *1.2* | *0.55* |
| *al Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS0319:2010 | *2.4* | *118.0* | *81.0* | *31.0* | *308.0* | *570.0* |

R *MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
site: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetsetc@iafrica.com / meetsetech@gmail.com

## Certificate of Analysis

| | | | |
|---|---|---|---|
| ent: | Jonathan / Stewart | Invoice No: | 10033 |
| mpany: | Goldplat Recovery | Certificate No: | GP28112017 |
| dress: | Corner Vermont & New Modder Roads | Date sample received: | 28/11/2017 |
| | Modder Bee, Benoni, 1500 | Certificate Date: | 28/11/2017 |
| No: | 0114231202/3/4 0835539210 | Day: | Tuesday |
| ail: | Jonathan.Hynd@goldplat.com | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 28/11/2017 | 28/11/2017 | 28/11/2017 | 28/11/2017 |
| **mple Number:** | | | | | | | | 13 | 14 | 15 | 16 |
| **mple name:** | | | | | | | | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info |
| **Number:** | | | | | | | | 65203 | 65204 | 65205 | 65206 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result GPF*** | ***Test Result GPG*** | ***Test Result GPH*** | ***Test Result GPI*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | - | MTLSO-WI-001.00 | ***6.11*** | ***6.10*** | ***6.22*** | ***6.14*** |
| ***.S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANAS 241:2015 | ***126*** | ***3060*** | ***4014*** | ***2939*** |
| ***lorides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | - | MTLSO-WI-002.00 | ***19*** | ***125*** | ***264*** | ***32*** |
| ***lphates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANS6340:2006 | ***150*** | ***1250*** | ***1750*** | ***1050*** |
| ***lcium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | - | | ***10.7*** | ***548.7*** | ***357.2*** | ***201.7*** |
| ***dium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | - | SANS6036:2010 | ***11*** | ***260*** | ***430*** | ***390*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS6007:2010 | ***0.6*** | ***0.7*** | ***9.8*** | ***19.0*** |
| ***olt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6020:2010 | ***<0.01*** | ***0.1*** | ***1*** | ***0.5*** |
| ***pper (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS6207:2010 | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***al Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***<0.50*** | | ***27.65*** | ***7.90*** | ***17.78*** | ***17.78*** |
| ***solved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***31.60*** | ***33.58*** | ***35.55*** | ***29.63*** |
| ***erotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | OUTSOURCED LAB | ***1070000*** | ***1240000*** | ***420000*** | ***380000*** |
| ***ilable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***1.1*** | ***0.8*** | ***1.1*** | ***1.8*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***1.1*** | ***0.8*** | ***1.1*** | ***1.8*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSO-WI-005.00 | ***0.4*** | ***1*** | ***1.8*** | ***1.35*** |
| ***al Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6010:2010 | ***1019.0*** | ***285.0*** | ***570.0*** | ***350.0*** |

***R MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

:ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

| | | | |
|---|---|---|---|
| ent: | Jonathan / Stewart | Invoice No: | 10059 |
| mpany: | Goldplat Recovery | Certificate No: | GP14122017 |
| dress: | Corner Vermont & New Modder Roads | Date sample received: | 14/12/2017 |
| | Modder Bee, Benoni, 1500 | Certificate Date: | 14/12/2017 |
| No: | 0114231202/3/4 0835539210 | Day: | Thursday |
| ail: | Jonathan.Hynd@goldplat.com | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **b Number:** | | | | | | | | 65225 | 65226 | 65227 | 65228 | 65229 | 65230 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result FM*** | ***Test Result FT*** | ***Test Result PF*** | ***Test Result PT*** | ***Test Result BB UP*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSQ-WI 001.00 | *10.01* | *9.70* | *9.75* | *8.27* | *8.70* | *6.63* |
| *).8* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANS85213:2005 | *2942* | *4390* | *4452* | *1119* | *2681* | *199* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTLSQ-WI 002.00 | *145.85* | *166.89* | *161.27* | *54.62* | *190.24* | *20.8* |
| *iphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANS6310:2005 | *1300* | *3100* | *3800* | *1000* | *1500* | *160* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *426.3* | *27.88* | *2.08* | *185.8* | *210.18* | *23.92* |
| *ium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6050:2010 | *380* | *1650* | *1600* | *130* | *570* | *20* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS5207:2010 | *6.8* | *7.4* | *6.8* | *0.2* | *4.3* | *<0.01* |
| *olt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *2.7* | *1.4* | *1.3* | *0.2* | *2.3* | *<0.01* |
| *per (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS5203:2010 | *460* | *0.5* | *0.1* | *0.4* | *20* | *<0.01* |
| *al Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *215.00* | *65.18* | *108.63* | *37.53* | *1554.00* | *8.30* |
| *solved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *245.00* | *59.25* | *47.40* | *33.58* | *148.00* | *13.43* |
| *terotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OUTSOURCED RM83 | *28518* | *6420000* | *401010* | *1987000* | *17907* | *99000* |
| *ilable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *6.4* | *6.4* | *6.72* | *2.7* | *7.28* | *0.84* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *6.4* | *6.4* | *6.72* | *2.7* | *7.28* | *0.84* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ-WI 005.00 | *2.03* | *1.43* | *1.48* | *0.7* | *1.18* | *0.58* |
| *al Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS6049:2010 | *40.0* | *255.0* | *150.0* | *32.0* | *85.0* | *12.0* |

*R MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
: EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10059
Certificate No: GP14122017
Date sample received: 14/12/2017
Certificate Date: 14/12/2017
Day: Thursday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 |
| **mple Number:** | | | | | | | | 7 | 8 | 9 | 10 | 11 | 12 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **o Number:** | | | | | | | | 65231 | 65232 | 65233 | 65234 | 65235 | 65236 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result BB DOWN*** | ***Test Result GPA*** | ***Test Result GPB*** | ***Test Result GPC*** | ***Test Result GPD*** | ***Test Result GPE*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTL8Q-WI-001.00 | *6.66* | *6.28* | *8.72* | *5.90* | *6.31* | *6.74* |
| *).S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANAS5210:2005 | *235* | *3432* | *2818* | *2267* | *3500* | *298* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTL8Q-WI-002.00 | *22* | *280* | *197* | *268* | *41* | *23* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANAS6310:2005 | *20* | *4800* | *1700* | *800* | *2300* | *160* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *37.5* | *151.0* | *202.0* | *177.7* | *219.2* | *14.0* |
| *lium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6050:2010 | *24* | *570* | *570* | *230* | *620* | *35* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS5207:2010 | *<0.01* | *0.2* | *2.5* | *0.2* | *0.3* | *<0.01* |
| *olt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *<0.01* | *0.6* | *2.2* | *0.5* | *0.5* | *<0.01* |
| *per (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS5203:2010 | *<0.01* | *0.1* | *18* | *0.1* | *<0.01* | *<0.01* |
| *al Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *71.10* | *31.60* | *179.73* | *5.93* | *98.75* | *12.64* |
| *solved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *12.25* | *23.70* | *144.00* | *25.68* | *25.68* | *9.09* |
| *erotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OUTSOURCED EMSL | *13900* | *742000* | *4800000* | *8150* | *980000* | *1300000* |
| *llable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *rate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS6210:2010 | *2.7* | *2.4* | *7.05* | *7.6* | *2.01* | *1.79* |
| *rate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *2.7* | *2.4* | *7.05* | *7.6* | *2.01* | *1.79* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MTL8Q-WI-005.00 | *0.2* | *1.05* | *0.98* | *0.73* | *1.65* | *0.31* |
| *al Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS6049:2010 | *6.0* | *178.0* | *47.0* | *9.0* | *1406.0* | *454.0* |

*R MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10059
Certificate No: GP14122017
Date sample received: 14/12/2017
Certificate Date: 14/12/2017
Day: Thursday

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 14/12/2017 | 14/12/2017 | 14/12/2017 | 14/12/2017 |
| **mple Number:** | | | | | | | | 13 | 14 | 15 | 16 |
| **mple name:** | | | | | | | | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info |
| **Number:** | | | | | | | | 65237 | 65238 | 65239 | 65240 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result GPF*** | ***Test Result GPG*** | ***Test Result GPH*** | ***Test Result GPI*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | - | MTLSQ-WI-001.00 | ***5.89*** | ***5.97*** | ***6.23*** | ***5.97*** |
| ***.S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANAS5210:2005 | ***115*** | ***6848*** | ***3222*** | ***2326*** |
| ***lorides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | - | MTLSQ-WI-002.00 | ***9*** | ***127*** | ***256*** | ***235*** |
| ***iphates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANAS6310:2005 | ***40*** | ***4400*** | ***1400*** | ***1300*** |
| ***lcium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | - | | ***4.4*** | ***167.5*** | ***409.0*** | ***203.0*** |
| ***lium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | - | SANS6050:2010 | ***11*** | ***250*** | ***400*** | ***340*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS5207:2010 | ***0.1*** | ***0.8*** | ***0.2*** | ***2.3*** |
| ***olt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6170:2010 | ***<0.01*** | ***0.1*** | ***0.9*** | ***0.4*** |
| ***per (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS5203:2010 | ***<0.01*** | ***<0.01*** | ***0.1*** | ***<0.01*** |
| ***al Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***<0.50*** | | ***15.41*** | ***25.68*** | ***43.45*** | ***13.83*** |
| ***solved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***6.32*** | ***17.78*** | ***25.68*** | ***7.90*** |
| ***erotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | OUTSOURCED EMSL | ***810000*** | ***1010000*** | ***310000*** | ***250000*** |
| ***ilable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5219:2010 | ***1.6*** | ***1.0*** | ***1.3*** | ***0.9*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS5210:2010 | ***1.6*** | ***1.0*** | ***1.3*** | ***0.9*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSQ-WI-005.00 | ***0.2*** | ***1.72*** | ***1.72*** | ***1.58*** |
| ***al Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6049:2010 | ***375.0*** | ***432.0*** | ***451.0*** | ***314.0*** |

***R MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx

Report Signitory: Engela Erasmus

MEETSETECH LABORATORY SERVICES
81B EVA ROAD, FAIRLEADS, BENONI, 1512
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Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

**Client:** Jonathan / Stewart
**Company:** Goldplat Recovery
**Address:** Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500
**Tel No:** 0114231202/3/4 0835539210
**Email:** Jonathan.Hynd@goldplat.com

**Invoice No:** 10074
**Certificate No:** GP09012018
**Date sample received:** 09/01/2018
**Certificate Date:** 09//01/2018
**Day:** Tuesday

| Parameters | Reporting Unit | Recommended Limit | Maximum Allowable Limit | Crisis Limit | General Standard (Water Act) | General Standard (Government Gazette) | Methods | Test Result FF | Test Result FM | Test Result PT | Test Result PF | Test Result FT | Test Result BB UP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Analysed: | | | | | | | | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 |
| Sample Number: | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Sample name: | | | | | | | | Water | Water | Water | Water | Water | Water |
| Sample date and time: | | | | | | | | no info | no info | no info | no info | no info | no info |
| Lab Number: | | | | | | | | 65259 | 65260 | 65261 | 65262 | 65263 | 65264 |
| Sample Description: | | | | | | | | Water | Water | Water | Water | Water | Water |
| Sample container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| PH | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | 8.98 | 7.86 | 7.98 | 8.91 | 9.00 | 9.25 |
| T.D.S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANS5213:2005 | 1714 | 4617 | 2128 | 3005 | 4900 | 343 |
| Chlorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 96 | 336 | 103.89 | 137.01 | 338.28 | 1.1 |
| Sulphates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANS6310:2005 | 3000 | 7800 | 4000 | 5200 | 8400 | 100 |
| Calcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 58.4 | 367.2 | 452 | 601.6 | 595.6 | 28 |
| Sodium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6050:2010 | 310 | 820 | 190 | 220 | 850 | 49 |
| Iron (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207:2010 | 4.5 | 0.2 | 0.3 | 0.4 | <0.01 | <0.01 |
| Cobolt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 2.6 | 1.1 | 0.5 | 0.6 | 0.8 | <0.01 |
| Copper (Cu) | mg/dm3 | - | - | - | - | 1 | SANS5203:2010 | 290 | <0.01 | 1.5 | 1 | <0.01 | <0.01 |
| Total Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 513.50 | 35.55 | 98.75 | 63.20 | 7.90 | 46.41 |
| Dissolved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 134.40 | 7.90 | 27.65 | 90.85 | 3.95 | 17.78 |
| Heterotophic Plate Count | cfu/1ml | - | - | - | - | n/s | OUTSOURCED EMS3 | | | | | | |
| Available Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 6.1 | 14.0 | 3.39 | 2.5 | 19.21 | 2.03 |
| Nitrate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 6.1 | 14.0 | 3.39 | 2.5 | 19.21 | 2.03 |
| Flouride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 1.55 | 2 | 1.3 | 1.55 | 1.95 | 0.6 |
| Total Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 222.0 | 39.0 | 158.0 | 224.0 | 60.0 | 119.0 |

FOR MEETSE - TECH LABORATORY SERVICES

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

MEETSETECH LABORATORY SERVICES
81B EVA ROAD, FAIRLEADS, BENONI, 1512
Website: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetsc@iafrica.com / meetsetech@gmail.com

## Certificate of Analysis

**Client:** Jonathan / Stewart
**Company:** Goldplat Recovery
**Address:** Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500
**Tel No:** 0114231202/3/4 0835539210
**Email:** Jonathan.Hynd@goldplat.com

**Invoice No:** 10074
**Certificate No:** GP09012018
**Date sample received:** 09/01/2018
**Certificate Date:** 09//01/2018
**Day:** Tuesday

| Parameters | Reporting Unit | Recommended Limit | Maximum Allowable Limit | Crisis Limit | General Standard (Water Act) | General Standard (Government Gazette) | Methods | Test Result BB DOWN | Test Result GPA | Test Result GPB | Test Result GPC | Test Result GPD | Test Result GPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Analysed: | | | | | | | | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 |
| Sample Number: | | | | | | | | 7 | 8 | 9 | 10 | 11 | 12 |
| Sample name: | | | | | | | | Water | Water | Water | Water | Water | Water |
| Sample date and time: | | | | | | | | no info | no info | no info | no info | no info | no info |
| Lab Number: | | | | | | | | 65265 | 65266 | 65267 | 65268 | 65269 | 65270 |
| Sample Description: | | | | | | | | Water | Water | Water | Water | Water | Water |
| Sample container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| PH | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | 9.03 | 8.96 | 8.87 | 8.29 | 8.14 | 8.57 |
| T.D.S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANABS213:2005 | 211 | 3580 | 326 | 2218 | 2198 | 243 |
| Chlorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 1 | 314 | 1 | 275 | 502 | 2 |
| Sulphates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANABS6310:2005 | 50 | 6800 | 1600 | 4000 | 5800 | 600 |
| Calcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 25.6 | 335.2 | 33.2 | 240.8 | 236.8 | 84.8 |
| Sodium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6060:2010 | 35 | 660 | 47 | 230 | 650 | 33 |
| Iron (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207:2010 | <0.01 | <0.01 | 0.6 | <0.01 | <0.01 | <0.01 |
| Cobolt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | <0.01 | 0.8 | 0.1 | 0.5 | 0.5 | <0.01 |
| Copper (Cu) | mg/dm3 | - | - | - | - | 1 | SANS5203:2010 | 0.1 | 0.1 | 0.6 | <0.01 | <0.01 | <0.01 |
| Total Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 8.89 | 1.98 | 43.45 | 3.95 | 15.80 | 3.95 |
| Dissolved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 2.96 | 9.88 | 39.50 | 7.90 | 3.95 | 2.96 |
| Heterotophic Plate Count | cfu/1ml | - | - | - | - | n/s | OUTSOURCED EMS3 | | | | | | |
| Available Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 5.6 | 2.3 | 3.05 | 8.6 | 1.81 | 2.03 |
| Nitrate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 5.6 | 2.3 | 3.05 | 8.6 | 1.81 | 2.03 |
| Flouride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 0.3 | 1.3 | 0.23 | 0.55 | 1.2 | 0.05 |
| Total Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 4.0 | 130.0 | 25.0 | 6.0 | 204.0 | 205.0 |

*FOR MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

MEETSETECH LABORATORY SERVICES
81B EVA ROAD, FAIRLEADS, BENONI, 1512
Website: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

**Client:** Jonathan / Stewart
**Company:** Goldplat Recovery
**Address:** Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500
**Tel No:** 0114231202/3/4 0835539210
**Email:** Jonathan.Hynd@goldplat.com

**Invoice No:** 10074
**Certificate No:** GP09012018
**Date sample received:** 09/01/2018
**Certificate Date:** 09//01/2018
**Day:** Tuesday

| Parameters | Reporting Unit | Recommended Limit | Maximum Allowable Limit | Crisis Limit | General Standard (Water Act) | General Standard (Government Gazette) | Methods | Test Result GPF | Test Result GPG | Test Result GPH | Test Result GPI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date Analysed: | | | | | | | | 09/01/2018 | 09/01/2018 | 09/01/2018 | 09/01/2018 |
| Sample Number: | | | | | | | | 13 | 14 | 15 | 16 |
| Sample name: | | | | | | | | Water | Water | Water | Water |
| Sample date and time: | | | | | | | | no info | no info | no info | no info |
| Lab Number: | | | | | | | | 65271 | 65272 | 65273 | 65274 |
| Sample Description: | | | | | | | | Water | Water | Water | Water |
| Sample container: | | | | | | | | 2L container | 2L container | 2L container | 2L container |
| PH | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | 8.32 | 8.01 | 7.95 | 7.95 |
| T.D.S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANABS213:2005 | 931 | 2907 | 3243 | 3039 |
| Chlorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 0 | 131 | 250 | 340 |
| Sulphates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANABS310:2005 | 1800 | 5400 | 5200 | 5600 |
| Calcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 60.4 | 421.2 | 134.8 | 233.6 |
| Sodium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6060:2010 | 65 | 240 | 400 | 460 |
| Iron (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS8207:2010 | <0.01 | 0.1 | 0.1 | <0.01 |
| Cobolt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | <0.01 | 0.2 | 0.8 | 0.6 |
| Copper (Cu) | mg/dm3 | - | - | - | - | 1 | SANS8203:2010 | <0.01 | <0.01 | <0.01 | <0.01 |
| Total Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 3.95 | 3.95 | 5.93 | 1.98 |
| Dissolved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 5.93 | 1.98 | 5.59 | 13.83 |
| Heterotophic Plate Count | cfu/1ml | - | - | - | - | n/s | OUTSOURCED EMB3 | | | | |
| Available Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS6210:2010 | 2.0 | 2.0 | 3.2 | 5.0 |
| Nitrate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS6210:2010 | 2.0 | 2.0 | 3.2 | 5.0 |
| Flouride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 0.1 | 1.1 | 0.8 | 0.8 |
| Total Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 168.0 | 276.0 | 337.0 | 228.0 |

FOR MEETSE - TECH LABORATORY SERVICES

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

MEETSE TECH LABORATORY

:TSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
site: www.meetsetech.com

Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

:nt: Jonathan / Stewart
npany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bec, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10104
Certificate No: GP31012018
Date sample received: 31/01/208
Certificate Date: 31/01/2018
Day: Wednesday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 |
| **mple Number:** | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **b Number:** | | | | | | | | 65303 | 65304 | 65305 | 65306 | 65307 | 65308 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result FF*** | ***Test Result FM*** | ***Test Result FM3*** | ***Test Result FM4*** | ***Test Result FT*** | ***Test Result PF*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSQ-WI-001.00 | *8.26* | *8.38* | *7.16* | *6.21* | *7.89* | *8.31* |
| *D.S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | - | SANAS5213:2005 | *2580* | *5678* | *3785* | *2460* | *5655* | *4255* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MTLSQ-WI-002.00 | *177* | *197* | *310* | *260* | *203* | *251* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | SANAS6310:2005 | *4000* | *7800* | *5800* | *3200* | *8000* | *5800* |
| *lcium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *333* | *388* | *498* | *787* | *250* | *418* |
| *dium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | SANS6050:2010 | *260* | *800* | *630* | *240* | *830* | *790* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS5207:2010 | *1.1* | *0.2* | *0.1* | *0.0* | *0.1* | *11.7* |
| *balt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *0.8* | *3.4* | *0.9* | *0.5* | *2.5* | *3.2* |
| *pper (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS5203:2010 | *3.1* | *0.1* | *0.1* | *0* | *0.1* | *12* |
| *tal Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *41.48* | *3.95* | *23.70* | *5.92* | *15.80* | *176.00* |
| *ssolved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *57.28* | *35.55* | *9.88* | *11.85* | *43.45* | *167.88* |
| *terotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | OUTSOURCED FMS3 | *1468000* | *310000* | *32000* | *3300* | *450000* | *980000* |
| *atlable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *trate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *4.1* | *7.3* | *204* | *8.0* | *5.89* | *8.38* |
| *trate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *4.1* | *7.3* | *204* | *8.0* | *5.89* | *8.38* |
| *ouride as F* | *mg/dm3* | - | - | - | - | - | MTLSQ-WI-005.00 | *1* | *2.25* | *0.75* | *0.38* | *1.75* | *1.25* |
| *tal Suspendid Solids (TSS)* | *mg/dm3* | - | - | - | - | - | SANS6049:2010 | *58.0* | *71.0* | *102.0* | *7.0* | *31.0* | *268.0* |

*OR MEETSE - TECH LABORATORY SERVICES*

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

ETSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
site: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10104
Certificate No: GP31012018
Date sample received: 31/01/208
Certificate Date: 31/01/2018
Day: Wednesday

| te Analysed: | | | | | | | | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mple Number: | | | | | | | | 7 | 8 | 9 | 10 | 11 | 12 |
| mple name: | | | | | | | | Water | Water | Water | Water | Water | Water |
| mple date and time: | | | | | | | | no info | no info | no info | no info | no info | no info |
| Number: | | | | | | | | 65309 | 65310 | 65311 | 65312 | 65313 | 65314 |
| mple Description: | | | | | | | | Water | Water | Water | Water | Water | Water |
| mple container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result PT* | *Test Result BB UP* | *Test Result BB DOWN* | *Test Result GPB* | *Test Result GP1* | *Test Result GP2* |
| | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | 8.09 | 7.05 | 7.54 | 8.56 | 7.15 | 7.05 |
| S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANS5213:2005 | 3077 | 173 | 281 | 4796 | 3308 | 3140 |
| orides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 125 | 18 | 31 | 50 | 35 | 249 |
| phates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANS6310:2005 | 5200 | 160 | 200 | 5400 | 5000 | 4200 |
| cium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 400.0 | 17.0 | 24.0 | 417.0 | 421.0 | 255.0 |
| ium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6056:2010 | 270 | 20 | 50 | 830 | 250 | 360 |
| n (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207:2010 | 0.6 | 0.0 | 0.0 | 1.8 | 0.1 | 0.1 |
| olt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 2.6 | 0.1 | 0.1 | 37 | 0.3 | 0.1 |
| per (Cu) | mg/dm3 | - | - | - | - | 1 | SANS5203:2010 | 0.1 | 0.1 | 0.6 | <0.01 | <0.01 | <0.01 |
| al Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 63.20 | 13.43 | 13.43 | 73.08 | 21.73 | 15.80 |
| solved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 63.20 | 45.43 | 16.98 | 189.60 | 23.70 | 27.65 |
| erotophic Plate Count | cfu/1ml | - | - | - | - | n/s | OUTSOURCED-EMSS | 1500000 | 166000 | 43000 | 1283000 | 20100 | 470000 |
| ilable Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 2.5 | 1.2 | 1.53 | 10.7 | 0.91 | 1.59 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 2.5 | 1.2 | 1.53 | 10.7 | 0.91 | 1.59 |
| uride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 0.63 | 0.35 | 0.5 | 2.25 | 2.63 | 2.25 |
| al Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 146.0 | 7.0 | 1.0 | 212.0 | 142.0 | 238.0 |

t MEETSE - TECH LABORATORY SERVICES

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

MEETSE TECH LABORATORY

ETSETECH LABORATORY SERVICES | Tel: 0119681648 / 0844659947 | Fax: 0865870322
EVA ROAD, FAIRLEADS, BENONI, 1512 | Engela Erasmus 0822539462 | Rosheen Marx 0834635693
ɔsite: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com

# Certificate of Analysis

ɛnt: Jonathan / Stewart | Invoice No: 10104
ɲpany: Goldplat Recovery | Certificate No: GP31012018
dress: Corner Vermont & New Modder Roads | Date sample received: 31/01/208
Modder Bee, Benoni, 1500 | Certificate Date: 31/01/2018
No: 0114231202/3/4 0835539210 | Day: Wednesday
ail: Jonathan.Hynd@goldplat.com

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 31/01/2018 | 31/01/2018 | 31/01/2018 | 31/01/2018 |
| **mple Number:** | | | | | | | | 13 | 14 | 15 | 16 |
| **mple name:** | | | | | | | | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info |
| **ɔ Number:** | | | | | | | | 65315 | 65316 | 65317 | 65318 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result GP3*** | ***Test Result GP4*** | ***Test Result GP5*** | ***Test Result GP6*** |
| | ***pH units*** | ***6.0-9.0*** | ***5.5-9.5*** | ***<4 - >11*** | ***5.5 - 9.5*** | - | MTLSQ-WI-001 00 | ***6.46*** | ***6.54*** | ***6.27*** | ***7.38*** |
| ***).S*** | ***mg/dm3*** | ***n/s*** | ***n/s*** | ***n/s*** | ***n/s*** | - | SANAS5213:2005 | ***3289*** | ***3568*** | ***11*** | ***295*** |
| ***lorides (Cl)*** | ***mg/dm3*** | ***250*** | ***600*** | ***1200*** | ***n/s*** | - | MTLSQ WI-002 00 | ***326*** | ***483*** | ***5*** | ***33*** |
| ***lphates (SO4 2)*** | ***mg/dm3*** | ***200*** | ***600*** | ***1200*** | ***n/s*** | - | SANAS6210:2005 | ***4800*** | ***4400*** | ***360*** | ***200*** |
| ***lcium (Ca)*** | ***mg/dm3*** | ***150*** | ***200*** | ***400*** | ***n/s*** | - | | ***352.0*** | ***519.0*** | ***21.0*** | ***42.0*** |
| ***dium (Na)*** | ***mg/dm3*** | ***100*** | ***400*** | ***800*** | ***n/s*** | - | SANS6050:2010 | ***420*** | ***630*** | ***17*** | ***32*** |
| ***n (Fe)*** | ***mg/dm3*** | ***0.01*** | ***1.00*** | ***2.0*** | ***1.00*** | - | SANS5207:2010 | ***0.0*** | ***0.1*** | ***0.0*** | ***0.4*** |
| ***bolt (Co)*** | ***mg/dm3*** | - | - | - | - | ***n/s*** | SANS6170:2010 | ***0.6*** | ***0.5*** | ***0*** | ***0*** |
| ***pper (Cu)*** | ***mg/dm3*** | - | - | - | - | ***1*** | SANS5203:2010 | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***tal Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***<0.50*** | | ***17.78*** | ***27.65*** | ***2.37*** | ***4.74*** |
| ***solved Organic Carbon*** | ***mg/dm3*** | - | - | - | - | ***53.2*** | | ***21.73*** | ***13.83*** | ***6.32*** | ***3.16*** |
| ***terotophic Plate Count*** | ***cfu/1ml*** | - | - | - | - | ***n/s*** | OUTSOURCED EMSS | ***105000*** | ***19400*** | ***185000*** | ***430000*** |
| ***ailable Cyanide (Cn)*** | ***mg/dm3*** | ***0.02*** | ***0.03*** | ***0.1*** | ***n/s*** | - | | ***<0.01*** | ***<0.01*** | ***<0.01*** | ***<0.01*** |
| ***rate as N*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS6210:2010 | ***2.3*** | ***0.9*** | ***2.3*** | ***0.9*** |
| ***rate as NO3*** | ***mg/dm3*** | ***6*** | ***10*** | ***20*** | ***n/s*** | - | SANS6210:2010 | ***2.3*** | ***0.9*** | ***2.3*** | ***0.9*** |
| ***uride as F*** | ***mg/dm3*** | - | - | - | - | - | MTLSQ-WI-005 00 | ***2*** | ***26.25*** | ***0.2*** | ***0.025*** |
| ***tal Suspendid Solids (TSS)*** | ***mg/dm3*** | - | - | - | - | - | SANS6049:2010 | ***276.0*** | ***317.0*** | ***261.0*** | ***196.0*** |

***R MEETSE - TECH LABORATORY SERVICES***

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

:TSETECH LABORATORY SERVICES
EVA ROAD, FAIRLEADS, BENONI, 1512
site: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafnca.com / meetsetech@gmail.com

MEETSE TECH LABORATORY

# Certificate of Analysis

nt: Jonathan / Stewart
ıpany: Goldplat Recovery
ress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10157
Certificate No: GP13032018
Date sample received: 13/03/2018
Certificate Date: 26/03/2018
Day: Tuesday

| e Analysed: | | | | | | | | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ıple Number: | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| ıple name: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| ıple date and time: | | | | | | | | no info | no info | no info | no info | no info | no info | no info |
| Number: | | | | | | | | 65378 | 65379 | 65380 | 65381 | 65382 | 65383 | 65384 |
| ıple Description: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| ıple container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| Parameters | Reporting Unit | Recommended Limit | Maximum Allowable Limit | Crisis Limit | General Standard (Water Act) | General Standard (Government Gazette) | Methods | Test Result | Test Result | Test Result | Test Result | Test Result | Test Result | Test Result |
| | | | | | | | | PF | PT | BB UP | BB DOWN | FM 3 | FM 4 | GPB |
| | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | | MTLSQ-WI 001.00 | 8.34 | 8.11 | 7.02 | 7.34 | 6.70 | 6.43 | 7.93 |
| .S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANS5210:2005 | 3350 | 211 | 202 | 313 | 3589 | 2324 | 3712 |
| lorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 119 | 9 | 18 | 27 | 267 | 272 | 224 |
| phates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANS6310:2005 | 5000 | 160 | 160 | 480 | 7100 | 3600 | 6600 |
| ium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 123.2 | 20.6 | 23.3 | 26.8 | 61.3 | 85.5 | 42.8 |
| ium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6000:2010 | 220 | 10 | 20 | 54 | 620 | 230 | 650 |
| n (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS8207:2010 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 |
| alt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 1 | 0 | 0 | 0 | 0.7 | 0.4 | 2.6 |
| per (Cu) | mg/dm3 | - | - | - | - | 1 | SANS5201:2010 | 2.4 | 0.1 | 0 | 0 | 0 | 0 | 490 |
| al Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 162.94 | 34.56 | 54.31 | 59.25 | 103.69 | 83.94 | 464.00 |
| solved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 192.56 | 61.72 | 54.31 | 44.44 | 74.00 | 83.94 | 39.50 |
| erotophic Plate Count | cfu/1ml | - | - | - | - | n/s | | 29000 | 340000 | 7800 | 21700 | 30000 | 310 | 2030000 |
| liable Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 4.3 | 2.1 | 1.03 | 1.7 | 2.23 | 1.2 | 6.63 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 4.3 | 2.1 | 1.03 | 1.7 | 2.23 | 1.2 | 6.63 |
| ride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 1.4 | 0.35 | 0.23 | 0.43 | 1.18 | 0.93 | 1.8 |
| al Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6059:2010 | 15.0 | 6.0 | 2.0 | 1.0 | 292.0 | 25.0 | 100.0 |

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OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

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ınions and interpretations expressed herein are outside the scope of SANAS accreditation.
ubcontracted test are not included in the SANAS schedule of accreditation for this laboratory.
e results relate only to the items tested. This certificate shall not be reproduced except with the approval of the laboratory.



Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

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bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com

MEETSE TECH LABORATORY

# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10157
Certificate No: GP13032018
Date sample received: 13/03/2018
Certificate Date: 26/03/2018
Day: Tuesday

| e Analysed: | | | | | | | | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 | 13/03/2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| nple Number: | | | | | | | | 8 | 9 | 10 | 11 | 12 | 13 |
| nple name: | | | | | | | | Water | Water | Water | Water | Water | Water |
| nple date and time: | | | | | | | | no info | no info | no info | no info | no info | no info |
| Number: | | | | | | | | 65385 | 65386 | 65387 | 65388 | 65389 | 65390 |
| nple Description: | | | | | | | | Water | Water | Water | Water | Water | Water |
| nple container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result* GP 1 | *Test Result* GP 2 | *Test Result* GP 3 | *Test Result* GP 4 | *Test Result* GP 5 | *Test Result* GP 6 |
| | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSO WI-001.00 | 8.19 | 6.30 | 6.21 | 7.10 | 6.25 | 7.90 |
| .S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANASS210:2005 | 3170 | 3197 | 3090 | 3402 | 204 | 231 |
| lorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSO WI-002.00 | 124 | 213 | 298 | 496 | 6 | 24 |
| phates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | | SANASS310:2005 | 5900 | 6000 | 5200 | 5300 | 240 | 320 |
| cium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 93.3 | 304.4 | 327.2 | 228.2 | 150.4 | 96.1 |
| ium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6050:2010 | 250 | 340 | 440 | 660 | 7 | 36 |
| n (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANSS207:2010 | 0.6 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 |
| balt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 0.1 | 0.6 | 0.4 | 0.4 | 0 | 0 |
| pper (Cu) | mg/dm3 | - | - | - | - | 1 | SANSS204:2010 | 0 | 0 | 0 | 0 | 0 | 0 |
| al Organic Carbon | mg/dm3 | | - | - | - | <0.50 | | 19.75 | 88.88 | 39.50 | 79.00 | 7.41 | 12.34 |
| solved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 93.81 | 83.94 | 88.88 | 108.63 | 29.63 | 20.74 |
| erotophic Plate Count | cfu/1ml | - | - | - | - | n/s | | 2730 | 16900 | 940000 | 300000 | 3100 | 30000 |
| ilable Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANSS210:2010 | 0.9 | 2.1 | 24.69 | 1.1 | 2.29 | 0.91 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANSS210:2010 | 0.9 | 2.1 | 24.69 | 1.1 | 2.29 | 0.91 |
| ride as F | mg/dm3 | - | - | - | - | - | MTLSO-WI-005.00 | 1.25 | 1.3 | 0.63 | 0.85 | 0.23 | 0.45 |
| al Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 110.0 | 167.0 | 53.0 | 168.0 | 163.0 | 83.0 |

MEETSE - TECH LABORATORY SERVICES

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

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pinions and interpretations expressed herein are outside the scope of SANAS accreditation.
ubcontracted test are not included in the SANAS schedule of accreditation for this laboratory.
e results relate only to the items tested. This certificate shall not be reproduced except with the approval of the laboratory.



Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

ETSETECH LABORATORY SERVICES
3 EVA ROAD, FAIRLEADS, BENONI, 1512
bsite: www.meetsetech.com
Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com



# Certificate of Analysis

ent: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10187
Certificate No: GP13042018
Date sample received: 13/04/2018
Certificate Date: 26/04/2018
Day: Friday

| te Analysed: | | | | | | | | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mple Number: | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| mple name: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| mple date and time: | | | | | | | | no info | no info | no info | no info | no info | no info | no info |
| Number: | | | | | | | | 65424 | 65425 | 65426 | 65427 | 65428 | 65429 | 65430 |
| mple Description: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| mple container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| *Parameters* | *Reporting Unit* | *Recommended Limit* | *Maximum Allowable Limit* | *Crisis Limit* | *General Standard (Water Act)* | *General Standard (Government Gazette)* | *Methods* | *Test Result* | *Test Result* | *Test Result* | *Test Result* | *Test Result* | *Test Result* | *Test Result* |
| | | | | | | | | FF | FM | FT | PF | PT | GPC | GPA |
| D.S | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | | MTLSO-WI-001-00 | 7.65 | 8.13 | 7.92 | 8.29 | 11.13 | 8.24 | 6.11 |
| lorides (Cl) | mg/dm3 | n/s | n/s | n/s | n/s | | SANASZ10:2005 | 5225 | 4966 | 4874 | 4746 | 3482 | 4152 | 2190 |
| lphates (SO4 2) | mg/dm3 | 250 | 600 | 1200 | n/s | | MTLSU-WI-002-00 | 197 | 188 | 190 | 318 | 177 | 244 | 288 |
| cium (Ca) | mg/dm3 | 200 | 600 | 1200 | n/s | | SANASZ10:2005 | 2000 | 2050 | 1750 | 625 | 1350 | 1200 | 875 |
| lium (Na) | mg/dm3 | 150 | 200 | 400 | n/s | - | | 313.0 | 260.0 | 238.0 | 150.0 | 103.0 | 109.0 | 163.0 |
| n (Fe) | mg/dm3 | 100 | 400 | 800 | n/s | | SANS6600-2010 | 600 | 620 | 700 | 740 | 480 | 620 | 220 |
| balt (Co) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | | SANS1297-2010 | 0.1 | 0.1 | 0.3 | 4.5 | 1.5 | 2.4 | 0.1 |
| pper (Cu) | mg/dm3 | - | - | - | - | n/s | SANS6170-2010 | 0.8 | 1.8 | 1.7 | 1.8 | 0.6 | 1.5 | 0.4 |
| al Organic Carbon | mg/dm3 | - | - | - | - | 1 | SANS2693:2010 | 0.8 | 0.1 | 0.1 | 2.6 | 9.1 | 16 | 0 |
| solved Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 25.68 | 19.75 | 33.58 | 108.63 | 213.30 | 73.08 | 27.65 |
| terotophic Plate Count | cfu/1ml | - | - | - | - | 53.2 | | 17.78 | 11.86 | 9.88 | 122.45 | 219.23 | 61.23 | 5.93 |
| ilable Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | n/s | | 329000 | 919000 | 64000 | 1625000 | 1410 | 1682000 | 1170 |
| rate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| rate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 17.8 | 9.5 | 10.17 | 8.8 | 5.88 | 8.14 | 6.33 |
| ride as F | mg/dm3 | - | - | - | - | - | SANS5210:2010 | 17.8 | 9.5 | 10.17 | 8.8 | 5.88 | 8.14 | 6.33 |
| al Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | MTLHQ-WI-005-00 | 2 | 1.9 | 1.75 | 1.6 | 1.25 | 0.65 | 0.35 |
| *MEETSE - TECH LABORATORY SERVICES* | | | | | | | SANS6059:2010 | 36.0 | 37.0 | 38.0 | 85.0 | 165.0 | 66.0 | 371.0 |

OVER THE LIMIT UNDER THE LIMIT ON THE LIMIT

Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

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Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

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Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com



# Certificate of Analysis

ient: Jonathan / Stewart
mpany: Goldplat Recovery
dress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10187
Certificate No: GP13042018
Date sample received: 13/04/2018
Certificate Date: 26/04/2018
Day: Friday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **te Analysed:** | | | | | | | | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 | 13/04/2018 |
| **mple Number:** | | | | | | | | 8 | 9 | 10 | 11 | 12 | 13 |
| **mple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **Number:** | | | | | | | | 65431 | 65432 | 65433 | 65434 | 65435 | 65436 |
| **mple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **mple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** | ***Test Result*** |
| | | | | | | | | ***FM 3*** | ***BB UP*** | ***BB DOWN*** | ***GP 1*** | ***GP 2*** | ***GP 3*** |
| **.S** | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MTLSO-WI-001 00 | *7.28* | *6.68* | *6.81* | *5.96* | *6.06* | *6.10* |
| **lorides (Cl)** | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | SANAS5213 2005 | *4252* | *197* | *256* | *2149* | *2269* | *2473* |
| **lphates (SO4 2)** | *mg/dm3* | *200* | *600* | *1200* | *n/s* | - | MTLSO-WI-002 00 | *382* | *27* | *40* | *124* | *213* | *334* |
| **cium (Ca)** | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | SANAS5410:2008 | *1725* | *750* | *88* | *1200* | *1250* | *1175* |
| **ium (Na)** | *mg/dm3* | *100* | *400* | *800* | *n/s* | - | | *111.2* | *28.7* | *25.0* | *274.2* | *295.7* | *184.8* |
| **n (Fe)** | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS6450 2010 | *860* | *19* | *33* | *220* | *340* | *460* |
| **balt (Co)** | *mg/dm3* | - | - | | | - | SANS5667 2010 | *0.1* | *0.1* | *0.1* | *1.0* | *1.2* | *0.4* |
| **pper (Cu)** | *mg/dm3* | - | | | | *n/s* | SANS6170 2010 | *0.8* | *<0.01* | *<0.01* | *0.2* | *0.3* | *0.3* |
| **al Organic Carbon** | *mg/dm3* | - | - | | - | *1* | SANS5263 2010 | *0.1* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| **solved Organic Carbon** | *mg/dm3* | | | | - | *<0.50* | | *9.88* | *21.73* | *1.98* | *5.93* | *3.95* | *7.90* |
| **erotophic Plate Count** | *cfu/1ml* | - | | | - | *53.2* | | *19.75* | *1.98* | *1.98* | *3.95* | *1.98* | *21.73* |
| **ilable Cyanide (Cn)** | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | *n/s* | | *74000* | *122000* | *56000* | *93000* | *266000* | *580000* |
| **rate as N** | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| **rate as NO3** | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS5210:2010 | *33.4* | *2.0* | *1.58* | *2.0* | *2.71* | *2.26* |
| **ride as F** | *mg/dm3* | | - | - | - | - | SANS5210:2010 | *33.4* | *2.0* | *1.58* | *2.0* | *2.71* | *2.26* |
| **al Suspendid Solids (TSS)** | *mg/dm3* | - | - | - | - | - | MTLSO-WI 003.00 | *1.6* | *0.08* | *0.09* | *0.6* | *1.07* | *0.85* |
| ***MEETSE - TECH LABORATORY SERVICES*** | | | | | | | SANS60-19:2010 | *195.0* | *8.0* | *5.0* | *132.0* | *181.0* | *598.0* |

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Data captured by: Rosheen Marx Report Signitory: Engela Erasmus

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September 2026

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Tel: 0119681648 / 0844659947 Fax: 0865870322
Engela Erasmus 0822539462 Rosheen Marx 0834635693
Email: meetse@iafrica.com / meetsetech@gmail.com



# Certificate of Analysis

Client: Jonathan / Stewart
Company: Goldplat Recovery
Address: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
Cell No: 0114231202/3/4 0835539210
Email: Jonathan.Hynd@goldplat.com

Invoice No: 10187
Certificate No: GP13042018
Date sample received: 13/04/2018
Certificate Date: 26/04/2018
Day: Friday

| Parameters | Reporting Unit | Recommended Limit | Maximum Allowable Limit | Crisis Limit | General Standard (Water Act) | General Standard (Government Gazette) | Methods | Date Analysed: 13/04/2018 | 13/04/2018 | 13/04/2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sample Number: 14 | 15 | 16 |
| | | | | | | | | Sample name: Water | Water | Water |
| | | | | | | | | Sample date and time: no info | no info | no info |
| | | | | | | | | Lab Number: 65437 | 65438 | 65439 |
| | | | | | | | | Sample Description: Water | Water | Water |
| | | | | | | | | Sample container: 2L container | 2L container | 2L container |
| pH | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | Test Result gp 4: 6.98 | Test Result gp 5: 6.06 | Test Result gp 6: 7.31 |
| T.D.S | mg/dm3 | n/s | n/s | n/s | n/s | - | SANAS1213-2005 | 2923 | 1000 | 1127 |
| Chlorides (Cl) | mg/dm3 | 250 | 600 | 1200 | n/s | | MTLSQ-WI-002.00 | 513 | 13 | 40 |
| Sulphates (SO4 2) | mg/dm3 | 200 | 600 | 1200 | n/s | | SANSNG-110-2005 | 1200 | 50 | 25 |
| Calcium (Ca) | mg/dm3 | 150 | 200 | 400 | n/s | | | 183.3 | 8.9 | 13.1 |
| Sodium (Na) | mg/dm3 | 100 | 400 | 800 | n/s | | SANS9050-2010 | 680 | 8 | 36 |
| Iron (Fe) | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207-2010 | <0.01 | 0.1 | 0.1 |
| Cobalt (Co) | mg/dm3 | - | - | - | - | n/s | SANS6170-2010 | 0.4 | <0.01 | <0.01 |
| Copper (Cu) | mg/dm3 | - | - | - | - | 1 | SANS7203-2010 | <0.01 | <0.01 | <0.01 |
| Total Organic Carbon | mg/dm3 | - | - | - | - | <0.50 | | 11.85 | 3.95 | 3.95 |
| Dissolved Organic Carbon | mg/dm3 | - | - | - | - | 53.2 | | 15.80 | 1.98 | 1.98 |
| Heterotophic Plate Count | cfu/1ml | | - | - | - | n/s | | 271000 | 152000 | 327000 |
| Available Cyanide (Cn) | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 |
| Nitrate as N | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS7210-2010 | 2.0 | 2.3 | 2.49 |
| Nitrate as NO3 | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS7210-2010 | 2.0 | 2.3 | 2.49 |
| Fluoride as F | mg/dm3 | - | - | - | - | - | MTLSQ-WI-003.00 | 1.13 | 0.03 | 0.63 |
| Total Suspendid Solids (TSS) | mg/dm3 | - | - | - | - | - | SANS5049-2010 | 355.0 | 605.0 | 143.0 |

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Data captured by: Rosheen Marx

Report Signitory: Engela Erasmus

Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

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Email: meetse@iafrica.com / meetsetech@gmail.com



MEETSE TECH LABORATORY

# Certificate of Analysis

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npany: Goldplat Recovery
ress: Corner Vermont & New Modder Roads
Modder Bee, Benoni, 1500
No: 0114231202/3/4 0835539210
ail: Jonathan.Hynd@goldplat.com

Invoice No: 10226
Certificate No: GP24052018
Date sample received: 24/05/2018
Certificate Date: 31/05/2018
Day: Thursday

| e Range: | | | | | | | | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| aple Number: | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| aple name: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| aple date and time: | | | | | | | | no info | no info | no info | no info | no info | no info | no info |
| Number: | | | | | | | | 65493 | 65494 | 65495 | 65496 | 65497 | 65498 | 65499 |
| aple Description: | | | | | | | | Water | Water | Water | Water | Water | Water | Water |
| aple container: | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result BB UP*** | ***Test Result BB DOWN*** | ***Test Result PT*** | ***Test Result PF*** | ***Test Result FM3*** | ***Test Result FM4*** | ***Test Result GBP*** |
| | *pH units* | *6.0-9.0* | *5.5-9.5* | *<4 - >11* | *5.5 - 9.5* | - | MEISO WI-001.00 | *6.40* | *7.17* | *8.08* | *9.63* | *7.77* | *5.94* | *11.49* |
| *D.S* | *mg/dm3* | *n/s* | *n/s* | *n/s* | *n/s* | | SANAS5213:2006 | *202* | *297* | *209* | *5380* | *4375* | *2298* | *7502* |
| *lorides (Cl)* | *mg/dm3* | *250* | *600* | *1200* | *n/s* | - | MEISO WI-002.00 | *30* | *57* | *18* | *509* | *424* | *333* | *508* |
| *lphates (SO4 2)* | *mg/dm3* | *200* | *600* | *1200* | *n/s* | | SANAS6010:2005 | *36* | *44* | *34* | *931* | *953* | *566* | *841* |
| *cium (Ca)* | *mg/dm3* | *150* | *200* | *400* | *n/s* | - | | *21.4* | *31.3* | *39.5* | *84.8* | *276.5* | *238.6* | *9.3* |
| *lium (Na)* | *mg/dm3* | *100* | *400* | *800* | *n/s* | | SANS6030:2010 | *23* | *47* | *15* | *1420* | *830* | *260* | *2070* |
| *n (Fe)* | *mg/dm3* | *0.01* | *1.00* | *2.0* | *1.00* | - | SANS6207:2010 | *0.1* | *0.0* | *0.1* | *12.0* | *0.2* | *0.1* | *19.0* |
| *balt (Co)* | *mg/dm3* | - | - | - | - | *n/s* | SANS6170:2010 | *0* | *0* | *0* | *4.3* | *0.98* | *0.51* | *2* |
| *pper (Cu)* | *mg/dm3* | - | - | - | - | *1* | SANS6203:2010 | *0.16* | *0.12* | *0.13* | *76* | *2.1* | *0.1* | *33.2* |
| *tal Organic Carbon* | *mg/dm3* | - | - | - | - | *<0.50* | | *3.00* | *5.00* | *14.00* | *94.00* | *10.00* | *7.00* | *119.00* |
| *ssolved Organic Carbon* | *mg/dm3* | - | - | - | - | *53.2* | | *19.00* | *20.00* | *19.00* | *128.00* | *27.00* | *14.00* | *116.00* |
| *terotophic Plate Count* | *cfu/1ml* | - | - | - | - | *n/s* | | *9600* | *7100* | *114000* | *1430* | *109000* | *3300* | *540* |
| *ailable Cyanide (Cn)* | *mg/dm3* | *0.02* | *0.03* | *0.1* | *n/s* | - | | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* | *<0.01* |
| *trate as N* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS6210:2010 | *1.3* | *1.3* | *2.01* | *11.0* | *30.2* | *9.95* | *21* |
| *trate as NO3* | *mg/dm3* | *6* | *10* | *20* | *n/s* | - | SANS6210:2010 | *1.3* | *1.3* | *2.01* | *11.0* | *30.2* | *9.95* | *21* |
| *uride as F* | *mg/dm3* | - | - | - | - | - | MEISO WI-005.00 | *0.28* | *0.33* | *0.12* | *4.63* | *2.1* | *1.8* | *7.71* |
| *tal Suspendid Solids (TSS)* | *mg/dm3* | | - | - | - | - | SANS6049:2010 | *6.0* | *1.0* | *142.0* | *91.0* | *72.0* | *32.0* | *118.0* |

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MEETSE TECH LABORATORY

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Invoice No: 10187
Certificate No: GP13042018
Date sample received: 13/04/2018
Certificate Date: 26/04/2018
Day: Friday

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **e Analysed:** | | | | | | | | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 | 24-31 May 2018 |
| **aple Number:** | | | | | | | | 8 | 9 | 10 | 11 | 12 | 13 |
| **aple name:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **aple date and time:** | | | | | | | | no info | no info | no info | no info | no info | no info |
| **Number:** | | | | | | | | 65500 | 65501 | 65502 | 65503 | 65504 | 65505 |
| **aple Description:** | | | | | | | | Water | Water | Water | Water | Water | Water |
| **aple container:** | | | | | | | | 2L container | 2L container | 2L container | 2L container | 2L container | 2L container |
| ***Parameters*** | ***Reporting Unit*** | ***Recommended Limit*** | ***Maximum Allowable Limit*** | ***Crisis Limit*** | ***General Standard (Water Act)*** | ***General Standard (Government Gazette)*** | ***Methods*** | ***Test Result*** GP1 | ***Test Result*** GP2 | ***Test Result*** GP3 | ***Test Result*** GP4 | ***Test Result*** GP5 | ***Test Result*** GP6 |
| | pH units | 6.0-9.0 | 5.5-9.5 | <4 - >11 | 5.5 - 9.5 | - | MTLSQ-WI-001.00 | 6.52 | 5.86 | 6.57 | 7.57 | 5.93 | 7.49 |
| **).S** | mg/dm3 | n/s | n/s | n/s | n/s | - | SANS5210:2003 | 2620 | 2745 | 3021 | 3379 | 98 | 189 |
| **lorides (Cl)** | mg/dm3 | 250 | 600 | 1200 | n/s | - | MTLSQ-WI-002.00 | 138 | 219 | 333 | 522 | 21 | 42 |
| **lphates (SO4 2)** | mg/dm3 | 200 | 600 | 1200 | n/s | - | SANS6-316-2005 | 714 | 698 | 692 | 712 | 46 | 22 |
| **:ium (Ca)** | mg/dm3 | 150 | 200 | 400 | n/s | - | | 229.1 | 228.3 | 185.3 | 205.5 | 8.5 | 10.7 |
| **ium (Na)** | mg/dm3 | 100 | 400 | 800 | n/s | - | SANS6050:2010 | 250 | 310 | 440 | 670 | 15 | 34 |
| **n (Fe)** | mg/dm3 | 0.01 | 1.00 | 2.0 | 1.00 | - | SANS5207:2010 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 |
| **olt (Co)** | mg/dm3 | - | - | - | - | n/s | SANS6170:2010 | 0.26 | 0.39 | 0.34 | 0.56 | 0 | 0 |
| **per (Cu)** | mg/dm3 | - | - | - | - | 1 | SANS5208:2010 | 0.25 | 0.04 | 0.03 | 0.05 | 0.02 | 0.01 |
| **al Organic Carbon** | mg/dm3 | - | - | - | - | <0.50 | | 0.00 | 14.00 | 13.00 | 21.00 | 24.00 | 4.00 |
| **solved Organic Carbon** | mg/dm3 | - | - | - | - | 53.2 | | 20.00 | 16.00 | 22.00 | 35.00 | 41.00 | 21.00 |
| **erotophic Plate Count** | cfu/1ml | - | - | - | - | n/s | | 13200 | 38000 | 90000 | 175000 | 175000 | 123000 |
| **ilable Cyanide (Cn)** | mg/dm3 | 0.02 | 0.03 | 0.1 | n/s | - | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **rate as N** | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 1.6 | 1.3 | 1.34 | 2.0 | 2.01 | 0.89 |
| **rate as NO3** | mg/dm3 | 6 | 10 | 20 | n/s | - | SANS5210:2010 | 1.6 | 1.3 | 1.34 | 2.0 | 2.01 | 0.89 |
| **ride as F** | mg/dm3 | - | - | - | - | - | MTLSQ-WI-005.00 | 0.74 | 2.33 | 3.35 | 2.64 | 0.52 | 1.58 |
| **al Suspendid Solids (TSS)** | mg/dm3 | - | - | - | - | - | SANS6049:2010 | 221.0 | 277.0 | 222.0 | 170.0 | 536.0 | 163.0 |

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Goldplat Reclamation Project - Geohydrological Specialist Study
September 2026

| | | | |
|---|---|---|---|
| MEETSE TECH LABORATORY | **CERTIFICATE OF ANALYSIS GOLDPLAT RECOVERY** | **QM No: 7.8/F-03-09** | ilac-MRA sanas T0756 |
| | | **ISO 17025 Clause 8.3** | |
| | | **REV No: 00** | |
| | Data captured by: R.Marx | Signature: | **Date Approved: 22 August 2018** |
| | Report signatory: E.Erasmus | | **Page 1 of 6** |

| **COMPANY INFORMATION** | |
|---|---|
| Meetse Tech Laboratory Services CC | Tel# 0119681648/0844659947 Fax# 0865870322 |
| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date Range | | 23/08/2018 – 31/08/2018 | | | | | |
| Date & Time | | 23/08/2018 10:00 | | | | | |
| Description & Container | | Water | | 5L container | | | |
| Invoice # | | 10325 | | | | | |
| Sample # | | 1 | 2 | 3 | 4 | 5 | 6 |
| Name | | B/B UP | B/B Down | PT | PF | FT | GP 1 |
| Lab # | | 65626 | 65626 | 65626 | 65626 | 65626 | 65626 |
| **SAMPLE RESULTS** | | | | | | | |
| Parameter & Allowed specifications | Method used | Result sample number 1 | Result sample number 2 | Result sample number 3 | Result sample number 4 | Result sample number 5 | Result sample number 6 |
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - | - |
| Alkalinity M<br><br>Alkalinity P mg/l | MTLSQ-WI-001 | 79.20 | 131.3 | 366.9<br><br>268.4 | 2203<br><br>1491 | 49.0<br><br>6.7 | 86.5 |
| Ammonia as N mg/l | SANS 5217:2010 | 1.43 | 1.19 | 0.48 | 54.26 | 1.38 | 3.33 |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 40.33 | 31.50 | 149.53 | 3.28 | 2.14 | 203.70 |
| Calcium Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 100.82 | 78.75 | 373.83 | 8.21 | 5.36 | 509.24 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600** | MTLSQ-WI-002 | 28.1 | 59.94 | 265.10 | 895.85 | 7.90 | 116.76 |

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| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
| | Data captured by: R.Marx / Signature: | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 2 of 6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis=1200<br>Water Act= n/s | | | | | | | |
| Cobolt mg/l/dm3<br>LIMITS: n/s | SANS 6170:2010 | 0.006 | <0.01 | 1.362 | 2.412 | <0.01 | 0.179 |
| Conductivity us | SANS 7888:2005 | 402 | 522 | 3310 | 102 | 123 | 25.5 |
| Copper as Cu mg/l/dm3<br>LIMITS: n/s | SANS 5203:2010 | 0.008 | 0.015 | 18.14 | 37.11 | <0.01 | 0.026 |
| *Cyanide mg/dm3<br>LIMITS: n/s | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>LIMITS: n/s | HACH 10173 | 6 | 8 | 43 | 198 | 4 | 1 |
| Fluorides as Fl mg/l/dms mg/l/dm3<br>LIMITS: n/s | HACH 10225 | 0.47 | 0.19 | 1.36 | 7.51 | 0.23 | 0.48 |
| *Heterotophic Plate Count cfu/1ml<br>LIMITS: n/s | | 4900 | 6200 | 470 | 340 | 70000 | 220000 |
| Iron as Fe mg/l/dm3<br>LIMITS:<br>Recommended= 0.01<br>Max=1.0<br>Crisis=2.0<br>Water Act= 1.0 | SANS 5207:2010 | 0.123 | 0.048 | 1.864 | 43.72 | 0.034 | 0.074 |
| *Magnesium as Mg mg/l | | 24.20 | 18.90 | 88.62 | 0.79 | 0.51 | 48.89 |
| Nitrates as N mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 1.67 | 1.49 | 3.50 | 31.15 | 0.83 | 0.50 |
| Nitrates as N03 mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 2.38 | 2.14 | 5.00 | 44.50 | 1.19 | 0.71 |
| pH Units<br>LIMITS:<br>Recommended= 6.0-9.0<br>Max=5.5-9.0<br>Crisis=<4.0 - >11<br>Water Act= 5.5-9.5 | SANS 5011:2005 | 6.38 | 6.84 | 11.52 | 11.93 | 8.21 | 6.17 |

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| | | **ISO 17025 Clause 8.3** | |
| | | **REV No: 00** | |
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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sodium as Na mg/l/dm3<br>**LIMITS:**<br>**Recommended= 100**<br>**Max=400**<br>**Crisis=800**<br>**Water Act= n/s** | SANS 6050:2010 | 33 | 63 | 380 | 2500 | 9 | 20.8 |
| Sulphate as So4 mg/l/dm3<br>**LIMITS:**<br>**Recommended= 200**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | SANS 6310:2005 | 68 | 59 | 575 | 1281 | 82 | 1020 |
| *Total Dissolved Solids mg/dm3<br>**LIMITS: N/S** | SANS 5213:2005 | 270 | 345 | 933 | 10909 | 69 | 2302 |
| Total Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 141.88 | 128.50 | 375.46 | 45.21 | 37.18 | 1276.45 |
| *Total Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 9 | 10 | 45 | 202 | 13 | 3 |
| Total Suspendid Solids mg/dm3<br>**LIMITS: n/s** | SANS 6049:2010 | 40 | 11 | 29 | 58 | 78 | 146 |

| | | | | |
|---|---|---|---|---|
| Legend | Black= Under limit | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | N/A=not applicable | N/S=not specified |

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| | | **ISO 17025 Clause 8.3** | |
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| **COMPANY INFORMATION** | |
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| Meetse Tech Laboratory Services CC | Tel# 0119681648/0844659947 Fax# 0865870322 |
| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date Range | | 23/08/2018 – 31/08/2018 | | | | | |
| Date & Time | | 23/08/2018 10:00 | | | | | |
| Description & Container | | Water | | 5L container | | | |
| Invoice # | | 10325 | | | | | |
| Sample # | | 7 | 8 | 9 | 10 | 11 | 12 |
| Name | | GP 2 | GP 3 | GP 4 | GP 6 | FM 3 | FM 4 |
| Lab # | | 65626 | 65626 | 65626 | 65626 | 65626 | 65626 |
| **SAMPLE RESULTS** | | | | | | | |
| Parameter & Allowed specifications | Method used | Result sample number 1 | Result sample number 2 | Result sample number 3 | Result sample number 4 | Result sample number 5 | Result sample number 6 |
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - | - |
| Alkalinity M<br><br>Alkalinity P mg/l | MTLSQ-WI-001 | 91.80 | 77.40 | 117.40 | 102.40 | 150.30 | 119.00 |
| Ammonia as N mg/l | SANS 5217:2010 | 4.05 | 4.76 | 12.61 | 1.67 | 25.11 | 0.71 |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/a** | MTLSQ-WI-011 | 266.01 | 262.77 | 93.18 | 16.00 | 520.18 | 83.00 |
| Calcium Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 665.03 | 656.93 | 232.96 | 39.99 | 1300.45 | 207.49 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200** | MTLSQ-WI-002 | 188.43 | 403.20 | 456.61 | 22.90 | 604.70 | 271.07 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Water Act= n/s** | | | | | | | |
| Cobolt mg/l/dm3<br>**LIMITS: n/s** | SANS 6170:2010 | 0.595 | 0.464 | 0.394 | <0.01 | 0.994 | 0.380 |
| Conductivity us | SANS 7888:2005 | 30 | 41.6 | 40.3 | 348 | 90.7 | 26.6 |
| Copper as Cu mg/l/dm3<br>**LIMITS: n/s** | SANS 5203:2010 | 0.005 | 0.003 | 0.004 | <0.01 | 0.026 | 0.016 |
| *Cyanide mg/dm3<br>**LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 3 | 11 | 7 | 1 | 18 | 4 |
| Fluorides as Fl mg/l/dms mg/l/dm3<br>**LIMITS: n/s** | HACH 10225 | 0.48 | 1.59 | 1.41 | 0.03 | 3.11 | 0.38 |
| *Heterotophic Plate Count cfu/1ml<br>**LIMITS: n/s** | | 6800 | 174000 | 680000 | 180000 | 27800 | 5400 |
| Iron as Fe mg/l/dm3<br>**LIMITS:<br>Recommended= 0.01<br>Max=1.0<br>Crisis=2.0<br>Water Act= 1.0** | SANS 5207:2010 | 0.172 | 0.166 | 0.053 | 0.022 | 0.070 | 0.230 |
| *Magnesium as Mg mg/l | | 63.84 | 63.06 | 22.36 | 3.84 | 124.84 | 19.92 |
| Nitrates as N mg/l/dm3<br>**LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s** | SANS 5210:2010 | 0.34 | 2.08 | 0.56 | <0.01 | 10.33 | 5.99 |
| Nitrates as N03 mg/l/dm3<br>**LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s** | SANS 5210:2010 | 0.48 | 2.97 | 0.84 | <0.01 | 14.75 | 8.56 |
| pH Units<br>**LIMITS:<br>Recommended= 6.0-9.0<br>Max=5.5-9.0<br>Crisis=<4.0 - >11<br>Water Act= 5.5-9.5** | SANS 5011:2005 | 5.99 | 5.98 | 7.36 | 7.58 | 7.18 | 6.00 |

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| | | **ISO 17025 Clause 8.3** | |
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| | **Report signatory:** E.Erasmus | | **Page 6 of 6** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sodium as Na mg/l/dm3<br>**LIMITS:**<br>**Recommended= 100**<br>**Max=400**<br>**Crisis=800**<br>**Water Act= n/s** | SANS 6050:2010 | 270 | 560 | 620 | 34 | 1730 | 217 |
| Sulphate as So4 mg/l/dm3<br>**LIMITS:**<br>**Recommended= 200**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | SANS 6310:2005 | 1184 | 1416 | 1180 | 61 | 2560 | 1015 |
| *Total Dissolved Solids mg/dm3<br>**LIMITS: N/S** | SANS 5213:2005 | 2735 | 3518 | 30.78 | 153 | 8055 | 2196 |
| Total Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 1254.41 | 1123.56 | 1023.18 | 88.39 | 1611.49 | 1184.76 |
| *Total Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 4 | 9 | 10 | 1 | 17 | 5 |
| Total Suspendid Solids mg/dm3<br>**LIMITS: n/s** | SANS 6049:2010 | 349 | 352 | 133 | 110 | 76 | 93 |

| | | | | |
|---|---|---|---|---|
| Legend | Black= Under limit | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | N/A=not applicable | N/S=not specified |

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|---|---|---|---|---|
| | Data captured by: R.Marx | Signature: | **Date Approved: 22 August 2018** | |
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| **COMPANY INFORMATION** | |
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| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | |
|---|---|---|---|---|---|---|
| Date Range | 29/11/2018 – 06/12/2019 | | | | | |
| Date & Time | Not known | | | | | |
| Description & Container | Water | | 5L container | | | |
| Invoice # | 10447 | | | | | |
| Sample # | 1 | 2 | 3 | 4 | 5 | 6 |
| Name | B/B UP | B/B Down | PT | PF | GP1 | GP2 |
| Lab # | 65787 | 65788 | 65789 | 65790 | 65791 | 65792 |

**SAMPLE RESULTS**

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| Parameter & Allowed specifications | Method used | Result sample number 1 | Result sample number 2 | Result sample number 3 | Result sample number 4 | Result sample number 5 | Result sample number 6 |
|---|---|---|---|---|---|---|---|
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - | - |
| Alkalinity M<br><br>Alkalinity P mg/l | MTLSQ-WI-001 | 111.7<br><br>- | 149.4<br><br>- | 475.2<br><br>196.0 | 2132.5<br><br>1203.0 | 22.0<br><br>- | 94.9<br><br>- |
| Ammonia as N mg/l | SANS 5217:2010 | 0.85 | 0.85 | 47.67 | 74.35 | 3.54 | 2.05 |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 35.04 | 34.58 | 191.25 | 28.84 | 119.14 | 191.17 |
| Calcium Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 87.61 | 86.44 | 478.12 | 72.11 | 297.85 | 477.92 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600** | MTLSQ-WI-002 | 0.9 | 0.6 | 379.12 | 1094.28 | 118.08 | 165.64 |

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| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
| | Data captured by: R.Marx<br>Signature: | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 2 of 9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crisis=1200<br>Water Act= n/a | | | | | | | |
| Cobolt mg/l/dm3<br>LIMITS: n/a | SANS 6170:2010 | <0.01 | <0.01 | 2.318 | 5.211 | 0.188 | 0.941 |
| Conductivity us | SANS 7888:2005 | 443 | 560 | 43.1 | 10.2 | 24 | 28.7 |
| Copper as Cu mg/l/dm3<br>LIMITS: n/a | SANS 5203:2010 | 0.060 | 0.063 | 16.19 | 85.30 | 0.438 | 0.050 |
| *Cyanide mg/dm3<br>LIMITS: n/a | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Diseolved Organic Carbon mg/dm3<br>LIMITS: n/a | HACH 10173 | 16 | 11 | 49 | 275 | 1 | 8 |
| Fluorides as Fl mg/l/dms mg/l/dm3<br>LIMITS: n/a | HACH 10225 | 5.35 | 5.69 | 3.78 | 9.19 | 0.89 | 1.99 |
| *Heterotophic Plate Count cfu/1ml<br>LIMITS: n/a | | 13000 | 3900 | 510 | 310 | 327000 | 62000 |
| Iron as Fe mg/l/dm3<br>LIMITS:<br>Recommended= 0.01<br>Max=1.0<br>Crisis=2.0<br>Water Act= 1.0 | SANS 5207:2010 | <0.01 | <0.01 | 0.357 | 65.8 | 0.235 | 0.004 |
| *Magnesium as Mg mg/l | | 21.03 | 20.75 | 114.95 | 17.30 | 71.48 | 114.70 |
| Nitrates as N mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/a | SANS 5210:2010 | 1.20 | 1.37 | 4.79 | 22.12 | 3.42 | 1.82 |
| Nitrites as N03 mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/a | SANS 5210:2010 | 0.01 | 0.01 | 0.24 | 3.5 | 0.02 | 0.06 |
| pH Units<br>LIMITS:<br>Recommended= 6.0-9.0<br>Max=5.5-9.0<br>Crisis=<4.0 - >11<br>Water Act= 5.5-9.5 | SANS 5011:2005 | 7.46 | 7.51 | 9.59 | 11.30 | 7.94 | 6.63 |

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| | | ISO 17025 Clause 8.3 |
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| | Report signatory: E.Erasmus | Page 3 of 9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sodium as Na mg/l/dm3 **LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 38 | 87 | 1280 | 3600 | 330 | 370 |
| Sulphate as So4 mg/l/dm3 **LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 48 | 57 | 873 | 1285 | 879 | 949 |
| *Total Dissolved Solids mg/dm3 **LIMITS: N/S** | SANS 5213:2005 | 259 | 336 | 2950 | 7629 | 2023 | 2571 |
| Total Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 128.26 | 133.90 | 810.00 | 198.60 | 490.73 | 865.70 |
| *Total Organic Carbon mg/dm3 **LIMITS: n/s** | HACH 10173 | 15 | 15 | 95 | 246 | 6 | 3 |
| Total Suspendid Solids mg/dm3 **LIMITS: n/s** | SANS 6049:2010 | 259 | 336 | 2950 | 7629 | 2023 | 2571 |

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|---|---|---|---|---|
| | Black= Under limit | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | N/A=not applicable | N/S=not specified |

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| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | |
|---|---|---|---|---|---|---|
| Date Range | 29/11/2018 – 06/01/2019 | | | | | |
| Date & Time | Not known | | | | | |
| Description & Container | Water | | 5L container | | | |
| Invoice # | 10447 | | | | | |
| Sample # | 7 | 8 | 9 | 10 | 11 | 12 |
| Name | GP3 | GP5 | GP6 | FM3 | FM4 | FM |
| Lab # | 65793 | 65794 | 65795 | 65796 | 65797 | 65798 |

**SAMPLE RESULTS**

Master document

| Parameter & Allowed specifications | Method used | Result sample number 7 | Result sample number 8 | Result sample number 9 | Result sample number 10 | Result sample number 11 | Result sample number 12 |
|---|---|---|---|---|---|---|---|
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - | - |
| Alkalinity M<br><br>Alkalinity P mg/l | MTLSQ-WI-001 | 25.9<br><br>- | 44.10<br><br>- | 98.3<br><br>- | 115.7<br><br>- | 78.4<br><br>- | 286.9<br><br>46.2 |
| Ammonia as N mg/l | SANS 5217:2010 | 3.15 | 1.14 | 2.28 | 32.16 | 1.60 | 47.21 |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 207.04 | 7.73 | 9.68 | 533.80 | 213.83 | 30.11 |
| Calcium Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 517.61 | 19.32 | 24.19 | 1334.50 | 534.58 | 75.28 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200** | MTLSQ-WI-002 | 468.08 | 0.5 | 0.3 | 625.22 | 269.25 | 987.17 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Water Act= n/s | | | | | | | |
| Cobolt mg/l/dm3<br>LIMITS: n/s | SANS 6170:2010 | 0.6 | <0.01 | <0.01 | 1.368 | 0.655 | 8.91 |
| Conductivity us | SANS 7888:2005 | 40.6 | 128 | 319 | 88.7 | 26.4 | 90.9 |
| Copper as Cu mg/l/dm3<br>LIMITS: n/s | SANS 5203:2010 | 0.052 | 0.039 | 0.030 | 0.141 | 0.052 | 0.276 |
| *Cyanide mg/dm3<br>LIMITS: n/s | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>LIMITS: n/s | HACH 10173 | 10 | 4 | 6 | 21 | 12 | 93 |
| Fluorides as Fl mg/l/dms mg/l/dm3<br>LIMITS: n/s | HACH 10225 | 1.82 | 2.81 | 1.38 | 4.18 | 1.64 | 3.15 |
| *Heterotophic Plate Count cfu/1ml<br>LIMITS: n/s | | 16500 | 400000 | 51000 | 33000 | 1440 | 57000 |
| Iron as Fe mg/l/dm3<br>LIMITS:<br>Recommended= 0.01<br>Max=1.0<br>Crisis=2.0<br>Water Act= 1.0 | SANS 5207:2010 | 0.223 | <0.01 | 0.397 | 0.014 | <0.01 | 3.585 |
| *Magnesium as Mg mg/l | | 124.23 | 4.63 | 5.80 | 320.28 | 128.30 | 18.07 |
| Nitrates as N mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 0.04 | 0.03 | 0.10 | 0.03 | 0.30 | 2.30 |
| Nitrates as N03 mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 1.37 | 1.94 | 2.74 | 7.41 | 10.26 | 20.30 |
| pH Units<br>LIMITS:<br>Recommended= 6.0-9.0<br>Max=5.5-9.0<br>Crisis=<4.0 - >11<br>Water Act= 5.5-9.5 | SANS 5011:2005 | 5.96 | 7.82 | 7.93 | 7.09 | 7.19 | 8.79 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sodium as Na mg/l/dm3 **LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 770 | 14 | 33 | 2700 | 350 | 2500 |
| Sulphate as So4 mg/l/dm3 **LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 1069 | 15 | 26 | 2319 | 813 | 1791 |
| *Total Dissolved Solids mg/dm3 **LIMITS: N/S** | SANS 5213:2005 | 3290 | 55 | 157 | 7796 | 2206 | 6883 |
| Total Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 848.68 | 47.07 | 88.52 | 1407.01 | 772.25 | 289.26 |
| *Total Organic Carbon mg/dm3 **LIMITS: n/s** | HACH 10173 | 13 | 8 | 4 | 22 | 7 | 100 |
| Total Suspendid Solids mg/dm3 **LIMITS: n/s** | SANS 6049:2010 | 3290 | 55 | 157 | 7796 | 2206 | 6883 |

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|---|---|---|---|---|
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| **COMPANY INFORMATION** | |
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| Meetse Tech Laboratory Services CC | Tel# 0119681648/0844659947 Fax# 0865870322 |
| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date Range | 29/11/2018 – 06/01/2019 | | | | | | |
| Date & Time | Not known | | | | | | |
| Description & Container | Water | 5L container | | | | | |
| Invoice # | 10447 | | | | | | |
| Sample # | 13 | | | | | | |
| Name | GPB | | | | | | |
| Lab # | 65799 | | | | | | |

| **SAMPLE RESULTS** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter & Allowed specifications | Method used | Result sample number 13 | | | | | |
| Acidity mg/l | MTLSQ-WI-001 | - | | | | | |
| Alkalinity M<br><br>Alkalinity P mg/l | MTLSQ-WI-001 | 894.0<br><br>330.3 | | | | | |
| Ammonia as N mg/l | SANS 5217:2010 | 30.56 | | | | | |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 321.93 | | | | | |
| Calcium Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 536.54 | | | | | |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200** | MTLSQ-WI-002 | 671.38 | | | | | |

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| | Report signatory: E.Erasmus | | Page 8 of 9 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Water Act= n/s | | | | | | | |
| Cobolt mg/l/dm3<br>LIMITS: n/s | SANS 6170:2010 | 11.18 | | | | | |
| Conductivity us | SANS 7888:2005 | 82.4 | | | | | |
| Copper as Cu mg/l/dm3<br>LIMITS: n/s | SANS 5203:2010 | 167.20 | | | | | |
| *Cyanide mg/dm3<br>LIMITS: n/s | | <0.01 | | | | | |
| *Dissolved Organic Carbon mg/dm3<br>LIMITS: n/s | HACH 10173 | 154 | | | | | |
| Fluorides as Fl mg/l/dms mg/l/dm3<br>LIMITS: n/s | HACH 10225 | 4.12 | | | | | |
| *Heterotophic Plate Count cfu/1ml<br>LIMITS: n/s | | 6100 | | | | | |
| Iron as Fe mg/l/dm3<br>LIMITS:<br>Recommended= 0.01<br>Max=1.0<br>Crisis=2.0<br>Water Act= 1.0 | SANS 5207:2010 | 11.05 | | | | | |
| *Magnesium as Mg mg/l | | 535.84 | | | | | |
| Nitrates as N mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 2.3 | | | | | |
| Nitrates as N03 mg/l/dm3<br>LIMITS:<br>Recommended= 6<br>Max=10<br>Crisis=20<br>Water Act= n/s | SANS 5210:2010 | 26.0 | | | | | |
| pH Units<br>LIMITS:<br>Recommended= 6.0-9.0<br>Max=5.5-9.0<br>Crisis=<4.0 - >11<br>Water Act= 5.5-9.5 | SANS 5011:2005 | 10.02 | | | | | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sodium as Na mg/l/dm3<br>LIMITS:<br>Recommended= 100<br>Max=400<br>Crisis=800<br>Water Act= n/s | SANS 6050:2010 | 2900 | | | | | |
| Sulphate as So4 mg/l/dm3<br>LIMITS:<br>Recommended= 200<br>Max=600<br>Crisis=1200<br>Water Act= n/s | SANS 6310:2005 | 1710 | | | | | |
| *Total Dissolved Solids mg/dm3<br>LIMITS: N/S | SANS 5213:2005 | 6357 | | | | | |
| Total Hardness (CaCo3) mg/l | MTLSQ-WI-011 | 1341.36 | | | | | |
| *Total Organic Carbon mg/dm3<br>LIMITS: n/s | HACH 10173 | 161 | | | | | |
| Total Suspendid Solids mg/dm3<br>LIMITS: n/s | SANS 6049:2010 | 6357 | | | | | |

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| **COMPANY INFORMATION** | |
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| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>011 423 1202/3/4 083 553 9210 | Tel# Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date Range | | 01/03/2019 – 11/03/2019 | | | | | |
| Date & Time | | Not known | | | | | |
| Description & Container | | Water | | 5L container | | | |
| Invoice # | | 10554 | | | | | |
| Sample # | | 1 | 2 | 3 | 4 | 5 | 6 |
| Name | | B/B UP | B/B Down | PF | PT | GP3 | GP1 |
| Lab # | | 65934 | 65935 | 65936 | 65937 | 65938 | 65939 |
| **SAMPLE RESULTS** | | | | | | | |
| Parameter & Allowed specifications | Method used | Result sample number 1 | Result sample number 2 | Result sample number 3 | Result sample number 4 | Result sample number 5 | Result sample number 6 |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 23.74 | 24.0 | 19.65 | 47.19 | 14.18 | 61.98 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | MTLSQ-WI-002 | 19.10 | 29.20 | 85.30 | 23.70 | 196.30 | 38.10 |
| Cobolt mg/l/dm3<br>**LIMITS: n/s** | SANS 6170:2010 | <0.01 | 0.024 | 0.149 | 0.016 | 0.210 | 0.038 |
| Copper as Cu mg/l/dm3<br>**LIMITS: n/s** | SANS 5203:2010 | 0.059 | 0.103 | 0.055 | 0.081 | 0.995 | 0.077 |
| *Cyanide mg/dm3<br>**LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 7 | 26 | 12 | 3 | 11 | 2 |
| *Heterotophic Plate Count cfu/1ml<br>**LIMITS: n/s** | | 13000 | 3900 | 310 | 510 | 16500 | 327000 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Iron as Fe mg/l/dm3<br>**LIMITS:**<br>**Recommended= 0.01**<br>**Max=1.0**<br>**Crisis=2.0**<br>**Water Act= 1.0** | SANS 5207:2010 | 0.105 | 0.096 | 0.572 | 0.044 | 0.719 | 0.073 |
| pH Units<br>**LIMITS:**<br>**Recommended= 6.0-9.0**<br>**Max=5.5-9.0**<br>**Crisis=<4.0 - >11**<br>**Water Act= 5.5-9.5** | SANS 5011:2005 | 8.62 | 7.38 | 8.49 | 7.84 | 8.74 | 7.82 |
| Sodium as Na mg/l/dm3<br>**LIMITS:**<br>**Recommended= 100**<br>**Max=400**<br>**Crisis=800**<br>**Water Act= n/s** | SANS 6050:2010 | 31.72 | 53.83 | 135.99 | 41.38 | 177.6 | 267.7 |
| Sulphate as So4 mg/l/dm3<br>**LIMITS:**<br>**Recommended= 200**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | SANS 6310:2005 | 4 | 13 | 49 | 37 | 74 | 411 |
| *Total Dissolved Solids mg/dm3<br>**LIMITS: N/S** | SANS 5213:2005 | 170 | 212 | 439 | 288 | 604 | 1485 |
| *Total Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 2 | 1 | 5 | 8 | 9 | 4 |

| | | | | |
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| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| CLIENT INFORMATION | |
|---|---|
| Client: Goldplat Recovery<br>011 423 1202/3/4 083 553 9210 | Tel# Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| Sample information | | | | | | |
|---|---|---|---|---|---|---|
| Date Range | 01/03/2019 – 11/03/2019 | | | | | |
| Date & Time | Not known | | | | | |
| Description & Container | Water | | 5L container | | | |
| Invoice # | 10554 | | | | | |
| Sample # | 7 | 8 | 9 | 10 | 11 | 12 |
| Name | Gp2 | Gp3 | Gp4 | Gp5 | Gp6 | Fm3 |
| Lab # | 65940 | 65941 | 65942 | 65943 | 65944 | 65945 |

**SAMPLE RESULTS**

| Parameter & Allowed specifications | Method used | Result sample number 7 | Result sample number 8 | Result sample number 9 | Result sample number 10 | Result sample number 11 | Result sample number 12 |
|---|---|---|---|---|---|---|---|
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 10.44 | 13.68 | 62.96 | 4.85 | 34.91 | 63.85 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | MTLSQ-WI-002 | 25.4 | 76.7 | 444.4 | 14.8 | 27.2 | 8.7 |
| Cobolt mg/l/dm3<br>**LIMITS: n/s** | SANS 6170:2010 | 0.093 | 0.431 | 0.293 | <0.01 | <0.01 | 2.755 |
| Copper as Cu mg/l/dm3<br>**LIMITS: n/s** | SANS 5203:2010 | 0.066 | 0.141 | 0.069 | 0.070 | 0.645 | 0.157 |
| *Cyanide mg/dm3<br>**LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 9 | 9 | 8 | 8 | <0.01 | 10 |
| *Heterotophic Plate Count cfu/1ml<br>**LIMITS: n/s** | | 62000 | 16500 | 170000 | 400000 | 51000 | 33000 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Iron as Fe mg/l/dm3<br>**LIMITS:**<br>**Recommended= 0.01**<br>**Max=1.0**<br>**Crisis=2.0**<br>**Water Act= 1.0** | SANS 5207:2010 | 0.080 | 0.139 | 0.119 | 0.312 | 0.080 | 0.295 |
| pH Units<br>**LIMITS:**<br>**Recommended= 6.0-9.0**<br>**Max=5.5-9.0**<br>**Crisis=<4.0 - >11**<br>**Water Act= 5.5-9.5** | SANS 5011:2005 | 9.09 | 8.39 | 8.32 | 6.11 | 8.08 | 7.38 |
| Sodium as Na mg/l/dm3<br>**LIMITS:**<br>**Recommended= 100**<br>**Max=400**<br>**Crisis=800**<br>**Water Act= n/s** | SANS 6050:2010 | 181.3 | 781.3 | 700.9 | 36.23 | 60.63 | 1953.0 |
| Sulphate as So4 mg/l/dm3<br>**LIMITS:**<br>**Recommended= 200**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | SANS 6310:2005 | 160 | 478 | 527 | 14 | 16 | 620 |
| *Total Dissolved Solids mg/dm3<br>**LIMITS: N/S** | SANS 5213:2005 | 638 | 2506 | 2841 | 115 | 179 | 8177 |
| *Total Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 4 | <0.01 | 7 | 5 | <0.01 | 24 |

| | | | | | |
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| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| **CLIENT INFORMATION** | |
|---|---|
| Client: Goldplat Recovery<br>011 423 1202/3/4 083 553 9210 | Tel# Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| **Sample information** | | |
|---|---|---|
| Date Range | 01/03/2019 – 11/03/2019 | |
| Date & Time | Not known | |
| Description & Container | Water | 5L container |
| Invoice # | 10554 | |

| | |
|---|---|
| Sample # | 13 |
| Name | FM 4 |
| Lab # | 65946 |

**SAMPLE RESULTS**

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| Parameter & Allowed specifications | Method used | Result sample number 13 |
|---|---|---|
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 52.69 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | MTLSQ-WI-002 | 98.5 |
| Cobolt mg/l/dm3<br>**LIMITS: n/s** | SANS 6170:2010 | 0.630 |
| Copper as Cu mg/l/dm3<br>**LIMITS: n/s** | SANS 5203:2010 | 0.090 |
| *Cyanide mg/dm3<br>**LIMITS: n/s** | | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | <0.01 |

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| | | | REV No: 00 | |
| | Data captured by: R.Marx | Signature: | Date Approved: 22 August 2018 | |
| | Report signatory: E.Erasmus | | Page 6 of 6 | |

| | | |
|---|---|---|
| *Heterotophic Plate Count cfu/1ml **LIMITS: n/s** | | 1440 |
| Iron as Fe mg/l/dm3 **LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | 0.324 |
| pH Units **LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 7.08 |
| Sodium as Na mg/l/dm3 **LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 506.90 |
| Sulphate as So4 mg/l/dm3 **LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 490 |
| *Total Dissolved Solids mg/dm3 **LIMITS: N/S** | SANS 5213:2005 | 2335 |
| *Total Organic Carbon mg/dm3 **LIMITS: n/s** | HACH 10173 | 3 |

Master document

| | | | | |
|---|---|---|---|---|
| | Black= Under limit | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | N/A=not applicable | N/S=not specified |

*Not SANAS Accredited tests and are not included in the SANAS schedule of accreditation for this laboratory

*** Subcontracted test are not included in the SANAS schedule of accreditation for this laboratory

These results relate only to the items tested and to the sample as received from the customer.

Sampling date and time information supplied by the customer. The sampling date and temperature as received from the customer can effect the validity of results.

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| MEETSE TECH LABORATORY | CERTIFICATE OF ANALYSIS GOLDPLAT RECOVERY | QM No: 7.8/F-03-09 |
|---|---|---|
| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
| | Data captured by: R.Marx | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 1 of 6 |

| COMPANY INFORMATION | |
|---|---|
| Meetse Tech Laboratory Services CC | Tel# 0119681648/0844659947 Fax# 0865870322 |
| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| CLIENT INFORMATION | |
|---|---|
| Client: Goldplat Recovery Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| Sample information | | | | | |
|---|---|---|---|---|---|
| Date Range | 27/06/2019 – 10/07/2019 | | | | |
| Date & Time | Not known | | | | |
| Description & Container | Water | | 5L container | | |
| Invoice # | 10676 | | | | |
| Sample # | 1 | 2 | 3 | 4 | 5 |
| Name | FM 3 | GBP | FM 4 | GP 4 | GP 6 |
| Lab # | 66106 | 66107 | 66108 | 66109 | 66110 |

**SAMPLE RESULTS**

| Parameter & Allowed specifications | Method used | Result sample number 1 FM3 | Result sample number 2 GBP | Result sample number 3 FM4 | Result sample number 4 GP4 | Result sample number 5 GP6 |
|---|---|---|---|---|---|---|
| Calcium (CaC03) mg/l/dm3 **LIMITS: Recommended= 150 Max=200 Crisis=400 Water Act= n/s** | MTLSQ-WI-011 | 1259.67 | 130.69 | 58.25 | 416.20 | 38.26 |
| Chloride as Cl mg/l/dm3 **LIMITS: Recommended= 250 Max=600 Crisis=1200 Water Act= n/s** | MTLSQ-WI-002 | 606.16 | 904.57 | 274.41 | 463.43 | 8.71 |
| Coboit mg/l/dm3 **LIMITS: n/s** | SANS 6170:2010 | 3.7 | 4.2 | 2.76 | 3.14 | 0.306 |
| Copper as Cu mg/l/dm3 **LIMITS: n/s** | SANS 5203:2010 | 0.61 | 37.7 | 0.4 | 0.54 | 0.056 |
| *Cyanide mg/dm3 **LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3 | HACH 10173 | 18 | 939 | 6 | 9 | 3 |

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|---|---|---|---|
| | | ISO 17025 Clause 8.3 | |
| | | REV No: 00 | |
| | Data captured by: R.Marx | Date Approved: 22 August 2018 | |
| | Report signatory: E.Erasmus | Page 2 of 6 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **LIMITS: n/s** | | | | | | |
| *Heterotophic Plate Count cfu/1ml **LIMITS: n/s** | | 21500 | 380 | 870 | 55000 | 68000 |
| Iron as Fe mg/l/dm3 **LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | 0.151 | 19.69 | 0.139 | 0.095 | 0.059 |
| pH Units **LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 7.15 | 11.14 | 5.9 | 6.47 | 6.16 |
| Sodium as Na mg/l/dm3 **LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 1367 | 664.64 | 120.28 | 406.516 | 10.7850 |
| Sulphate as So4 mg/l/dm3 **LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 204.6 | 1308 | 534 | 1348 | 16 |
| *Total Dissolved Solids mg/dm3 **LIMITS: N/S** | SANS 5213:2005 | 7513 | 6149 | 2145 | 3411 | 143 |
| *Total Organic Carbon mg/dm3 **LIMITS: n/s** | HACH 10173 | 1 | 43 | <0.01 | 2 | <0.01 |
| | Black= Under limit | | | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | | | N/A=not applicable | N/S=not specified |
| Comments: | | | | | | |
| Results authorized by (TS) Engela Erasmus | | | | | | |

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| | Report signatory: E.Erasmus | Page 3 of 6 |

| COMPANY INFORMATION | |
|---|---|
| Meetse Tech Laboratory Services CC | Tel# 0119681648/0844659947 Fax# 0865870322 |
| 81B Eva Road, Fairleads, Benoni, 1512 | Engela Erasmus # 0822539462 Rosheen Marx # 0834635693 |
| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| CLIENT INFORMATION | |
|---|---|
| Client: Goldplat Recovery Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| Sample information | | | | | |
|---|---|---|---|---|---|
| Date Range | 27/06/2019 – 10/07/2019 | | | | |
| Date & Time | Not known | | | | |
| Description & Container | Water | | 5L container | | |
| Invoice # | 10676 | | | | |
| Sample # | 6 | 7 | 8 | 9 | 10 |
| Name | GP5 | GP1 | GP2 | GP3 | Blesbok Upstream |
| Lab # | 66111 | 66112 | 66113 | 66114 | 66115 |

**SAMPLE RESULTS**

| Parameter & Allowed specifications | Method used | Result sample number 1 GP5 | Result sample number 2 GP1 | Result sample number 3 GP2 | Result sample number 4 GP3 | Result sample number 5 Blesbok Upstream |
|---|---|---|---|---|---|---|
| Calcium (CaC03) mg/l/dm3 **LIMITS: Recommended= 150 Max=200 Crisis=400 Water Act= n/s** | MTLSQ-WI-011 | 16.484 | 42.116 | 220.028 | 56.17 | 26.95 |
| Chloride as Cl mg/l/dm3 **LIMITS: Recommended= 250 Max=600 Crisis=1200 Water Act= n/s** | MTLSQ-WI-002 | 14.26 | 108.58 | 189.96 | 345.32 | 9.87 |
| Cobolt mg/l/dm3 **LIMITS: n/s** | SANS 6170:2010 | 0.292 | 2.51 | 3.29 | 3.12 | 0.176 |
| Copper as Cu mg/l/dm3 **LIMITS: n/s** | SANS 5203:2010 | 0.054 | 0.36 | 0.46 | 0.50 | 0.02 |
| *Cyanide mg/dm3 **LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| *Dissolved Organic Carbon mg/dm3 | HACH 10173 | <0.01 | 1 | 1 | 10 | 20 |

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|---|---|---|
| | | ISO 17025 Clause 8.3 |
| | Data captured by: R.Marx | REV No: 00 |
| | | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 4 of 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **LIMITS: n/s** | | | | | | |
| *Heterotophic Plate Count cfu/1ml **LIMITS: n/s** | | 168000 | 340000 | 1340000 | 980000 | 33000 |
| Iron as Fe mg/l/dm3 **LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | 0.07 | 0.078 | 0.081 | 0.123 | 0.154 |
| pH Units **LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 6.01 | 6.08 | 6.31 | 8.00 | 6.40 |
| Sodium as Na mg/l/dm3 **LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 9.8212 | 64.317 | 81.369 | 373.87 | 15.6737 |
| Sulphate as So4 mg/l/dm3 **LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 19 | 574 | 605 | 509 | 37 |
| *Total Dissolved Solids mg/dm3 **LIMITS: N/S** | SANS 5213:2005 | 92 | 2135 | 2563 | 2653 | 212 |
| *Total Organic Carbon mg/dm3 **LIMITS: n/s** | HACH 10173 | <0.01 | <0.01 | 113 | 5 | 14 |
| | Black= Under limit | | | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | | | N/A=not applicable | N/S=not specified |
| Comments: | | | | | | |
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| | | REV No: 00 |
| | Data captured by: R.Marx | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 5 of 6 |

| COMPANY INFORMATION | |
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| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| CLIENT INFORMATION | |
|---|---|
| Client: Goldplat Recovery Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| Sample information | | |
|---|---|---|
| Date Range | 27/06/2019 – 10/07/2019 | |
| Date & Time | Not known | |
| Description & Container | Water | 5L container |
| Invoice # | 10676 | |
| Sample # | 11 | |
| Name | Blesbok Downstream | |
| Lab # | 66116 | |

| SAMPLE RESULTS | | |
|---|---|---|
| Parameter & Allowed specifications | Method used | Result sample number 1 Blesbok Downstream |
| Calcium (CaC03) mg/l/dm3<br>**LIMITS:**<br>**Recommended= 150**<br>**Max=200**<br>**Crisis=400**<br>**Water Act= n/s** | MTLSQ-WI-011 | 81.95 |
| Chloride as Cl mg/l/dm3<br>**LIMITS:**<br>**Recommended= 250**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | MTLSQ-WI-002 | 103.6 |
| Cobolt mg/l/dm3<br>**LIMITS: n/s** | SANS 6170:2010 | 0.199 |
| Copper as Cu mg/l/dm3<br>**LIMITS: n/s** | SANS 5203:2010 | 0.037 |
| *Cyanide mg/dm3<br>**LIMITS: n/s** | | <0.01 |
| *Dissolved Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | 9 |
| *Heterotophic Plate Count cfu/1ml<br>**LIMITS: n/s** | | 46000 |
| Iron as Fe mg/l/dm3<br>**LIMITS:** | SANS 5207:2010 | 0.051 |

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| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
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| | Report signatory: E.Erasmus | Page 6 of 6 |

| | | |
|---|---|---|
| **Recommended= 0.01**<br>**Max=1.0**<br>**Crisis=2.0**<br>**Water Act= 1.0** | | |
| pH Units<br>**LIMITS:**<br>**Recommended= 6.0-9.0**<br>**Max=5.5-9.0**<br>**Crisis=<4.0 - >11**<br>**Water Act= 5.5-9.5** | SANS 5011:2005 | 6.72 |
| Sodium as Na mg/l/dm3<br>**LIMITS:**<br>**Recommended= 100**<br>**Max=400**<br>**Crisis=800**<br>**Water Act= n/s** | SANS 6050:2010 | 53.5802 |
| Sulphate as So4 mg/l/dm3<br>**LIMITS:**<br>**Recommended= 200**<br>**Max=600**<br>**Crisis=1200**<br>**Water Act= n/s** | SANS 6310:2005 | 52 |
| *Total Dissolved Solids mg/dm3<br>**LIMITS: N/S** | SANS 5213:2005 | 343 |
| *Total Organic Carbon mg/dm3<br>**LIMITS: n/s** | HACH 10173 | <0.01 |

| | | | |
|---|---|---|---|
| Black= Under limit | | Green= On Limit | Red=Over Limit |
| TNTC=to numerous to count | | N/A=not applicable | N/S=not specified |

Comments:

Results authorized by (TS) Engela Erasmus

- These results relate only to the items tested and to the sample as received from the client
- This certificate will not be reproduced, except in full, without the approval of the laboratory

*Not SANAS Accredited tests and are not included in the SANAS schedule of accreditation for this laboratory

*** Subcontracted test not included in the SANAS schedule of accreditation for this laboratory

- (!) Results could be influenced as a result of deviation noted under "Unacceptable" "condition of sample"

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|---|---|---|
| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
| | Data captured by: R.Marx | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 1 of 7 |

| COMPANY INFORMATION | |
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| Website: www.meetsetech.com | Email: meetse@iafrica.com / meetsetech@gmail.com |

| CLIENT INFORMATION | |
|---|---|
| Client: Goldplat Recovery<br>Tel# 011 423 1202/3/4 083 553 9210 | Corner Vermont & New Modder Roads, Modder Bee, Benoni, 1500 |

| Sample information | | | | | |
|---|---|---|---|---|---|
| Date Range | 21/08/2019 - 28/08/2019 | | | | |
| Date & Time | Not known | | | | |
| Description & Container | Water | | 5L container | | |
| Invoice # | 10676 | | | | |
| Sample # | 1 | 2 | 3 | 4 | 5 |
| Name | Ians dam | Ians discharge | B/B UP | B/B DOWN | PT |
| Lab # | 66144 | 66145 | 66146 | 66147 | 66148 |

| SAMPLE RESULTS | | | | | | |
|---|---|---|---|---|---|---|
| Parameter & Allowed specifications | Method used | Result sample number 1<br>Ians dam | Result sample number 2<br>Ians discharge | Result sample number 3<br>B/B Up | Result sample number 4<br>B/B Down | Result sample number 5<br>PT |
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - |
| Alkalinity M<br>Alkalinity P mg/l | MTLSQ-WI-001 | 1794.3<br>1071.0 | 2000<br>2000 | 213.4<br>7.5 | 156.1<br>0 | 344.8<br>267.5 |
| Ammonia as N mg/l | SANS 5217:2010 | | | | | |
| Calcium (CaC03) mg/l/dm3 LIMITS: Recommended= 150 Max=200 | MTLSQ-WI-011 | 4.88 | 5.85 | 34.15 | 29.84 | 308.74 |

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MEETSE TECH LABORATORY

**CERTIFICATE OF ANALYSIS**
**GOLDPLAT RECOVERY**

QM No: 7.8/F-03-09
ISO 17025 Clause 8.3
REV No: 00
Date Approved: 22 August 2018
Page 2 of 7

Data captured by: R.Marx

Report signatory: E.Erasmus

| | | | | | | |
|---|---|---|---|---|---|---|
| **Crisis=400 Water Act= n/s** | | | | | | |
| **Chloride as Cl mg/l/dm3 LIMITS: Recommended= 250 Max=600 Crisis=1200 Water Act= n/s** | MTLSQ-WI-002 | 695.85 | 437.71 | 46.10 | 33.40 | 605.01 |
| **Cobolt mg/l/dm3 LIMITS: n/s** | SANS 6170:2010 | 1.279 | 0.231 | 0.067 | 0.084 | 1.251 |
| **Copper as Cu mg/l/dm3 LIMITS: n/s** | SANS 5203:2010 | 25.7 | 15.2 | 0.027 | .008 | 17.92 |
| ***Cyanide mg/dm3 LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| ***Dissolved Organic Carbon mg/dm3 LIMITS: n/s** | HACH 10173 | 79 | 197 | 1 | 6 | 360 |
| ***Heterotophic Plate Count cfu/1ml LIMITS: n/s** | | | | | | |
| **Iron as Fe mg/l/dm3 LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | 9 | 15.53 | 0.182 | <0.01 | 3.55 |
| **pH Units LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 12.16 | 13.95 | 8.94 | 8.00 | 11.85 |
| **Sodium as Na mg/l/dm3 LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 1620 | 8000 | 100 | 73 | 820 |
| **Sulphate as So4 mg/l/dm3 LIMITS: Recommended= 200 Max=600 Crisis=1200** | SANS 6310:2005 | 630 | 120 | 30 | 42 | 1681 |

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| MEETSE TECH LABORATORY | CERTIFICATE OF ANALYSIS GOLDPLAT RECOVERY | QM No: 7.8/F-03-09 |
|---|---|---|
| | | ISO 17025 Clause 8.3 |
| | Data captured by: R.Marx | REV No: 00 |
| | Report signatory: E.Erasmus | Date Approved: 22 August 2018 |
| | | Page 3 of 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Water Act= n/s** | | | | | | |
| ***Total Dissolved Solids mg/dm3 LIMITS: N/S** | SANS 5213:2005 | 4504 | 31025 | 473 | 347 | 4809 |
| ***Total Organic Carbon mg/dm3 LIMITS: n/s** | HACH 10173 | 109 | 203 | 13 | 21 | 365 |
| **Total Suspendid Solids mg/dm3 LIMITS: n/s** | SANS 6049:2010 | 131 | 42 | 14 | 2 | 337 |
| | Black= Under limit | | | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | | | N/A=not applicable | N/S=not specified |
| **Comments:** | | | | | | |
| **Results authorized by (TS) Engela Erasmus** | | | | | | |

| Sample information | | | | | |
|---|---|---|---|---|---|
| **Date Range** | 21/08/2019 - 28/08/2019 | | | | |
| **Date & Time** | Not known | | | | |
| **Description & Container** | Water | | 5L container | | |
| **Invoice #** | 10676 | | | | |
| **Sample #** | 6 | 7 | 8 | 9 | 10 |
| **Name** | PF | GPB | FM3 | FM4 | GP1 |
| **Lab #** | 66149 | 66150 | 66151 | 66152 | 66153 |

| SAMPLE RESULTS | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter & Allowed specifications** | Method used | Result sample number 6 PF | Result sample number 7 GPB | Result sample number 8 FM3 | Result sample number 9 FM4 | Result sample number 10 GP1 |
| **Acidity mg/l** | MTLSQ-WI-001 | - | - | - | - | - |
| **Alkalinity M** | MTLSQ-WI-001 | 744.5 | 216.9 | 238.5 | 97.0 | 22.6 |
| **Alkalinity P mg/l** | | 354.3 | 499.0 | 0 | 0 | 0 |
| **Ammonia as N mg/l** | SANS 5217:2010 | | | | | |

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| | | REV No: 00 |
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| | Report signatory: E.Erasmus | Page 4 of 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Calcium (CaC03) mg/l/dm3 LIMITS: Recommended= 150 Max=200 Crisis=400 Water Act= n/s** | MTLSQ-WI-011 | 83.02 | 31.18 | 485.27 | 241.37 | 54.75 |
| **Chloride as Cl mg/l/dm3 LIMITS: Recommended= 250 Max=600 Crisis=1200 Water Act= n/s** | MTLSQ-WI-002 | 619.36 | 423.72 | 743.4 | 262.23 | 143.48 |
| **Cobolt mg/l/dm3 LIMITS: n/s** | SANS 6170:2010 | 3.570 | 1.816 | 3.82 | 0.395 | 0.130 |
| **Copper as Cu mg/l/dm3 LIMITS: n/s** | SANS 5203:2010 | 57.2 | 35.4 | 1.78 | <0.01 | <0.01 |
| ***Cyanide mg/dm3 LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| ***Dissolved Organic Carbon mg/dm3 LIMITS: n/s** | HACH 10173 | 144 | 77 | 38 | 9 | 211 |
| ***Heterotophic Plate Count cfu/1ml LIMITS: n/s** | | | | | | |
| **Iron as Fe mg/l/dm3 LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | 19.03 | 11.46 | 0.05 | 2.77 | <0.01 |
| **pH Units LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 10.36 | 10.20 | 8.18 | 7.00 | 6.25 |
| **Sodium as Na mg/l/dm3 LIMITS: Recommended= 100 Max=400 Crisis=800 Water Act= n/s** | SANS 6050:2010 | 1570 | 1060 | 2080 | 230 | 290 |
| **Sulphate as So4** | SANS | 1025 | 801 | 1918 | 852 | 980 |

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| | Report signatory: E.Erasmus | Page 5 of 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| mg/l/dm3 LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s | 6310:2005 | | | | | |
| *Total Dissolved Solids mg/dm3 LIMITS: N/S | SANS 5213:2005 | 5035 | 2977 | 833.1 | 2056 | 2181 |
| *Total Organic Carbon mg/dm3 LIMITS: n/s | HACH 10173 | 141 | 114 | 78 | 8 | 7 |
| Total Suspendid Solids mg/dm3 LIMITS: n/s | SANS 6049:2010 | 88 | 57 | 25 | 60 | 876 |
| | Black= Under limit | | | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | | | N/A=not applicable | N/S=not specified |
| Comments: | | | | | | |
| Results authorized by (TS) Engela Erasmus | | | | | | |

| Sample information | | | | | |
|---|---|---|---|---|---|
| Date Range | 21/08/2019 - 28/08/2019 | | | | |
| Date & Time | Not known | | | | |
| Description & Container | Water | | 5L container | | |
| Invoice # | 10676 | | | | |
| Sample # | 11 | 12 | 13 | 14 | 15 |
| Name | GP2 | GP3 | GP4 | GP5 | GP6 |
| Lab # | 66154 | 66155 | 66156 | 66157 | 66158 |

| SAMPLE RESULTS | | | | | | |
|---|---|---|---|---|---|---|
| Parameter & Allowed specifications | Method used | Result sample number 11 GP2 | Result sample number 12 GP3 | Result sample number 13 GP4 | Result sample number 14 GP5 | Result sample number 15 GP6 |
| Acidity mg/l | MTLSQ-WI-001 | - | - | - | - | - |
| Alkalinity M | MTLSQ-WI-001 | 75.2 | 41.7 | 59.2 | 27.6 | 70.7 |

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| MEETSE TECH LABORATORY | CERTIFICATE OF ANALYSIS GOLDPLAT RECOVERY | QM No: 7.8/F-03-09 |
|---|---|---|
| | | ISO 17025 Clause 8.3 |
| | | REV No: 00 |
| | Data captured by: R.Marx | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 6 of 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Alkalinity P mg/l** | | 0 | 0 | 0 | 0 | 0 |
| **Ammonia as N mg/l** | SANS 5217:2010 | | | | | |
| **Calcium (CaC03) mg/l/dm3 LIMITS: Recommended= 150 Max=200 Crisis=400 Water Act= n/s** | MTLSQ-WI-011 | 123.69 | 347.94 | 143.86 | 89.93 | 26.96 |
| **Chloride as Cl mg/l/dm3 LIMITS: Recommended= 250 Max=600 Crisis=1200 Water Act= n/s** | MTLSQ-WI-002 | 187.53 | 353.40 | 474.71 | 12.4 | 76.2 |
| **Cobolt mg/l/dm3 LIMITS: n/s** | SANS 6170:2010 | 0.702 | 0.415 | 0.378 | 0.111 | 0.074 |
| **Copper as Cu mg/l/dm3 LIMITS: n/s** | SANS 5203:2010 | <0.01 | 0.130 | 0.054 | <0.01 | <0.01 |
| ***Cyanide mg/dm3 LIMITS: n/s** | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| ***Dissolved Organic Carbon mg/dm3 LIMITS: n/s** | HACH 10173 | 4 | 5 | 31 | 4 | 7 |
| ***Heterotophic Plate Count cfu/1ml LIMITS: n/s** | | | | | | |
| **Iron as Fe mg/l/dm3 LIMITS: Recommended= 0.01 Max=1.0 Crisis=2.0 Water Act= 1.0** | SANS 5207:2010 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **pH Units LIMITS: Recommended= 6.0-9.0 Max=5.5-9.0 Crisis=<4.0 - >11 Water Act= 5.5-9.5** | SANS 5011:2005 | 7.54 | 7.16 | 7.62 | 5.85 | 6.98 |
| **Sodium as Na mg/l/dm3 LIMITS: Recommended= 100** | SANS 6050:2010 | 290 | 540 | 680 | 7 | 30 |

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|---|---|---|
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| | Data captured by: R.Marx | Date Approved: 22 August 2018 |
| | Report signatory: E.Erasmus | Page 7 of 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Max=400 Crisis=800 Water Act= n/s** | | | | | | |
| **Sulphate as So4 mg/l/dm3 LIMITS: Recommended= 200 Max=600 Crisis=1200 Water Act= n/s** | SANS 6310:2005 | 1007 | 894 | 1063 | 19 | 29 |
| ***Total Dissolved Solids mg/dm3 LIMITS: N/S** | SANS 5213:2005 | 2415 | 2240 | 3005 | 69 | 160 |
| ***Total Organic Carbon mg/dm3 LIMITS: n/s** | HACH 10173 | 9 | 2 | 36 | 8 | 3 |
| **Total Suspendid Solids mg/dm3 LIMITS: n/s** | SANS 6049:2010 | 264 | 207 | 306 | 438 | 369 |
| | Black= Under limit | | | | Green= On Limit | Red=Over Limit |
| | TNTC=to numerous to count | | | | N/A=not applicable | N/S=not specified |
| **Comments:** | | | | | | |
| **Results authorized by (TS) Engela Erasmus** | | | | | | |

- These results relate only to the items tested and to the sample as received from the client
- This certificate will not be reproduced, except in full, without the approval of the laboratory

*Not SANAS Accredited tests and are not included in the SANAS schedule of accreditation for this laboratory

*** Subcontracted test not included in the SANAS schedule of accreditation for this laboratory

- (!) Results could be influenced as a result of deviation noted under "Unacceptable" "condition of sample"

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# Goldplat Recovery (Pty) Ltd:

## GEOCHEMICAL ASSESSMENT OF TAILINGS DISPOSAL

**DOC NO: REVISION 2**

**Prepared by**

**Dr. R.H. Boer**

**Aquatox Consulting (Pty) Ltd**

Aquatox
Consulting Pty Ltd

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**Prepared for:**

**GOLDPLAT RECOVERY PTY LTD**

**October 2021**

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# 1 Introduction and Scope of Report

Aquatox Consulting (Pty) Ltd (Aquatox) were appointed by Goldplat Recovery (Pty) Ltd to assist with geochemical characterisation of the waste rock and tailings for the proposed Goldplat recovery project near Benoni, Witwatersrand. A decision is required to establish where the waste material emanating from the process plant should be deposited. There are three(3) options available and this document will evaluate and present the pro's and con's of the options.

The Goldplat project comprises of an array of on-site gold recovery processes and techniques.

## 1.1 The qualifications of specialist

Rudy Boer graduated with a PhD (Geochemistry) in 1995 from the University of the Witwatersrand. He, furthermore, received post-graduate tuition during long-term sojourns at the following institutions:

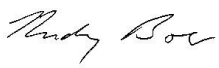
- Centre de Recherches sur la Geologie des Matieres Premieres Minerales et Energetiques (CREGU), Nancy, France;
- Laboratoire de Spectrométrie de Vibrations, Université de Nancy I, Nancy, France;
- Department of Geological Sciences, University of Michigan, Ann Arbor, United States of America.

After four years with the Economic Geology Research Unit, he joined the Department of Geology at the University of the Witwatersrand. During the eight years that he was employed at the University of the Witwatersrand, he was involved in a wide variety of applied economic geology and exploration geochemistry projects. Subsequently, he took up a professorship at the University of the Free State where his main responsibilities included the development, co-ordination and management of a newly introduced Masters degree programme in Mineral Resource Management. Rudy is a Fellow of the Geological Society of South Africa (Mem. No. 964609), from which he has also received the Jubilee Medal. He currently serves on several Water Research Commission Project Steering Committees and is registered with the South African Council for Natural Scientific Professions (Reg. No. 400010/03).

# 2 DECLARATION OF INDEPENDENCE

## 2.1 SPECIALIST DECLARATION OF INDEPENDENCE AND STATEMENT OF OBJECTIVITY

I, Rudolf Hans (Rudy) Boer (ID 6011125085085), hereby declare that I have no conflict of interest related to the work of this report. Specially, I declare that I have no personal financial interests in the property and/or development being assessed in this report, and that I have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the development. I declare that the opinions expressed in this report are my own and a true reflection of my professional expertise.



*R.H. Boer* PhD, Pr Sci Nat, FGSSA

### 2.1.1 Summary of the EAP's past experience

He was author and co-author of more than 30 technical peer reviewed publications in international journals and approximately 40 extended abstracts published in conference proceedings, as well as numerous technical publications. He has also been responsible for the project management of over 140 environmental projects ranging from water use license applications to mining right environmental management plans.

## 3 Background and Brief

The geochemical characterisation of the waste rock and tailings material is required to support the water use license and waste license applications of the Goldplat Recovery (Pty)Ltd (Goldplat) project.

Goldplat operates from a 22-hectare freehold site based near Benoni in Gauteng, which is near the centre of the East Rand Goldfield. After testing to establish assay, moisture content, recoverability and size, Goldplat purchases the waste materials from licenced mine operators when they become available, which helps management to schedule production in an efficient manner and makes it more difficult for potential competitors to enter the market.

Goldplat's extraction processes and multiple process lines enable it to keep materials separate, which provides a high degree of flexibility when proposing a solution for a particular type of material. The processes which are employed include roasting in a rotary kiln, crushing, milling, thickening, flotation, gravity concentrators, leaching, CIL, elution and smelting of bullion.

Production is scheduled to make the most efficient use of the materials taking into account the ore grade and anticipated recovery factors. Raw materials are blended and routed to the various plants in an effort to ensure that production levels are reasonably consistent from month to month. In some cases, similar material can be treated in different plants. The wide variety of materials stockpiled means that it can benefit from being able to blend materials for more effective processing.

Precious metals are usually recovered from materials within a single process. In some cases, there may be a second process which takes place many months afterwards, for instance where the residue from processing very high-grade material is left to oxidize in a stock dam in order to enhance the overall recovery rate. Such stock dams can contain substantial amounts of gold and PGM. Goldplat's recovery plant is designed to process a variety of material, such as:

- Woodchips, which are generated from underground mine supports which become caught up in the ore being processed. They are screened off after the milling stage of the mine operator's processing plant;
- Vlei material, which is generated in the vicinity of the mine operator's processing plant and which tends to accumulate in settlement dams or vleis;
- Fine carbon, which is generated when modern processing plant re-processes activated carbon for reuse. The abraded carbon grains are collected by screens or filters in the mine operator's processing plant;
- Waste grease, which when replaced is re-processed by Goldplat to recover spillages of ore which has stuck to the grease;

- Liners, which are used to protect the mill shell used in the mine operator's processing plant. Made of rubber or steel alloys, they collect small amounts of gold or precious metals which can be liberated through the company's processes.

Any product which contains precious metals is of interest to Goldplat's research team who will investigate methods to extract metal from types of material which have not previously been processed by other mines.

Three disposal alternatives were investigated in this study:

Alternative 1: Disposal into West Pit 3;

Alternative 2: Extension of the current TSF on the foot print of the historic 5L24; and

Alternative 3: Disposal at the historic 5L23 dump (established in 1938).

## 3.1 Nature of the brief

The large array of extraction processes, as well as the different material submitted for extraction, should have an influence on the nature of the waste material. The objectives for the geochemical characterisation are to determine the most environmental responsible manner for the disposal of tailings. The approach towards obtaining a result was to determine and define the impact of waste disposal within the proposed disposal sites as follow:

- Geological description
- Assessment of waste rock and tailings geochemistry to provide an assessment of the potential geochemical reactivity and stability of residues for the project;
- Classification of the waste rock and tailings in terms of the National Environmental Management: Waste Act 59 of 2008 (NEM: WA);
- A description of the relevant properties of two possible waste storage facilities on-site, i.e. 5L23 and 5L24, which would enable a selection to be made with regard to a preferable site.

# 4 Legislated requirements

## 4.1 Waste Classification and Management Regulations

The National Norms & Standards for the Assessment of Waste for Landfill Disposal (GN 635) have replaced the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF, 1998). In terms of Regulation 7(2) of GN 635, the potential level of risk associated with disposal or downstream use of wastes must be determined by following the prescribed and; appropriate leach test protocols. The Regulations Regarding The Planning and Management Of Residue Stockpiles And Residue Deposits from a Prospecting, Mining, Exploration Or Production Operation' published in Government Gazette No 39020 dated 24 July 2015, require that mining residues be assessed in terms of the National Environmental Management: Waste Act 59 of 2008 (NEM: WA).

The procedures require the determination of both the Total Concentration (TC in mg/kg) and Leachable Concentration (LC in mg/L) of a particular contaminant in a waste to be assessed against the Total Concentration Thresholds (TCT) and the Leachable Concentration Thresholds (LCT) for particular contaminants in a waste.

Various threshold levels for the TCT (TCT0, TCT1, TCT2) and LCT (LCT0, LCT1, LCT2 and LCT3) are provided which, in combination, determine the Risk Profile and corresponding waste types as set out below.

- Type 4 Waste: wastes with all determinant concentrations below the LCT0 and TCT0 values;
- Type 3 Waste: wastes with any determinant concentration above the LCT0 but below the LCT1 value and all determinant concentrations below the TCT1 values;
- Type 2 Waste; wastes with any determinant concentration above the LCT1 but below the LCT2 values, and all determinant concentrations below the TCT1 values;
- Type 1 Waste: wastes with any determinant concentration above the LCT2 but below the LCT3 values, or above the TCT1 but below the TCT2 values; and
- Type 0 Waste: wastes with any determinant concentration above the LCT3 or TCT2 values.

# 5 Methodology

The approach that was followed for the geochemical assessment of the waste rock and tailings materials was to collect representative samples of material. Information on the site geology and the project sites were sourced from a number of reports and on-site observations.

The methodology followed for the assessment was as follows:

- Initial site visit and inception meeting with client representatives and the project team;
- Identification of different waste types (if any) present on-site;
- Sampling of surface and borehole water for analyses at an accredited laboratory;
- Samples of the different composition were then identified in the available tailings material, stock materials and two natural (i.e. background or floor) samples were collected for submission to the laboratory;
- Samples were analysed for their mineral content in a semi-quantitative manner using the X-ray diffraction technique (XRD);
- Following the mineralogical characterisation, the samples were analysed for their whole rock chemical composition, using the X-ray Fluorescence (XRF) technique;
- Finally, samples were submitted to leaching with a slightly acidic fluid and the leachate was analysed for major and trace elements;
- The analytical results were interpreted and placed into the framework as dictated by NEM: WA 2008 (Act No. 59 of 2008), Sections No. 634, 635 and 636.

# 6 Geology

In the East Rand Goldfield, the gold bearing conglomerates, which were extensively mined from surface down to depths in excess of 2500 m, outcrop at two localities near Benoni and again near Nigel (Figure 2). For the rest of the area, the reefs sub-crop against the Transvaal or Karoo Supergroups. The Main Reef was mined extensively and the Kimberly Reefs to a lesser extent. For the majority of the area, the Witwatersrand Formation is overlain by the Transvaal Supergroup, which in this area comprises the Black Reef Formation and the overlaying Malmani Formation. The Black Reef, which was also locally mined for gold, occurs at the base of the Black Reef Formation.

Sedimentary rocks of the Karoo Supergroup overlie the Transvaal Supergroup. It consists mainly of shale, sandstone and mudstones of the Ecca Group. Economic coal layers, which were mined at a number of localities, occur within some of the strata, in particular the Vryheid Formation. A coal seam is visible in the open pit on the Goldplat premises (Figure 1). The strata visible in the pit wall consist of shale, mudstone and sandstone. The entire Goldplat premises is covered with rocks belonging to the Ecca Group. Structurally, the basin is marked by prominent folding, resulting in a number of sub-basins. These faults tend to strike east-west, while another major fault-set strikes north-west south-east. A number of diabase and syenite dykes and sills occur in the area.

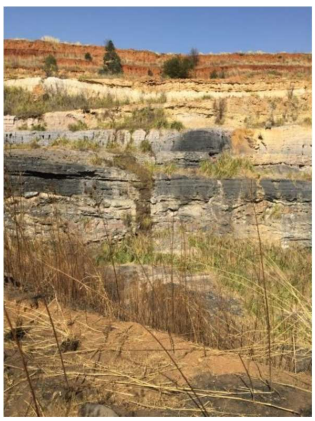


*Figure 1. Carbonaceous shale of the Vryheid Formation, Ecca Group. The rocks of the Karoo Supergroup cover the entire Goldplat site.*

Beneath the above-mentioned reef a disconformity truncates (cuts) the Main and Blyvooruitzicht Formations across the Springs monocline, and has eroded until the Jeppestown Subgroup. This subgroup is the youngest subgroup of the West Rand Group, and is part of the Witwatersrand Supergroup within the East Rand Basin. On the western part of the basin the Witwatersrand sediments are covered by the Ventersdorp Supergroup. The Ventersdorp Supergroup consists of amygdaloidal and porphyritic lavas, which have been eroded over the north-eastern part of the basin by pre-Transvaal erosion. The Black Reef Formation and dolomite of the Transvaal Supergroup then overlie the Ventersdorp Supergroup. The closure of the syncline occurs in the central and eastern parts. It is here where the Ventersdorp Supergroup and Witwatersrand Supergroup are covered by the Karoo Supergroup. These highly weathered lower Karoo sediments of up to 80 m thick also cover more than 90% of the rest of the East Rand Basin. These Karoo sediments consist of shale, sandstones and coal beds of the Ecca Group with the Dwyka formation at its base. Peneplanation took place before the area was covered by the Karoo Supergroup. Over the south-westerly parts of the basin the Black Reef quartzite has been deposited on the Ventersdorp lavas. The quartzite of this reef is known to be mature quarzitic sandstone, which is known to represent a phase of beach-type deposits. The Black Reef quartzite has a total thickness of m across the basin. This deposition was progressively followed by upper and lower Witwatersrand Rocks, northwards and eastwards. A slight and often indistinct angular unconformity appears at the base of the Black Reef quartzite formation between the Witwatersrand and Ventersdorp Supergroups. The Black Reef quartzite and the Malmani dolomite of the Transvaal Supergroup together cover about two-thirds of the East Rand Basin and reach a maximum depth of 400 m on the Daggafontein / Grootvlei boundary. The Malmani dolomite is known to be rich in chert and light of colour in the lower and upper dolomite zones. These zones are also known as the five

formations, which subdivide the Malmani Subgroup. These formations together have an overall thickness of +/- 370 m. At the basal transitional zone, the Oak Tree Formation, the dolomite is known to be dark in colour due to the absence or little chert and the high quantities of clastic sediment. This clastic sediment is known to consist of quartzite and carbonaceous mudstone.

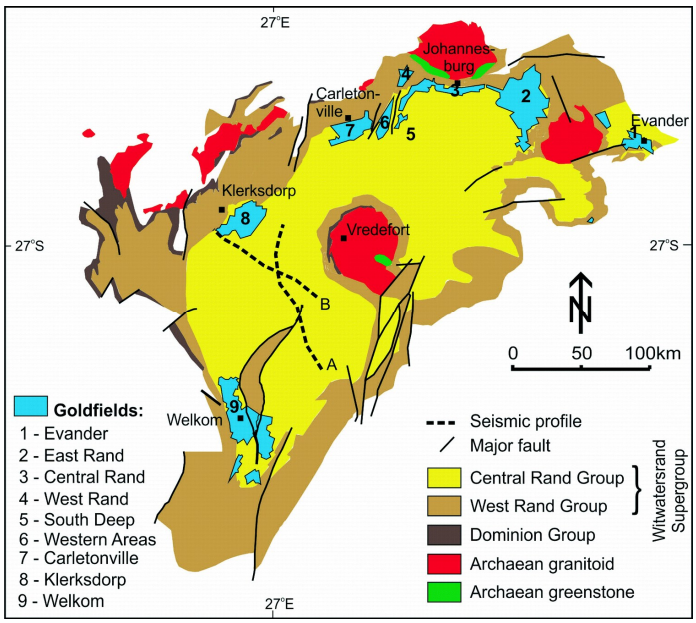



*Figure 2. The position of the East Rand Goldfield relative to the other mining centres of the Witwatersrand.*

# 7 Sample Locations

## 7.1 Water Sampling

A summary of the available analytical results of water samples collected at Goldplat Recovery (Pty) Ltd are shown in Table 1 and the sample locations are depicted in Figure 3.

It is clear that the average TDS value for samples collected show high levels of pollution occurring over an extended period of time, i.e. since 2018. Two important aspects are obvious, 1) there seems to be an increase of pollution in an easterly direction across the premises, and 2) the pollution does not seem to form a migratory plume, but rather remain static at the source of pollution. The most westerly samples, i.e. GP5 and GP6, shown no signs of pollution. Furthermore, the lack of pollution plume migration is clearly shown in the upstream sample and downstream sample collected from the Blesbok Spruit, which show no pollution to be present in this section of the Blesbok Spruit.

It is important to note that no additional effort is required to contain pollution within the site boundaries, because of the fact that the water just does not migrate.

*Table 1. TDS analytical results for Goldplat samples*

| New Sample ID | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TDS (mg/l) | 01/06/2017 | 09/01/2018 | 31/01/2018 | 13/03/2018 | 12/04/2018 | 24-31 May 2018 | 13-26 July 2018 | 31/08/2018 | 29/11/2018 | 01/03/2019 | 27/06/2019 | 28/08/2019 |
| B/BOK DOWNSTREAM | 319 | 211 | 281 | 313 | 256 | 297 | 224 | 345 | 336 | 212 | 343 | 347 |
| B/BOK UPSTREAM | 115 | 343 | 173 | 202 | 197 | 202 | 341 | 270 | 259 | 170 | 212 | 473 |
| FF | 64 | 1714 | 2580 | | 5225 | | | | | | | |
| FM | 78 | 4617 | 5678 | | 4966 | | 5306 | | | | | |
| FM3 | 272 | 3580 | 3785 | 3589 | 4253 | 4375 | | | 7786 | 8177 | 7513 | 833.1 |
| FM4 | | 2218 | 2460 | 2324 | 4153 | 2298 | 2195 | 2196 | 2206 | 2335 | 2145 | 2056 |
| FT | 72 | 4900 | 5655 | | 4874 | | | | | | | |
| GP1 | | | 3308 | 3170 | 2149 | 2620 | 2380 | 2302 | 2023 | 1485 | 2135 | 2181 |
| GP2 | | | 3140 | 3197 | 2269 | 2745 | 2757 | 2735 | 2571 | 638 | 2563 | 2415 |
| GP3 | | | | 3090 | 2473 | 3021 | 3138 | 3518 | 3290 | 2506 | 2653 | 2240 |
| GP4 | | 2198 | | 3402 | 2923 | 3379 | 3192 | 30.78 | | 2841 | 3411 | 3006 |
| GP5 | | | | 204 | 1000 | 98 | 916 | | | 115 | 92 | 69 |
| GP6 | | 243 | | 231 | 1127 | 189 | 181 | 153 | 157 | 179 | 143 | 160 |
| GPB | | 326 | 4796 | 3713 | 2190 | 7502 | 5623 | | 6357 | 604 | 6148 | 2977 |
| PF | 83 | 3005 | 4255 | 3350 | 4748 | 5380 | 5347 | 10908 | 7629 | 439 | | 5035 |
| PT | 79 | 2128 | 3077 | 211 | 3482 | 209 | 1908 | 933 | 2950 | 288 | | 4809 |
| DWAF 1996: Class 1 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 |
| DWAF 1996: Class 2 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| DWAF 1996: Class 3 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 | 2400 |

;

*Figure 3. Water monitoring positions.*

## 7.2 Rock Samples

Composite samples collected include samples from the old tailings material (GPL 01a, GPL 01b, GPL 01c and GPL 01d). New tailings include samples GPL 02, stock material (GPL 03, GPL 04 and GPL05). Historic tailings from dump 5L23 is represented by GPL 06, GPL 07, GPL 08. The background value of locations 5L23 and 5L24 are represented by samples GPL 10 and GPL 09, respectively.

*Table 2. Sample description and identification*

| Sample date | GPL Sample description | Atox Sample ID | Long | Lat |
|---|---|---|---|---|
| 25-03-2020 | Old tailings 22 kg | GPL01a | 28,376942 | -26,182492 |
| 25-03-2020 | Old tailings 22 kg | GPL01b | 28,378609 | -26,182889 |
| 25-03-2020 | Old tailings 22 kg | GPL01c | 28,378129 | -26,181098 |
| 25-03-2020 | Old tailings 22 kg | GPL01d | 28,376986 | -26,181055 |
| 25-03-2020 | TP5; | GPL9 | 28,380325 | -26,180302 |
| 25-03-2020 | PGM Stockpile | GPL4 | 28,374411 | -26,184084 |
| 25-03-2020 | Woodchips Stockpile | GPL 3 | 28,371604 | -26,181990 |
| 25-03-2020 | Stockpile | GPL 5 | 28,370315 | -26,183526 |
| 25-03-2020 | 5L23 | GPL 7 | 28,363132 | -26,176741 |
| 25-03-2020 | 5L23 | GPL 6 | 28,367928 | -26,175773 |
| 25-03-2020 | 5L23 | GPL 8 | 28,364651 | -26,176472 |
| 07-05-2020 | 5L23 floor | GPL10 | 28,370641 | -26,174002 |

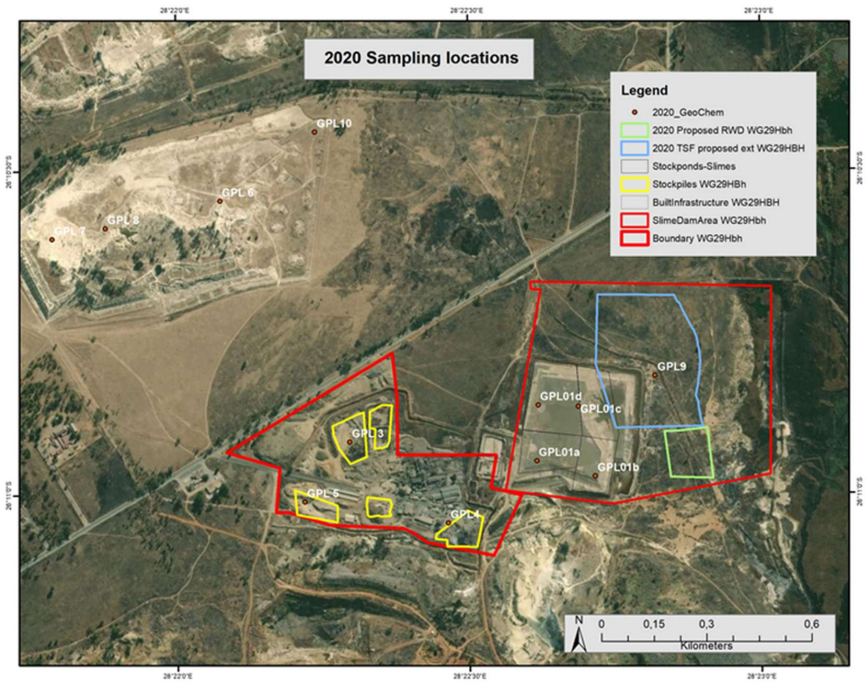



*Figure 4. Sample locations.*

## 8 Mineralogy

Rocks are made up of minerals and minerals consist of elements. If one could understand thee nature of the minerals present, it is possible to know more about possible hazardous constituents. The reason for performing the mineralogical studies on the waste material is primarily to obtain data that have the potential to yield more information regarding the nature of the original material, as well as the weathering conditions that these rock experienced. Furthermore, data would be obtained that relate something about the effect of the gold extraction process on the analysed material.

Mineralogical analyses were performed using the XRD analytical technique. The results are reported in Table 3. The XRD data suggest that the samples could be characterised into three groups.

- (Group 1) Quartz – Illite - Kaolinite – which include samples GPL1, GPL2, GPL3, GPL5, GPL9 and GPL 10;
- (Group 2) Quartz – Pyrophyllite – including samples GPL6, GPL7 and GPL8, whereas
- (Group 3) Quartz – Plagioclase – Enstatite - is typified by sample GPL4.

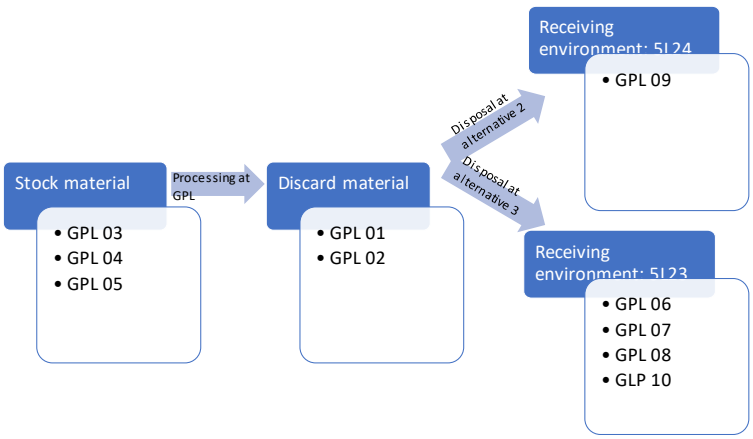



*Figure 5. Schematic lay out of the samples in relation to the process flow.*

## 8.1 Paragenesis

- Group 1 – the samples are characterized by the dominance of quartz and the presence of the clay minerals illite and kaolinite. The presence of hematite, goethite and gypsum show that the samples were subjected to oxidation of iron-rich sulphides, such as pyrite. Furthermore, secondary dolomite and calcite shows that the sample was subjected to intense weathering, which destroyed the pristine mineralogy of the samples. The chlorite suggests the alteration of an original ferro-magnesium phase.
- Group 2 – the samples all originate from the 5L23 waste rock dump, which consist of a distinct white matrix. Quartz, pyrophyllite and illite are the dominant mineral phases present. The absence of any trace of kaolinite and secondary iron phases, such as hematite or goethite is conspicuous. The mineralogy of the latter samples also indicate that the samples were subjected to intense weathering.
- Group 3 – the sample display a relative pristine mineralogy with quartz, plagioclase and the ortho-pyroxene, enstatite, being the dominant phases. The mineralogy of this sample suggests that the sample did not experienced weathering to the same degree as compared to the other groups. The mineralogy of this sample relates more to a basic igneous rock, such as a typical platinum-hosting ore.

*Table 3. X-ray diffraction data for samples from the Goldplat area*

| | Quartz | Kaolinite | Hematite | Goethite | Pyrophyllite | Illite | Gypsum | Chlorite | Calcite | Dolomite | Plagioclase | Chromite | Enstatite | Chloritoid | Actinolite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPL1_Old Tailings | 85.22 | 1.3 | 0.24 | 0.52 | 0.28 | 5.91 | 2.54 | 0.12 | 1.08 | 2.79 | 0 | 0 | 0 | 0 | 0 |
| GPL2_Plant Residue Current | 83.53 | 1.44 | 0.4 | 0.46 | 0.17 | 10.2 | 1.96 | 0.18 | 0 | 1.65 | 0 | 0 | 0 | 0 | 0 |
| GPL3_Woodchips Stockpile | 90.11 | 2.29 | 0.18 | 0 | 0.17 | 2.35 | 0 | 0.17 | 0.4 | 4.32 | 0 | 0 | 0 | 0 | 0 |
| GPL5_Stockpile | 85.98 | 1.36 | 0.14 | 0.73 | 0.29 | 8.7 | 1.39 | 0.14 | 0 | 1.28 | 0 | 0 | 0 | 0 | 0 |
| GPL6_5L23 | 78.4 | 0 | 0 | 0 | 11.47 | 9.52 | 0.44 | 0.17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GPL7_5L23 | 78.74 | 0 | 0 | 0 | 14.35 | 6.91 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GPL8_5L23 | 87.73 | 0 | 0 | 0 | 6.33 | 4.8 | 1.1 | 0.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GPL9_TP5 | 90.77 | 3.17 | 0.28 | 0.78 | 0.27 | 3.02 | 1.64 | 0.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GPL 10 | 93.27 | 3.26 | 0.13 | 1.19 | 0 | 2.15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GPL4_PGM Stockpile | 36.06 | 0 | 0 | 0 | 0 | 0 | 3.2 | 0 | 0 | 0 | 23.97 | 4.02 | 22.66 | 9.09 | 1.01 |

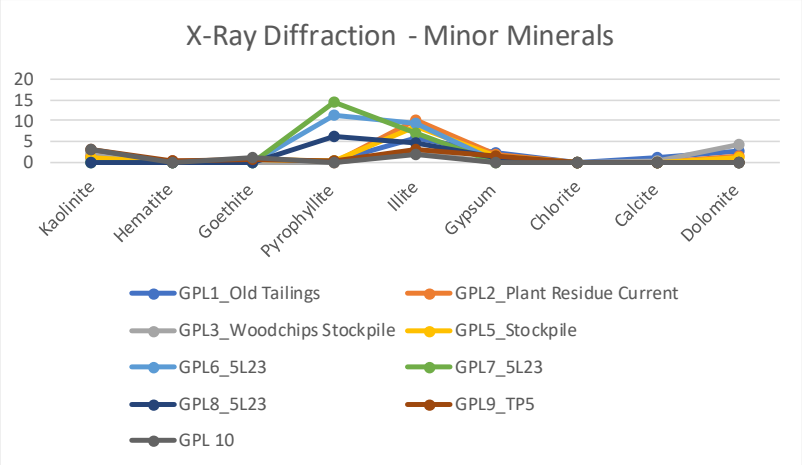



*Figure 6. Graphic presentation of the X-Ray Diffraction of the minor minerals.*

*Table 4. X-ray fluorescence data for samples from the Goldplat area*

| | Group 1 | | | | | Group 2 | | | Group 3 |
|---|---|---|---|---|---|---|---|---|---|
| | GPL1 | GPL2 | GPL3 | GPL5 | GPL9 | GPL6 | GPL7 | GPL8 | GPL4 |
| $Fe_2O_3$ | 9.23 | 7.59 | 5.82 | 8.25 | 8.70 | 1.27 | 1.30 | 1.11 | 11.65 |
| $SiO_2$ | 67.02 | 69.36 | 70.44 | 74.35 | 76.63 | 87.56 | 85.94 | 84.90 | 44.32 |
| $Al_2O_3$ | 8.75 | 9.39 | 5.68 | 8.79 | 8.97 | 7.19 | 8.33 | 9.36 | 11.98 |
| $K_2O$ | 0.70 | 1.00 | 0.55 | 0.99 | 0.26 | 0.92 | 0.90 | 1.50 | 0.36 |
| $P_2O_5$ | 0.11 | 0.10 | 0.05 | 0.09 | 0.06 | 0.02 | 0.02 | 0.03 | 0.08 |
| $Mn_3O_4$ | 0.29 | 0.10 | 0.22 | 0.10 | 0.05 | 0.01 | 0.01 | 0.01 | 0.15 |
| CaO | 3.10 | 1.90 | 2.84 | 0.64 | 0.18 | 0.20 | 0.32 | 0.21 | 4.76 |
| MgO | 0.72 | 0.67 | 1.79 | 0.35 | <0.010 | 0.11 | 0.13 | 0.15 | 6.21 |
| $TiO_2$ | 0.49 | 0.48 | 0.33 | 0.49 | 0.57 | 0.31 | 0.23 | 0.30 | 0.55 |
| $Na_2O$ | 0.26 | 0.09 | 0.06 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | 0.51 |
| $V_2O_5$ | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.01 | 0.04 |
| BaO | 0.03 | 0.03 | 0.03 | 0.03 | 0.01 | <0.009 | <0.009 | <0.009 | 0.02 |
| $Cr_2O_3$ | 0.13 | 0.09 | 0.07 | 0.10 | 0.12 | 0.07 | 0.05 | 0.10 | 2.79 |
| SrO | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 |
| $ZrO_2$ | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.03 | 0.02 | 0.02 | 0.01 |
| MnO | 0.21 | 0.07 | 0.16 | 0.07 | 0.04 | <0.010 | 0.01 | <0.010 | 0.11 |
| LOI | 8.80 | 9.32 | 12.95 | 6.01 | 5.22 | 2.60 | 2.60 | 2.61 | 17.11 |
| Total (XRF) | 99.68 | 100.17 | 100.89 | 100.25 | 100.84 | 100.31 | 99.85 | 100.33 | 100.55 |

## 8.2 Whole rock chemistry

The whole rock geochemical data for the samples is a direct reflection of the mineralogy. Group 1 show elevated iron concentrations in comparison with the Group 2 samples, whereas Group 3 show high iron value due to the presence of the pyroxene and the amphibole occurrences. The silicone values show a peak in Group 2 due to the high modal proportion of quartz. Calcium is somewhat elevated in Group 1 samples due to the presence of carbonate minerals, *i.e.* dolomite and calcite. The Group 3 sample reflects a completely different composition compared to the other samples in Groups 1 and 2. The Loss on Ignition (LOI) values in Group 1 samples reflect the abundance of clay minerals compared to Group 2 samples.

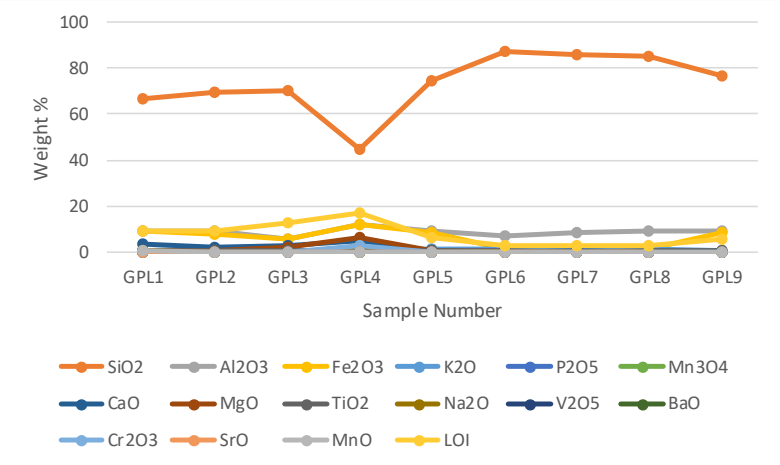



*Figure 7. Graphic presentation of whole rock composition of the various samples.*

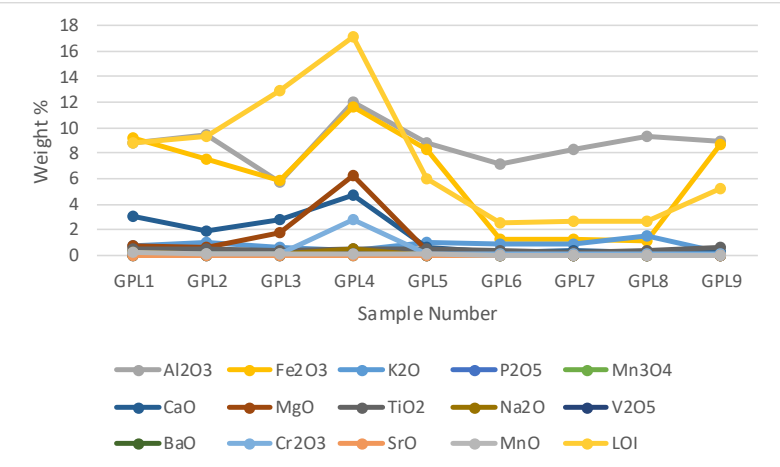



*Figure 8. Graphic presentation of whole rock composition of the various samples, excluding $SiO_3$.*

## 8.3 Leachate Chemistry

Leachable concentrations for samples GPL 01 and GPL 02 were obtained from the analyses conducted at Waterlab, an accredited analytical chemical laboratory. The results were compared to the leach concentrate threshold limits defined in the National norms and standards GNR 635 of 2013.

*Table 5. Chemical analyses of the leachate for two samples from Goldplat, as well as threshold values from GN R.635*

| Analyses | | | | | | |
|---|---|---|---|---|---|---|
| | GPL1 | GPL2 | LCT Limits (mg/l) from GN R635 | | | |
| Sample Number | 93676 | 93677 | | | | |
| TCLP / Borax / Distilled Water | Distilled Water | Distilled Water | | | | |
| Ratio* | 1:20 | 1:20 | | | | |
| Units | mg/ℓ | mg/ℓ | LCT0 mg/l | LCT1 mg/l | LCT2 mg/l | LCT3 mg/l |
| As, Arsenic | 0,010 | 0,006 | 0,01 | 0,5 | 1 | 4 |
| B, Boron | 5,35 | 0,256 | 0,5 | 25 | 50 | 200 |
| Ba, Barium | 0,040 | <0.025 | 0,7 | 35 | 70 | 280 |
| Cd, Cadmium | <0.001 | <0.001 | 0,003 | 0,15 | 0,3 | 1,2 |
| Co, Cobalt | 0,274 | 0,072 | 0,5 | 25 | 50 | 200 |
| $Cr_{Total,}$ Chromium Total | <0.025 | <0.025 | 0,1 | 5 | 10 | 40 |
| Cr(VI), Chromium (VI) | <0.010 | <0.010 | 0,05 | 2,5 | 5 | 20 |
| Cu, Copper | <0.010 | <0.010 | 2,0 | 100 | 200 | 800 |
| Hg, Mercury | <0.001 | <0.001 | 0,006 | 0,3 | 0,6 | 2,4 |
| Mn, Manganese | <0.025 | <0.025 | 0,5 | 25 | 50 | 200 |
| Mo, Molybdenum | 0,035 | <0.025 | 0,07 | 3,5 | 7 | 28 |
| Ni, Nickel | <0.025 | <0.025 | 0,07 | 3,5 | 7 | 28 |
| Pb, Lead | 0,006 | <0.001 | 0,01 | 0,5 | 1 | 4 |
| Sb, Antimony | 0,026 | 0,014 | 0,02 | 1,0 | 2 | 8 |
| Se, Selenium | 0,002 | <0.001 | 0,01 | 0,5 | 1 | 4 |
| V, Vanadium | <0.025 | <0.025 | 0,2 | 10 | 20 | 80 |
| Zn, Zinc | <0.025 | <0.025 | 5,0 | 250 | 500 | 2000 |
| ***Inorganic Anions*** | **mg/ℓ** | **mg/ℓ** | | | | |
| Total Dissolved Solids* | 550 | 478 | 1000 | 12 500 | 25 000 | 100 000 |
| Chloride as Cl | 14 | 6 | 300 | 15 000 | 30 000 | 120 000 |
| Sulphate as SO4 | 330 | 379 | 250 | 12 500 | 25 000 | 100 000 |
| Nitrate as N | <0.1 | <0.1 | 11 | 550 | 1100 | 4400 |
| Fluoride as F | <0.2 | <0.2 | 1,5 | 75 | 150 | 600 |
| Total Cyanide as CN [o] | 0,09 | 0,46 | 0,07 | 3,5 | 7 | 28 |
| pH | 9,0 | 9,6 | | | | |
| Paste pH | 8,7 | 8,6 | | | | |
| Moisture % | 24,7 | 22,7 | | | | |

[o] = outsourced

Total concentrations for samples GPL 01 and GPL 02 were obtained from the analyses conducted at Waterlab, an accredited analytical chemical laboratory. The results were compared to the total concentrate threshold limits defined in the National norms and standards GNR 635 of 2013.

*Table 6. Total concentrate analyses of the waste material of two samples from Goldplat*

| Analyses | | | | | TCT Limits (mg/kg) from GN R635 | | |
|---|---|---|---|---|---|---|---|
| | GPL1 | | GPL2 | | | | |
| Sample Number | 93676 | | 93677 | | TCT0 | TCT1 | TCT2 |
| Digestion | HNO3 : HF | | HNO3 : HF | | | | |
| Dry Mass Used (g) | 0,25 | | 0,25 | | | | |
| Volume Used (mℓ) | 100 | | 100 | | | | |
| **Units** | **mg/ℓ** | **mg/kg** | **mg/ℓ** | **mg/kg** | **mg/kg** | **mg/kg** | **mg/kg** |
| As, Arsenic | 0,282 | 113 | 0,256 | 102 | 5,8 | 500 | 2000 |
| B, Boron | 1,08 | 432 | 0,044 | 18 | 150 | 15000 | 6000 |
| Ba, Barium | 0,767 | 307 | 0,628 | 251 | 62,5 | 6250 | 25000 |
| Cd, Cadmium | <0.001 | <0.400 | <0.001 | <0.400 | 7,5 | 260 | 1040 |
| Co, Cobalt | <0.025 | <10 | <0.025 | <10 | 50 | 5000 | 20000 |
| $Cr_{Total,}$ Chromium Total | 1,45 | 580 | 0,997 | 399 | 46000 | 800000 | N/A |
| Cu, Copper | 0,821 | 328 | 0,242 | 97 | 16 | 19500 | 78000 |
| Hg, Mercury | <0.001 | <0.400 | <0.001 | <0.400 | 0,93 | 160 | 640 |
| Mn, Manganese | 4,49 | 1796 | 1,56 | 624 | 1000 | 25000 | 100000 |
| Mo, Molybdenum | <0.025 | <10 | <0.025 | <10 | 40 | 1000 | 4000 |
| Ni, Nickel | 0,394 | 158 | 0,429 | 172 | 91 | 10600 | 42400 |
| Pb, Lead | 2,22 | 888 | 0,615 | 246 | 20 | 1900 | 7600 |
| Sb, Antimony | 0,067 | 27 | 0,022 | 8,80 | 10 | 75 | 300 |
| Se, Selenium | 0,003 | 1,20 | <0.001 | <0.400 | 10 | 50 | 200 |
| V, Vanadium | 0,214 | 86 | 0,179 | 72 | 150 | 2680 | 10720 |
| Zn, Zinc | 3,13 | 1252 | 0,800 | 320 | 240 | 160000 | 640000 |
| ***Inorganic Anions*** | **mg/ℓ** | **mg/kg** | **mg/ℓ** | **mg/kg** | | | |
| Cr(VI), Chromium (VI) Total [°] | --- | <5 | --- | <5 | 6,5 | 500 | 2000 |
| Total Fluoride [°] | --- | 213 | --- | 185 | 100 | 10000 | 40000 |
| Total Cyanide as CN [°] | --- | 140 | --- | 59 | 14 | 10500 | 42000 |

[°] = Outsourced

## 8.4 Approach to the determination of the potential for Acid Mine Drainage generation

One of the biggest risks to the environment is the potential for rocks to generate an acid drainage. The ability to accurately determine this risk in a quantitative manner, has been a topic of controversial discussion for a long period and remains an unsolved issue.

In the absence of local criteria, two tests are commonly used for the assessment of acid producing potential of rock and tailings material. The two methods involved are (1) the acid base accounting technique (ABA) and (2) the net acid generation potential (NAG) technique. None of these two methods are reliable as both methods introduce an unrealistic parameter during the analytical procedure. In both cases the material is pulverized to a fine powder before interaction with the water or other chemical substance is allowed. It is obvious that such treatment skews the results, as the available surface area for reaction is increased by several orders of magnitude. The available surface area is not representative of the natural environment and the results of any

test cannot be extrapolated to occur or represent a natural environment. Such results are considered unrepresentative of the in situ or natural occurrence of the material under investigation.

These classifications consider the Neutralisation Potential (NP)/Acid Potential (AP) ratio. The criteria indicate the potential for ARD, and are based on NP/AP ratios.

The second test used to assess whether a sample is capable of neutralizing the potential acidity is the NAG test. A strong oxidising agent, hydrogen peroxide ($H_2O_2$), is used to rapidly oxidise sulphide minerals in the sample. The NAG screening criteria to assess the capacity of a sample to neutralise acidity generated during the test procedure, is set.

Typically, ABA and NAG testing is used in isolation to determine acid generating potential of a sample. However, the mineralogical-based analyses used in the current study provide a more comprehensive and realistic picture of the potential for acid mine drainage (AMD), bearing in mind that actual acid generating and metal leaching potential is best determined through confirmatory test work, such as kinetic leaching tests.

A study of the mineralogical composition, as well as the distribution of modal proportions of minerals in the rock enables the definition of potential AMD generation in finer detail and accuracy. The mineralogical based approach towards the study of AMD generation potential formed the basis of the approach used in this investigation.

It is a well-known fact that the auriferous pebble conglomerates of the Witwatersrand Supergroup contain pyrite as the dominant sulphide mineral. During the oxidation of pyrite secondary sulphate minerals form, *e.g.* gypsum, jarosite, etc. The oxidation of sulphide minerals occurs on exposure to atmospheric oxygen or oxygenated waters. A model describing the oxidation of pyrite is discussed in Appendix 1.

## 8.5 Waste Rock Geochemistry

The complete results of the waste rock testing programme are given in Table 4, and the results are summarised, interpreted and discussed in the subsections below.

Elemental composition was carried out to identify the metals in the composite tailings and waste rock samples. The purpose of these analyses is to quantify the total metal content of the material, and thereby determine the enrichment of potentially environmentally sensitive elements. It must be noted that the presence of a potential element of concern does not necessarily indicate a potential impact on the receiving environment; however, it does indicate where to focus needs when assessing the potential for metal mobility.

### 8.5.1 Chemical Weathering

Chemical weathering changes the composition of rocks, often transforming them when water interacts with minerals to create various chemical reactions. Chemical weathering is a gradual and ongoing process as the mineralogy of the rock adjusts to the surface environment. New or secondary minerals develop from the original minerals of the rock. In this the processes of oxidation and hydrolysis are most important. Chemical weathering is enhanced by such geological agents as the presence of water and oxygen.

### 8.5.2 Dissolution and carbonation

Rainfall is acidic because atmospheric carbon dioxide dissolves in the rainwater producing weak carbonic acid. In unpolluted environments, the rainfall pH is around 5.6. Acid rain occurs when gases such as sulphur dioxide and nitrogen oxides are present in the atmosphere. These oxides react in the rain water to produce stronger acids and can lower the pH to 4.5 or even 3.0.

Some minerals, due to their natural solubility (e.g. evaporites), oxidation potential (iron-rich minerals, such as pyrite), or instability relative to surficial conditions will weather through dissolution naturally, even without acidic water.

One of the most well-known solution weathering processes is carbonation, the process in which atmospheric carbon dioxide leads to solution weathering. Carbonation occurs on rocks which contain calcium carbonate. This takes place when rain combines with carbon dioxide or an organic acid to form a weak carbonic acid which reacts with calcium carbonate and forms calcium bicarbonate. This process speeds up with a decrease in temperature, not because low temperatures generally drive reactions faster, but because colder water holds more dissolved carbon dioxide gas.

The reactions are as follows:

$CO_2 + H_2O \rightarrow H_2CO_3$

carbon dioxide + water → carbonic acid

$H_2CO_3 + CaCO_3 \rightarrow Ca(HCO_3)_2$

carbonic acid + calcium carbonate → calcium bicarbonate

### 8.5.3 Hydration

Mineral hydration is a form of chemical weathering that involves the rigid attachment of $H^+$ and $OH^-$ ions to the atoms and molecules of a mineral.

When rock minerals take up water, the increased volume creates physical stresses within the rock. For example, iron oxides are converted to iron hydroxides and the hydration of anhydrite forms gypsum.

#### *8.5.3.1 Hydrolysis of silicates and carbonates*

Hydrolysis is a chemical weathering process affecting silicate and carbonate minerals. In such reactions, pure water ionizes slightly and reacts with silicate minerals. An example reaction:

$Mg_2SiO_4 + 4\ H^+ + 4\ OH^- \rightleftharpoons 2\ Mg^{2+} + 4\ OH^- + H_4SiO_4$

olivine (forsterite) + four ionized water molecules ⇌ ions in solution + silicic acid in solution

This reaction theoretically results in complete dissolution of the original mineral, if enough water is available to drive the reaction. In reality, pure water rarely acts as a $H^+$ donor. Carbon dioxide, though, dissolves readily in water forming a weak acid and $H^+$ donor.

$Mg_2SiO_4 + 4\ CO_2 + 4\ H_2O \rightleftharpoons 2\ Mg^{2+} + 4\ HCO_3^- + H_4SiO_4$

olivine (forsterite) + carbon dioxide + water ⇌ Magnesium and bicarbonate ions in solution + silicic acid in solution

This hydrolysis reaction is much more common. Carbonic acid is consumed by silicate weathering, resulting in more alkaline solutions because of the bicarbonate.

Aluminosilicates when subjected to the hydrolysis reaction produce a secondary mineral rather than simply releasing cations.

$$2\ KAlSi_3O_8 + 2\ H_2CO_3 + 9\ H_2O \rightleftharpoons Al_2Si_2O_5(OH)_4 + 4\ H_4SiO_4 + 2\ K^6 + 2\ HCO_3^-$$

Orthoclase (aluminosilicate feldspar) + carbonic acid + water ⇌ Kaolinite (a clay mineral) + silicic acid in solution + potassium and bicarbonate ions in solution. The latter reaction is responsible for the relative high modal proportions occurring in the Goldplat samples analysed.

### 8.5.4 Oxidation

Within the weathering environment chemical oxidation of a variety of metals occurs, e.g. Fe in pyrite. The most commonly observed is the oxidation of $Fe^{2+}$ (iron) and combination with oxygen and water to form $Fe^{3+}$ hydroxides and oxides such as goethite, limonite, and hematite. This gives the affected rocks a reddish-brown colouration on the surface which crumbles easily and weakens the rock. This process is better known as 'rusting', though it is distinct from the rusting of metallic iron.

The main agents of chemical weathering are:

Water. Some minerals, such as rock salt, will dissolve readily in water; others such as pyroxene will also do so, though at a much slower rate.

Carbonic acid. Rainwater and groundwater are not pure water; some of the molecules of water react with the carbon dioxide in the atmosphere (in the case of rainwater) or produced by bacteria and plant roots (in the case of groundwater) producing carbonic acid, as follows:

$H_2O$ (water) + $CO_2$ (carbon dioxide) → $H_2CO_3$ (carbonic acid)

Oxygen. This is a highly reactive chemical, and the only reason that there's so much of it about in the atmosphere is its constant production by biological processes and a shortage of things that it hasn't reacted with already.

#### *8.5.4.1 Chemical weathering of common minerals*

The list below has been arranged more or less in order from the minerals most susceptible to chemical weathering to the most resistant.

- Halite. Salt, of course, dissolves in water. This is why you are unlikely to see rock salt on the surface except in desert environments.
- Gypsum. This, like halite, is soluble in water; similar remarks apply to it.
- Calcite. It is the mineral forming limestone and its metamorphic counterpart, marble. It can just dissolve in water; it also reacts with carbonic acid as follows:

$CaCO_3$ (calcite) + $H_2CO_3$ (carbonic acid) → $Ca^{2+}$ + $2(HCO_3)^-$ (dissolved ions of calcium and bicarbonate).

- Silicate minerals. Of silicate minerals in general we may observe that the more mafic minerals with higher melting points are more susceptible to chemical weathering than felsic low-temperature minerals. This will be reflected in the order in which they are listed below.
- Olivine. This mafic mineral has the formula $(Mg,Fe)_2SiO_4$. Recall that the (Mg,Fe) in the formula means that it is a solid solution in which varying quantities of magnesium or iron can play the same chemical role. It reacts with carbonic acid as follows:

$(Mg,Fe)_2SiO_4$ (olivine) + $4H_2CO_3$ (carbonic acid) → $2(Mg,Fe)^{2+}$ + $4HCO_3^-$ (dissolved ions of magnesium/iron and bicarbonate) + $H_4SiO_4$ (silicic acid).

As with limestone, the constituent parts of the mineral are now entirely dissolved in water, leaving no residual mineral.

On the other hand, iron olivine can react with water and atmospheric oxygen like this:

$$2Fe_2SiO_4 + 4H_2O + O_2 \rightarrow 2Fe_2O_3 + 2H_4SiO_4$$

And the hematite can further react with water as follows:

$$Fe_2O_3 + H_2O \rightarrow 2FeO(OH) \text{ (goethite)}$$

Hematite and goethite are both very insoluble in water: they remain as residual minerals. It is these iron oxides that give soils their reddish or yellowish colour.

- Pyroxene. The typical rock-forming pyroxenes have the formula $(Mg,Fe)SiO_3$. This can react with carbonic acid as follows:

$$(Mg,Fe)SiO_3 + H_2O + 2H_2CO_3 \rightarrow (Mg,Fe)^{2+} + 2HCO_3^- + H_4SiO_4$$

Again, as with olivine, the constituent parts of the mineral are dissolved in water. However, as with olivine, iron pyroxene can react with oxygen and water to produce the residual mineral hematite:

$$2FeSO_3 + 4H_2O + 2O_2 \rightarrow 2Fe_2O_3 + 2H_4SiO_4$$

Again, the hematite can turn to goethite.

- Mica and amphibole, minor constituents of felsic and intermediate rocks, undergo rather more complicated reactions.

In summary, the residual minerals produced are clay minerals; iron oxides; and, in the case of biotite, the mineral gibbsite ($Al(OH)_3$), which is usually found in association with clay.

Potassium and sodium feldspars produce residual clay minerals. The reaction by which potassium feldspar produces kaolinite (plus various dissolved substances):

$$4KAlSi_3O_8 \text{ (K feldspar)} + 4H_2CO_3 \text{ (carbonic acid)} + 2H_2O \text{ (water)} \rightarrow Al_4Si_4O_{10}(OH)_8 \text{ (kaolinite)} + 4K^+ \text{ (potassium ions)} + 4HCO_3^- \text{ (bicarbonate ions)} + 8SiO_2 \text{ (dissolved quartz)}$$

As sodium is chemically almost indistinguishable from potassium feldspar and reacts in a similar way.

- Quartz is the most stable of the silicate minerals. This is why quartz sand is so common as a sediment; when all the other constituents of igneous rocks have either dissolved or been converted to clay, grains of quartz will remain. This is why there is no such thing as a large grain of sand: the maximum size of such grains is limited by the size of the quartz crystals that form in granite and similar rocks.

Note, however, that quartz sandstone is vulnerable to chemical weathering, because although the grains of quartz themselves are resistant, the minerals cementing them together may not be.

Clay minerals are very resistant to chemical weathering, because they are, as we have seen, a product of chemical weathering, and, like all minerals, they are stable under the conditions under which they were formed.

- Iron oxides. These, as we have seen, are a product of chemical weathering of iron-bearing forms of such mafic minerals as olivine and pyroxene. We have noted that hematite can be converted to goethite by oxidation:

$Fe_2O_3 + H_2O \rightarrow 2FeO(OH)$

Once iron oxide has formed, there is very little that can happen to it except conversion to another sort of iron oxide; these are regarded as the most stable of all common classes of minerals.

Clay Minerals

Clay minerals are an important group of minerals because they are among the most common products of chemical weathering.

Based on their structures and chemical compositions, the clay minerals can be divided in to three main classes:

- The kaolinites (kandites) based on a structure similar to Kaolinite
- The smectites based on a structure similar to Pyrophyllite
- The illites based on a structure similar to Muscovite

Each of these are formed under different environmental and chemical conditions.

*Kaolinites*

The kaolinites are clays that show a T-O structure, with the octahedral layer similar to the gibbsite structure. Since the layers are electronically neutral, the bonding between layers is by weak van de Waals bonds. Kaolinite is the most common of this group and has the chemical formula $Al_2Si_2O_5(OH)_4$.

Kaolinite is formed by weathering or hydrothermal alteration of aluminosilicate minerals. Thus, rocks rich in feldspar commonly weather to kaolinite. In order to form, ions like Na, K, Ca, Mg, and Fe must first be leached away by the weathering or alteration process. This leaching is favoured by acidic conditions (low pH). Granitic rocks, because they are rich in feldspar, are a common source for kaolinite.

Halloysite, is also a kaolinite clay, with a structure similar to Kaolinite. However, it has water molecules occurring between the T-O sheets, and has the chemical formula - $Al_2Si_2O_5(OH)_4.4H_2O$.

Kaolinite, because it does not absorb water, does not expand when it comes in contact with water. Thus, kaolinite is the preferred type of clay for the ceramic industry.;

*Smectites*

The smectite group of clays has a T-O-T structure that is similar to that of Pyrophyllite, but can also have significant amounts of Mg and Fe substituting into the octahedral layers. Thus, the smectites can be both dioctahedral and trioctahedral.

The most important aspect of the smectite group is the ability for $H_2O$ molecules to be absorbed between the T-O-T sheets, causing the volume of the minerals to increase when they come in contact with water. Thus, the smectites are expanding clays.

The most common smectite is Montmorillinite, with a general chemical formula :

$$(½Ca,Na)(Al,Mg,Fe)_4(Si,Al)_8O_{20}(OH)_4.nH_2O$$

Montmorillinite is the main constituent of Bentonite, derived by weathering of volcanic ash. Montmorillinite can expand by several times its original volume when it comes in contact with water. This makes it useful as a drilling mud (to keep drill holes open), and to plug leaks in soil, rocks, and dams.

Montmorillinite, however, is a dangerous type of clay to encounter if it is found in tunnels or road cuts. Because of its expandable nature, it can lead to serious slope or wall failures.

*Illites*

The Illite clays have a structure similar to that of Muscovite, but is typically deficient in alkalies, with less Al substitution for Si. Thus, the general formula for the illites is:

$$KyAl_4(Si_{8-y},Al_y)O_{20}(OH)_4$$

usually with $1 < y < 1.5$, but always with $y < 2$.

Because of possible charge imbalance, Ca and Mg can also sometimes substitute for K.

The K, Ca, or Mg interlayer cations prevent the entrance of $H_2O$ into the structure. Thus, the illite clays are non-expanding clays.

Illite type clays are formed from weathering of K and Al-rich rocks under high pH conditions. Thus, they form by alteration of minerals like muscovite and feldspar.

Mixed Layer Clay

Mixed layer clays are common, and consist of clays that change from one type to another through a stacking sequence. The sequences can be ordered and regular, or high unordered and irregular. For example, montmorillinite layers can alternate with illite layers in an ordered way, or there can be several layers of montmorillinite with random layers of illite.

The results of the mineralogy of the proposed disposal sites, i.e. 5L23 and 5L24, indicate that the clay minerals formed during weathering of the historic waste material, over time (~80 years since placement) have developed a large modal proportion of clay, mainly Illite and pyrophyllite, in the matrix of the dump footprint.

# 9 Leaching of rocks in the unsaturated *versus* the saturated zone

The nature of potential effluent draining from rocks in the unsaturated zone, and that of rocks within the saturated zone, is characteristic. The question we need to answer is what will the geochemical signature (pollution potential) of this material be for the following scenarios:

- Material above the water table
- Material below the water table

A hypothetical scenario was sketched to evaluate and assess the potential impacts on water quality emanating from these two scenarios.

The presence of pyrite in stock material does not predetermine that processing of the material will produce significant acid mine drainage (AMD). The amount and nature of the pyrite present is an important factor, however. Rocks that formed in ancient freshwater environments are generally low in sulphur.

A second important factor is the particle size of the $FeS_2$. AMD production only becomes a serious problem when the grain size is about 0.25 µm in diameter in "framboidal" pyrite. This corresponds to a surface area of 4.8 $m^2/g$. Crystal sizes of 5 – 10 µm (5 µm = 0.24 $m^2/g$), show reduced AMD production and became unlikely to produce AMD when crystal sizes exceeded 400 µm. Particle sizes are usually small in marine rocks and become larger in lacustrine rocks. Mining and milling the rock to fine particle sizes vastly increases pyrite surface area and exposes the pyrite in waste piles to oxidation and weathering. Serious AMD release can result.

A third factor determining the risk of AMD is the proximity of carbonate rocks that can neutralize AMD acidity. Dolomitic rock from the Malmanie Formation is known to outcrop in the Modderfontein area.

Of basic importance when determining risk is the absolute and relative amounts of the exposed pyrite that occur above or below the water table. Above the water table, oxidation rates are usually catalysed by bacteria and can be very fast in fine-grained waste-rock piles. Rates in water-saturated waste materials or below the water table are generally much slower because of the unavailability of free oxygen.

## 9.1 Overall $FeS_2$ oxidation reactions

Oxidation of pyrite first occurs at its exposed surface, where pyritic sulphur with a formal charge of (-1) is oxidised to sulphate (+6) and the ferrous iron is released to solution. The stoichiometry of the oxidation half reaction shows that if oxygen is the oxidising agent, 2 moles of $H^+$ are produced by one mole of pyrite. In contrast, oxidation by $Fe^{3+}$ releases 16 moles of protons for each mole of pyrite. It is, thus, essential to know which reaction dominates in any attempt to predict the acid-generation capacity of a system.

The abiotic oxidation rate of pyrite has been studied extensively over the last forty years. Empirical rate law expressions have been developed for different pH ranges and different availabilities of oxygen, e.g. above the water table, below the water table and a fluctuating water table. In spite of all this excellent research work, elementary reactions to describe the mechanisms of pyrite oxidation remain unknown.

## 9.2 The role of sulphur- and iron—oxidising bacteria

Sulphur- and iron-oxidising bacteria flourish at the oxidised side of redox interfaces. They are important especially because they catalyse and thus greatly accelerate reactions that are thermodynamically favoured, but

may be abiotically slow. *Thiobacteria* are most important to sulphur oxidation above the water table, as in waste discard dumps. All iron oxidising bacteria are aerobic, thus also flourishing in the environment above the water table.

## 9.3 Oxidation and neutralisation trends and secondary minerals

Acid mine waters that are formed by pyrite oxidation in the saturated zone evolve very differently from those that developed in the unsaturated materials above the water table. Fe(II) from pyrite oxidation remains largely unoxidized in the groundwaters. Once the groundwater had discharged into streams, oxidation the Fe(II) lowered stream pH values, making streams more corrosive to geological materials.

The pyrite in waste dumps above the water table has usually been crushed, making it finer-grained and thus more much more reactive than the $FeS_2$ in undisturbed rock in the saturated zone. Under such conditions when $Fe^{3+}$ and $O_2$ are readily available as oxidants, the breakdown of $FeS_2$ catalyzed by thiobacteria is greatly accelerated. The result is often pH values from 0 to 2, and the accumulation of extraordinary concentrations of total iron and sulphate (Pinetown and Boer, 2006).

## 9.4 Discussion and recommendation

The chemical analyses of the leachates of the waste show no evidence of harmful AMD components to be present in this study. The discard (tailings) material contain ferrihydrates, e.g. goethite, and sulphates, e.g. gypsum, which show that AMD was present. However, the high modal percentages of clay minerals, e.g. pyrophyllite and illite, dominate the behaviour of the discard. The influence of the high clay volumes on the hydrological properties of the discard has the effect of inhibiting flow of groundwater. By implication this fact also inhibits the migration of a pollution plume emanating from the discard source.

Discard material that finds itself permanently under the water table in the saturated zone would be distinctly less prone to the formation of acid mine drainage. On the other hand, samples in the unsaturated zone above the water table is more likely to produce AMD. This is mainly due to the availability of abundant oxygen. The zone in which the water table fluctuate would also be prone to enhanced AMD formation (Figure 9).

It is prohibitively difficult to quantify the degree or volume of AMD formation, due to the lack of knowledge concerning the controlling factor required for AMD formation.

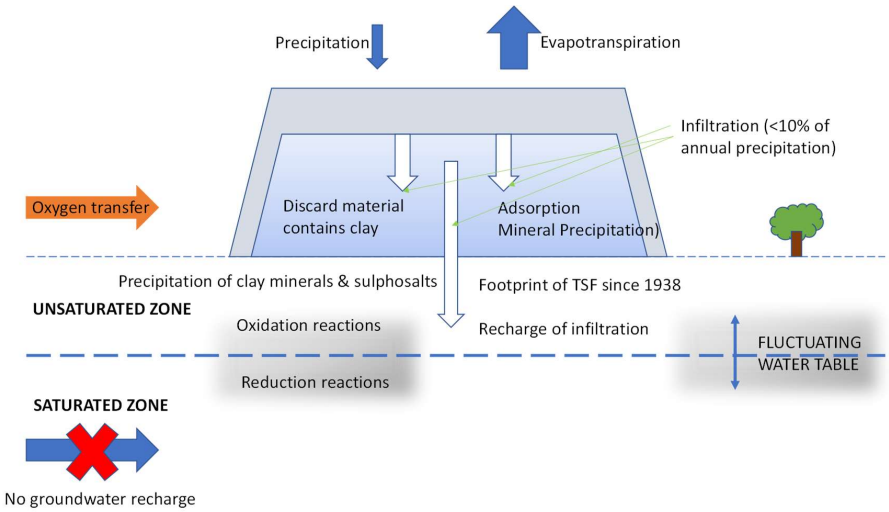



*Figure 9. Schematic representation of the main features at the proposed disposal sites 5L23 and 5L24.*

# 10 Waste classification

Based on the results of the total waste concentrate analyses, the materials are classified as Type 3 wastes.

The tailings material on the other hand, classifies as a Type 3 waste based on elevated total concentrations of, As, Ba, Pb, Zn and Cu exceeding the TCT0 value in all samples. Sample GPL01 exceed the TCT0 value for B, Mn, Ni and Sb. Furthermore, the leachate concentrations in sample GPL01 exceed As, B, Sb values of LCT0. Both samples GPL01 and GPL02 exceeded the total CN values of LCT0.

Type 3 waste may only be disposed of at a Class C landfill designed in accordance with section 3(1) and (2) of the Norms and Standards. However, the mineralogy of GPL01 and GPL02 indicate a high modal proportion of clay minerals in the waste material. This has the distinct effect of inhibiting the flow of the polluting elements through the waste material.

For backfill of West Pit 3 it is required that the side walls be shaped to at least 1:3 slope. A composite barrier for a Class C landfill would need to be installed to line the facility due to the permeability of the sedimentary rock hosting the pit.

Due to the mineralogy of the foot print of the historic 5L23 and 5L24 dumps it is suggested that the existing clay layers not be disturbed but covered by a 1.5 mm thick HDPE geomembrane. Toe drains to collect natural run-off is to be installed. The return water can be collected and pumped to the Goldplat plant for re-use.

# 11 Impact assessment

## 11.1 Impact assessment methodology

The specialist studies that were undertaken over the project area is attached to this report. The significance of each identified impact was determined using the approach outlined below (terminology form the Department

of Environmental Affairs and Tourism Guideline on EIA regulations, April 1998). This approach incorporates aspect for assessing the potential significance of impacts as indicated below:

*Table 7. Impact assessment criteria description*

| CRITERIA | Description |
|---|---|
| *Nature* | The effect that the proposed activity will have on the environment and includes what will be affected and how. |
| *Extent / Scale* | The spatial extent of the impact, i.e. limited to the site; local (limited to within 25 km of the area); regional (limited to ~200 km radius); national (limited to the borders of South Africa); or international (extending beyond South Africa's borders). |
| *Duration* | Indicates whether the impact will be temporary (during construction only); short term (1-5 years); medium term (5-10 years); long term (longer than 10 years, but will cease after operation); or permanent. |
| *Intensity / Magnitude* | Establishes whether the magnitude of the impact exceeds ambient groundwater guidelines, and is described as none (no impact); low (where guidelines are not exceeded); medium (where guidelines are exceeded occasionally, but the receiving environment is not sensitive); or high (where guidelines are exceeded in sensitive environments, i.e. residential areas). |
| *Probability* | Considers the likelihood of the impact occurring and is described as uncertain; improbable (low likelihood); probable (distinct possibility); highly probable (most likely); or definite (impact will occur regardless of prevention measures). |
| *Significance* | Significance before and after mitigation is low if the impact will not have an influence on the decision or require to be accommodated in the project design; medium if the impact could have an influence on the environment and will require modification of the project design or alternative mitigation or high where it could have a "no-go" implication regardless of any possible mitigation. |
| *Status of the impact* | Is a statement of whether the impact is positive (a benefit); negative (a cost); or neutral, indicating in each case who is likely to benefit and who is likely to bear the costs of each impact. |
| *Degree of Confidence in Predictions* | Is based on the availability of specialist knowledge and other information. |

*Table 8. Definitions of the various significance ratings*

| SIGNIFICANCE RATING | CRITERIA |
|---|---|
| *Low* | The impact is likely to have a negligible influence the receiving environment and no modifications or mitigations are necessary to the proposed plan. This is allocated to impacts of any severity at a local scale and temporary. |
| *Medium* | The impact could have an influence on the receiving environment, which will require modification of the proposed and/or alternative mitigation. This is allocated to impacts with moderate severity that extends locally to regionally in the short term. |
| *High* | The impact could have a significant influence the receiving environment and could result in a 'no-go' implication for the development, regardless of any mitigation. This would be allocated to impacts of high magnitude, locally for longer than a month, and/or for impacts of a high magnitude regionally and beyond. |

*Table 9. Impact assessment methodology*

| **OCCURRENCE** | | **Severity** | |
|---|---|---|---|
| Probability of occurrence | Duration of occurrence | Magnitude (intensity) of impact | Scale / extent of impact |
| To assess each impact, the following four ranking scales are used: | | | |
| **PROBABILITY (P)** | **DURATION (D)** | | |
| 5 – Definite/don't know | 5 – Permanent: after rehabilitation and closure | | |
| 4 – Highly probable | 4 – Long-term: decommissioning phase and until rehabilitated. | | |
| 3 – Medium probability | 3 – Medium-term: operational phase | | |
| 2 – Low probability | 2 – Short-term: Construction phase | | |
| 1 – Improbable | 1 – Immediate | | |
| 0 – None | | | |
| **SCALE (S)** | **MAGNITUDE (M)** | | |
| 5 – International | 10 – Very high/don't know | | |
| 4 – National | 8 – High: >20% change from current conditions | | |
| 3 – Regional | 6 – Moderate: 10 to 20% change from current conditions | | |
| 2 – Local | 4 – Low: <10% change from current conditions | | |
| 1 – Site only | 2 – Minor – **Negligible:** no measurable effect (<1%) from current conditions | | |
| 0 – None | | | |
| The significance of the two aspects, occurrence and severity, is assessed using the following formula:<br>**SP (significance points) = (magnitude + duration + scale) * probability**<br>The maximum value is 150 significance points (SP). The impact significance points are assigned a rating of high, medium or low with respect to their environmental impact as follows: | | | |
| **SP >60** | Indicates **high** environmental significance | An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation. | |
| **SP 26 – 60** | Indicates **medium** environmental significance | An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated. | |
| **SP <26** | Indicates **low** environmental significance | Impacts with little real effect and which should not have an influence on or require modification of the project design. | |
| **+** | Positive impact | An impact that is likely to result in positive consequences/effects. | |
| Potential impacts were assessed using the above calculation and rating system, and mitigation measures were proposed for all relevant project phases (construction to decommissioning). | | | |
| **Level of confidence (C) -** Percentage level of confidence that the impact or risk can occur and mitigated indicated by specialist or EAP | | | |
| A | 75 – 100% | | |
| B | 50 – 74% | | |
| C | 26 - 50 % | | |
| D | 0 – 25% | | |

## 11.2 Assessment of potential impacts and risks

The potential risk associated with the three options vary considerably.

- Option 1 – West Pit 3: The placement of waste material into the pit would require a geomembrane to be placed covering the sidewalls in order to prevent seepage from migrating into the sidewall. The volume of material required to be stripped to obtain an acceptable angle of repose would be economically unacceptable.
- Option 2 – Extension of current TSF at 5L24: The risk of further pollution would be negligible. An extension of the existing TSF would seem to be the preferred option.
- Option 3 – Deposition at 5L23: The option seems feasible. The proximity of the channel which feeds into the Blesbokspruit nearby, should be considered in the design for run-off management.

Aquatox

## 11.3 Summary of the geochemical impact assessment (EIA) in Matrix format

| Facilities/ Activity/ Products/ Services | Identified / possible Environmental Impact | Pre-mitigation quantification and qualification of Impact | | | | | | Mitigation | Post- mitigation Quantification and qualification of Impact | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Probability | Extent | Duration | Magnitude | Significance points | Confidence | | Probability | Extent | Duration | Magnitude | Significance points | Confidence |
| Alternative 1: Deposition into West Pit 3 | | | | | | | | | | | | | | |
| Storage of tailings in West pit 3 | Surface and Ground water quality change | 4 | 3 | 5 | 8 | 64 | A | Shaping of pit side walls to 1:3 gradient<br>Class C liner | 2 | 3 | 4 | 4 | 22 | A |
| Alternative 2: Deposition onto 5L24, extending the new TSF | | | | | | | | | | | | | | |
| Extension of current stock dam on 5L24 historic dump foot print | Surface and Ground water quality change | 4 | 1 | 5 | 4 | 40 | A | Removal of vegetation and shaping of surface layer covered with 1,5mm thick HDPE geomembrane with toe drains. | 0 | 1 | 5 | 2 | 0 | A |
| Alternative 3: Deposition at 5L23. | | | | | | | | | | | | | | |
| 5L23: New dump on historic dump foot print | Surface and Ground water quality change | 4 | 1 | 5 | 4 | 40 | A | Removal of vegetation and shaping of surface layer covered with 1,5mm thick HDPE geomembrane with toe drains. | 0 | 1 | 5 | 2 | 0 | A |

## 12 Effluent Impact – the effective use of synthetic goeomembrane liners

The type of liner system used depends mainly on the material to be used on top of the structure, local hydraulic pressure gradient, and climate conditions. More practical information and scientific knowledge on the use of base liners is being presented in this document. Apart from preventing polluted leachate from seeping into the groundwater, an additional benefit of lining a waste disposal facility is that more water in the waste disposal facility can be captured and returned to the processing plant.

In the mining industry, geomembranes and other geosynthetic products used in basal structures face harsh conditions that are not comparable to those in other industrial applications or landfill constructions. The chemistry of the waste effluent may increase the hydraulic conductivity of geosynthetic clay liners, among others. Little information is currently available because of suspicions that high sulphate content and very high salinity can reduce the durability of geomembranes.

The usage of geomembrane-lined basal structures is known worldwide, but all the structures described in the literature are more or less unique. Geomembranes used in basal structures are typically made from one of the following materials: linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE), polyvinyl chloride (PVC), polypropylene (PP), ethylene propylene diene monomer (EPDM), and ethylene interpolymer alloy (EIA). When choosing geomembrane type, key properties that need to be considered are chemical resistance of the geomembrane, tensile strength, temperature resistance, installation conditions, cost, and previous experiences of its use (Table 10).

Selection of an appropriate geomembrane requires a clear understanding of the combined operation of the geomembrane liner and the underliner and overliner layers, as well as the relevant normal and shear loads. Based on practical experiences (Tuomela, 2021), developed a selection chart to facilitate determination of a suitable geomembrane material (only for HDPE and LLDPE) and its strength (Table 11). The chart takes into consideration the foundation conditions (the bearing capacity of the subsoil), the underliner and overliner materials, geomembrane thickness, and the load directed at the geomembrane.

*Table 10. Listing and comparison of different geomembrane types*

| Material | Advantages | Disadvantages |
|---|---|---|
| HDPE 1 | • Broad chemical resistance<br>• Good weld strength<br>• Good low temperature properties | • Potential for stress cracking<br>• High degree of thermal expansion<br>• Potential poor puncture resistance<br>• Potential poor multiaxial strain resistance |
| LLDPE 2 | • Better flexibility than HDPE<br>• Better layflat than HDPE<br>• Good multiaxial strain properties | • Inferior UV resistance compared with HDPE<br>• Inferior chemical resistance compared with HDPE |
| PP 3 | • Can be fabricated and folded at the factory, so fewer field-fabricated seams<br>• Excellent multiaxial properties<br>• Good conformability<br>• Broad seaming temperature window | • Limited resistance to hydrocarbons and chlorinated water |
| PVC 4 | • Good workability and layflat behavior<br>• Easy to seam<br>• Can be folded, so fewer field-fabricated seams | • Potential poor resistance to UV and ozone<br>• Potential poor resistance to weathering<br>• Potential poor performance at high and low temperatures |
| BGM | • Can be used in challenging climates<br>• Not so sensitive to the quality of the upper material | • Heavier and thicker (although these can also be advantages)<br>• Thickness is a critical factor for good properties |

| | | |
|---|---|---|
| | • Being heavy, can also be installed in windy conditions<br>• The only tools needed for installation are a welding torch and roller | • The chemical resistance of bitumen |
| EPDM 5 | • Good resistance to UV and ozone<br>• High strength characteristics<br>• Excellent layflat behavior<br>• Good low temperature performance | • Potential low resistance to hydrocarbons and solvents<br>• Potential poor seam quality |

*Table 11. General guide to selecting an appropriate linear low-density (LLDPE) or high-density (HDPE) polyethylene geomembrane.*

| Foundation Conditions [1] | Underliner[2] | Overliner[3] | Effective Normal Stress (MPa) * | | |
|---|---|---|---|---|---|
| | | | <0.5 | 0.5–1.2 | >1.2 |
| Firm or high stiffness | Coarse-grained | Coarse-grained | 2 mm LLDPE or HDPE | 2 mm LLDPE or HDPE | 2.5 mm LLDPE or HDPE |
| | | Fine-grained | 1.5 mm LLDPE or HDPE | 2 mm LLDPE or HDPE | 2.5 mm LLDPE or HDPE |
| | Fine-grained | Coarse-grained | 1.5 mm LLDPE or HDPE | 1.5 mm LLDPE or HDPE | 2 mm LLDPE or HDPE |
| | | Fine-grained | 1 mm LLDPE or HDPE | 1.5 mm LLDPE or HDPE | 2 mm LLDPE or HDPE |
| Soft or low stiffness | Coarse-grained | Coarse-grained | 2 mm LLDPE | 2 mm LLDPE | 2.5 mm LLDPE |
| | | Fine-grained | 1.5 mm LLDPE | 2 mm LLDPE | 2.5 mm LLDPE |
| | Fine-grained | Coarse-grained | 2 mm LLDPE | 2 mm LLDPE | 2.5 mm LLDPE |
| | | Fine-grained | 1.5 mm LLDPE | 2 mm LLDPE | 2.5 mm LLDPE |

The results of geochemical characterisation of the waste material at Goldplat can be summarised as follows:

- The results of the waste rock geochemical assessment indicate that the major lithologies present in any of the proposed mining areas are classified as non-acid generating;
- The waste rock lithologies are not significantly enriched with respect to other trace elements;
- The potentially leachable concentrations of trace elements from the waste rocks are generally low and below their respective drinking water guideline values;
- Although based on the total concentrations, the waste rock would classify as a Type 3 waste material, but the concentrations are not considered to be significantly enriched and a risk-based approach in assessing the potential impacts arising from the waste rock dumps to the groundwater resource should be adopted at Goldplat;
- Based on the relative low elevations of total and leachate concentrations of the tailings material relative to the waste rock samples, this classification could be influenced by adopting a risk based approach. It woud be an unlikely requirement to design the TFS in accordance with the requirements for Type 3 waste materials.

[1] Foundation conditions need to be subjected to appropriate investigations and tests to determine compatibility with the geomembrane. Description of foundation conditions is a relative measure of stiffness.
[2] Underliner refers to the material directly beneath the geomembrane (primary geomembrane for double composite liner systems). Testing and design calculations are require d to assess the impacts on the geomembrane.

[3] Overliner refers to the material directly above the geomembrane. Testing and design calculations are required to assess the impacts on the geomembrane. * Effective normal stress is the maximum stress on the geomembrane due to the ore and other externally applied loads

Based on the evidence available to date at Goldplat, geomembrane structures would not be able to reduce the amount of seepage water lost through lined basal structures in comparison with naturally low permeability soil structures. For tailings ponds, there are more modern disposal methods to consider, such as thickened tailings, paste, or dry dumping, which have the major advantage of reducing the amount of seepage water. However, in the case of Goldplat these alternatives are non-viable because of higher initial and operating costs. A conclusion of this review is that Goldplat would need guidelines and recommendations on design and construction of geomembrane-lined basal structures. To improve the function of the structure, more specific knowledge is needed from practical use and from precise scientific studies. However, from a geochemical perspective, the main conclusion is that there is no need for the placement of a geomembrane liner. The base soil structure at Goldplat TSF and the effluent impact do not justify the placement of a geomembrane.

# 13 Conclusions and Recommendations

The results of geochemical characterisation can be summarised as follows:

- The results of the waste rock geochemical assessment indicate that the major lithologies present in any of the existing stockpile areas are classified as non-acid generating;
- The waste rock lithologies are not significantly enriched with respect to other trace elements;
- The potentially leachable concentrations of trace elements from the waste rocks are generally low and below their respective drinking water guideline values;
- Although based on the total concentrations, the waste rock would classify as a Type 3 waste material, but the concentrations are not considered to be significantly enriched and a risk-based approach in assessing the potential impacts arising from the waste rock dumps to the groundwater resource should be adopted;
- Based on the elevated total and leachate concentrations of the tailings material relative to the waste rock samples, it would be likely that this classification could be influenced by adopting a risk-based approach and the TFS be designed in accordance with a scaled-down version of the requirements for Type 3 waste materials.
- The C-liner required would only include the 1,5 mm thick HDPE geomembrane to be placed. The 300mm clay liner, that form part of the C-liner per definition, would be unnecessary since the discard material already contain a significant modal proportion of clay minerals, as a weathering product of the original waste. The placement of toe-drains will handle the run-off from the facility.
- In conclusion, a modal proportion of less than three percent of sulphate minerals in the form of gypsum are present in the samples studied. Small modal proportions of ferrihydrite minerals were detected in samples analysed. Furthermore, sulphate showed a slight enhancement in the leachate tests which indicate that some sulphide minerals were present before weathering of the samples. Thus, it could be stated with reasonable confidence that acid forming potential of the waste material at Goldplat does not pose a problem and certainly should *not* be considered as a fatal flaw.
- Finally, the high clay content in the waste material act as an efficient non-permeable layer that would contain any water and prevent it from passing through to form a pollution plume.
- Based on the evidence available to date at Goldplat, geomembrane structures can considerably reduce the amount of seepage water lost through lined basal structures in comparison with naturally low

permeability soil structures. However, for tailings ponds, there are already more modern disposal methods to consider, such as thickened tailings, paste, or dry dumping, which have the major advantage of reducing the amount of seepage water. However, from a geochemical perspective, the main conclusion is that there is no need for the placement of a geomembrane liner. The base soil structure at Goldplat TSF and the effluent impact do not justify the placement of a geomembrane.

## 14 Sources of information

Pinetown KL and Boer RH 2006, A quantitative evaluation of the modal distribution of minerals in coal; deposits in the Highveld area and the associated impact on the generation of acid and neutral mine drainage, WRC project 1264/1/06.

Tuomela A, Ronkanen A-K, Rossi PM, Rauhala A, Haapasalo H and Kujala K. 2021, Using Geomembrane Liners to Reduce Seepage through the Base of Tailings Ponds—A Review and a Framework for Design Guidelines. Geosciences, 11, 93.

Appendix 1: AMD formation

Based on this model, the oxidation of pyrite requires three basic ingredients: pyrite, oxygen, and water, yielding an overall oxidation reaction which generally is written as:

$$FeS_2 + 7/2\ O_2 + H_2O \Rightarrow Fe^{2+} + 2SO_4^{2-} + 2H^+ \quad [1]$$

Atmospheric oxygen is the most common oxidant, although oxygen dissolved in water can also result in pyrite oxidation, but due to the limited solubility of oxygen in water, this process is not that common. Aqueous ferric iron can oxidize pyrite as well, according to the following reaction:

$$FeS_2 + 14Fe^{3+} + 8\ H_2O \Rightarrow 15Fe^{2+} + 2SO_4^{2-} + 16H^+ \quad [2]$$

Although this reaction generates substantially more acidity per mole of pyrite oxidized, it only occurs where there is a significant amount of dissolved ferric iron, and is therefore restricted to acidic (pH <4.5) environments.

Pyrite oxidation is generally initiated through reaction [1] at circumneutral or higher pH, followed by reaction [2] when conditions have become sufficiently acidic (<pH 4.5). A third reaction is required to generate and replenish ferric iron, through oxidation of ferrous iron by oxygen as follows:

$$Fe^{2+} + ¼\ O_2 + H^+ \Rightarrow Fe^{3+} + ½\ H_2O \quad [3]$$

Although ferric iron can oxidize pyrite in the absence of oxygen, this reaction cannot proceed Indefinitely as oxygen is required for the oxidation of ferric iron from ferrous iron (reaction 3).

The ferrous iron generated in reaction [1] can be removed from solution under slightly acidic to alkaline conditions through oxidation and subsequent hydrolysis and the formation of relatively insoluble iron hydroxide phases (e.g. ferrihydrite) as follows:

$$Fe^{2+} + ¼\ O_2 + 2½\ H_2O \Rightarrow Fe(OH)_3 + 2H^+ \quad [4]$$

The combination of reactions [1] and [4], therefore represent the typical reactions when the conditions are not acidic (i.e., pH > 4.5), and gives the following combined reaction:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \Rightarrow Fe(OH)_3 + 2\ H_2SO_4 \quad [5]$$

Appedix 2: Laboratory certificates

aquatico Laboratories (Pty). Ltd.

ilac-MRA sanas Testing Laboratory T0685

## Test Report



**Client:** Irene Lea Enviromental and Hydrogeology CC
**Address:** 3 Herbert Baker Street, Sharon Park, 1496
**Report no:** 270267
**Project:** GoldPlats

**Date of report:** 20 July 2026
**Date accepted:** 10 July 2026
**Date completed:** 17 July 2026
**Date received:** 10 July 2026

| Lab no: | | | | 508326 | 508327 | 508328 | 508329 |
|---|---|---|---|---|---|---|---|
| Date sampled: | | | | 08-Jul-26 | 08-Jul-26 | 08-Jul-26 | 08-Jul-26 |
| Aquatico sampled: | | | | No | No | No | No |
| Sample type: | | | | Water | Water | Water | Water |
| Locality description: | | | | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
| | | Analyses | Unit | Method | | | |
| A | AQL | pH @ 25°C | pH | ALM 20 | 7.53 | 7.96 | 10.2 | 9.17 |
| A | AQL | Electrical conductivity (EC) @ 25°C | mS/m | ALM 20 | 1124 | 1293 | 841 | 26.1 |
| A | AQL | Total Dissolved solids @ 180°C | mg/l | ALM 24 | 9372 | 10434 | 6226 | 188 |
| A | AQL | Total Alkalinity | mg $CaCO_3$/l | ALM 01 | 277 | 245 | 717 | 34.0 |
| A | AQL | Chloride (Cl) | mg/l | ALM 02 | 761 | 880 | 1416 | 53.6 |
| A | AQL | Sulphate ($SO_4$) | mg/l | ALM 03 | 5490 | 6637 | 1420 | 4.04 |
| A | AQL | Nitrate ($NO_3$) as N | mg/l | ALM 06 | 6.77 | 22.1 | <0.194 | <0.194 |
| A | AQL | Total oxidised nitrogen as N | mg/l | ALM 06 | 11.9 | 34.7 | 0.363 | 0.253 |
| A | AQL | Nitrite ($NO_2$) as N | mg/l | ALM 07 | 5.09 | 12.6 | 0.347 | 0.152 |
| A | AQL | Ammonium ($NH_4$) as N | mg/l | ALM 05 | 119 | 99.6 | 43.1 | 1.97 |
| A | AQL | Orthophosphate ($PO_4$) as P | mg/l | ALM 12 | <0.009 | 0.016 | <0.009 | <0.009 |
| A | AQL | Fluoride (F) | mg/l | ALM 08 | 0.964 | 0.539 | 1.02 | <0.263 |
| A | AQL | Calcium (Ca) | mg/l | ALM 30 | 519 | 521 | 20.7 | 8.98 |
| A | AQL | Magnesium (Mg) | mg/l | ALM 30 | 28.2 | 52.6 | 18.9 | 11.3 |
| A | AQL | Sodium (Na) | mg/l | ALM 30 | 2290 | 2749 | 1948 | 15.8 |
| A | AQL | Potassium (K) | mg/l | ALM 30 | 83.8 | 84.0 | 22.9 | 3.78 |
| A | AQL | Aluminium (Al) | mg/l | ALM 31 | <0.003 | <0.003 | 0.228 | 0.006 |
| A | AQL | Iron (Fe) | mg/l | ALM 31 | 0.103 | 0.220 | 12.9 | <0.004 |
| A | AQL | Manganese (Mn) | mg/l | ALM 31 | 2.18 | 1.19 | 0.075 | 0.015 |
| A | AQL | Total Chromium (Cr) | mg/l | ALMT 31 | 0.050 | 0.030 | <0.010 | <0.010 |
| A | AQL | Copper (Cu) | mg/l | ALM 31 | <0.003 | <0.003 | 0.489 | <0.003 |
| A | AQL | Nickel (Ni) | mg/l | ALM 31 | 0.260 | 0.175 | 17.2 | <0.007 |
| A | AQL | Cobalt (Co) | mg/l | ALM 31 | 19.0 | 15.6 | 1.17 | <0.003 |
| A | AQL | Cadmium (Cd) | mg/l | ALM 31 | <0.002 | <0.002 | <0.002 | <0.002 |
| A | AQL | Lead (Pb) | mg/l | ALM 31 | <0.004 | <0.004 | 0.010 | <0.004 |

A: Accredited N: Not accredited Sub: Sub-contracted NR: Not requested RTF: Results to follow NATD: Not able to determine ND: Not Detected
ATR: Alternative Test Report; Results relate only to the items received and tested; Results reported against the limit of detection; Results marked as "Not SANAS Accredited" in this report are not covered by the Scope of Accreditation for this laboratory; Uncertainty of measurement available on request for all methods included in the SANAS Schedule of Accreditation; The report shall not be reproduced except in full without approval of the laboratory

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aquatico Laboratories (Pty). Ltd.

ilac-MRA sanas Testing Laboratory T0685

## Test Report



**Client:** Irene Lea Enviromental and Hydrogeology CC
**Address:** 3 Herbert Baker Street, Sharon Park, 1496
**Report no:** 270267
**Project:** GoldPlats

**Date of report:** 20 July 2026
**Date accepted:** 10 July 2026
**Date completed:** 17 July 2026
**Date received:** 10 July 2026

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lab no:** | | | | | 508326 | 508327 | 508328 | 508329 |
| **Date sampled:** | | | | | 08-Jul-26 | 08-Jul-26 | 08-Jul-26 | 08-Jul-26 |
| **Aquatico sampled:** | | | | | No | No | No | No |
| **Sample type:** | | | | | Water | Water | Water | Water |
| **Locality description:** | | | | | Toe 1 | Toe 2 | Stream 1 | Benoni 1 |
| | | **Analyses** | **Unit** | **Method** | | | | |
| A | AQL | Total hardness | mg $CaCO_3$/l | ALM 26 | 1412 | 1518 | 130 | 69 |
| N | AQL | Total Nitrogen | mg/l | ALM 26 | 174 | 201 | 108 | 2.22 |
| N | AQL | Total Kjeldahl Nitrogen (TKN) | mg/l | ALM 11 | 162 | 166 | 107 | 1.97 |
| A | AQL | Barium (Ba) | mg/l | ALM 33 | 0.043 | 0.060 | <0.002 | 0.015 |
| A | AQL | Strontium (Sr) | mg/l | ALM 33 | 1.80 | 2.57 | 0.111 | 0.052 |
| A | AQL | Dissolved Uranium (U) | mg/l | ALM 37 | <0.015 | 1.90 | 0.238 | <0.015 |
| A | AQL | Bicarbonate alkalinity | mg $CaCO_3$/l | ALM 26 | 277 | 243 | 285 | 29.2 |
| A | AQL | HNO3-Microwave digestion | mg/l | ALM 90 | Yes | Yes | Yes | Yes |
| N | AQL | TKN-Microwave digestion | mg/l | ALM 90 | Yes | Yes | Yes | Yes |

A: Accredited N: Not accredited Sub: Sub-contracted NR: Not requested RTF: Results to follow NATD: Not able to determine ND: Not Detected
ATR: Alternative Test Report; Results relate only to the items received and tested; Results reported against the limit of detection; Results marked as "Not SANAS Accredited" in this report are not covered by the Scope of Accreditation for this laboratory; Uncertainty of measurement available on request for all methods included in the SANAS Schedule of Accreditation; The report shall not be reproduced except in full without approval of the laboratory

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# Appendix C: Public Participation

# Goldplats Recovery (Pty) Ltd

# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni (CoE) Metropolitan Municipality Gauteng Province

**VOCMA Reference Number WU48373**

**Public Participation Report for the Draft IWWMP**

**October 2026**

## Report Preparation By

| Kongiwe Environmental (Pty) Ltd | |
|---|---|
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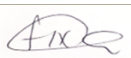
| **Website** | www.kongiwe.com |

## Report Information

| | |
|---|---|
| **Project** | Integrated Water Use Licence Application for the Goldplat Reclamation Project |
| **Report Title** | Public Participation Report |
| **VOCMA Reference Number** | WU48373 |
| **Client** | Goldplat Recovery (Pty) Ltd |
| **Project No.** | GOLD#001 |
| **Compilation Date** | October 2026 |
| **Status of Report** | Draft |

## Approval

| Verification | Name | Capacity | Signature | Date |
|---|---|---|---|---|
| **Compiled by** | Vanessa Viljoen | Principal Stakeholder Consultant | | 15 September 2026 |
| **Reviewed by** | Anela Fixi | Environmental Consultant |  | 18 September 2026 |

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Appendix C8: Meeting Minutes

Appendix C9: Written Comments

Appendix C10: Comments and Response Report

## 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 |


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## Abbreviations

| Abbreviation | Description |
|---|---|
| **BID** | Background Information Document |
| **CBO** | Community-Based Organisation |
| **CRR** | Comments and Response Report |
| **DLRRD** | Department of Land Reform and Rural Development |
| **EAP** | Environmental Assessment Practitioner |
| **e-WULAAS** | Electronic Water Use Licence Application and Authorisation System |
| **IAP2** | International Association for Public Participation |
| **IFC** | International Finance Corporation |
| **I&AP** | Interested and Affected Party |
| **IWULA** | Integrated Water Use Licence Application |
| **IWWMP** | Integrated Water and Waste Management Plan |
| **CoE** | City of Ekurhuleni Metropolitan Municipality |
| **NGO** | Non-Governmental Organisation |
| **NWA** | National Water Act, 1998 (Act No. 36 of 1998) |
| **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 |
| **VOCMA** | Vaal-Orange Catchment Management Agency |


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# 1. Introduction

Goldplat Recovery (Pty) Ltd ('Goldplat') proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Mining (Pty) Ltd (Ergo) gold plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

A Water Use Licence (WUL) is required for the Project activities that may impact water resources. Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Goldplat to undertake the IWULA for the Project.

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 and will be supported by an Integrated Water and Waste Management Plan (IWWMP). The IWULA will be reviewed and considered by the Vaal-Orange Catchment Management Agency (VOCMA) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the Project comply with the National Water Act, 36 of 1998 (Act No. 36 of 1998) (NWA).

## 1.1 Project Location

The Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni (CoE) Metropolitan Municipality. The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project.

The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the project.

The process water and slurry pipelines run from Goldplat and extend all the way to the Ergo Plant. They run past residential areas, open areas, wetlands and industrial areas.

# 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 was developed to ensure compliance with relevant legislation and facilitate meaningful stakeholder engagement, as required for the IWULA process.

This Public Participation Report outlines the public consultation activities which will be undertaken as part of the IWULA.

## 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:

- National Water Act (Act No. 36 of 1998).
- Protection of Personal Information Act, 2013 (Act No. 4 of 2013) (POPIA).
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000) (PAIA).


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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. |

## 2.2 International Standards

In addition to the above legislation, the PPP is to be aligned to international good-practice guidelines for public participation, particularly regarding 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.

## 2.3 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 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


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- 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 meetings with the VOCMA, Gauteng Province *(this meeting was undertaken)*.<br>• Stakeholder identification (WinDeed searches, compilation of stakeholder database).<br>• 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).<br>• Consultation with relevant Authorities, including Ward councillors) (Microsoft Teams/ one-on-one consultation meetings).<br>• Compilation of announcement documents (Background Information Document (BID), registration and comment form, newspaper advertisement, site notice) and providing Project information to stakeholders.<br>• Distribution and placement of announcement materials.<br>• Obtaining initial comments and suggestions from stakeholders.<br>• Development of Comments and Response Report (CRR), capturing all comments/questions and responses<br>• Land Claims enquiry. |
| IWULA Consultation Phase. | • Site visit with (VOCMA (this will be undertaken).<br>• Ongoing consultations with directly affected landowners (Microsoft Teams/one-on-one consultation meetings).<br>• Update the stakeholder database.<br>• Compile and make available the IWWMP for public review and comment.<br>• Provide feedback about the specialist studies conducted and mitigation measures proposed, by means of consultation meetings with stakeholders (Microsoft Teams).<br>• Provide an opportunity for stakeholders to comment on specialist findings, impacts assessments and recommendations.<br>• Verify that comments raised by stakeholders have been recorded accurately.<br>• Inform specialists and the proponent of additional stakeholders' comments. |
| Decision Making Phase. | • The IWULA will be submitted to VOCMA in terms of the NWA. Once VOCMA has come to a decision regarding the IWULA, the VOCMA will notify the applicant and any person who has objected to the application. Written reasons for the decision will be given. |

## 2.4 Summary of Issues Raised by Stakeholders

Comments raised by stakeholders during the IWULA consultation phases will be included in the CRR, as will be presented in **Appendix C10.**


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# 3. Public Participation Approach

## 3.1 Submission of the Integrated Water Use Licence Application

The IWULA process started when the Goldplat Reclamation Project was registered on the Department of Water and Sanitation (DWS) electronic Water Use Licence Application and Authorisation System (e-WULAAS) on Friday, 23 January 2026.

A pre-application meeting was held with the VOCMA official as shown in Table 3-1below. Phase 1 of the e-WULAAS application has been completed and submitted. A site visit will be conducted with VOCMA.

## 3.2 Authority Consultations

Consultation was undertaken to provide Authorities with an overview of the Goldplat Reclamation Project and the associated IWULA process, including the specialist studies undertaken and/or planned. Authorities were afforded the opportunity to raise comments, seek clarification, provide input on the process, and engage directly with the Project Team.

Table 3-1 provides a summary of the consultstion meetings held with the relevant Authorities to date.

***Table 3-1: Stakeholder Meetings held to date***

| Meeting Dates | Stakeholders | Time Slots |
|---|---|---|
| **Online Meeting** | | |
| Monday, 24 March 2026 | A Microsoft Teams online pre-application meeting was held with officials from the Competent Authority, the Vaal-Orange Catchment Management Agency (VOCMA). | 11H00 – 11H30 |

## 3.3 Summary of meetings with Authorities

### 3.3.1 Pre-Application meeting with VOCMA

An online pre-application meeting was held with the VOCMA Case Officer, Ms Thabelo Tshipate, on **Wednesday, 13 March 2024, from 11:00 – 11:30**. Information was presented by means of a PowerPoint presentation.

**The purpose of this meeting was to:**

- Present and discuss the IWULA for the Goldplat Reclamation Project;
- Provide an overview of the identified water uses and the associated IWULA Process;
- Provide an opportunity to raise comments/seek clarity as well as provide input; and
- Record comments raised and included them in the CRR.

A list of meetings and consultations undertaken during the IWULA process will be provided in **Appendix C8**.

Minutes of these meetings, along with the presentation materials, will be compiled and distributed to all stakeholders who attended, and presented in **Appendix C8**.

All comments raised by stakeholders during these meetings will be recorded in the CRR, with responses prepared in accordance with the project scope and available information. The CRR is presented in **Appendix C10.**

## 3.4 Landowner Consent

According to the NWA and the associated Water Use Licence Application and Appeals Regulations, applicants must demonstrate lawful access to the land where the proposed water use will take place.


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*The Goldplat process water and slurry pipelines will be routed within the existing Ergo servitude. Goldplat will secure a servitude agreement with Ergo for the sections located within the servitude area. For any pipeline sections and infrastructure located outside the Ergo servitude, Goldplat will obtain the required landowner consent agreements from the affected property owners.*

## 3.5 Stakeholder Mapping and Identification

Stakeholder mapping is a process of identifying stakeholders before the project commences. Identified stakeholders are grouped according to their levels of participation, interest, and influence in the 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 were used as part of the stakeholder identification and analysis process for the 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 City of Ekurhuleni (CoE) Metropolitan Municipality.
- Identify and consult relevant ward councillors and ward committees from the affected wards, Directly and Indirectly Affected Wards, including:
- **Directly Affected Ward:**
  - Mr Samuel Ngobese, Ward Councillor: Ward 73
  - Mr David Simelane, Ward Councillor: Ward 74
  - Mr Henry Buitendacht, Ward Councillor: Ward 82
  - Mr Brandon Pretorius, Ward Councillor: Ward 97
  - Ms Antoinette Verster, Ward Councillor: Ward 105
- **Indirectly Affected Ward:**
  - Mr Samuel Ngobese, Ward Councillor: Ward 73
  - Mr Brandon Pretorius, Ward Councillor: Ward 97
- Consult with directly affected landowners and inform indirectly affected including land occupiers.
- Consult with the Department of Land Reform and Rural Development (DLRRD), Office of the Regional Land Claims Commissioner (Gauteng).
- 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.
- Update the stakeholder database from attendance registers from stakeholder meetings.

**I&APs have been 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.


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  - **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).
- **Business and Industry:** Small, Medium and Micro Enterprises (SMMEs), mines, industrial and large business organisations.

A stakeholder database will be compiled and updated throughout the regulatory process and is presented in **Appendix C1**.

### 3.6 Land Claims Enquiry

A formal letter of enquiry will be compiled and sent to the Gauteng Department of Land Reform and Rural Development's (DLRRD) Office of the Regional Land Claims Commissioner on **Tuesday, 29 September 2026** for the attention of **Mr Solomon Maruma**. The letter included a list of all directly affected properties, which will be evaluated to determine if there are land claims, as presented in **Appendix C2**. Feedback will be received from DLRRD by means of a letter.

## 4. Communication and Engagement

### 4.1 Public Participation Materials

In accordance with legislative requirements and good practice guidelines, the following documents were prepared and distributed to stakeholders as part of the IWULA and Public Participation Process (PPP).

**Background Information Document (BID):** The BID was emailed on **Tuesday, 29 September 2026** to I&APs listed on the stakeholder database, as presented in **Appendix C3**. The BID was also available on Kongiwe's website (https://kongiwe.com/projects). The BID provided the following details:

- An overview of the Goldplat Reclamation Project;
- The PPP to be undertaken in support of the IWULA;
- The public review and comment period for the IWWMP;
- Details how stakeholders could register as an I&AP and be kept informed about the Project developments;
- Invitation to attend an online meeting via Microsoft Teams; and
- Contact details of the stakeholder engagement consultants.

**Notification Letter with a Registration and Comments Form:** An email was sent to stakeholders on **Tuesday, 29 September 2026**, to inform them about the Project. The email also shared details of the online meeting and invited the broader public to formally register as I&APs. A 'Registration and Comment Form' was provided to stakeholders to formally register as an I&AP and to submit their comments, as presented in **Appendix C3.**

A reminder notification will be emailed to stakeholders to remind them of the availability of the **Draft IWWMP** for public review and comment. The reminder will also encouraged stakeholders to attend the online meeting. A copy of the reminder notification will be provided in **Appendix C6.**

**SMS:** SMSs were sent to stakeholders with no access to the internet. Arrangements will be made to ensure that these stakeholders had full access to Project documentation.


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**Newspaper Advertisements:** A newspaper advertisement will be published in the **Benoni City Times,** a local newspaper within the Project area, on **Friday, 2 October 2026**. A copy of the advertisement will be provided in **Appendix C4**.

**The advert included the following details:**

- An overview of the Project;
- Applicable water use legislation and details of VOCMA as 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 an online meeting via Microsoft Teams; and
- Contact details of the stakeholder engagement consultants.

**Site Notice:** Site notices will be compiled and placed in and around the Project area. The site notice **(Appendix C5)** included the following:

- An overview of the Project, including a locality map;
- Applicable water use legislation and details of VOCMA as the Competent Authority;
- PPP to be followed and where relevant information could be obtained; and
- Invitation to attend an online meeting via Microsoft Teams and where stakeholders can register to attend.

Photographs and coordinates of the locations where the site notices will be displayed, together with the site notice location map, will be provided in **Appendix C5**.

**Telephonic Discussions:** Stakeholders will be consulted by means of telephonic discussions, where required. These discussions facilitate the process of inviting stakeholders to 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 Engagements

This section outlines the consultation approach and summarises the stakeholder engagements undertaken during the Draft and Final IWWMP processes.

## 5.1 Consultation Approach

Consultation will be undertaken to provide stakeholders with an overview of the Project and to obtain comments that informed the specialist studies and project planning. Stakeholders will be invited to participate in both online and in-person engagements, depending on their preference. These engagements will provide an opportunity to present the Project and the Draft IWWMP, discuss the project, respond to queries, receive stakeholder input, and engage directly with the Project Team. Locality, infrastructure, land tenure, water use maps will be presented during the meetings where relevant.

**The following meetings will be held:**

- **Landowner Meetings:** Consultation meetings will be held with directly affected landowners, where applicable or requested.
- **Local Authorities**: Consultation meetings will be held with relevant municipalities, including ward councillors and ward committee members.
- **Online Meeting with Broader Stakeholders:** An online engagement will be held with the broader public during the public review period.


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Table 5-1 provides a summary of the stakeholder engagements to be undertaken.

*Table 5-1: Stakeholder Meetings*

| Meeting Dates | Stakeholders | Time Slots |
|---|---|---|
| **Online Meetings** | | |
| Wednesday, 28 October 2026 | A Microsoft Teams online meeting will be held with indirectly affected landowners and broader stakeholders. | 10H00 – 11H00 |

Focused efforts will be made to engage directly affected stakeholders, including residents within the Project area and vulnerable groups at the local level. These stakeholders will be consulted directly, as well as through their representatives and other recognised community leaders where appropriate. Engagements will be conducted in a culturally appropriate and inclusive manner, providing stakeholders with the opportunity to express their views, raise concerns, and ask questions openly. Stakeholders will be given the opportunity to communicate in the language of their choice, with translation provided where required to ensure meaningful participation.

Authorities, NGOs, landowner's / land occupiers and community members will be engaged to promote attendance, by means of telephonic consultation and distribution of emails and SMS.

A list of meetings and consultations to be undertaken during the IWULA process will be provided in **Appendix C8**.

Minutes of these meetings, along with the presentation materials, will be compiled and distributed to all stakeholders who attended, and presented in **Appendix C8**.

All comments raised by stakeholders during these meetings will be recorded in the CRR, with responses prepared in accordance with the project scope and available information. The CRR will be presented in **Appendix C10.**

## 5.2 Availability of the Draft IWWMP Report for Public Review and Comment

As part of the IWULA process, the Applicant is required to prepare an IWWMP for the proposed mining-related activities. The Draft IWWMP for the Project will be made available for public review and comment for 60 days, from **Tuesday, 6 October 2026 to Friday, 4 December 2026**.

A notification of the availability of the **Draft IWWMPs** for public review and comment will be distributed on **Tuesday, 29 September 2026** to all stakeholders on the database

**The Draft IWWMP will be available as follows:**

- An electronic copy on Kongiwe's website: https://kongiwe.com/projects/
- A Hard copy of the **Draft IWWMP** will be made available at the Lawrence Bongani Sibanyoni Public Library (Kingsway). Contact details are shown in Table 5-2.

Relevant Authorities will be notified by email of the availability of the **Draft IWWMP** and will be provided with a link to access the report as part of the project announcement.

*Table 5-2: Public Places where Hard Copies of the Draft IWWMP will be placed*

| Location | Physical Address | Contact Person |
|---|---|---|
| **Draft IWWMP and Specilist Studies available at:** | | |
| Lawrence Bongani Sibanyoni Library | Cnr Ndlovele and Isibusisu Streets, Kingsway, Benoni, 1501 | Mr Mfundo Nxumalo – (072) 212 2884<br>Monday - Friday<br>Open: 08:00 – 16:30<br>1st Saturday of the month<br>Open: 08:00 – 13:00 |


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## 5.3 Summary of Consultations

Table 5-3 below provides a summary of consultations relating to the Draft IWWMPs.

***Table 5-3: Summary of Consultations***

| Activity | Details | Reference in Draft Scoping Report |
|---|---|---|
| Identification of stakeholders | • Landowners were identified by means of WinDeed searches and a stakeholder database will be compiled.<br>• Stakeholders were identified through research and stakeholder networking.<br>• 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**<br>Stakeholder Database |
| Identification of land claims | • A formal letter of enquiry will be compiled and submitted to the Land Claims Commission, DLRRD, Gauteng.<br>• The letter comprised a list of directly affected properties for the Project. Feedback will be received from DLRRD. | **Appendix C2**<br>Land Claims Enquiry to (DLRRD), Gauteng |
| Development of the BID | • The BID will be developed and emailed to all stakeholders on the database.<br>• The BID will be available on Kongiwe's website (under public documents). | **Appendix C3**<br>BID |
| Placement of newspaper advertisements | • An advert will be placed in the Benoni City Times a local newspaper. | **Appendix C4**<br>Newspaper Advertisements |
| Placement of site notices | • Site notices will be placed at publicly accessible places within proximity of the Project area. Additionally, site notices will be placed at the Lawrence Bongani Sibanyoni Library.<br>• A site notice report and site notice map will be developed, indicating the exact locations of where the site notices will be placed, with photos and GPS coordinates. | **Appendix C5**<br>Site Notice Report and Placement Map |
| Announcement of the Project and the availability of the Draft IWWMP | • The announcement letter will be emailed to stakeholders to:<br>– Announce availability of the Draft IWWMP report.<br>– Invite stakeholders to the online meeting.<br>– Indicate where the Draft IWWMP will be available for public review and comment.<br>• The Draft IWWMP will be available on Kongiwe's website.<br>• A copy of the Draft IWWMP will be placed in the Lawrence Bongani Sibanyoni Library. | **Appendix C6**<br>Announcement Correspondence |
| Stakeholder consultation meetings | • Consultation during the pre-application phase will be aimed at providing key stakeholders with an overview of the Project, and to obtain comments which informed specialist studies and project planning.<br>• Stakeholders will be invited to participate through online and in-person engagements. Consultation meetings with authorities, directly and indirectly affected landowners will be held via on-line forums such | **Appendix C8**<br>List of Meetings and Meeting Minutes<br><br>**Appendix C10**<br>CRR |


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| Activity | Details | Reference in Draft Scoping Report |
|---|---|---|
| | as Microsoft Teams or in-person depending on preference.<br>• The Project team presented a formal presentation of the Project the Locality, Infrastructure and Land Tenure maps will be displayed as part of the meetings.<br>• Minutes of these meetings will be compiled and distributed to everyone who attended these meetings.<br>• Comments raised from the meeting will be included into the CRR. | |
| Broader public consulting meeting | • Stakeholders will be invited to participate through online and in-person engagements. The purpose of these meetings will be to discuss the Project, contents of the Draft IWWMP, to provide stakeholders with an opportunity to raise their comments and to interact with the Project team members.<br>• Minutes of these meetings will be compiled and distributed to everyone who attended these meetings.<br>• Comments raised from the meeting will be included into the CRR. | **Appendix C8**<br>List of Meetings and Meeting Minutes<br><br>**Appendix C10**<br>CRR |

## 5.4 Consultation to be undertaken as part of the Final IWWMP

Once the Final IWWMP will be submitted to the VOCMA, stakeholders will have the opportunity to verify that their comments submitted during the draft review period have been captured and to review the responses provided by the Project Team. Table 5-4 provides a summary of the anticipated activities during the Final IWWMP process.

***Table 5-4: PPP Activities that will be undertaken during the Final IWWMP process***

| Activity | Details |
|---|---|
| Update of stakeholder information | The stakeholder database will be updated with new stakeholders who formally registered, participated in stakeholder meetings and/or submitted comments. |
| Placement of the Final IWWMPs | The Final IWWMP will be available on Kongiwe's website. |
| Final Submission to the Authorities | The Final IWWMP and other required technical information will be uploaded and submitted as Phase 3 on the electronic submission system (e-WULAAS). |
| Announcement of the Submission of the Final IWWMPs to VOCMA | A notification letter notifying stakeholders that the Final IWWMP will be submitted to VOCMA will be emailed to the full stakeholder database.<br><br>An SMS will be sent to stakeholders with no access to the internet. |

## 5.5 Consultation During the Decision-Making Phase

The IWULA will be submitted to the VOCMA in terms of the NWA. Once the VOCMA, has come to a decision regarding the IWULA, the VOCMA will notify the applicant and any person who has objected to the application, providing written reasons for the decision.


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# 6. Appendices


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# Appendix C1: Stakeholder Database

# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province

## Stakeholder Database

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Agricultural Union | TLU SA Central Region | Ms | Lynette | Du Plessis | Manager TAU SA Central Region | Gauteng |
| Directly Affected Landowner | Atoll Metal Recovery (Pty) Ltd t/a Atoll Mining | Mr | Gavin | Gouws | Managing Directlor | Gauteng |
| Directly Affected Landowner | New Modderfontein Township (Pty) Ltd | Mr | James | Stewart | Private Landowner | Gauteng |
| Directly Affected Landowner | Vereeniging Property and Investments (Pty) Ltd | Mr | Sam | Hancock | Financial Director | Gauteng |
| Directly Affected Landowner | Industrial Zone (Pty) Ltd (iProp) | Ms | Jeanie | Pelser | CEO | Gauteng |
| Directly Affected Landowner | Transnet Freight Rail Ltd: Gauteng | Ms | Suzan | Aidelomo | Gauteng Environmental Specialist | Gauteng |
| Directly Affected Landowner | Department of Public Works and Infrastructure (DPWI) | Ms | Friedah | Khoza | Property Manager | Gauteng |
| Directly Affected Landowner | South African National Roads Agency Limited (SANRAL) | Mr | David | Thubane | Land Acquisition Specialist | Gauteng |
| Directly Affected Landowner | Transnet Freight Rail Ltd | Mr | Thembinkosi | Memela | Property Technician | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Directly Affected Landowner | South African National Roads Agency Limited (SANRAL) | Ms | Victoria | Bota | Environmentalist (Gauteng Region) | Gauteng |
| Directly Affected Landowner | Fullimput 1480 CC | Mr | Henlo | Meyer | Director: Markon Group | Gauteng |
| Directly Affected Landowner, Indirectly Affected Landowner | City of Ekurhuleni Metropolitan Municipality | Mr | Winston | Marumo | Real Estate and Property Management Department | Gauteng |
| Environmental NGO's | African Potential Group | Dr | Jenny | Coetzee | CEO | Gauteng |
| Environmental NGO's | African Potential Group | Mr | Nkateko | Maholobela | Lead Environmental Health-Strategist | Gauteng |
| Environmental NGO's | African Potential Group | Ms | Minja | Milovanovic | Head of Science and Innovation | Gauteng |
| Environmental NGO's | Andrew Barker Development Consultant/ KlipSA | Mr | Andrew | Barker | Development Consultant | Gauteng |
| Environmental NGO's | Benchmarks Foundation (BMF) | Mr | David | van Wyk | Environmental | Gauteng |
| Environmental NGO's | Birdlife South Africa (BLSA) | Dr | Kirsten | Day | Policy & Advocacy Manager | Gauteng |
| Environmental NGO's | Council of Geoscience: National | Dr | Thakane | Ntholi | Specialist Scientist | Gauteng |
| Environmental NGO's | Earthlife Africa Johannesburg | Ms | Makoma | Lekalakala | Director | Gauteng |
| Environmental NGO's | Endangered Wildlife Trust (EWT) | Dr | Ian | Little | Head of Conservation and Science | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Environmental NGO's | Federation for Sustainable Environment (FSE) | Ms | Mariette | Liefferink | Chief Executive Officer | Gauteng |
| Environmental NGO's | Gauteng Wetland Forum | Mr | Bismark | Mashau | Chairperson | Gauteng |
| Environmental NGO's | Groundwork | Mr | Bobby | Peek | Director | Gauteng |
| Environmental NGO's | Mining Affected Communities United in Action (MACUA) | Mr | Gilbert | Moela | Media Liaison | Gauteng |
| Environmental NGO's | South African National Biodiversity Institute (SANBI) | Ms | Vivian | Malema | Director: Biodiversity Education and Public Engagement Directorate | Gauteng |
| Environmental NGO's | South African National Biodiversity Institute (SANBI) | Ms | Zama | Nzeru | Admin | Gauteng |
| Environmental NGO's | Wildlife & Environmental Society of South Africa (WESSA) | Mr | John | Wesson | Manager: Conservation Specialist | Gauteng |
| Environmental NGO's | Wildlife & Environmental Society of South Africa (WESSA) | Ms | Seipati | Mphasane | Senior Education Officer: Environmental Coordinator | Gauteng |
| Environmental NGO's | Wildlife & Environmental Society of South Africa (WESSA) Springs & Nigel branch | Mr | Peter | Law | Springs-Nigel Branch Chair | Gauteng |
| Indirectly Affected Landowner | Gauteng Department of Human Settlement | Ms | Mpho | Mamashela | Property Management | Gauteng |
| Interested & Affected Party | Goldplat Recoveries | Mr | Esau | Mokoteli | General Manager | Gauteng |
| Interested & Affected Party | Grootvaly Blesbokspruit Conservation Trust | Mr | Patrick | Ganda | Memebr | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Interested & Affected Party | Grootvaly Blesbokspruit Conservation Trust | Mr | Philip | De Jager | Chairman | Gauteng |
| Interested & Affected Party | Laher's T/A Ishhala Livestock | Mr | Ismail | Laher | | Gauteng |
| Libraries | Lawrence Bongani Sibanyoni Library | Mr | Mfundo | Nxumalo | Management | Gauteng |
| Local Government | Johannesburg Roads Agency (JRA) | Mr | Andre | Nel | Operations Manager: Road and Stormwater Planning | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Adv | Tersia | Visser | Area Manager: Property Management-Springs and Kwa-Thema CCA | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Dr | Ewert | Maseko | Acting Area Manager: Property Management Springs and Kwa-Thema CCA | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Cllr | Thulani | Simelane | Ward Councillor: Ward 74 | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Dr | Imogen | Mashazi | Municipal Manager | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Bafana | Mazibuko | Disaster & Emergency Services Department | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Chris | Kapp | Air Quality/Noise Control | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Christopher | Munyai | Brakpan Economic Development | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Flip | Visser | Air Quality Section | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Gerhard | Mac Carron | Ekurhuleni Spatial Planning | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Jerry | Chaka | Director Environmental Health | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Nkosindiphile | Xhakaza | Mayor | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Pule | Makena | Catchment Management Specialist | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Rendani | Khorombi | Waste Management Services Division: Compliance | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Samukelo | Shongwe | Specialist: Air Quality Management | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Scelo | Ndima | Environmental Resource and Waste Management Department | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Sthembiso | Garane | LED Manager: (HOD: Economic Development) | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Mr | Victor | Nesengani | Waste Management Services Division: Compliance | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Bongeka | Mtyana | Environmental Resource and Waste Management Department | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Dudu | Twala | Area Manager: Brakpan CCA: City Planning | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Kwanele | Mdletshe | Environmental Resource and Waste Management Department | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Lerato | Selolo | Compliance Division | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Lillian | Matlala | Environmental Officer | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Linda | Naicker | Municipal Managers PA | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Nelisiwe | Mvuni | IDP Manager | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Nthabiseng | Tshivhenga | Speaker | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Pheta P. | Mokoena | Waste Manager: EMM | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Precious | Mabogoane | Air Quality and Noise Practitioner | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Regina | Gosebo | Senior Admin | Gauteng |
| Local Municipality | City of Ekurhuleni Metropolitan Municipality | Ms | Yvonne | Moropa | Executive PA: Head of Environmental Resources | Gauteng |
| National Government | Department of Agriculture (DoA) | Ms | Vuyiswa | Qobo | Environmental Officer | Gauteng |
| National Government | Department of Forestry Fisheries and the Environment (DFFE) | | | DFFE | Forestry Branch | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | | | DFFE - Biodiversity | | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Mr | Bongani | Mabuda | Environmental Officer | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Mr | Obed | Baloyi | Environmental Impact Evaluation | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Mr | Phumudzo Morris | Mavhunga | Waste Management: Licensing | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Mr | Themba | Dlamini | Regional Office | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Ms | Mashudu | Mudau | Protected Areas Planning and Management Effectiveness | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Ms | Mulalo | Sundani | National Office: Directorate: Forestry Regulation and Oversight: Environmental | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Ms | Portia | Makitla | Biodiversity and Conservation | Gauteng |
| National Government | Department of Forestry, Fisheries and the Environment (DFFE) | Ms | Thizwikoni | Munzhelele | Case Officer | Gauteng |
| National Government | Department of Health (DOH): National | Ms | Belinda | Makhafola | Directorate: Environmental Health Services | Gauteng |
| National Government | Department of Land Reform and Rural Development (DLRRD) | Mr | Harry | Maphutha | Regional Land Claims Commissioner | Gauteng |
| National Government | Department of Land Reform and Rural Development (DLRRD) | Mr | Matsobane Solomon | Maruma | Land Claims Gauteng Regional Officer | Gauteng |
| National Government | Department of Land Reform and Rural Development (DLRRD) | Mrs | Amukelani | Shiburi | Land Claim Officer | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| National Government | Department of Land Reform and Rural Development (DLRRD) | Ms | Desiree | Kgole | Commission on Restitution of Land Rights- Gauteng Regional Officer | Gauteng |
| National Government | Department of Land Reform and Rural Development (DLRRD) | Ms | Edith | Mokgoko | Commission on Restitution of Land Rights- Gauteng Regional Officer | Gauteng |
| National Government | Department of Land Reform and Rural Development (DLRRD) | Ms | Fundiswa | Ndaba | Commission on Restitution of Land Rights- Gauteng Regional Officer | Gauteng |
| National Government | Department of Mineral and Petroleum Resources (DMPR) | Adv | Mmadikeledi | Moloto | DDG: Mineral Regulation | Gauteng |
| National Government | Department of Mineral and Petroleum Resources (DMPR) | Mr | David | Msiza | Mine Health and Safety Inspectorate | Gauteng |
| National Government | Department of Mineral and Petroleum Resources (DMPR) | Mr | Musa | Mangobe | Gauteng Environment | Gauteng |
| National Government | Department of Mineral and Petroleum Resources (DMPR) | Mr | Nicholas | Chavalala | Deputy Director: Mine Environmental Management | Gauteng |
| National Government | Department of Mineral and Petroleum Resources (DMPR) | Mr | Rudzani | Mabogo | Head of Environment: Director for Compliance and Enforcement | Gauteng |
| National Government | Department of Public Works and Infrastructure (DPWI) | Mr | Malusi | Ganiso | Town Planning Services (HO) | Gauteng |
| National Government | Department of Public Works and Infrastructure (DPWI) | Mr | Thapelo | Duma | PA to Regional Manager | Gauteng |
| National Government | Department of Public Works and Infrastructure (DPWI) | Mr | Zakhele | Ndebele | Real Estate Management Services | Gauteng |
| National Government | Department of Public Works and Infrastructure (DPWI) | Ms | Jabulile | Mabaso | Acting Regional Manager | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| National Government | Department of Water and Sanitation (DWS) | Mr | Desmond | Mutshaine | Geochemistry | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | James | Mofokeng | Environmental Specialist-Blesbokspruit: Catchment Forum | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Londolani | Mutshekwa | National | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Mogale | Matseba | Manager: Water Resource Planning and Management: Catchment Forum | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Noe | Malise | Resource Protection & Waste | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Phillimon | Khwinana | Control Environmental Officer, Blesbokspruit and Rietspruit Catchment Forum Ch | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Victor | Nkuna | Environmental Officer | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Ms | Faith Fulufhelo | Khosa | Gauteng Regional Representative | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Ms | Karabo | Modiba | Environmental Officer | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Ms | Mulalo | Sidogi | Environmental Officer | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Ms | Nosie | Mazwi | Director: Mining and Industry Water Quality Regulation | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Ms | Portia C | Chawane | Control Environmental Officer Grade A | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| National Government | Department of Water and Sanitation (DWS) | Ms | Thabelo | Tshipate | Environmental Officer | Gauteng |
| National Government | Minerals Council South Africa: National | Mr | Babalwa | Matiwane | Environment Department: National | Gauteng |
| National Government | Minerals Council South Africa: National | Mr | Matome | Makwela | Environmental Advisor | Gauteng |
| National Government | Minerals Council South Africa: National | Ms | Jeannette | Hofsajer | Environment Department: National Administration | Gauteng |
| National Government | National Nuclear Regulator (NNR) | Mr | Patle | Mohajane | Programme Manager: NORM | Gauteng |
| National Government | South African Human Rights Commission | Mr | Zamantungwa | Mbeki | Gauteng Provincial Manager | Gauteng |
| National Government (Provincial Office) | Department of Forestry, Fisheries and the Environment (DFFE) | Mr | Mthokozese | Nsizwane | Environmental Office | Gauteng |
| National Government (Provincial Office) | Department of Forestry, Fisheries and the Environment (DFFE) | Ms | Khuliso | Khomari | Environmental Officer | Gauteng |
| National Government | Department of Water and Sanitation (DWS) | Mr | Mabona (Rodney) | Lesiba | Control Environmental Officer, Klip River and Natalspruit Catchment Forum Assis | Gauteng |
| NGO | Johannesburg Chamber of Commerce & Industry | Ms | Bernadette | Zerler | Chief Executive | Gauteng |
| Parastatal | Eskom | Mr | Jason | Kasper | Land and Rights Manager | Gauteng |
| Parastatal | Eskom | Mr | Moitheri | Khuphane | Ekurhuleni Environmental | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Parastatal | Eskom | Mr | Sbu | Nkalanga | Ekurhuleni Representative | Gauteng |
| Parastatal | Eskom | Ms | Charmaine | Mare | Environmental Manager | Gauteng |
| Parastatal | Eskom | Ms | Nkateko | Msimango | Ekurhuleni Environmental | Gauteng |
| Parastatal | National Transmission Company South Africa (NTCSA) | Mr | Khululwa | Matshoba | Senior Environmental Advisor | Gauteng |
| Parastatal | Passenger Rail Agency of South Africa (PRASA) | Mr | Siphiwe | Mathobela | General Manager | Gauteng |
| Parastatal | South African National Roads Agency Limited (SANRAL) | Ms | Ria | Barkhuizen | Environmentalist (NR) | Gauteng |
| Parastatal | Transnet Freight Rail Ltd | Mr | Thembela | Cuba | Rail Infrastructure Manager JHB | Gauteng |
| Parastatal | Transnet Freight Rail Ltd | Ms | Phindi | Ntuli | Acting Senior Manager: Regional Portfolio Manager | Gauteng |
| Parastatal | Transnet Freight Rail Ltd | Mr | Xolisa | Kilani | Technical Engineer | Gauteng |
| Parastatal | Transnet Freight Rail Ltd | Ms | Zanele | Manyathi | Environmental Manager | Gauteng |
| Parastatal | Transnet Freight Rail Ltd: Gauteng | Ms | Annalize | Harmse | Chief Admin Official | Gauteng |
| Provincial Government | Department of Health (DOH): Ekurhuleni District | Mr | Cheleng | Khotle | Environmental Health Manager | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Provincial Government | Gauteng Department of Health | Ms | Christina | Moumakwe | Deputy Director: Environmental Health Services | Gauteng |
| Provincial Government | Gauteng Wetland Forum (GDEnv) | Mr | Mpfareleni | Mashau | Contact for Management | Gauteng |
| Provincial Government | Gauteng Wetland Forum (GDEnv) | Mr | Tebogo | Nkadimeng | Representative | Gauteng |
| Provincial Government | The Gauteng Department of Environment (GDEnv) | Mr | Erick | Moletsane | Manager: Environmental Planning & Impact Assessment | Gauteng |
| Provincial Government | The Gauteng Department of Environment (GDEnv) | Mr | Tjatja | Mosia | Environmental Officer | Gauteng |
| Provincial Government | The Gauteng Department of Environment (GDEnv) | Ms | Christina | Seegers | Protected Areas | Gauteng |
| Provincial Government | The Gauteng Department of Environment (GDEnv) | Ms | Hellen | Sithole | Environmental Officer: Ekurhuleni | Gauteng |
| Residential Associations | Community Policing Forum | Mr | Ahmed | Essop | Head Patroller | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Ahmed | Limalia | Rynsoord Resident | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Faizel | Peerbhai | New Modder Resident | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Imtiaz | Essop | New Modder Resident | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Liyakat | Laher | New Modder Resident | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Waseem | Rahim | New Modder Resident | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Mr | Yusuf | Mayet | Rynsoord Resident | Gauteng |
| Residential Associations | New Modder and Rynsoord Residents Association | Ms | Fathima | Khan | New Modder Resident | Gauteng |
| Residential Associations | Residential Associations | Mr | Jafar (Jeff) | Adams | Resident New Modder (part of CPF) | Gauteng |
| Ward Councillor | City of Ekurhuleni Metropolitan Municipality | Cllr | Antoinette | Verster | Ward Councillor: Ward 105 | Gauteng |
| Ward Councillor | City of Ekurhuleni Metropolitan Municipality | Cllr | Brandon | Pretorius | Ward Councillor: Ward 97 | Gauteng |
| Ward Councillor | City of Ekurhuleni Metropolitan Municipality | Cllr | David | Simelane | Ward Councillor: Ward 74 | Gauteng |
| Ward Councillor | City of Ekurhuleni Metropolitan Municipality | Cllr | Henry | Buitendacht | Ward Councillor: Ward 82 | Gauteng |
| Ward Councillor | City of Ekurhuleni Metropolitan Municipality | Cllr | Samuel | Ngobese | Ward Councillor: Ward 73 | Gauteng |
| Water Bodies - Institution | Rand Water | Ms | Faith | Tshisikule | Wayleave Inspector | Gauteng |
| Water Bodies - Institution | Randwater | Mr | Jimmy | Maluleke | Environmental Co-ordinator | Gauteng |
| Water Bodies - Institution | Randwater | Mr | Lesley | Hoy | Manager Environmental Assessments & Compliance | Gauteng |

| I&AP Sector | Organisation | Mr/Ms | First Name | Last Name | Position | Province |
|---|---|---|---|---|---|---|
| Water Bodies - Institution | Ekurhuleni Water Care Company (ERWAT) | Mr | Brendan | Adam | Environmental Officer | Gauteng |
| Water Bodies - Institution | Vaal-Orange Catchment Management agency (VOCMA) | Mr | Khathutshelo | Mudau | Specialised Production | Gauteng |
| Water Bodies - Institution | Vaal-Orange Catchment Management Agency (VOCMA) | Ms | Basani Lerato | Nkuna | Environmental Officer | Gauteng |
| Water Bodies - Institution | Vaal-Orange Catchment Management Agency (VOCMA) | Mrs | Nametso | Sithole | Scientist Production | Gauteng |
| Water Bodies - Institution | Water Research Commission | Dr | Shafick | Adams | Senior Research Manager | Gauteng |
| Water Bodies - Institution | Water Research Commission | Mr | Bennie | Mokgonyana | Water Use & Waste Management | Gauteng |
| Water Bodies - Institution | Water Research Commission | Ms | Penny | Jaca | Water Resource Management | Gauteng |
| Water Bodies - Institution | Water Research Commission | Ms | Shirley | Machelisi | Water Use & Waste Management | Gauteng |

# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province

## Landowners Database

## Directly Affected Landowners

| Farm Name & Number | Farm ID | Farm Portion | Owner-Windeed | Farm owner | Contact Person |
|---|---|---|---|---|---|
| Modderfontein 76 | IR | 43 (RE) | Atoll Metal Recovery Pty Ltd | Atoll Metal Recovery Pty Ltd | Mr Brain Blackstock |
| Modderfontein 76 | IR | 3 (RE) | Choice Decisions 1260 CC | Choice Decisions 1260 CC | Mr Henlo Meyer |
| Modderfontein 76 | IR | 111 | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Geduld 123 | IR | 122 (An unregistered portion of portion 58) | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Rietfontein 128 | IR | 96 (RE) | City Council of Springs | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Kwa Thema 210 | IR | 0 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Modderfontein 76 | IR | 65 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |

| Farm Name & Number | Farm ID | Farm Portion | Owner-Windeed | Farm owner | Contact Person |
|---|---|---|---|---|---|
| The Springs 129 | IR | 0 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| The Springs 129 | IR | 53 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Weltevreden 118 | IR | 77 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Weltevreden 118 | IR | 0 (RE) | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Witpoortje 117 | IR | 1 (RE) | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Rietfontein 128 | IR | 139 | Mun Springs | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Rietfontein 128 | IR | 166 | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Rietfontein 128 | IR | 0 (RE) | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| The Springs 129 | IR | 19 | No Windeed Info – Individual erf numbers | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Witpoortje 117 | IR | 155 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Modderfontein 76 | IR | 51 (RE) | Gauteng Provincial Government | Department of Public Works and Infrastructure (DPWI) | Ms Friedah Khoza |
| Geduld 123 | IR | 189 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |

| Farm Name & Number | Farm ID | Farm Portion | Owner-Windeed | Farm owner | Contact Person |
|---|---|---|---|---|---|
| Witpoort Estates AH 196 | IR | 0 | Ergo Mining Pty Ltd | Ergo Mining Pty Ltd | Mr Masala Tshamano |
| Witpoortje 117 | IR | 183 | Ergo Mining Pty Ltd | Ergo Mining Pty Ltd | Mr Masala Tshamano |
| Geduld 123 | IR | 138 (RE) | Fullimput 1480 CC | Fullimput 1480 CC | Mr Henlo Meyer |
| Vulcania 279 | IR | 0 (RE) | IPROP (Pty) Ltd | IPROP (Pty) Ltd | Ms Jeanie Pelser |
| Modderfontein 76 | IR | 88 (A portion of portion 36) | National Housing Board | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Modderfontein 76 | IR | 85 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Modderfontein 76 | IR | 1 (RE) | New Modder Township (Pty) Ltd | New Modder Township (Pty) Ltd | Mr James Ross Stewart |
| Rietfontein 128 | IR | 76 | No Windeed Information | Transnet Ltd | Mr Thembinkosi Msikeleli Memela |
| Rietfontein 128 | IR | 215 | No Windeed Information | No Windeed Information | To be Identified |
| Weltevreden 118 | IR | 63 | No Windeed Information | No Windeed Information | To be Identified |
| Kwa Thema 210 | IR | 37 | No Windeed Information | South African National Roads Agency Limited (SANRAL) | Ms Victoria Bota |
| Saint-Gobain 752 | IR | 0 | Saint-Gobain Construction Products South Africa Pty Ltd | Saint-Gobain Construction Products South Africa Pty Ltd | To be Identified |

| Farm Name & Number | Farm ID | Farm Portion | Owner-Windeed | Farm owner | Contact Person |
|---|---|---|---|---|---|
| The Springs 129 | IR | 38 | South African Rail Commuter Corp Ltd | Transnet Ltd | Mr Thembinkosi Msikeleli Memela |
| Modderfontein 76 | IR | 24 | Transnet Ltd | Transnet Ltd | Mr Thembinkosi Msikeleli Memela |
| Weltevreden 118 | IR | 15 | Transnet Ltd | Transnet Ltd | Mr Thembinkosi Msikeleli Memela |
| Rietfontein 128 | IR | 106 | Vereeniging Property and Investments (Pty) Ltd | Vereeniging Property and Investments (Pty) Ltd | Mr Gavin Yeats |

## Indirectly Affected Landowners

| Farm Name & Number | Farm ID | Farm Portion | Owner-Windeed | Farm owner | Contact Person |
|---|---|---|---|---|---|
| Modderfontein 76 | IR | 96 | Golden Dumps Research Pty Ltd | Golden Dumps Research Pty Ltd | Mr Douglas Davidson |
| Modderfontein 76 | IR | 44 | Sphandile Trading Enterprise Pty Ltd | Sphandile Trading Enterprise Pty Ltd | Mr Dumisani Ellis Ntuli |
| Modderfontein 76 | IR | 63(RE) | Fishprop Pty Ltd | Fishprop Pty Ltd | To be Identified |
| Modderfontein 76 | IR | 64 | City of Ekurhuleni Metropolitan Municipality | City of Ekurhuleni Metropolitan Municipality | Ms Lillian Matlala |
| Modderfontein 76 | IR | 67 | Provincial Government of Gauteng | Gauteng Department of Human Settlements | Ms Mpho Mamashela |

# Appendix C2: Land Claims

## Vanessa Viljoen

**From:** Vanessa Viljoen
**Sent:** Tuesday, 29 September 2026 11:36
**To:** Matsobane Solomon Maruma; Matsobane Solomon Maruma
**Cc:** Jean-Mari Williams
**Subject:** Land Claims enquiry: Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni (CoE) Metropolitan Municipality, Gauteng Province
**Attachments:** GOLD#001_LC_V1.pdf

Dear Mr Solomon Maruma

Kongiwe Environmental (Pty) Ltd ("Kongiwe") has been appointed to undertake the Integrated Water Use Licence Application for the Goldplat Reclamation Project.

The Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni Metropolitan Municipality (CoE). The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project. The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the Project. The process water and slurry pipelines are proposed to run from the Goldplat stock dam area and extend all the way to the Ergo Plant. They will run past residential areas, open areas, wetlands and industrial areas.

**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 (Pty) Ltd.**
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

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# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni (CoE) Metropolitan Municipality, Gauteng Province

**DWS Reference Number WU48373**

## LAND CLAIMS ENQUIREY

| | |
|---|---|
| **Date** | Tuesday, 29 September 2026 |
| **Attention** | Mr Matsobane Solomon Maruma |
| **Government Body** | Gauteng Department of Land Reform and Rural Development (DLRRD)<br>Office of the Regional Land Claims Commissioner |
| **Email** | Matsobane.Maruma@dlrrd.gov.za / Solomon.Maruma@dlrrd.gov.za |

Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed as the Environmental Consultant tasked with conducting the Integrated Water Use Licence Application (IWULA) process which is aimed at critically evaluating the potential environmental and social impacts of the Project.

Goldplat Recovery (Pty) Ltd ('Goldplat') proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

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 and will be supported by an Integrated Water and Waste Management Plan (IWWMP). The IWULA will be reviewed and considered by the Vaal-Orange Catchment Management Agency (VOCMA) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the Project comply with the National Water Act, 1998 (Act No. 36 of 1998).

The Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni Metropolitan Municipality (CoE). The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project. The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the Project. The process water and slurry pipelines are proposed to run from the Goldplat stock dam area and extend all the way to the Ergo Plant. They will run past residential areas, open areas, wetlands and industrial areas.

**The Project area impacts the farm portions listed in the table below:**

| Farm Name and Number | Farm ID | Farm Portion | Farm Owner |
|---|---|---|---|
| Modderfontein 76 | IR | 43 (RE) | Atoll Metal Recovery Pty Ltd |
| Modderfontein 76 | IR | 3 (RE) | Choice Decisions 1260 CC |

| Farm Name and Number | Farm ID | Farm Portion | Farm Owner |
|---|---|---|---|
| Modderfontein 76 | IR | 111 | City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 | IR | 65 | City of Ekurhuleni Metropolitan Municipality |
| Geduld 123 | IR | 122 (An unregistered portion of portion 58) | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 | IR | 96 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Kwa Thema 210 | IR | 0 | City of Ekurhuleni Metropolitan Municipality |
| The Springs 129 | IR | 0 | City of Ekurhuleni Metropolitan Municipality |
| The Springs 129 | IR | 53 | City of Ekurhuleni Metropolitan Municipality |
| Weltevreden 118 | IR | 77 | City of Ekurhuleni Metropolitan Municipality |
| Weltevreden 118 | IR | 0 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Witpoortje 117 | IR | 1 (RE) | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 | IR | 139 | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 | IR | 166 | City of Ekurhuleni Metropolitan Municipality |
| Rietfontein 128 | IR | 0 (RE) | City of Ekurhuleni Metropolitan Municipality |
| The Springs 129 | IR | 19 | City of Ekurhuleni Metropolitan Municipality |
| Witpoortje 117 | IR | 155 | City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 | IR | 51 (RE) | Department of Public Works and Infrastructure (DPWI) |
| Geduld 123 | IR | 189 | City of Ekurhuleni Metropolitan Municipality |
| Witpoort Estates AH 196 | IR | 0 | Ergo Mining Pty Ltd |
| Witpoortje 117 | IR | 183 | Ergo Mining Pty Ltd |
| Geduld 123 | IR | 138 (RE) | Fullimput 1480 CC |
| Vulcania 279 | IR | 0 (RE) | IPROP (Pty) Ltd |


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| Farm Name and Number | Farm ID | Farm Portion | Farm Owner |
|---|---|---|---|
| Modderfontein 76 | IR | 88 (A portion of portion 36) | City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 | IR | 85 | City of Ekurhuleni Metropolitan Municipality |
| Modderfontein 76 | IR | 1 (RE) | New Modder Township (Pty) Ltd |
| Rietfontein 128 | IR | 76 | No Windeed Information |
| Rietfontein 128 | IR | 215 | No Windeed Information |
| Weltevreden 118 | IR | 63 | No Windeed Information |
| Kwa Thema 210 | IR | 37 | South African National Roads Agency (SANRAL) |
| Saint – Gobain 752 | IR | 0 | Saint-Gobain Construction Products South Africa Pty Ltd |
| The Springs 129 | IR | 38 | Transnet Ltd |
| Modderfontein 76 | IR | 24 | Transnet Ltd |
| Weltevreden 118 | IR | 15 | Transnet Ltd |
| Rietfontein 128 | IR | 106 | Vereeniging Property and Investments (Pty) Ltd |

Kongiwe wishes to enquire if there are any land claims on any of the farms listed in the table above. Please could you revert to us as a matter of urgency.

Yours faithfully,

**Vanessa Viljoen**
**Stakeholder Engagement Consultant**


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# Appendix C3: Consultation Materials

# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality Gauteng Province

**DWS Reference Number: WU48373**

# Background Information Document

## Purpose of the Document

This Background Information Document (BID) aims to provide information regarding:

- The project background of the Goldplat Reclamation Project ("the Project"), located in the City of Ekurhuleni Metropolitan Municipality (CoE), Gauteng Province;
- Water Use Licence (WUL) approval requirements;
- The Public Participation Process (PPP) that will be undertaken as part of the Project's Integrated Water Use Licence Application (IWULA), and comment period for the draft Integrated Water and Waste Management Plan (IWWMP); and
- How to register as an Interested and Affected Party (I&AP) and be kept informed about the Project's developments.

## Project Background

Goldplat Recovery (Pty) Ltd ('Goldplat') proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

Hydraulic reclamation is a water-based process with a lower risk profile than conventional underground or open-cast mining. During hydraulic reclamation, a high-pressure water monitor is used to erode the sides of the existing stock dam compartments and the process water then mixes with the unconsolidated material forming a slurry. The slurry reports via gravity feed to a pumpstation, where it is then pumped and conveyed via a new pipeline to a gold processing plant. The existing Ergo Mining (Pty) Ltd ('Ergo') gold plant is proposed to be used to reprocess the reclaimed tailings on behalf of Goldplat as well as provide the source of process water.

A WUL is required for the Project activities that may impact water resources. Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Goldplat to undertake the IWULA for the Project.

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 and will be supported by an IWWMP. The IWULA will be reviewed and considered by the Vaal-Orange Catchment Management Agency (VOCMA) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the Project comply with the National Water Act, 1998 (Act No. 36 of 1998).


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## Method of Reclamation

The proposed reclamation method which will be used to reclaim the stock dam compartments is referred to as a top-down hydraulic reclamation process. It must be noted that only the Rooidam and Top stock dams are earmarked for reclamation as part of this project, and not all the Goldplat TSFs. This technique uses high-pressure water monitors to erode unconsolidated tailings material within the stock dam compartments. The water from the water monitor mixes with the tailings and forms a slurry. The slurry then flows under gravity feed to a collection sump which is positioned at the lowest elevation of the bench being reclaimed.

At the sump, finger screens remove any detritus that may impact pumping operations, and the screened slurry then flows into the sump and is subsequently conveyed to the pump station. The position of the collection sump will change as the reclamation progresses. To control the volume of slurry reporting to the reclamation station, valves are used to hold and release slurry contained in the collection sump. From the pumpstation, located at the lowest point of a stock dams, slurry will then be pumped and conveyed, via a new pipeline, to the Ergo Plant for reprocessing. Approximately 50 000 tons per month of slurry will be pumped to the Ergo Plant. Process water used in the reclamation activities will be sourced from Ergo through the same pipeline route.

Ensuing tailings from the Ergo Plant will be deposited onto the Brakpan/Withok TSF.

## Infrastructure for the Proposed Project

The following infrastructure will be utilised:

- Reclamation infrastructure at the Rooidam and Top stock dam areas, consisting of a pump station which includes:
  - Slurry sump including a floating pontoon;
  - Vibrating Screen;
  - Water tank;
  - Motor control centre; and
  - Slurry and associated Pumps.
- Stormwater management infrastructure associated with the stock dams, including:
  - Lined catchment paddock; and
  - Perimeter berm.
- 11 kV overhead powerlines capable of transmitting 3 kVA of electricity and electricity reticulation, sourced from the Goldplat plant or Eskom;
- Existing administration buildings, including change houses and ablution facilities at the Goldplat plant;
- Existing access roads;
- Construction contractors' yards (temporary facilities); and
- Slurry and process water pipelines running 15.6 km on the same route:
  - One slurry pipeline of 300 mm in diameter to Ergo Plant; and
  - One process water pipeline of 250 mm in diameter from the Ergo Plant.

**Figure 1** presents the site infrastructure layout for the Project.


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## Project Location

**Figure 2** presents the local context of the project area. The Project is located approximately 7 km east of the Benoni CBD within the CoE. The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project.

The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the Project.

The process water and slurry pipelines are proposed to run from the Goldplat stock dam area and extend all the way to the Ergo Plant. They will run past residential areas, open areas, wetlands and industrial areas.

## Land Use

The Project area is predominantly surrounded by mining areas, industrial areas, residential areas, railway infrastructure, and existing road networks. Most of the Project area has been subject to significant disturbance due to past mining activities and urban infrastructure.

## Access

The major access routes in the vicinity of Goldplat include the R51, which provides connectivity to the Modder Bee Road, leading to access to the Goldplat area.

Existing on-site access roads will be utilised.

## Power and Water Supply

Power supply for the reclamation activities will be sourced from Eskom and connected at the existing Goldplat plant.

Potable water will be sourced from the existing Goldplat plant.

Process water required for the reclamation activity will be sourced from the Ergo Plant and conveyed through a new process water pipeline to the Project site for reuse in a closed-circuit system. The pipeline will follow existing servitudes / Surface Right Permits (SRPs) held by Ergo and in agreement with Ergo.


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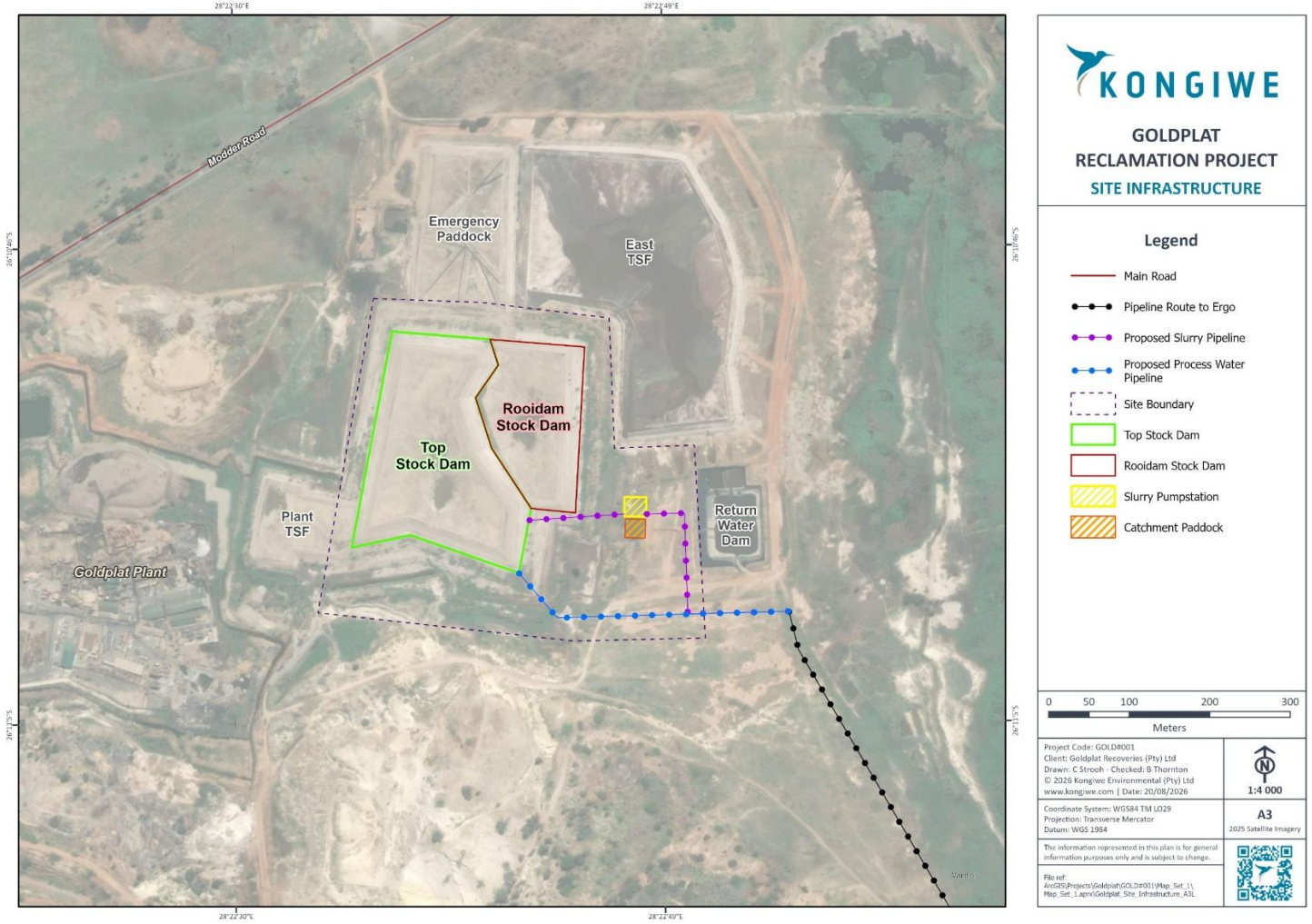


*Figure 1: Proposed Infrastructure*


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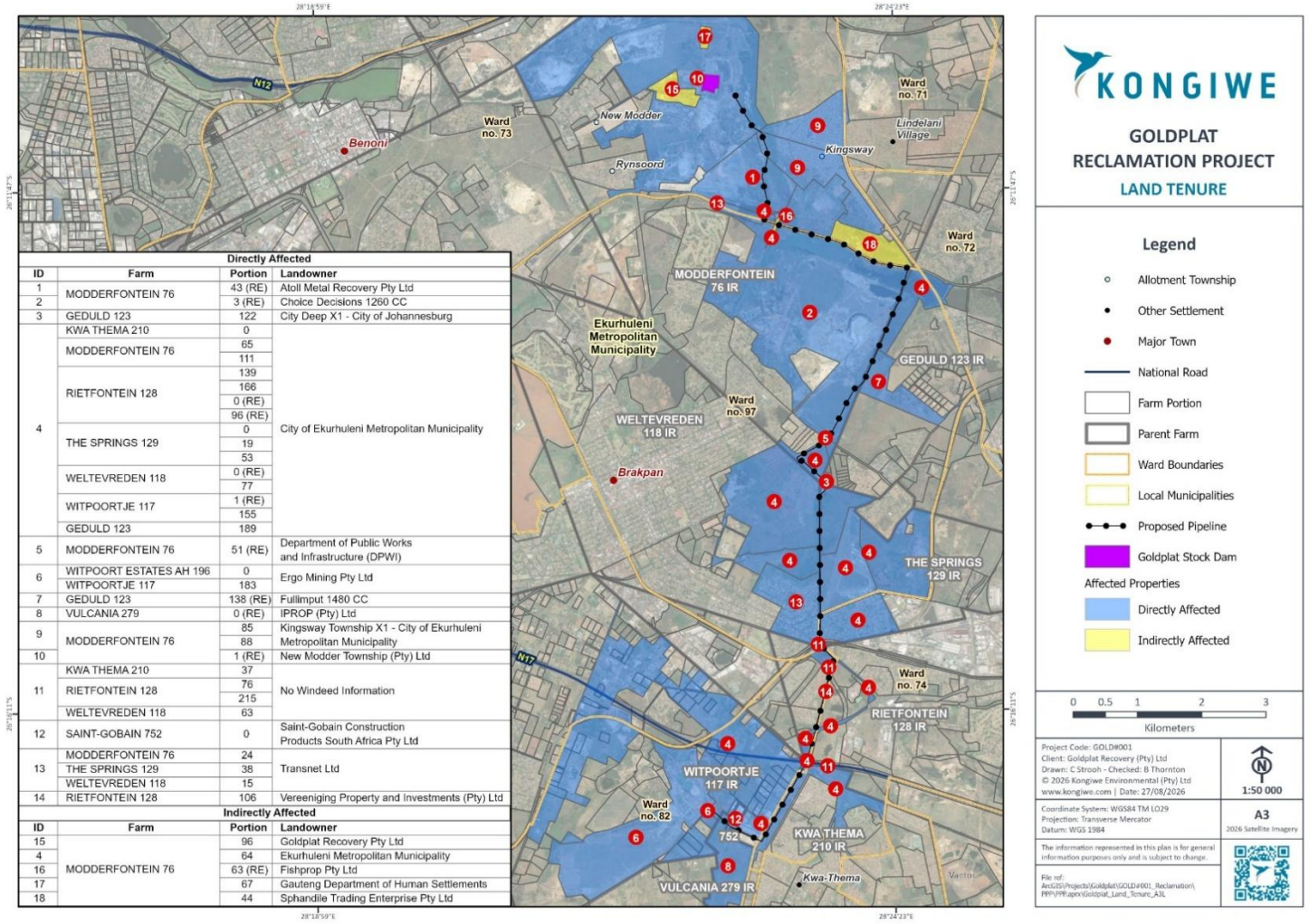


**Directly Affected**

| ID | Farm | Portion | Landowner |
|---|---|---|---|
| 1 | MODDERFONTEIN 76 | 43 (RE) | Atoll Metal Recovery Pty Ltd |
| 2 | | 3 (RE) | Choice Decisions 1260 CC |
| 3 | GEDULD 123 | 122 | City Deep X1 - City of Johannesburg |
| 4 | KWA THEMA 210 | 0 | City of Ekurhuleni Metropolitan Municipality |
| | MODDERFONTEIN 76 | 65 | |
| | | 111 | |
| | RIETFONTEIN 128 | 139 | |
| | | 166 | |
| | | 0 (RE) | |
| | | 96 (RE) | |
| | THE SPRINGS 129 | 0 | |
| | | 19 | |
| | | 53 | |
| | WELTEVREDEN 118 | 0 (RE) | |
| | | 77 | |
| | WITPOORTJE 117 | 1 (RE) | |
| | | 155 | |
| | GEDULD 123 | 189 | |
| 5 | MODDERFONTEIN 76 | 51 (RE) | Department of Public Works and Infrastructure (DPWI) |
| 6 | WITPOORT ESTATES AH 196 | 0 | Ergo Mining Pty Ltd |
| | WITPOORTJE 117 | 183 | |
| 7 | GEDULD 123 | 138 (RE) | Fullimput 1480 CC |
| 8 | VULCANIA 279 | 0 (RE) | IPROP (Pty) Ltd |
| 9 | MODDERFONTEIN 76 | 85 | Kingsway Township X1 - City of Ekurhuleni Metropolitan Municipality |
| | | 88 | |
| 10 | | 1 (RE) | New Modder Township (Pty) Ltd |
| 11 | KWA THEMA 210 | 37 | No Windeed Information |
| | RIETFONTEIN 128 | 76 | |
| | | 215 | |
| | WELTEVREDEN 118 | 63 | |
| 12 | SAINT-GOBAIN 752 | 0 | Saint-Gobain Construction Products South Africa Pty Ltd |
| 13 | MODDERFONTEIN 76 | 24 | Transnet Ltd |
| | THE SPRINGS 129 | 38 | |
| | WELTEVREDEN 118 | 15 | |
| 14 | RIETFONTEIN 128 | 106 | Vereeniging Property and Investments (Pty) Ltd |

**Indirectly Affected**

| ID | Farm | Portion | Landowner |
|---|---|---|---|
| 15 | MODDERFONTEIN 76 | 96 | Goldplat Recovery Pty Ltd |
| 4 | | 64 | Ekurhuleni Metropolitan Municipality |
| 16 | | 63 (RE) | Fishprop Pty Ltd |
| 17 | | 67 | Gauteng Department of Human Settlements |
| 18 | | 44 | Sphandile Trading Enterprise Pty Ltd |

*Figure 2: Locality Map*


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## Life of Operation

The life of the Project is expected to be five years. An estimated maximum amount of 50 000 tons/month of slurry is expected to be pumped from Goldplat via a new pipeline to the Ergo Plant for beneficiation.

## Rehabilitation

Once reclamation is completed, the areas will then be assessed for contamination (particularly in terms of radiation). Contaminated soils will be removed, and the land levelled to its original functioning topography levels. The resultant stock dam footprints may then be reused as a future site for tailings deposition.

## Purpose of an IWWMP

An IWWMP is a comprehensive plan which is used to manage and protect water resources while effectively managing waste within mining or industrial projects. It can be considered a living document that will continue to be revised and updated as and when there are fundamental changes, or as stipulated by the Department of Water and Sanitation (DWS) throughout the life of a project. The purpose of updates is to accommodate any additional information and improved technology to ensure that water and waste management is continually optimised and adapted to the changing needs of the water management area, thereby reducing the risks of project activities to the environment and humans.

The IWWMP for the Project will follow the content list as stipulated in the Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals, GN R267, Government Gazette 40713 24 March 2017.

From a legal perspective, an approved IWWMP fulfils the requirement of an IWULA and provide a comprehensive plan for managing water uses, as outlined in Section 21 of the NWA.

From a best management practice perspective, an IWWMP provides the mine with a consolidated approach for the implementation of Best Practice Guidelines (BPGs) (DWAF, 2006, 2008) to integrate mine water management while protecting surrounding water resources

## Legislative Requirements

For a water user to acquire a WUL, an IWULA must be submitted in accordance with the Water Use Licence Application and Appeals Regulations 2017, to the DWS.

The steps involved in the IWULA process are outlined in **Figure 3**.


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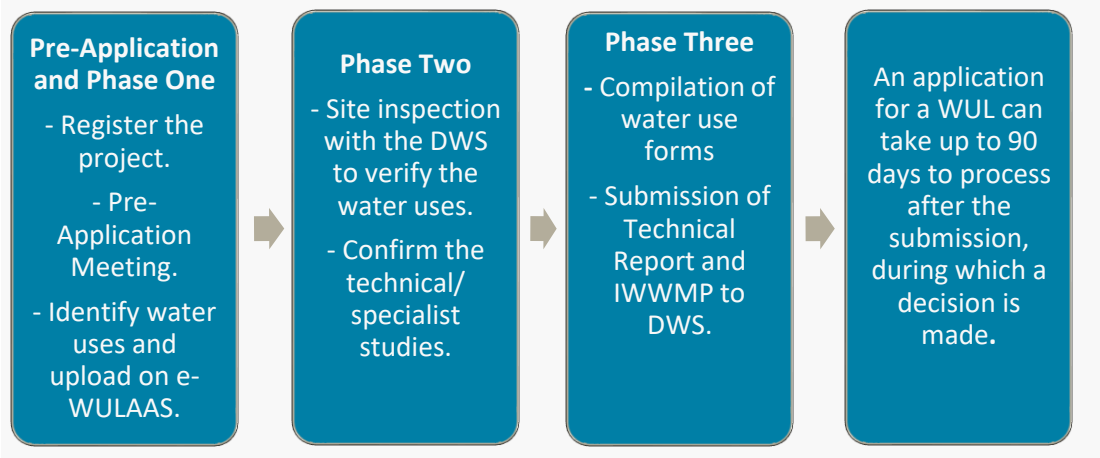


*Figure 3: IWULA Process*

## Specialist Studies

The specialist studies that will be submitted to support the IWULA are listed below:

- Groundwater Impact Assessment;
- Surface water Impact Assessment; and
- Wetland Impact Assessment.

The findings of the specialist studies will be incorporated into the IWWMP.

## Public Participation Process

The PPP will form an integral part of the IWULA process. The PPP is intended to ensure that stakeholders are adequately informed about the Project and are provided with reasonable opportunities to participate in the process, raise issues and concerns, provide relevant information and local knowledge, and make suggestions regarding potential measures to enhance Project benefits and address potential impacts. The PPP also sets out the various mechanisms through which the Project team will provide information, engage with stakeholders and receive and consider comments throughout the IWULA process.

The PPP has been developed to ensure compliance with the relevant legislation and facilitate meaningful stakeholder engagement for the IWULA process. Comments, concerns and relevant information received from stakeholders will be documented and considered, where relevant, as part of the IWULA process.

## Availability of the Draft IWWMP for Public Review and Comment

The Draft IWWMP for the Project will be made available for public review and comment for 60 days, from **Tuesday, 6 October 2026 to Friday, 4 December 2026**.

A notification of the availability of the draft IWWMPs for public review and comment will be distributed on **Tuesday, 29 September 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/


© 2026 Kongiwe Environmental (Pty) Ltd

- A hard copy of the draft IWWMP at the Lawrence Bongani Sibanyoni Public Library (Kingsway). Contact details are shown in
- Table 1.

*Table 1: Public Places where Hard Copies of the Draft IWWMP will be available*

| Location | Physical Address | Contact Person |
|---|---|---|
| **Draft IWWMP available at:** | | |
| Lawrence Bongani Sibanyoni Library | Cnr Ndlovele and Isibusisu Streets, Kingsway, Benoni, 1501 | Mr Mfundo Nxumalo – (072) 212 2884<br>Monday - Friday<br>Open: 08:00 – 16:30<br><br>First Saturday of the month<br>Open: 08:00 – 13:00 |

## Stakeholder Engagement Meetings

A Consultation meeting will be held using Microsoft Teams (online meeting). The purpose of this 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 interact with the Project team.

Table 2 provides details of the proposed stakeholder meeting. Please confirm your attendance of the meeting.

*Table 2: Stakeholder Meeting*

| Proposed Dates | Available Time Slot | Method of Engagement |
|---|---|---|
| **Online Meeting** | | |
| Wednesday, 28 October 2026 | 10H00 – 11H00 | Microsoft Teams |

## Invitation to participate as a Stakeholder

Kongiwe has put measures in place to ensure that all stakeholders are meaningfully engaged throughout the consultation process through a range of communication channels, documents and online platforms. The proposed methods of engagement for the Project are as follows:

- Telephonic consultations.
- Short Message Services (SMSs).
- Email correspondence:
  - Stakeholders with access to emails are encouraged to send their comments/queries via email.
- Online engagements:
  - Project information will be made available timeously on Kongiwe's website.
  - Microsoft Teams meetings.
  - One-on-one consultation meetings.


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The above-mentioned methods of engagement are intended to facilitate meaningful dialogue with stakeholders and provide opportunities to raise comments, concerns and/or suggestions regarding the Project. Minutes of stakeholder meetings will be compiled and included in the Comments and Responses Report (CRR).

**Stakeholders are encouraged to indicate their preferred method of engagement on the Registration Form attached to this BID.**

**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.

## For an Inclusive Consultation Process, Stakeholders are Encouraged to:

- Register as an I&AP;
- Inform other people whom you believe may be interested in and/or affected by the Project;
- Provide comments, concerns and/or suggestions regarding the Project;
- Ensure that comments are submitted within the specified timeframes;
- Provide relevant information and/or local knowledge regarding the Project area and its environment; and
- Attend meetings scheduled throughout the process to obtain information, raise concerns and participate in discussions regarding the Project.

## Comments, Objections and Queries

For any comments, objections or queries, I&APs are encouraged to complete the *Registration and Comments Form* attached to this BID. Completed Registration and Comments Forms may be submitted via email. For further information regarding the Project, the consultation process, or the submission of comments, please contact a representative of Kongiwe's Stakeholder Engagement Team, as shown in Table 3.

***Table 3: Kongiwe Contact Details***

| | | |
|---|---|---|
| Ms Jean-Mari Williams | +27 (10) 140 1726 | stakeholders@kongiwe.com |
| Ms Vanessa Viljoen | +27 (10) 140 1725 | |

**Our team welcomes your participation and looks forward to your involvement throughout this process**


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# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province

**DWS Reference Number: WU48373**

# 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

| **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 | ☐ | |

If you intend to attend the stakeholders' meeting (Please indicate your preference)

| Meeting Dates | Available Time Slots | Method of Engagement | Yes | No |
|---|---|---|---|---|
| **Online Meeting:** | | | | |
| Wednesday, 28 October 2026 | 10H00 – 11H00 | Microsoft Teams | 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 | |
|---|---|---|---|


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# Appendix C4: Newspaper Advertisement

# Entrepreneur takes bold leap to build her business

Ntsakisi Shipalana

For Engelina Lebo Monama, entrepreneurship did not begin with a business plan or a large investment. It began in childhood, surrounded by sewing machines, fabric cut-offs and the example of a father who taught her what confidence looked like.

Born and raised in Kingsway, Benoni, the 26-year-old founder of Isiphithiphithi Wears Fashion House and Isiphithiphithi Workwear comes from a family with a long history in clothing and design.

Her grandmother, Nomasondo, and mother, Josephine Monama, were seamstresses, while her paternal grandfather was a seamster who worked in Johannesburg.

Two of her aunts are now full-time seamstresses in Limpopo.

As a young girl, Lebo was naturally drawn to her mother's sewing machine and the fabric around the house.

"I was always drawn to her machine, playing with it and playing with the fabric cut-offs around the house," she said.

Her father, a taxi owner, died in 2006 when Lebo was six years old. Yet one childhood memory of him remains particularly vivid.

After she was bullied at school, her father decided to accompany her. They left home at about 05:45, made three deliveries before heading to school and eventually arrived at around 11:30.

Lebo remembers that he showed no fear.

"He knew what he was doing and he was confident," she said, recalling how walking into school beside him made her feel like a princess.

That confidence would later help her take a leap of her own.

In 2016, while she was in matric, Lebo wrote in her diary that she wanted to own her own company within two years. Two years later, that company was registered. She was 17.

She did not have formal business knowledge and did not even know exactly what the business would become.

What she did have was a dream that eventually took the form of four printed caps.

The idea had come to her in a dream, which she believed was from God. Still, Lebo worried about what people would say about a young girl talking about Isiphithiphithi.

"I didn't have everything figured out. I just had to believe enough to take the first step."

From those four caps, Isiphithiphithi has grown into a business that manufactures clothing and workwear and provides printing and clothing solutions to schools, corporates, choirs and organisations.

It has sold some 8 200 items and now supplies uniforms to four schools.

**Passion is not enough**

But the journey has not been as smooth as the finished products might suggest.

Lebo says entrepreneurship has cost her "sleep, time, friendships, comfort, energy and money."

There have been late nights, sacrifices and periods when the journey felt lonely.

The hardest period came in 2025, when she questioned whether the dream would work. Financial, emotional and mental pressure forced her to confront the reality of trying to carry a growing business largely on her own.

Rather than seeing that period as a failure, Lebo says it taught her one of the most important lessons of entrepreneurship: passion is not enough.

"I learned that the business needs structure, not just passion. It needs systems, people and the right support around it," she said.

**Engelina Lebo Monama, founder of Isiphithiphithi Wears Fashion House and Isiphithiphithi Workwear.**

She also learnt that growth does not always announce itself with a major breakthrough.

For her, one of the most meaningful moments came when she created a job for someone else and was able to pay them a salary.

That was when Lebo realised she had built something beyond an idea.

The Youth Employment Service (YES) programme later became another important part of her journey.

Lebo says YES came at a time when she was beginning to lose hope and gave her renewed confidence and access to opportunities.

She became a Top 35 Under 35 YES winner and exhibited her photography at venues including Cape Town International Airport and the Sandton Convention Centre. The programme also helped open the door for Isiphithiphithi to make clothing for Pizza Hut.

As the business grew, so did Lebo's understanding of what she wanted it to represent.

Isiphithiphithi has expanded into uniforms, workwear, printing and photography, but she says expansion was never about becoming bigger simply for the sake of it.

**Peace, purpose, meaning**

Through 25 Art Peace, Lebo works with young people in her community, helping them recognise their own potential.

"I didn't create their light. I just brought a little spark to something that was already inside them."

For Lebo, that sense of community is inseparable from her roots.

"Benoni raised me," she said, crediting the people and small businesses around her with helping shape her entrepreneurial journey.

Her advice to other young people is rooted in the reality of her own beginning: they do not need to have everything figured out before starting.

"I want young people to understand that their circumstances don't have to become the size of their dreams," she said.

"Leap. Start small if you have to, but start. Your dream does not need to look big in the beginning for it to become something big."

**Colin Leshou's Buttler's room-to-bloom garden offers large sweeping spaces and creates a captivating setting.**

# Enjoy the splendour of beautiful gardens

Seven magnificent gardens have burst into colourful bloom ahead of the Boksburg Open Gardens 2026 -- A Garden Affair.

On October 11, from 09:00 to 16:00, from Sunward Park to Libradene, greening gurus will be on hand to offer sage gardening advice, from sustainable grey water harvesting to implementing organic gardening products, as well as invaluable expertise on establishing garden-to-table vegetable patches.

Tickets to this spectacular tour are R100 per person, with proceeds supporting the Suid-Afrikaanse Vroue Federasie's (SAVF) Kowa Pienaar old age home in Elspark.

Gardener-approved seedlings, plants, and products, as well as boerewors rolls and refreshments, will also be available at participating gardens.

At La Vie en Rose, Parkrand, visitors can take time out of the busy tour schedule to enjoy delectable baked goods on offer at the tea garden.

Tickets are available at Quicket or at the gates on the day.

**Featured gardens include:**

- Marisa and Bernard McDonald's Greenhouse (15 Pontac Road, Sunward Park).
- Yolanda Swanepoel's A timeless cottage garden (18 Explorer Way, Sunward Park).
- Marinda Hawthorn's Multi-dimensional layer and levels (3 Taurus Street, Sunward Park).
- Edward Wilson's Botanical paradise (55 Nicholson Road, Sunward Park).
- Colin Leshou's Buttler's room to bloom (7 Butler Street, Parkrand).
- Surieta Esterhuizen's La Vie en Rose (7 Malherbe Street, Parkrand).
- Carin Mathee's The little pocket English garden (105 Tuscan Estate, 15 Van Heerden Street, Libradene Village).

**Tour etiquette:**

- No pets allowed.
- Do not harvest or gather plant cuttings from participating gardens.
- Cash and card payments are welcome.
- Parking available in the streets around the show gardens - do not park on neighbouring driveways or grass.

**Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province**

**DWS Reference Number WU48373**

**Applicant:** Goldplat Recovery (Pty) Ltd
**Project Name:** Integrated Water Use Licence Application for the Goldplat Reclamation Project.

Goldplat Recovery (Pty) Ltd ('Goldplat') proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

A Water Use Licence (WUL) is required for the Goldplat Reclamation Project (the "Project") activities that may impact water resources. Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Goldplat to undertake the Integrated Water Use Licence Application (IWULA) for the Project. 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 and will be supported by an Integrated Water and Waste Management Plan (IWWMP). The IWULA will be reviewed and considered by the Vaal-Orange Catchment Management Agency (VOCMA) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the Project comply with the National Water Act, 1998 (Act No. 36 of 1998).

The Project is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni Metropolitan Municipality (CoE). The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project. The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the Project. The process water and slurry pipelines are proposed to run from the Goldplat stock dam area and extend all the way to the Ergo Plant. They will run past residential areas, open areas, wetlands and industrial areas.

**Availability of the Draft IWWMP for Public Review and Comment:** The Draft IWWMP for the Project will be made available for public review and comment for 60 days, from **Tuesday, 6 October 2026 to Friday, 4 December 2026**. Any objection to the application may be lodged in writing within the stipulated 60 days. 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.

A hard copy of the **Draft IWWMP** will be made available at the Lawrence Bongani Sibanyoni Public Library (Kingsway), Cnr Ndlovele and Isibusisu Streets, Kingsway, Benoni, 1501 - Mr Mfundo Nxumalo – (072) 212 2884.

**Stakeholder Meetings:** A consultation meeting will be held using Microsoft Teams (online meeting). The purpose of this meeting is to discuss the Project and the contents of the **Draft IWWMP**, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise their comments and interact with the Project team. Please see below the proposed stakeholder meeting details:

**Online meeting on Microsoft Teams: Wednesday, 28th October 2026 at 10H00 - 11H00.**

To register as an I&AP, contact: Kongiwe Environmental Stakeholder Engagement Team, **Ms Jean-Mari Williams - Phone:** (010) 140 1726, **Ms Vanessa Viljoen - Phone:** (010) 140 1725 or **E-mail: stakeholders@kongiwe.com**

KONGIWE

**Our team welcomes your participation and looks forward to your involvement throughout this process.**

**IMPROVE** your business in **Benoni**

*"Only those who will risk going too far can possibly find out how far one can go."*
*- T.S. Eliot*

**ASK US HOW**

BENONI CITY TIMES

**Mercia Morton:**
078 553 3663
merciam@caxton.co.za

**Debbie Pratt:**
010 971 3324
dpratt@caxton.co.za

Print, web, classifieds and on our social media platforms

# Appendix C5: Site Notice

# Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province

## DWS Reference Number WU48373

Goldplat Recovery (Pty) Ltd ('Goldplat') proposes to reclaim and reprocess its 'Top' and 'Rooidam' Stock Dams with the objective of recovering residual gold using the hydraulic reclamation method.

A Water Use Licence (WUL) is required for the Project activities that may impact water resources. Kongiwe Environmental (Pty) Ltd ('Kongiwe') has been appointed by Goldplat to undertake the Integrated Water Use Licence Application (IWULA) for the Project. 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 and will be supported by an Integrated Water and Waste Management Plan (IWWMP). The IWULA will be reviewed and considered by the Vaal-Orange Catchment Management Agency (VOCMA) as the Competent Authority (CA) presiding over the application, ensuring that all water-related aspects of the Project comply with the National Water Act, 1998 (Act No. 36 of 1998).

The Goldplat Reclamation Project (the "Project") is located approximately 7 km east of the Benoni CBD within the City of Ekurhuleni Metropolitan Municipality (CoE). The Modder Bee Road is situated to the west to northwest of the Project, while the R51 is to the east, and the N12 to the north of the Project. The residential suburb of New Modder is situated to the west of the Project and the residential suburb of Rynsoord is situated to the southwest of the Project. The process water and slurry pipelines are proposed to run from the Goldplat stock dam area and extend all the way to the Ergo Plant. They run past residential areas, open areas, wetlands and industrial areas.

### Availability of the Draft IWWMP for Public Review and Comment:

The **Draft IWWMP** for the Project will be made available for public review and comment for 60 days, from **Tuesday, 6 October 2026 to Friday, 4 December 2026**. Any objection to the application may be lodged in writing within the stipulated 60 days.

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.

A hard copy of the **Draft IWWMP** will be made available at the Lawrence Bongani Sibanyoni Public Library (Kingsway), Cnr Ndlovele and Isibusisu Streets, Kingsway, Benoni, 1501 - Mr Mfundo Nxumalo – (072) 212 2884.

### Stakeholder Meetings:

A consultation meeting will be held using Microsoft Teams (online meeting). The purpose of this meeting is to discuss the Project and the contents of the **Draft IWWMP**, and to provide Interested and Affected Parties (I&APs) with the opportunity to raise their comments and interact with the Project team.

Please see below the proposed stakeholder meeting details:

| Proposed Dates | Available Time Slot | Method of Engagement / Venue |
|---|---|---|
| **Online Meeting** | | |
| Wednesday, 28 October 2026 | 10H00 – 11H00 | Microsoft Teams |

**To register as an I&AP, contact:**
**Kongiwe Environmental Stakeholder Engagement Team**
**Ms Jean-Mari Williams - Phone: (010) 140 1726**
**Ms Vanessa Viljoen - Phone: (010) 140 1725**
**E-mail: stakeholders@kongiwe.com**

**Our team welcomes your participation and looks forward to your involvement throughout this process.**

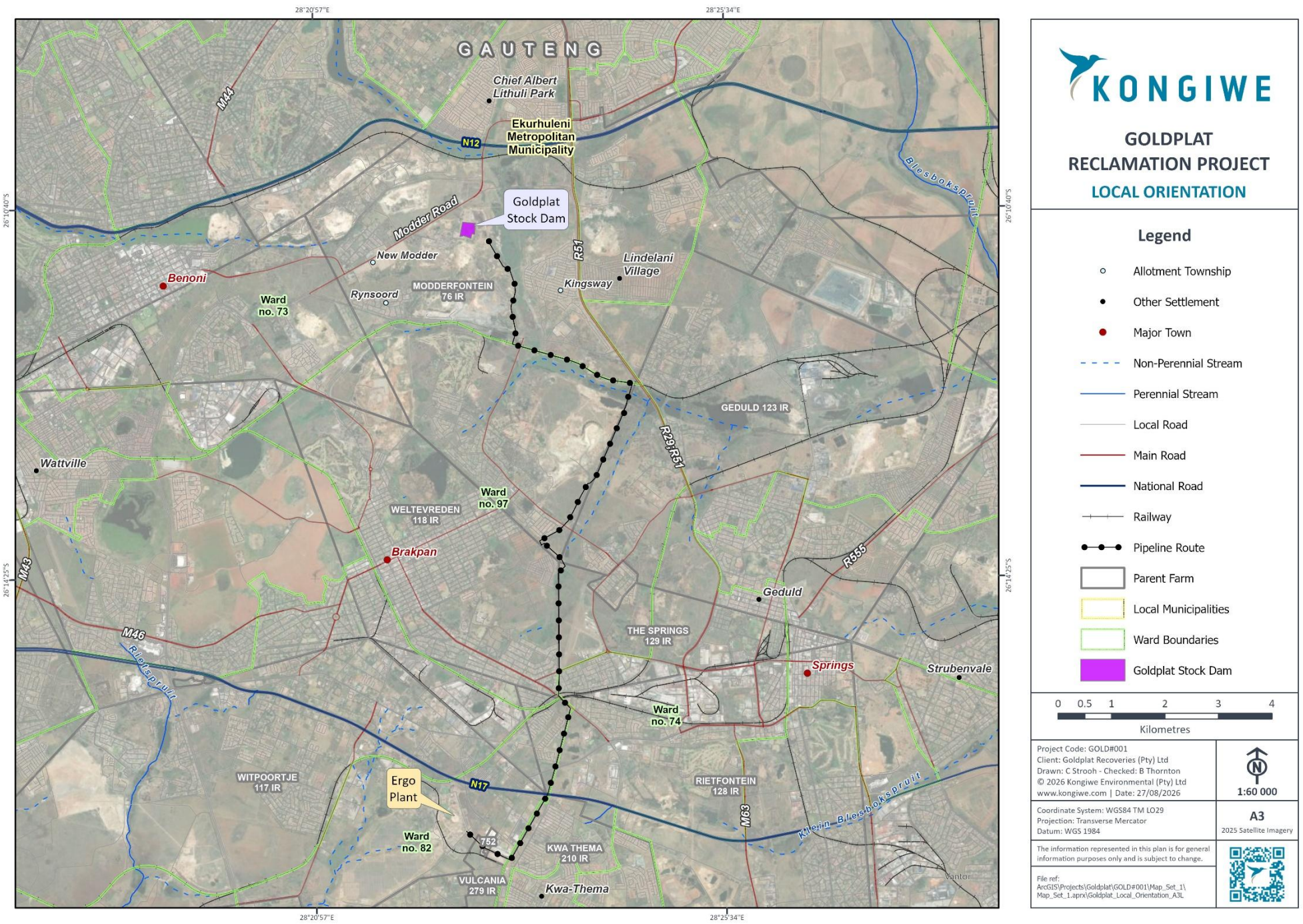


**Figure 1: Locality Map**

# Appendix C6: Correspondence

## Kongiwe Stakeholder Engagement

**From:** Kongiwe Stakeholder Engagement
**Sent:** Tuesday, 29 September 2026 10:28
**To:** Phumla Mngwengwe; Jean-Mari Williams; Anela Fixi
**Subject:** Integrated Water Use Licence Application for the Goldplat Reclamation Project located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province
**Attachments:** GOLD#001_BID_Final.pdf; GOLD#001_REG_FRM.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Completed

**Tracking:**

| Recipient | Read |
|---|---|
| Phumla Mngwengwe | |
| Jean-Mari Williams | Read: 2026/09/29 10:32 |
| Anela Fixi | |

Dear Stakeholder

Kongiwe Environmental (Pty) Ltd ("Kongiwe") hereby gives notice that the **Draft Integrated Water and Waste Management Plan (IWWMP)** for the Goldplat Reclamation Project ("the Project"), located in the City of Ekurhuleni Metropolitan Municipality, Gauteng Province is available for public review and comment.

**Availability of the Draft IWWMP for Public Review and Comment:**
The **Draft IWWMP** for the Project will be made available for public review and comment for 60 days, from **Tuesday, 6 October 2026 to Friday, 4 December 2026**.

**The Draft IWWMP will be made available as follows:**

- An electronic copy on Kongiwe's website: https://kongiwe.com/projects/.
- A Hard copy of the **Draft IWWMP** at the Lawrence Bongani Sibanyoni Public Library (Kingsway).

**Invitation to Online Meeting:**
Interested and Affected Parties (I&APS) are invited to attend an **Online Meeting** as indicated in the table below:

| Proposed Date | Available Time Slot | Method of Engagement |
|---|---|---|
| **Online Meeting** | | |
| Wednesday, 28 October 2026 | 10H00 – 11H00 | Microsoft Teams (once stakeholders have registered a Microsoft Teams link will be sent) |

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.
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www.kongiwe.com

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# Appendix C7: Authority Correspondence

# Appendix C8: Meeting Minutes

# Appendix C9: Written Comments

# Appendix C10: Comment and Response Report

## Appendix D: Wetland Study

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**/**

# Wetland Functional and Impact Assessment for the proposed Goldplat Reclamation Project

## City of Ekurhuleni Metropolitan Municipality, Gauteng Province, South Africa

**31/08/2026**


**Prepared by:**

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| | | |
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| **Report Name** | **Wetland Functional and Impact Assessment for the proposed Goldplat Reclamation Project** | |
| **Specialist Theme** | Aquatic Biodiversity Theme – Wetland Assessment | |
| **Project Reference** | Goldplat Reclamation Project | |
| **Report Version** | 31/08/2026 | |
| **Environmental Assessment Practitioner** | KONGIWE | |
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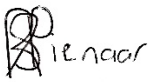
| **Responsible Specialist** | Rian Pienaar (SACNASP 135544) |  |
| **Declaration** | The Biodiversity Company and its associates act as independent consultants in accordance with the requirements of the South African Council for Natural Scientific Professions. We confirm that we have no affiliation 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 interests 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. | |

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# 1 Introduction

## 1.1 Background

The Biodiversity Company was commissioned to undertake a wetland baseline and impact assessment in support of the Integrated Water Use Licence Application (IWULA) for the proposed Goldplat Reclamation Project (the "Project"). The Project entails the reclamation and reprocessing of residual gold-bearing material from the 'Top' and 'Rooidam' stock dams, as well as the construction and operation of associated slurry and process water pipelines between the Goldplat Recovery (Pty) Ltd ('Goldplat') site and the Ergo Mining (Pty) Ltd ('Ergo') processing plant. The project is located approximately 7 km east of the Benoni Central Business District (CBD) within the City of Ekurhuleni Metropolitan Municipality (CoE), Gauteng Province (Figure 1-1).

The proposed reclamation will be undertaken using a top-down hydraulic reclamation method. In this process, high-pressure water monitors are used to erode unconsolidated tailings material within the stock dam compartments, whereafter the process water mixes with the material to form a slurry. The slurry will flow via gravity to a collection sump and then to the pump station before being pumped through a new pipeline to the Ergo Plant for beneficiation. Process water required for the reclamation process will be supplied from the Ergo Plant via the proposed process water pipeline. Supporting infrastructure associated with the project includes reclamation infrastructure at the stock dams, stormwater management infrastructure, electricity reticulation, temporary construction facilities, and slurry and process water pipelines.

The life of the project is expected to be approximately five years, with an estimated throughput of 50 000 tons of slurry per month.

Given the nature of the proposed activities and their proximity to wetlands and other water resources, a wetland assessment is required to identify and delineate wetlands associated with the project area, determine their ecological condition and functional importance, assess likely risks and impacts associated with the proposed activities, and provide mitigation measures to inform the water use authorisation process. This report should therefore assist the Environmental Assessment Practitioner (EAP) and the competent authority in making informed decisions regarding the protection and management of aquatic ecosystems that may be affected by the proposed development.

This assessment has been undertaken in support of the National Water Act (Act No. 36 of 1998) (NWA), which provides for the protection and sustainable use of South Africa's water resources. The findings and recommendations presented herein are intended to inform the Integrated Water Use Licence Application (IWULA) process and associated decision-making requirements for activities that may trigger water uses in terms of Section 21 of the NWA, particularly where activities may impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of a watercourse.

***Figure 1-1 Location of the 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. The 500 m radius has been demarcated for the project to facilitate the identification of wetlands, and this area is referred to as the Project Area of Influence (PAOI);
- An assessment of the related impacts through the use of the Risk Assessment Matrix (DWS, 2023);
- The provision of recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

### 1.3 Project Description

The proposed reclamation method is referred to as top-down hydraulic reclamation. This method uses high-pressure water monitors to erode unconsolidated tailings material within the stock dam compartments. The process water mixes with the tailings material to form a slurry, which is then directed via gravity flow to a collection sump positioned at the lowest elevation of the active reclamation bench. At the sump, coarse material and debris are removed by means of screening before the slurry is transferred to a pump station. From the pump station, the slurry will be pumped via a new pipeline to the Ergo processing plant, where the material will be reprocessed for gold recovery. Process water required for the reclamation activities will be supplied from the Ergo Plant via the proposed process water pipeline.

The project infrastructure will include reclamation infrastructure at the Top and Rooidam stock dam areas, consisting of a slurry sump, vibrating screen, water tank, motor control centre, and associated slurry and water pumps. Associated stormwater management infrastructure will also be established and will include a lined catchment paddock and perimeter berm. Additional infrastructure will include electricity reticulation supplied from the existing Goldplat plant or Eskom, existing access roads and administration buildings, temporary construction contractor yards, a 300 mm diameter slurry pipeline and one 250 mm diameter process water pipeline.

The process water and slurry pipelines will extend from the Goldplat site to the Ergo Plant along an existing or agreed servitude route. According to the received information, the pipeline route runs past open areas, industrial areas, residential areas and wetland systems. As such, the project has the potential to interact with multiple watercourses and associated buffer areas along both the reclamation footprint and the pipeline corridor.

The project is expected to operate for approximately five years, during which an estimated maximum of 50 000 tons of slurry per month will be conveyed to the Ergo Plant for beneficiation. Following completion of the reclamation activities, the affected areas will be assessed for contamination, particularly with respect to radiation, and contaminated material will be removed. The reclaimed stock dam footprints may may then be reused as a future site for tailings deposition.

The proposed layout is illustrated in Figure 1-2 below.

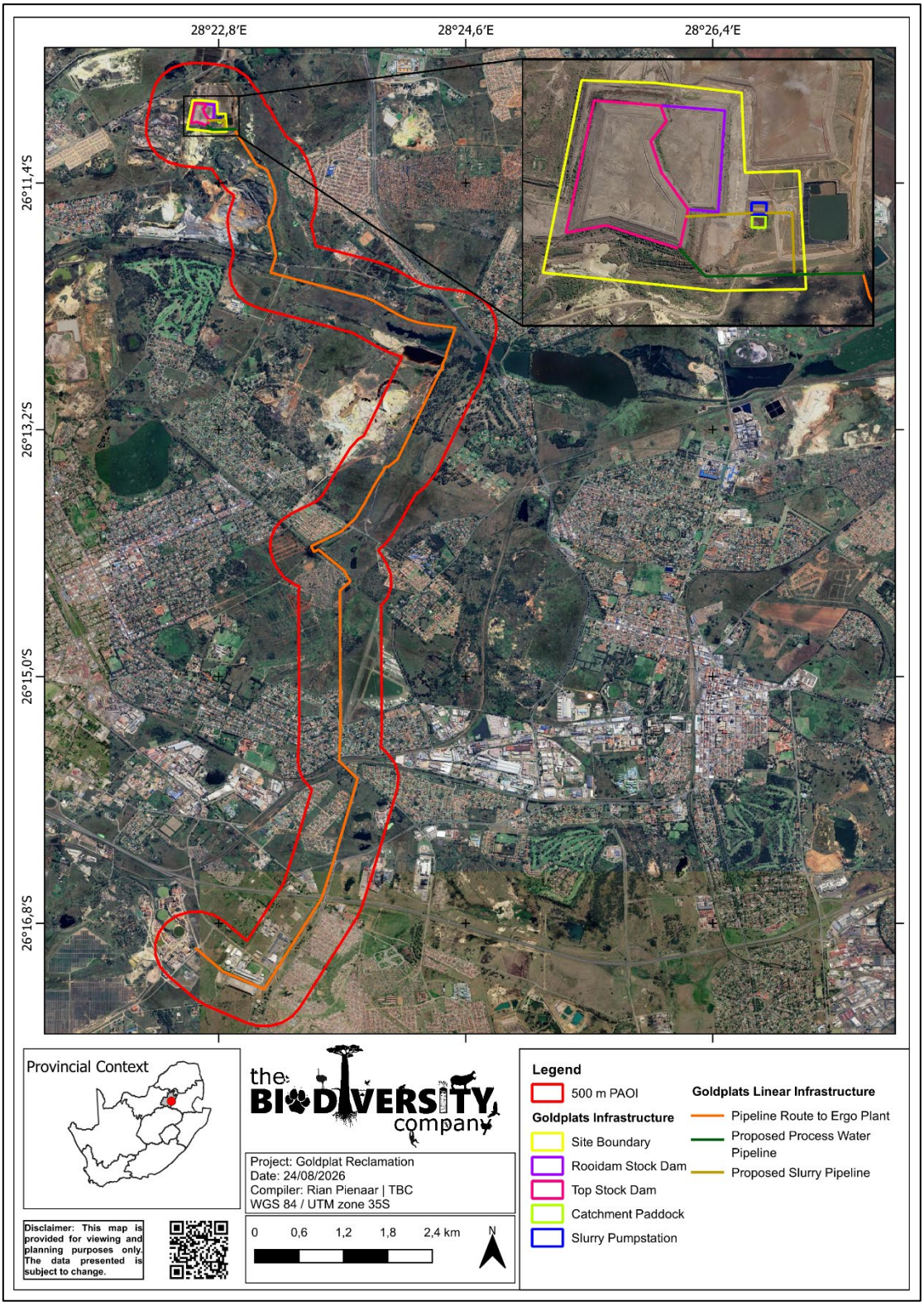



***Figure 1-2 Detailed layout for the project***

## 1.4 Assumptions and Limitations

The following aspects were considered as limitations:

- It has been assumed that the extent of the project area provided to the specialist is accurate;

- The assessment focussed on areas exhibiting wetland indicators and where wetlands were considered likely to occur based on desktop and field observations;
- Representative sampling of the identified wetland areas was undertaken and is considered sufficient for the purpose of this assessment;
- Freshwater features within the broader 500 m regulated area that were not immediately adjacent to the proposed development footprint were assessed on a desktop level where access was not possible;
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side; and
- In areas that have been heavily transformed by historical mining and associated infrastructure, the identification of wetland indicators may be constrained by the altered state of the soils and vegetation.

## 1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the 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 1-1 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. |
| | 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 |
| | NEMA: Environmental Impact Assessment Regulations (2014), as amended, with cognisance of Appendix 6 requirements in GN 517 of 11 (June 2021, as amended). | The minimum criteria for reporting. |
| | NEMA: Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020) | Protocol for the specialist assessment and minimum report content requirements. |
| | National Environmental Management: Waste Act (Act No. 59 of 2008) | The regulation of waste management to protect the environment. |
| | 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. |
| | 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 | Transvaal Nature Conservation Ordinance (Act No. 12 of 1998) | To consolidate and amend the laws relating to nature conservation and to provide matters incidental thereto. |
| | Gauteng Conservation Plan (2024) | The spatial designation of conservation areas and targets within the province. |

## 1.6 National Water Act (NWA, 1998)

The Department of Water and Sanitation (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 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 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 (EA) process needs to be followed. This could follow either the Basic Assessment (BA) process or the Environmental Impact Assessment (EIA) process, depending on the scale of the impact.

### 1.8 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on freshwater biodiversity, as per Government Notice 320 published in terms of NEMA, dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” – the following has been assumed:

- An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of:
    - “very high sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment;
    - “low sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement;
- Where the information gathered from the site sensitivity verification differs from the screening tool designation of “very high” aquatic biodiversity sensitivity, and it is found to be of a “low” sensitivity, an Aquatic Biodiversity Compliance Statement must be submitted;

- Similarly, where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" aquatic biodiversity sensitivity, and it is found to be of a "very high" sensitivity, an Aquatic Biodiversity Specialist Assessment must be submitted.

An Aquatic / Freshwater Biodiversity Specialist Assessment Report must contain the information as presented in Table 1-2 below.

***Table 1-2 Aquatic Biodiversity Specialist Assessment information requirements as per the relevant protocol, including the location of the information within this report***

| Information to be Included (as per GN 320, 20 March 2020) | Report Section |
|---|---|
| The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of aquatic sciences | 8.4 |
| Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae | 8.4 |
| A signed statement of independence by the specialist(s) | 8.3 |
| The assessment must be undertaken on the preferred site and within the proposed development footprint | 1.3 |
| A baseline description of the aquatic biodiversity and ecosystems on the site, including:<br>aquatic ecosystem types;<br>presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns. | N/A |
| The threat status of the ecosystem and species as identified by the screening tool | 3.6.1 |
| An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area) | 3.1.4 |
| A description of the ecological importance and sensitivity of the aquatic ecosystem including:<br><br>(a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g., movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and<br>(b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater) | 3.4.1 |
| The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate | N/A |
| Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:<br><br>Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?<br><br>Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?<br><br>How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:<br><br>(a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes);<br>(b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);<br>(c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and<br>(d) to what extent will the risks associated with water uses and related activities change. | 4.3 |
| How will the proposed development impact on the functioning of the aquatic feature? This must include:<br><br>(a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system); | 4.3 |

| | |
|---|---|
| (b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river);<br>(c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchannelled valley-bottom wetland to a channelled valley -bottom wetland);<br>(d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);<br>(e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and<br>(f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.) | |
| How will the proposed development impact on key ecosystems regulating and supporting services especially:<br><br>(a) flood attenuation;<br>(b) streamflow regulation;<br>(c) sediment trapping;<br>(d) phosphate assimilation;<br>(e) nitrate assimilation;<br>(f) toxicant assimilation;<br>(g) erosion control; and<br>(h) carbon storage? | 4.3 |
| How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site? | N/A |
| A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment | 2.1 |
| The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant | 8.1 |
| A description of the assumptions made, any uncertainties or gaps in knowledge or data | 1.4 |
| The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant | 3.5 |
| Additional environmental impacts expected from the proposed development | N/A |
| Any direct, indirect and cumulative impacts of the proposed development on site | 4 |
| The degree to which impacts and risks can be mitigated | 5 |
| The degree to which the impacts and risks can be reversed | 5 |
| The degree to which the impacts and risks can cause loss of irreplaceable resources | 4 |
| A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies | 8.1.4 |
| Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr) | 4 |
| A motivation must be provided if there were development footprints identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate | 4 |
| A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and | 6.2 |
| Any conditions to which this statement is subjected | 6.2 |

# 2 Fieldwork

## 2.1 Freshwater Biodiversity Field Assessment

A wetland site visit was undertaken on 18 and 19 January 2022, which constituted a wet season survey. The present report represents an update of the earlier wetland assessment to align the report with the current legislative and methodological framework, and the findings of the field assessment are considered applicable to the present report. The survey focused on the identification, delineation and assessment of wetlands and associated aquatic features within and surrounding the project area, including areas associated with the proposed reclamation footprint and pipeline corridor. The seasonality of the survey is not considered to be a limitation to the assessment, and the results presented in this report are considered to be conclusive in the opinion of the specialist.

# 3 Results & Discussion

## 3.1 Desktop Dataset Assessment

### 3.1.1 Climate

The project area is situated within the Highveld summer rainfall region of Gauteng and is characterised by warm, wet summers and cool to cold, dry winters. Rainfall in the area occurs predominantly during the summer months, typically between October and March, with the majority of precipitation associated with convective thunderstorms. Based on regional climatic descriptions for the area, the mean annual precipitation is approximately 662 mm. Temperatures are characterised by warm summer conditions and cold winter conditions, with frost occurring frequently during winter. These climatic conditions influence the hydrological functioning of wetlands in the region, particularly through seasonal rainfall inputs, surface runoff, localised saturation, and fluctuations in soil moisture levels (Mucina & Rutherford, 2006; Figure 3-1).

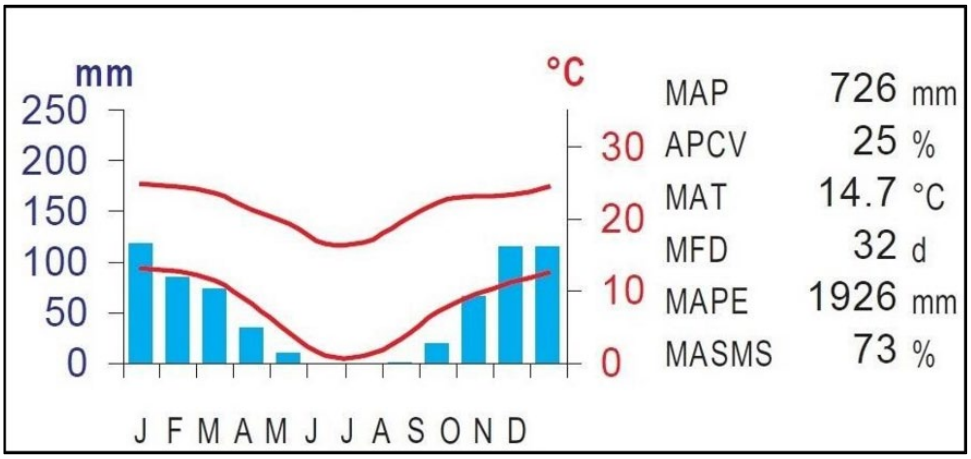



***Figure 3-1 Climate for the Project Area of Influence based on the Soweto Highveld Grassland (Mucina & Rutherford, 2006)***

### 3.1.2 Geology and Soils

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ba 1 land type. The Ba 1 land type is characterised by plinthic catena, with upland duplex and margalitic soils being rare. Dystrophic and mesotrophic red soils are widespread within this land type.

The geology of the project area is characterised by shale, mudstone and sandstone of the Madzaringwe Formation of the Karoo Supergroup, with Karoo Suite dolerites also occurring prominently within the broader area. To the west, rocks of the Ventersdorp, Transvaal and Witwatersrand Supergroups are significant, while the southern portions are characterised by the Volksrust Formation of the Karoo Supergroup. Deep soils occur in this area and are typically associated with the Ea, Ba and Bb land types (Mucina & Rutherford, 2006).

### 3.1.3 Hydrological Characteristics

The PAOI falls within the Highveld Ecoregion, within the Vaal-Orange Water Management Area (WMA). At a finer scale, the project occurs within the C21D, C21E and C22C quaternary catchments. The fine-scale hydrological features details are presented in the following section.

#### 3.1.3.1 Topographical River Lines and Inland Water Areas

The topographical inland water and river line data for the “2628” quarter degree square was used to identify aquatic features within the 500 m regulated area. This dataset indicates the presence of several

non-perennial river lines crossing the PAOI, particularly along the pipeline. These river lines indicate areas of concentrated surface flow and potential wetland development.

The dataset further indicates the presence of various inland water areas within the PAOI, including dams, marsh/vlei areas, non-perennial pans, perennial pans, large reservoirs and sewage works. The larger mapped features are concentrated in the northern and central portions of the PAOI, with smaller inland water features scattered throughout the broader study area. These features indicate areas with a higher likelihood of wetland occurrence or hydrological connectivity and were therefore considered during the desktop assessment of the project area (Figure 3-2).

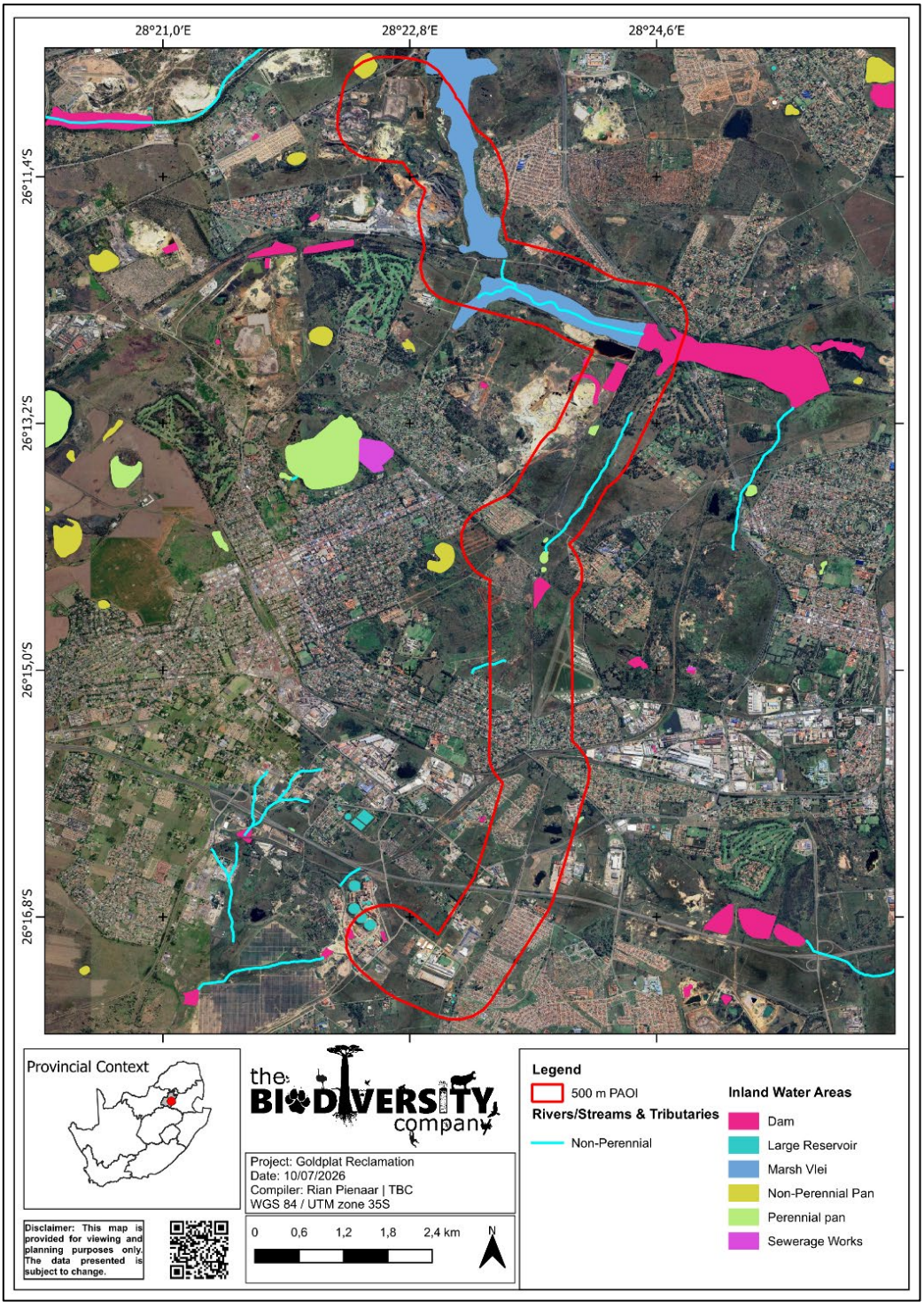



***Figure 3-2 Topographical Drainage and Inland Water Areas relevant to the project***

### 3.1.4 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the project to ecologically important landscape features are summarised in Table 3-1.

***Table 3-1 Summary of relevance of the project to ecologically important landscape features***

| Desktop Information Considered | Relevant/Irrelevant | Section |
|---|---|---|
| South African Inventory of Inland Aquatic Ecosystems (SAIIAE) | Relevant – PAOI overlaps with National Biodiversity Assessment (NBA) wetlands. | 3.1.4.1 |
| National Freshwater Priority Area (NFEPA) | Relevant – PAOI overlaps with NFEPA wetlands. | 3.1.4.2 |
| Provincial Conservation Plan | Relevant – PAOI overlaps with Ecological Support Areas and Critical Biodiversity Areas of the Gauteng Conservation Plan. | 3.1.4.3 |
| Strategic Water Source Areas | Relevant – The PAOI overlaps with the Eastern Karst Belt Groundwater Strategic Water Source Area (GWSA). | 3.1.4.4 |

#### 3.1.4.1 South African Inventory of Inland Aquatic Ecosystems

The spatial dataset released as part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) and included in the National Biodiversity Assessment (NBA 2018) was used to identify wetlands within the 500 m regulated area (Figure 3-3). Three wetland types were identified within the PAOI, namely unchannelled valley-bottom wetlands, depressions and seeps. The unchannelled valley-bottom wetlands represent the dominant wetland type within the study area and occur extensively within the northern, central and southern portions of the PAOI. According to the NBA 2018 dataset, these systems are rated as Critically Endangered (CR) and Not Protected. Depression wetlands are scattered throughout the broader project area and are rated as Least Concern (LC) and Poorly Protected, while the smaller seep systems occur as isolated features associated with slopes and transitional terrain positions and are rated as Critically Endangered (CR) and Poorly Protected.

These mapped features indicate a moderate to high likelihood of wetland occurrence across portions of the PAOI and were considered during the desktop assessment of the project area. The SAIIAE dataset serves as a useful conservation planning and screening tool; however, the national-scale mapping does not replace site-specific field verification, and therefore the extent and classification of wetlands were confirmed during the field assessment where access was possible.

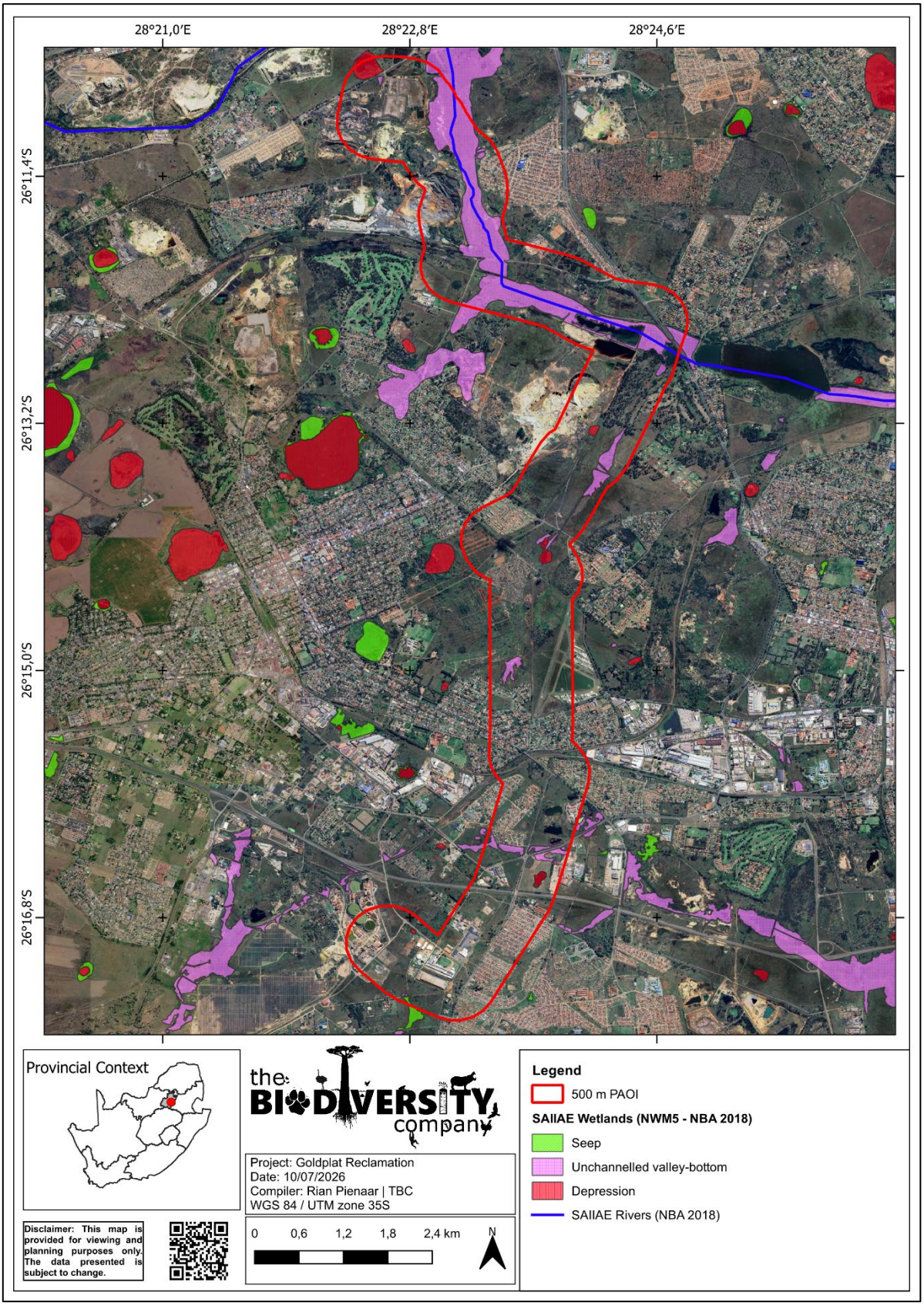



***Figure 3-3 South African Inventory of Inland Aquatic Ecosystems with relevance to the project***

### 3.1.4.2 National Freshwater Ecosystem Priority Areas

According to Nel *et al*. (2011), six wetland types occur within the 500 m regulated area, namely channelled valley-bottom wetlands, unchannelled valley-bottom wetlands, depressions, floodplain wetlands, seep wetlands and wetland flats. The mapped NFEPA river and associated channelled valley-bottom and floodplain wetlands form the main drainage corridor through the northern and central portions of the PAOI. Additional unchannelled valley-bottom wetlands occur in adjacent low-lying areas, while depressions, seeps and wetland flats are scattered throughout the broader study area, particularly toward the south.

These mapped NFEPA features indicate a relatively high degree of freshwater ecological sensitivity within and surrounding the project area and were used to inform the desktop identification of potentially sensitive aquatic areas. However, the NFEPA dataset is a national-scale conservation planning tool and does not replace site-specific wetland delineation and field verification (Figure 3-4).

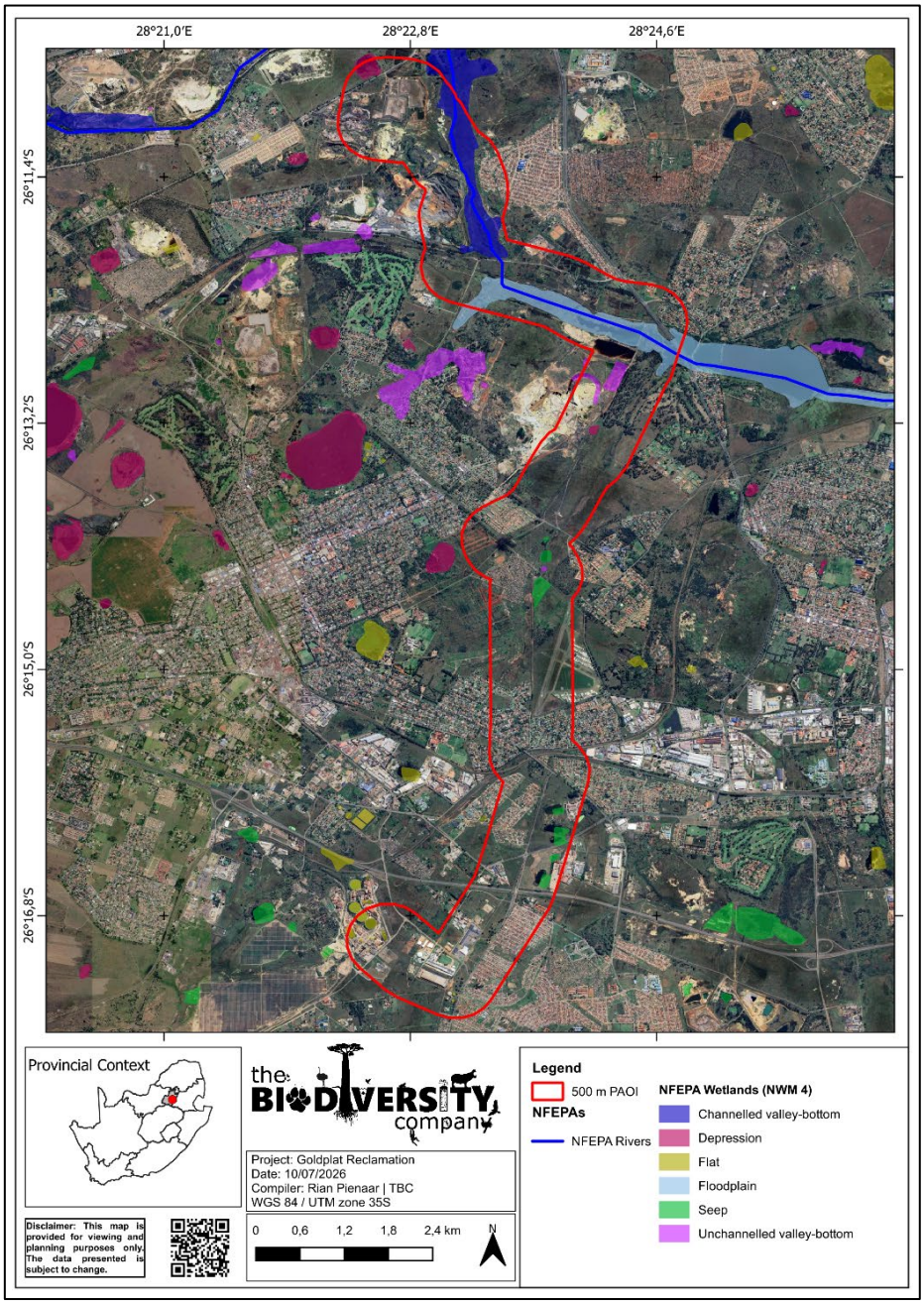



***Figure 3-4 NFEPA Wetlands with relevance to the project***

### 3.1.4.3 Gauteng Conservation Plan

The Gauteng Conservation Plan (C-Plan Version 4) indicates that the 500 m regulated area is dominated by areas classified as Critical Biodiversity Area 1 (CBA1), with smaller occurrences of CBA2, Ecological Support Areas (ESA) 1 and ESA 2 also present within the broader project area. The widespread occurrence of CBA1 within the PAOI indicates that much of the area is considered important for achieving biodiversity targets and maintaining ecological processes at a provincial scale. The smaller CBA2 and ESA units represent areas of supporting biodiversity value and ecological function.

These mapped biodiversity priority areas suggest that the broader project area retains ecological importance despite the presence of extensive anthropogenic disturbance. The CBA and ESA categories are likely associated with wetlands, drainage lines, open areas and remaining ecological corridors within the landscape, and were therefore considered during the desktop assessment of environmental sensitivity (Figure 3-5).

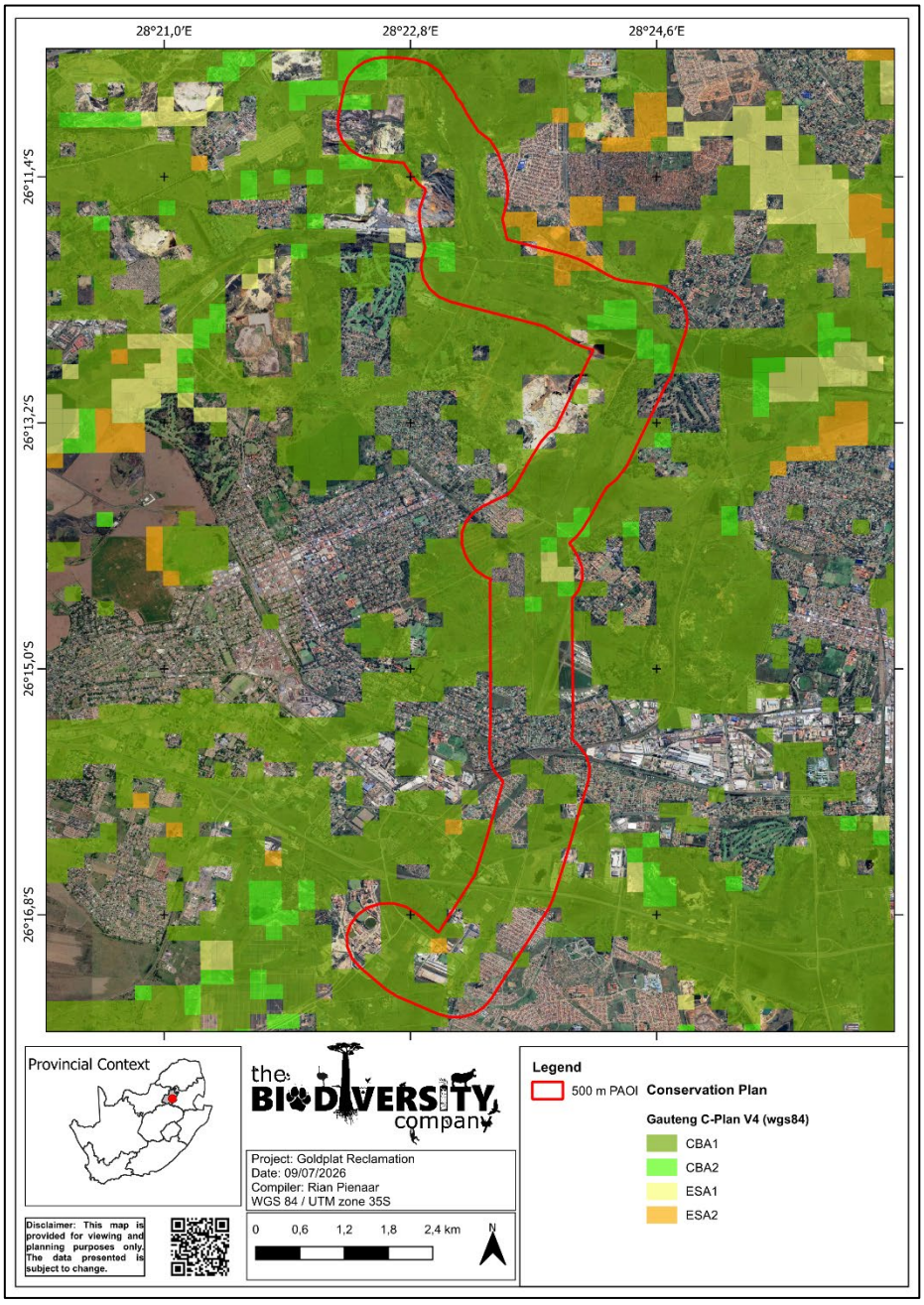



***Figure 3-5 The Gauteng Conservation Plan v4 overlain on the project area***

### 3.1.4.4 Strategic Water Source Areas

The Strategic Water Source Area (SWSA) dataset indicates that much of the 500 m regulated area overlaps with the Eastern Karst Belt Groundwater Strategic Water Source Area (GWSA) (Figure 3-6). This indicates that the project area falls within a region of broader strategic importance for groundwater contribution and water resource support. Although the site is located within a transformed mining and urban landscape, the overlap with the SWSA highlights the importance of protecting aquatic systems and managing activities that may affect groundwater recharge, surface water quality, and wetland functioning.

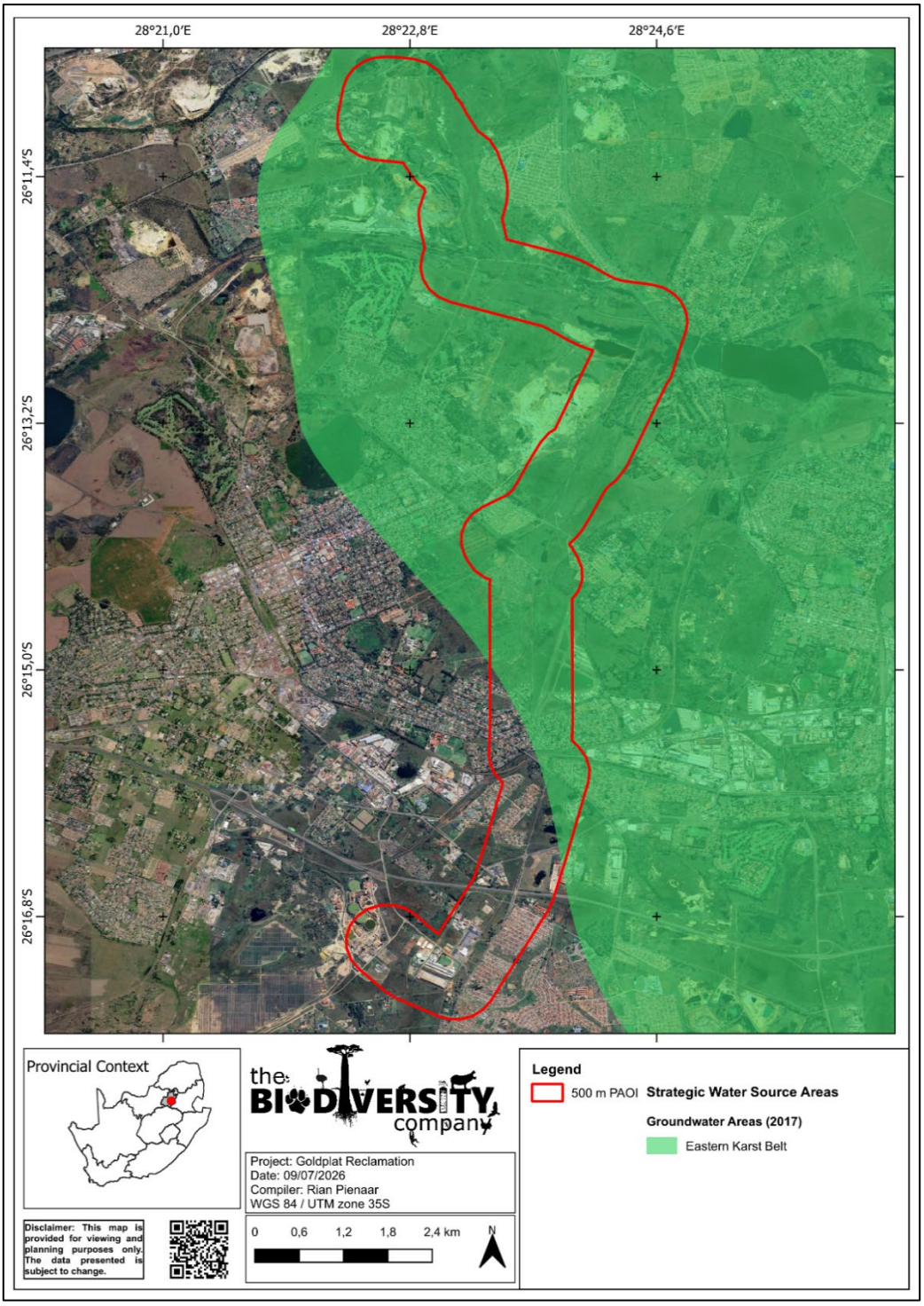



***Figure 3-6 Strategic Water Source Areas with relation to the PAOI***

## 3.2 Wetland Field Survey

### 3.2.1 Delineation

The wetland areas were delineated in accordance with the Department of Water Affairs and Forestry (DWAF) (2005) guidelines. A total of eight HGM units were identified within the 500 m regulated area, comprising three channelled valley-bottom wetlands (HGM 1, HGM 2 and HGM 7), two unchan=nelled valley-bottom wetlands (HGM 5 and HGM 8), two hillslope seep wetlands (HGM 4 and HGM 6), and one depression wetland (HGM 3) (see Figure 3-7 & Figure 3-8). In addition to these natural wetland systems, several drainage features and artificial wetland areas were also identified within the broader project area.

The delineated wetlands are distributed across the northern, central and southern portions of the project area. The most extensive systems are associated with the main drainage corridor traversing the central and northern parts of the PAOI, where the channelled and unchannelled valley-bottom wetlands occur. The hillslope seep wetlands occur as more localised systems associated with sloping terrain, while the depression wetland is present as an isolated feature within the broader landscape. The artificial wetland areas are associated with transformed or disturbed portions of the site, particularly in relation to historical mining and infrastructure development. Together, these delineated systems indicate a relatively complex aquatic environment within and surrounding the project.

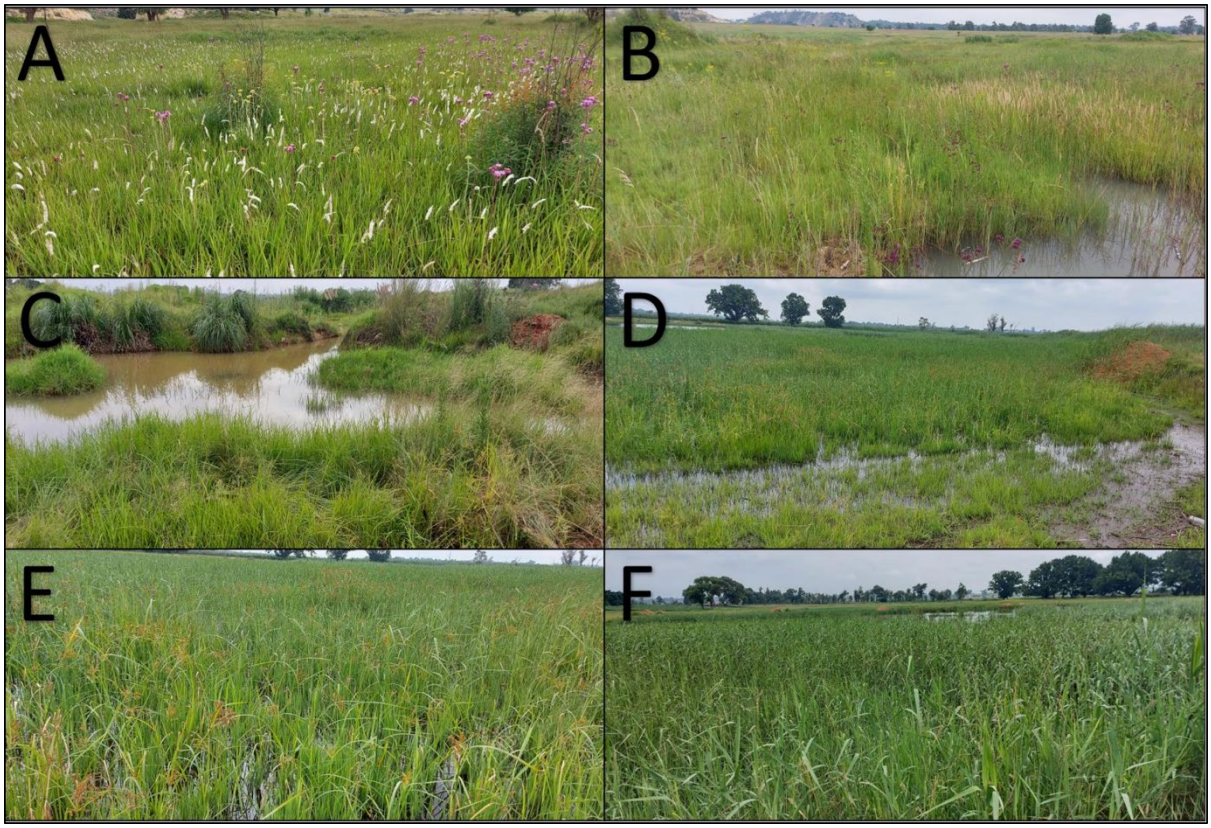



***Figure 3-7 Examples of the different wetlands found within the project area A) Hillslope seep; B) Hillslope seep; C & D) Channelled valley bottoms; and E & F) Unchannelled valley bottoms***

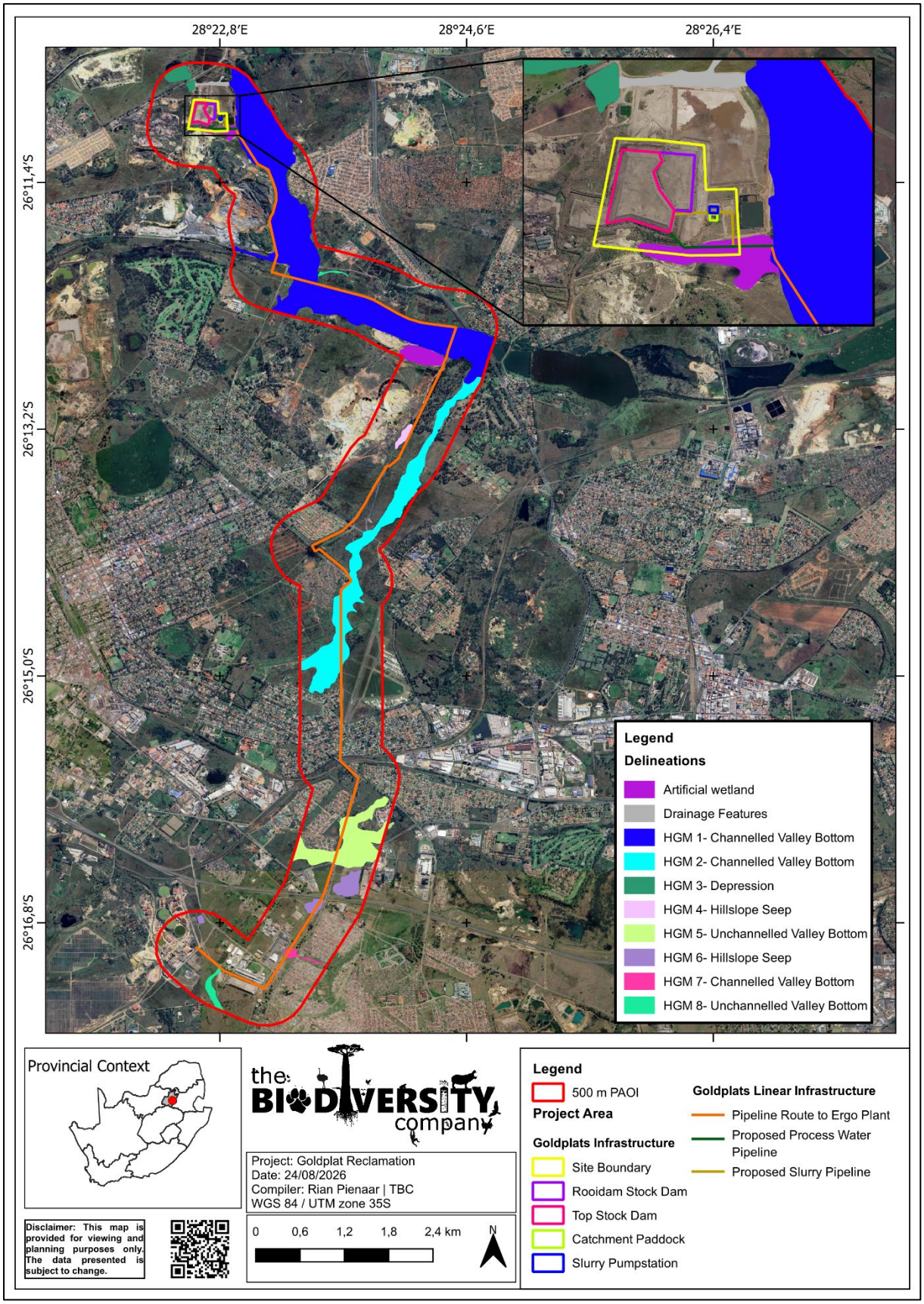



***Figure 3-8 Delineation of wetland features within the Proposed Site and Project Area of Influence***

### 3.2.2 Area of Wetlands

The table below summarises the individual wetland areas and the percentage that each HGM unit comprises of the total wetland area within the PAOI, which amounts to 391.61 ha.

***Table 3-2 Summary of wetland areas within the Project Area of Influence***

| HGM Units | Area (Ha) | Size (%) |
|---|---|---|
| HGM 1 | 216.60 | 55.31 |
| HGM 2 | 83.91 | 21.43 |
| HGM 3 | 6.67 | 1.70 |
| HGM 4 | 2.65 | 0.68 |
| HGM 5 | 42.54 | 10.86 |
| HGM 6 | 12.24 | 3.13 |
| HGM 7 | 2.47 | 0.63 |
| HGM 8 | 5.36 | 1.37 |
| Artificial Wetlands | 14.32 | 3.66 |
| Drainage Features | 4.85 | 1.24 |
| **Total** | **391.61** | **100** |

### 3.2.3 Classification and Description

The wetland classification as per SANBI guidelines (Ollis *et al*., 2013) for the proposed site is presented in Table 3-3. Several different wetland types were identified within the project area, namely channelled valley-bottom wetlands, an unchannelled valley-bottom, seep wetlands and a depression wetland.

***Table 3-3 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, 2 & 7** | Inland | Highveld | Mesic Highveld Grassland Group 3 | Valley-floor | Channelled valley-bottom | N/A | N/A |
| **HGM 3** | | | | Plain/Bench | Depression | Endorheic | N/A |
| **HGM 4 & 6** | | | | Slope | Seep | Without channelled outflow | N/A |
| **HGM 5 & 8** | | | | Valley floor | Unchannelled Valley-bottom | N/A | N/A |

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 3-9 presents a diagram of a typical channelled valley bottom, showing the dominant movement of water into, through and out of the system.

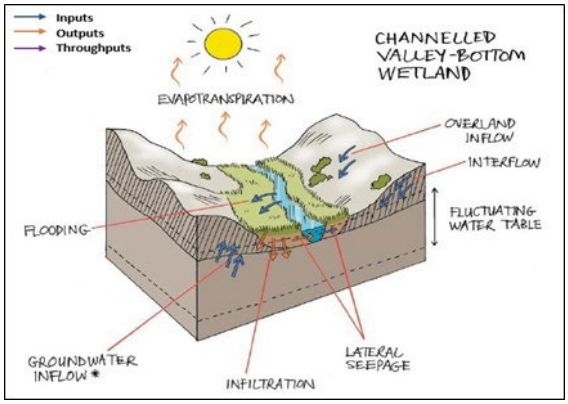



***Figure 3-9 Amalgamated diagram of a typical channelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013)***

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 categorises 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 3-10 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

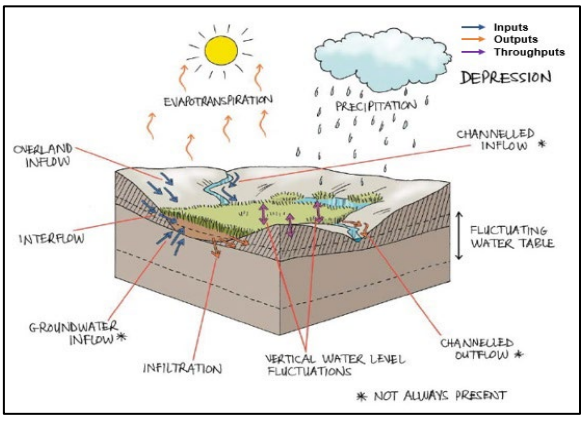



***Figure 3-10 Amalgamated diagram of a typical depression wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

A seep wetland is typically located on gently to steeply sloping land and is characterized 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 3-11 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

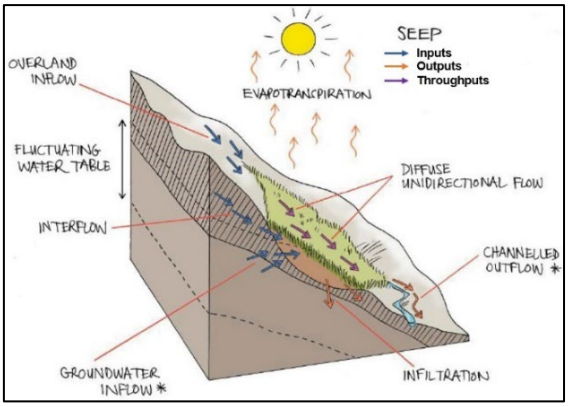



***Figure 3-11 Amalgamated diagram of a typical seep wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013)***

Unchannelled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows. Figure 3-12 presents a diagram of a typical unchannelled valley bottom wetland, showing the dominant movement of water into, through and out of the system.

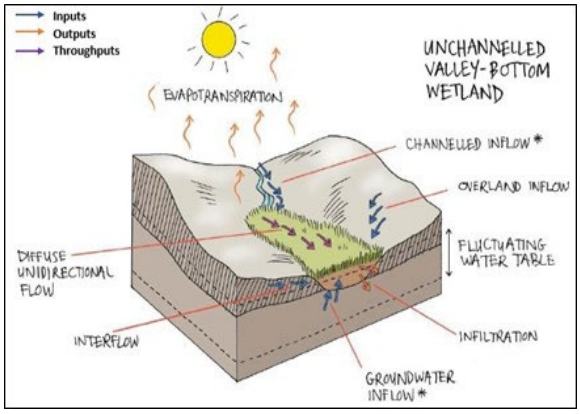



***Figure 3-12 Amalgamated diagram of an unchannelled valley-bottom wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013)***

The DWAF (2005) manual separates the classification of watercourses into three separate types of channels or sections defined by their position relative to the zone of saturation in the riparian area (Figure 3-13). The classification system separates channels into:

- Those that do not have baseflow (‘A’ Sections);
- Those that sometimes have baseflow (‘B’ Sections) or non-perennial; or
- Those that always have baseflow (‘C’ Sections) or perennial.

The drainage features on within the PAOI can be described as “A Section” channels.

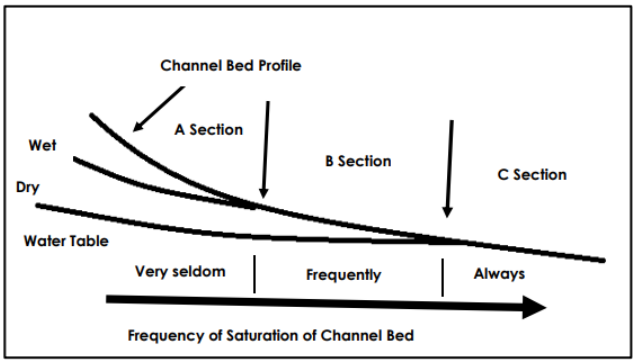



***Figure 3-13 Watercourse classifications (DWAF, 2005)***

## 3.3 Risk Screening

Table 3-4 provides the results of risk screening for the natural wetlands and provides motivation for each of the determined categories.

***Table 3-4 Risk status of the delineated wetlands***

| HGM unit / Feature | Risk Status | Reasoning |
|---|---|---|
| HGM 1, 2, 4, 5, 6, 7 & 8 | At Risk | The proposed slurry process water pipelines traverse delineated wetlands within the project area and direct impacts to these systems are therefore expected. Indirect impacts associated with the reclamation of the Top Stock Dam and Rooidam Stock Dam may also affect nearby wetland features located downslope of or in close proximity to the reclamation footprint, through altered runoff, sediment mobilisation, erosion and potential water quality deterioration. |
| HGM 3 | Not at Risk | Due to the location of this feature within the landscape and its distance to the proposed pipeline, the wetland is considered not to be at risk. |

## 3.4 Functional and Ecological Assessment

Only wetlands considered to be at an appreciable level of risk in relation to the proposed project and associated activities were included in the functional and ecological assessments. Artificial wetland features and drainage features were identified within the project area and may provide certain ecosystem services; however, these features do not represent natural ecological systems and do not have appropriate reference conditions for ecosystem health assessment. Such features were therefore not included in the formal ecological assessment. In addition, wetland features that have been heavily transformed by historical tailings deposition and associated mining activities, were assessed with due consideration of their altered ecological condition and level of disturbance within the project area.

### 3.4.1 Functional Assessment

#### 3.4.1.1 General Functional Description

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 attenuation3 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).

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 volatilization. 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).

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 stabilizing 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).

Unchannelled valley-bottoms are characterised by sediment deposition, a gentle gradient with streamflow generally being spread diffusely across the wetland, ultimately ensuring prolonged saturation levels and high levels of organic matter. The assimilation of toxicants, nitrates and phosphates are usually high for unchannelled valley-bottom wetlands, especially in cases where the valley is fed by sub-surface interflow from slopes. The shallow depths of surface water within this system adds to the degradation of toxic contaminants by means of sunlight penetration (Kotze *et al*., 2009).

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

Non-perennial rivers and drainages, as documented by Kotze *et al.* (2009), are characterised by their intermittent flow patterns, which are not sustained throughout the year. These systems are crucial for flood attenuation, particularly during periods of flow, as their channels allow for the temporary storage and slow release of water. This attenuation is most effective when the riverbed and surrounding soils are not fully saturated. The deposition of sediments and organic material within these systems contributes to the retention of water, thereby enhancing the capacity to moderate flow variability. Non-perennial drainages also play a role in nutrient cycling, particularly in the assimilation of nitrates through processes such as denitrification, facilitated by the organic matter present. These features improve water quality by trapping sediments and assimilating excess nutrients and pollutants from agricultural and industrial sources. Although their capacity for erosion control is limited due to their intermittent nature, non-perennial systems provide ecosystem services by connecting various aquatic habitats and supporting biodiversity during wet periods.

#### 3.4.1.2 Ecosystem Services

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze *et al*., 2009) (see section 8.1.3.1 for the methodology). The results of the assessment are discussed below. Ecosystem services contributing to these scores include flood attenuation, stream flow regulation, sediment trapping, nutrient and toxicant assimilation, erosion control and the maintenance of biodiversity.

***Table 3-5 Summary of the average ecosystem scores for the assessed systems***

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

The channelled valley-bottom wetlands (HGM 1, HGM 2 and HGM 7) and the unchannelled valley-bottom wetlands (HGM 5 and HGM 8) contribute most strongly to ecosystem services related to flood attenuation, stream flow regulation, sediment trapping, nutrient and toxicant assimilation, and biodiversity maintenance. These systems are associated with the main drainage corridors and lower-lying parts of the landscape and therefore play an important role in moderating runoff, slowing surface flows, promoting infiltration, and improving water quality. The more extensive valley-bottom systems, particularly HGM 1, are considered especially important in this regard due to the extent of wetland vegetation and their position within the broader drainage network.

The depression wetland (HGM 3) contributes primarily to water quality enhancement, sediment retention and biodiversity maintenance. Depression wetlands are often effective at trapping sediments and assimilating nutrients and toxicants due to their inward-draining nature and tendency to retain water for longer periods. These characteristics allow such systems to perform an important ecological function within transformed landscapes by improving water quality and supporting wetland-dependent biota.

The hillslope seep wetlands (HGM 4 and HGM 6) contribute mainly to sub-surface flow regulation, nutrient and toxicant assimilation, and biodiversity maintenance. Although seep systems generally contribute less to flood attenuation than valley-bottom systems, they remain important in regulating local hydrology and maintaining ecological connectivity across the landscape. These systems also assist in filtering diffuse runoff and supporting specialised wetland vegetation within sloping terrain.

Overall, HGM 1 scored the highest ecological functionality and was rated as High. HGM 2, HGM 3, HGM 5 and HGM 7 were rated as “Moderately High”, indicating that these wetlands remain important providers of ecosystem services despite varying levels of disturbance. HGM 4 was rated as “Intermediate”, while HGM 6 and HGM 8 were rated as “Moderately Low”, reflecting the reduced ecological functioning of these systems due to historical and ongoing anthropogenic disturbance within the project area.

### 3.4.2 Present Ecological State

The Present Ecological State (PES) of the delineated wetlands was assessed to determine the extent to which each system has been modified by historical and current anthropogenic activities within the project area (see 8.1.3.2 for the methodology).

***Table 3-6 Average Present Ecological State scores for the assessed wetlands***

| D - Largely Modified | E – Seriously Modified | F- Critically Modified |
|---|---|---|
| HGM 1 | HGM 5 | HGM 4 |
| HGM 2 | HGM 6 | |
| HGM 3 | HGM 8 | |
| HGM 7 | - | |

The results indicate that the delineated wetlands range in condition from Largely Modified (Class D) to Critically Modified (Class F). These ratings reflect the cumulative influence of historical mining activities, tailings deposition, altered hydrology, vegetation disturbance, erosion, infrastructure development and surrounding urban land uses within the broader landscape.

HGM 1, HGM 2, HGM 3 and HGM 7 were assigned a PES Class D (Largely Modified). Although these wetlands have been affected by surrounding anthropogenic activities, they still retain recognisable wetland characteristics and continue to perform important ecological functions. These systems remain influenced by altered runoff inputs, adjacent development, disturbed catchment conditions and historical mining-related impacts, but still support wetland vegetation and some degree of hydrological and ecological functioning.

HGM 5, HGM 6 and HGM 8 were assigned a PES Class E (Seriously Modified). These systems show a greater degree of ecological disturbance and modification, with impacts including vegetation loss, hydrological alteration, localised infilling or erosion, and disturbance associated with roads, infrastructure and historical land transformation. While these wetlands still retain identifiable wetland features, their ecological functioning has been substantially reduced.

HGM 4 was assigned a PES Class F (Critically Modified). This wetland has been extensively altered by historical disturbance, resulting in severe modification of ecological processes and a substantial loss of natural wetland structure and functioning. Although remnants of wetland characteristics remain identifiable, the system is considered critically modified in its current state.

Overall, the PES assessment indicates that all delineated wetlands within the project area have been affected to varying degrees by anthropogenic disturbance. However, several wetlands still retain sufficient ecological function to warrant protection, while the more degraded systems will require management intervention and rehabilitation where impacts cannot be avoided.

### 3.4.3 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) assessment was applied to the delineated HGM units in conjunction with the ecosystem service scores presented in the preceding sections in order to determine the relative sensitivity and ecological importance of the wetlands within the project area. Various components were considered as part of the EIS assessment, including overlap with Strategic Water Source Areas (SWSAs), the NFEPA and NBA 2018 wetland ecosystem threat status and protection level, as well as the present condition of the wetlands. These factors were considered collectively to provide an indication of the ecological importance, sensitivity and conservation value of each delineated wetland unit, with higher EIS categories indicating wetlands that are more ecologically important, more sensitive to disturbance and therefore require greater protection and more careful management of potential impacts (see section 8.1.3.3 for methodology).

Table 3-7 provides a summary of the broader ecological context considered in the EIS assessment for the delineated wetland types. It should be noted that the detailed PES ratings assigned to the individual HGM units differ between wetlands and are presented separately in Section 3.4.2.

***Table 3-7 Aspects considered in the Ecological Importance and Sensitivity assessment***

| HGM Type | NFEPA Wet Type | | | NBA Wetlands | | | SWSA (Y/N) | CBA/ ESA (Y/N) | EIS Rating |
|---|---|---|---|---|---|---|---|---|---|
| | Type | Ecosystem Threat Status | Ecosystem Protection Level | Wetland Condition | Ecosystem Threat Status 2018 | Ecosystem Protection Level | | | |
| **Channelled Valley-Bottom** | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| **Depression** | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| **Hillslope Seep** | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |
| **Unchannelled Valley-Bottom** | Mesic Highveld Grassland Group 3 | Critical Endangered | Not Protected | D Largely Modified (Field Visit) | Critically Endangered | Not Protected | Y | Y | C - Moderate |

### 3.4.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the delineated wetlands were determined from the results of the PES and EIS assessments. These assessments indicated that the wetland features within the project area have been transformed by historical and current impacts but still provide ecological services within the broader landscape. Based on the assessment, the target ecological category for all delineated wetlands is Class D. Wetlands currently in PES Class D should be maintained, while wetlands currently in PES Class E or F should be improved to Class D. The appropriate REC and RMO estimated for the wetland areas are presented in Table 3-8 below.

***Table 3-8 Summary of the REC and RMO categories assigned to the relevant wetlands***

| HGM Unit | REC – RMO |
|---|---|
| HGM 1 | D – Maintain |
| HGM 2 | D – Maintain |
| HGM 3 | D – Maintain |
| HGM 4 | D - Improve |
| HGM 5 | D - Improve |
| HGM 6 | D - Improve |
| HGM 7 | D – Maintain |
| HGM 8 | D - Improve |

## 3.5 Buffer Requirements

The scientific buffer calculation (Macfarlane *et al*., 2014) was applied to determine the appropriate buffer zone widths relevant to the proposed pipeline infrastructure and stock dam reclamation areas. Based on the outcome of the assessment, the post-mitigation buffer for the proposed slurry pipeline and proposed process water pipeline was determined to be 15 m, while the post-mitigation buffer for the Top Stock Dam and Rooidam Stock Dam reclamation areas was determined to be 40 m.

***Table 3-9 Buffer requirements***

| Aspect | Post-Mitigation |
|---|---|
| Pipelines | 15 m |
| Top Stock Dam and Rooidam Stock Dam reclamation areas | 40 m |

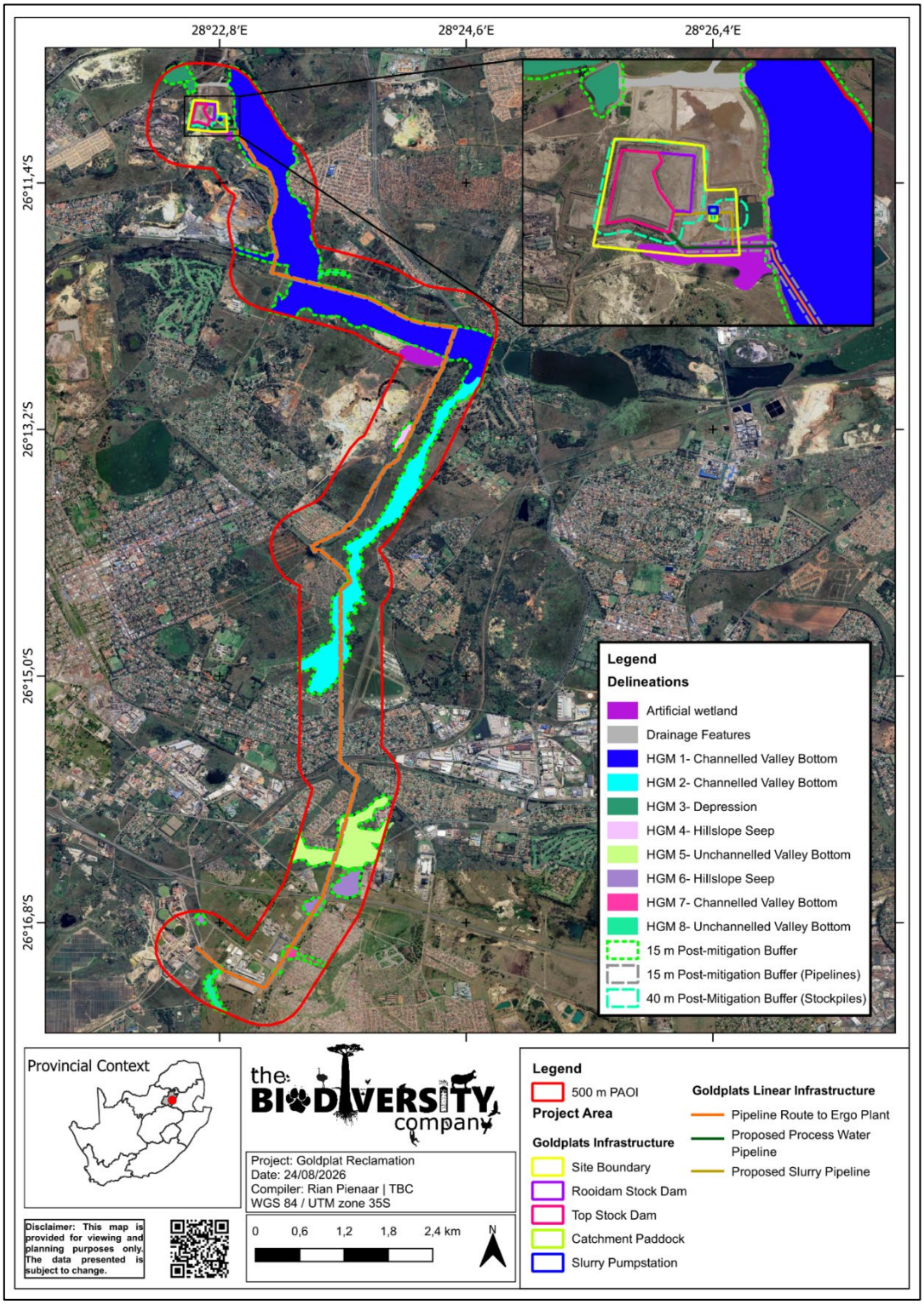



***Figure 3-14 Recommended buffers for the identified wetlands (excluding activities within watercourses)***

### 3.5.1 Regulation Zones

Table 3-10 presents the legislated zones of regulation that would be applicable to the wetland areas.

The regulated areas of a watercourse in terms of GN 509 as it relates the NWA (1998) must be considered for infrastructure located within these areas.

Listed activities in terms of the NEMA (1998), (Act 107 of 1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation.

Based on the proposed activities and the location of the development footprint relative to delineated watercourses, the relevant authorisation requirements are considered applicable.

***Table 3-10 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).<br>Department of Water and Sanitation (DWS) | In accordance with GN509 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:<br>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;<br>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<br>a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation. |
| Listed activities in terms 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:<br><br>The development of:<br><br>(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;<br>Where such development occurs—<br><br>Within a watercourse;<br><br>In front of a development setback; or<br>If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse. |
| | Activity 14 of Listing Notice 3 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that:<br><br>The development of—<br>(ii) infrastructure or structures with a physical footprint of 10 square metres or more;<br>where such development occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback; or<br>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. |
| | Activity 23 of Listing Notice 3 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that:<br><br>The expansion of—<br>(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or<br>(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback adopted in the prescribed manner; or<br>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. |

## 3.6 Site Sensitivity Verification

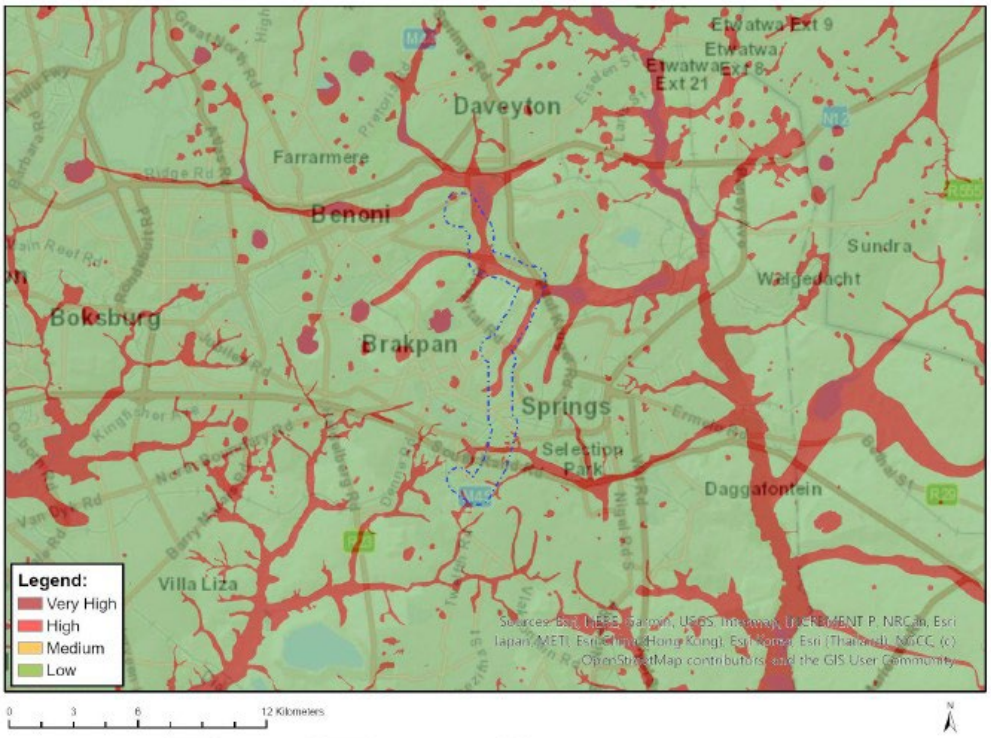
### 3.6.1 Desktop Ecological Sensitivity

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

- The National Web-based Environmental Screening Tool has characterised the Aquatic Biodiversity Theme sensitivity as “Low” for majority of the Project Site and PAOI (Figure 3-15); and

- The National Web-based Environmental Screening Tool has characterised the Aquatic Biodiversity Theme sensitivity as “Very High” for sections within the PAOI, assigned for the presence of wetlands (depression, seep and Unchannelled valley-bottom) and rivers (Figure 3-15).

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY




| Very High sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|---|---|---|---|
| X | | | |

**Sensitivity Features:**

| Sensitivity | Feature(s) |
|---|---|
| Low | Low Sensitivity |
| Very High | Wetlands_Depression |
| Very High | Wetlands_Seep |
| Very High | Wetlands_Unchannelled valley-bottom |
| Very High | Rivers |

***Figure 3-15 The Aquatic Biodiversity Theme Sensitivity for the proposed project (National Environmental Web-based Screening Tool (DEA, 2024)***

### 3.6.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas as shown in Table 3-11 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 PES and EIS assessment processes followed in the previous section, and consideration has been given to any observed or likely presence of sensitive fauna and flora. A map highlighting the Freshwater Sensitivity for the PAOI is depicted in Figure 3-16.

It should be noted that the Ecological Importance and Sensitivity (EIS) ratings and the specialist sensitivity verification represent different assessment approaches and are therefore not directly equivalent.

***Table 3-11 Summary of the screening tool vs specialist assigned sensitivities***

| Features | Screening Tool Theme | Environmental Screening Tool Sensitivity | Specialist Sensitivity | Tool Validated or Disputed by Specialist - Reasoning |
|---|---|---|---|---|
| **HGM 1 - 8** | Aquatic Biodiversity Theme | Very High | High | Screening Tool Sensitivity Disputed.<br>Rationale for the specialist assigned 'High' rating:<br>These wetland systems have experienced historical impacts related to mining and impoundments. Even though largely and seriously modified, the wetlands still present functionality and this has contributed towards determining the sensitivity ratings. The wetlands have therefore been assigned a 'High' sensitivity rating. |
| **Non-perennial Drainage** | | Low | Medium | Screening Tool Sensitivity Disputed.<br>Rationale for the specialist assigned 'Medium' rating:<br>These watercourses have experienced historical impact related to mining activities. The connectivity of some of the features to downstream watercourses increases their importance in maintaining the hydrological functioning of these systems and providing a corridor to the larger watercourses. This has contributed towards determining the sensitivity rating. The watercourses have therefore been assigned a 'Medium' sensitivity rating. |
| **Artificial Wetlands** | | Low | Low | Screening Tool Sensitivity Validated.<br>Rationale for the specialist assigned 'Low' rating:<br>This is an off-channel feature and is artificial and has therefore been assigned a 'Low' sensitivity rating. |
| **Remaining Area** | | Low | Low | Screening Tool Sensitivity Validated.<br>Rationale for the specialist assigned 'Low' rating:<br>Much of the area has been historically modified through agricultural and mining activity. The proposed activities are not anticipated to significantly modify the hydrological characteristics of the entire area; therefore a 'Low' sensitivity has been assigned for these areas in relation to freshwater biodiversity. |

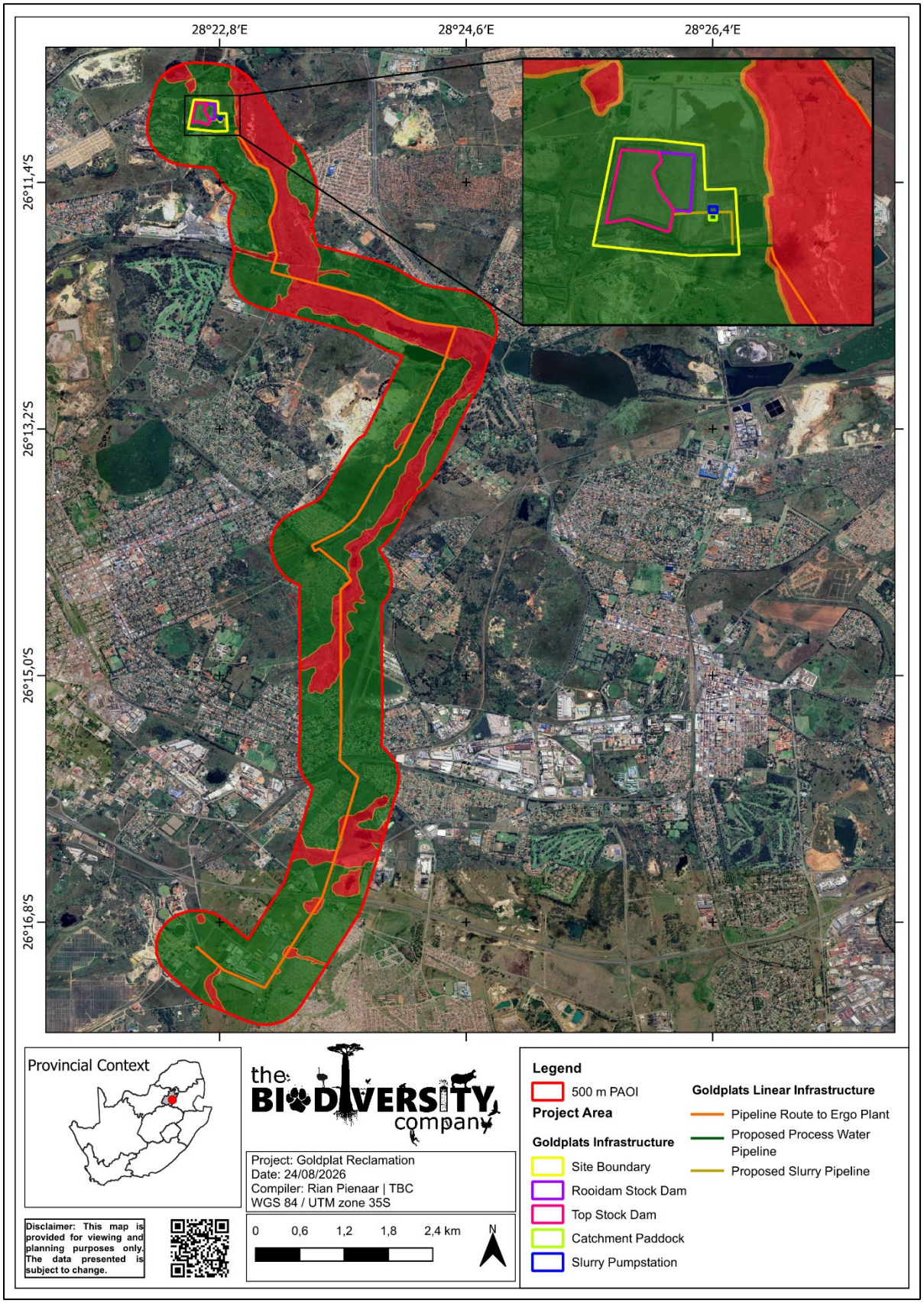



***Figure 3-16 Sensitivity Map for the Project Area of Influence***

# 4 Risk and Impact Assessment

## 4.1 Current Impacts to Freshwater Biodiversity

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

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

## 4.2 Alternatives Considered

No other site alternatives were provided for the proposed project, and the assessed areas are considered to be the preferred options for development and have been used to determine potential impacts to the identified wetlands.

## 4.3 Quantitative Risk and Impact Assessment

The Risk / Impact Assessment considered the indirect impacts, to the wetland systems and drainage features. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 4-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology, and phasing to avoid impacts.

A Risk / Impact Assessment was undertaken for the various project components and is presented below. It was conducted in accordance with the methodology in section 8.2.1

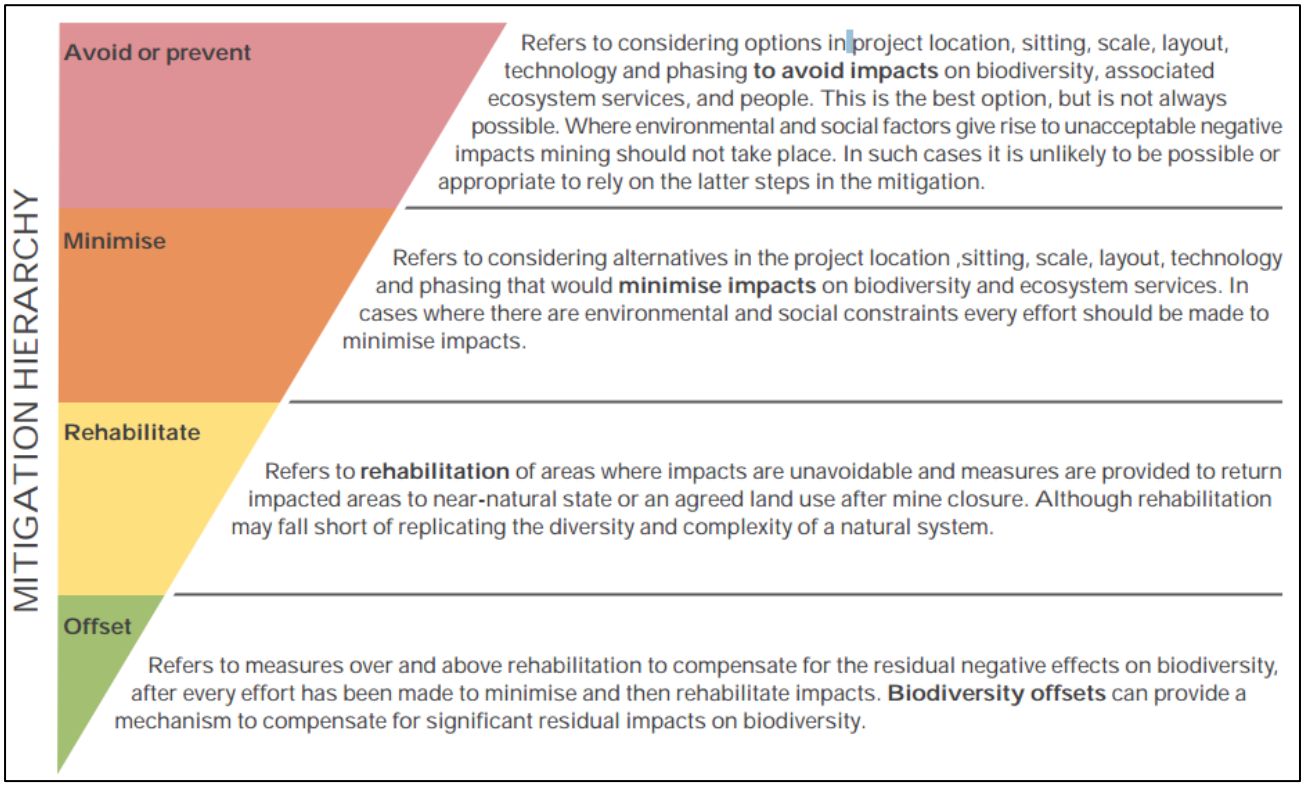



***Figure 4-1 The mitigation hierarchy as described by the DEA (2013)***

### 4.3.1 Potential Anticipated Impacts

A risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act (Act No. 36 of 1998) to investigate the level of risk posed by the Goldplat Reclamation Project to wetlands and associated aquatic features within the project area. The assessment considered the likely impacts associated with the reclamation of the Top Stock Dam and Rooidam Stock Dam, together with the construction, operation, decommissioning and rehabilitation of the proposed slurry pipeline, proposed process water pipeline and associated supporting infrastructure, including the slurry pumpstation, and the lined catchment paddock.

The most significant risks are expected to be associated with the direct disturbance of delineated wetlands during pipeline installation, indirect impacts associated with reclamation activities occurring adjacent to or upslope of wetland features, and operational risks linked to leaks, spills, erosion, sedimentation and altered surface water flow. Potential impacts include the loss or disturbance of wetland vegetation, loss of hydromorphic soils, erosion and sedimentation of wetlands, changes to flow patterns, degradation of habitat, reduced water quality, and the loss of ecosystem services. Additional risks may arise from construction traffic, storage of fuels and chemicals, stormwater concentration, vegetation clearing, and inadequate rehabilitation of disturbed wetland areas.

Although several of these impacts may be temporary and localised if effectively mitigated, the cumulative effect of mining-related disturbance in the area increases the sensitivity of the affected systems. Where impacts to delineated wetlands cannot be avoided, strict mitigation, rehabilitation and monitoring measures will be required to reduce the residual risk to an acceptable level.

***Table 4-1 Activities and impacts relevant to the proposed activity***

| Phase | Activity | Aspect | Potential Impact |
|---|---|---|---|
| Construction Phase | Vegetation clearing and site preparation | Removal of wetland vegetation | Loss of wetland habitat; loss of indigenous vegetation; reduced ecological functioning |
| | Excavation for the Proposed Slurry Pipeline and Proposed Process Water Pipeline | Trenching through wetlands and buffers | Disturbance of hydromorphic soils; direct wetland habitat loss; erosion and sedimentation |
| | Construction of the Slurry Pumpstation | Surface disturbance within sensitive areas | Altered surface runoff; compaction of soils |
| | Temporary stockpiling of soil and materials | Soil disturbance and exposed surfaces | Increased erosion; sedimentation of wetlands; spread of invasive species |
| | Vehicle and machinery movement | Traffic within or near wetlands | Soil compaction; vegetation disturbance; increased erosion and runoff |
| | Storage of fuels, oils, chemicals and cementitious materials | Potential contamination | Water quality impairment; contamination of wetlands and downstream systems |
| | Stormwater management | Concentrated runoff | Flow modification; erosion of watercourses; sedimentation of wetlands |
| | Construction activities in sensitive areas | General disturbance | Loss of biodiversity; habitat fragmentation; reduced ecosystem service supply |
| | Construction of catchment paddock | Soil disturbance and exposed surfaces | Increased erosion; sedimentation of wetlands; spread of invasive species |
| Operational Phase | Reclamation of the Top Stock Dam and Rooidam Stock Dam | Hydraulic reclamation activities | Sediment mobilisation; increased turbidity; contamination of downstream wetlands; altered runoff pathways |
| | Operation of the Proposed Slurry Pipeline | Pipeline leaks, bursts or spills | Water quality deterioration; contamination of wetland habitat; loss of ecological functioning |
| | Operation of the Proposed Process Water Pipeline | Pipeline leaks or spills | Water quality impairment; altered wetland chemistry; downstream contamination |
| | Operation and maintenance of the Slurry Pumpstation | Localised disturbance and contamination risk | Habitat disturbance; spills; localised erosion and sedimentation |
| | Ongoing operation of reclaimed areas | Altered topography and runoff | Changes to flow paths; wetland drying or inundation; erosion and instability |
| | Operation and maintenance of lined catchment paddock | Runoff/stormwater containment and management | Alteration of natural hydrology; overtopping or containment failure; leakage/seepage from the paddock; deterioration in water quality; failure to detect liner or berm damage; localised erosion and hydrocarbon or chemical spills |
| Decommissioning Phase | Removal of pipeline infrastructure | Excavation in or near wetlands | Disturbance of wetland soils and vegetation; erosion; temporary habitat loss |
| | Removal of ancillary infrastructure | Surface disturbance | Localised habitat degradation; increased runoff and soil disturbance |
| | Traffic and machinery movement | Access through sensitive areas | Soil compaction; vegetation damage; erosion |
| | Removal of the lined catchment paddock | Removal or closure of the paddock and associated infrastructure, regrading, stabilisation and rehabilitation of disturbed areas | Mobilisation of retained sediment/material; temporary erosion and sedimentation; failure to restore natural drainage and poor revegetation/invasion by alien species |
| Rehabilitation Phase | Reshaping and stabilisation of disturbed areas | Earthworks and landform modification | Temporary disturbance to wetlands; erosion if poorly implemented |
| | Rehabilitation of pipeline footprint and disturbed wetland areas | Revegetation and restoration | Improvement of habitat if successful; risk of poor recovery if not maintained |
| | Alien invasive vegetation control | Vegetation management | Improved ecological condition if implemented; reduced wetland functioning if neglected |

***Table 4-2 Summative results of the Risk Assessment conducted for the proposed project***

| Phase | Activity | Impact | Potentially affected watercourses | Significance (max = 100) | Risk Rating | Confidence level |
|---|---|---|---|---|---|---|
| | | | Name/s | | | |
| CONSTRUCTION | Construction of pipelines | Traffic | HGM 1 - 2 & HGM 4 - 8 | **19,2** | **L** | High |
| | | Clearing vegetation outside wetland areas | HGM 1 - 2 & HGM 4 - 8 | **4,8** | **L** | High |
| | | Clearing wetland vegetation | HGM 1 - 2 & HGM 4 - 8 | **38,4** | **M** | High |
| | | Construction of laydown yard | HGM 1 - 2 & HGM 4 - 8 | **11,2** | **L** | High |
| | | Stormwater management | HGM 1 - 2 & HGM 4 - 8 | **19,2** | **L** | High |
| | | Operation of machinery and equipment | HGM 1 - 2 & HGM 4 - 8 | **4,8** | **L** | High |
| | | Storage of chemicals, mixes and fuel | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | | Ablution facilities | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | | Excavations within wetlands | HGM 1 - 2 & HGM 4 - 8 | **48** | **M** | High |
| | Reclamation site set-up | Traffic | HGM 1 - 2 & HGM 4 - 8 | **28,8** | **L** | High |
| | | Clearing vegetation outside riparian and wetland areas | HGM 1 - 2 & HGM 4 - 8 | **4,8** | **L** | High |
| | | Construction of laydown yard | HGM 1 - 2 & HGM 4 - 8 | **32** | **M** | High |
| | | Digging cut-off trenches | HGM 1 - 2 & HGM 4 - 8 | **32** | **M** | High |
| | | Operation of machinery and equipment | HGM 1 - 2 & HGM 4 - 8 | **11,2** | **L** | High |
| | | Storage of chemicals, mixes and fuel | HGM 1 - 2 & HGM 4 - 8 | **16** | **L** | High |
| | | Ablution facilities | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | Construction of catchment paddock | Soil disturbance and exposed surfaces | HGM 1 - 2 & HGM 4 - 8 | **12,8** | **L** | High |
| OPERATIONAL | | Pumping of tailings by means of hydraulic system | HGM 1 - 2 & HGM 4 - 8 | **38,4** | **M** | High |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Reclamation of waste impoundments | Spills and leaks | HGM 1 - 2 & HGM 4 - 8 | **32** | **M** | High |
| | Operation of pipelines | Maintenance / management of pipeline | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | | Impeding flows | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | Operation of lined catchment paddock | Containment of stormwater / dirty water | HGM 1 - 2 & HGM 4 - 8 | **16** | **L** | High |
| | | Overtopping, spills and leaks | HGM 1 - 2 & HGM 4 - 8 | **19,2** | **L** | High |
| | Maintenance of lined catchment paddock | Maintenance / management of paddock and berm integrity | HGM 1 - 2 & HGM 4 - 8 | **14,4** | **L** | High |
| | | | | | | |
| **DECOMMISSIONING** | Decommissioning pipelines | Excavation within wetlands | HGM 1 - 2 & HGM 4 - 8 | **38,4** | **M** | High |
| | | Removal of pipelines | HGM 1 - 2 & HGM 4 - 8 | **19,2** | **L** | High |
| | | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | **19,2** | **L** | High |
| | Decommissioning lined catchment paddock | Excavation, removal of liner and reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | **12,8** | **L** | High |
| | Rehabilitation of tailing facilities | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | **9,6** | **L** | High |
| | | Reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | **24** | **L** | High |
| | Rehabilitation of pipeline footprint areas | Increased traffic | HGM 1 - 2 & HGM 4 - 8 | **3,2** | **L** | High |
| | | Reshaping the landscape | HGM 1 - 2 & HGM 4 - 8 | **12,8** | **L** | High |
| | | | | | | |

# 5 Mitigation Measures

Mitigation measures for the Goldplat Reclamation Project must follow the mitigation hierarchy, with priority given to the avoidance of delineated wetlands and their associated buffer areas wherever feasible. Where avoidance is not possible, impacts must be minimised through careful planning, restricted working areas, appropriate construction methods, pollution prevention, and rehabilitation of disturbed areas.

## 5.1 General Mitigation Measures

- All delineated wetlands and associated buffer areas must be clearly demarcated on site prior to the commencement of any construction or operational activities;
- All project personnel must be inducted on the sensitivity and location of wetlands and buffer areas;
- No laydown areas, stockpiles, batching areas, refuelling areas, waste storage, or hazardous material storage may be located within delineated wetlands or their buffers, unless specifically authorised;
- All activities must remain within the approved development footprint and unnecessary disturbance outside these areas must be prohibited;
- Existing roads, tracks and disturbed access routes must be used wherever possible, and the creation of new access routes through wetlands must be avoided; and
- A suitably qualified environmental specialist or Environmental Control Officer (ECO) must monitor compliance with wetland-related mitigation measures during all relevant phases of the project.

## 5.2 Reclamation-Specific Mitigation

- Reclamation activities associated with the Top Stock Dam and Rooidam Stock Dam must remain strictly within the approved reclamation footprint;
- Active reclamation areas must be managed in a phased manner so that disturbance is limited to the minimum area required at any one time;
- Rehabilitation of disturbed areas must be undertaken progressively, where feasible, rather than being postponed until the end of the project;
- Temporary cut-off trenches, berms or other suitable stormwater diversion measures must be installed where required to prevent contaminated runoff or sediment-laden water from entering adjacent wetlands;
- Stormwater must be managed through appropriately designed structures that reduce flow concentration and erosion;
- Areas of higher soil saturation, seepage and preferential flow paths must be identified and avoided where possible;
- Surface stabilisation measures must be implemented on exposed and disturbed areas to reduce erosion and sediment mobilisation; and

- Water quality monitoring should be undertaken upstream and downstream of sensitive wetland systems where there is a risk of contamination associated with reclamation.

### 5.3 Pipelines and Pumpstation Mitigation

- The Proposed Slurry Pipeline, Proposed Process Water Pipeline and Slurry Pumpstation must be located in already disturbed areas as far as practicable to reduce additional impacts to wetlands;
- The construction footprint within and adjacent to wetlands must be kept to the minimum necessary extent;
- Heavy machinery should be excluded from delineated wetlands wherever feasible. Where machinery access is unavoidable, disturbance must be minimised and carefully controlled;
- Excavated wetland soils should, where feasible, be kept separate from upland soils and replaced in the correct profile order during reinstatement;
- Disturbed wetland crossings and adjacent areas must be reinstated immediately after installation to restore original contours and hydrological functioning as far as possible;
- Effective erosion and sediment control measures must be installed and maintained at all wetland crossings and disturbed areas;
- Cement, fuels, oils and other hazardous materials must be managed in a manner that prevents contamination of wetlands and drainage features;
- Pipelines and associated infrastructure must be routinely inspected and maintained to minimise the risk of leaks, spills and structural failure; and
- Any leaks or spills associated with the Proposed Slurry Pipeline, Proposed Process Water Pipeline or Slurry Pumpstation must be contained and remediated immediately.

### 5.4 Rehabilitation and Monitoring

- All disturbed wetland areas must be rehabilitated as soon as practicable following disturbance;
- Rehabilitation must aim to restore landform, soil stability, hydrological functioning and vegetation cover as far as possible;
- Disturbed and denuded areas must be revegetated with suitable locally indigenous species where feasible;
- Alien invasive vegetation must be controlled within disturbed areas for the duration of the project and during rehabilitation;
- Rehabilitated areas must be monitored to assess recovery and to identify where additional intervention is required; and
- Wetlands impacted by the project should be rehabilitated in support of the REC / RMO of Class D.

# 6 Conclusion

A total of eight wetland Hydrogeomorphic (HGM) units were identified within the 500 m PAOI associated with the Goldplat Reclamation Project. These comprise three channelled valley-bottom wetlands (HGM 1, HGM 2 and HGM 7), two unchannelled valley-bottom wetlands (HGM 5 and HGM 8), two hillslope seep wetlands (HGM 4 and HGM 6), and one depression wetland (HGM 3). In addition to these natural wetland systems, several artificial wetland features and drainage features were identified within the broader project area.

The delineated wetlands are largely to critically modified (PES Classes D–F) but continue to provide important ecological functions and services. All natural wetlands have Moderate Ecological Importance and Sensitivity (EIS), highlighting the need for their protection and management.

HGM 1, HGM 2, HGM 4, HGM 5, HGM 6, HGM 7 and HGM 8 were identified as being at risk from the proposed project. The main risks are associated with the Proposed Slurry Pipeline and Proposed Process Water Pipeline crossing wetland areas, as well as indirect impacts from reclaiming the Top Stock Dam and Rooidam Stock Dam. HGM 3 was not considered to be at appreciable risk because of its landscape position and separation from the development footprint.

The ecological management objectives are to maintain HGM 1, HGM 2, HGM 3 and HGM 7 in Class D, and to improve HGM 4, HGM 5, HGM 6 and HGM 8 towards Class D through rehabilitation and management. Post-mitigation buffers of 15 m are recommended for the Proposed Slurry Pipeline and Proposed Process Water Pipeline, and 40 m for the Top Stock Dam and Rooidam Stock Dam reclamation areas.

## 6.1 Risk and Impact Statement

A risk assessment was undertaken for the proposed Goldplat Reclamation Project in relation to the Top Stock Dam, Rooidam Stock Dam, Proposed Slurry Pipeline, Proposed Process Water Pipeline, Lined Catchment Paddock, and Slurry Pumpstation. The post-mitigation risks associated with the project are generally expected to fall within the Low to Moderate significance range. The higher residual risks are primarily associated with excavation within wetlands, the clearing of wetland vegetation, reclamation-related runoff and sediment mobilisation, and potential leaks or spills during operation.

Provided that the recommended mitigation, rehabilitation and monitoring measures are fully implemented, the anticipated impacts to wetlands and associated aquatic features are expected to be reduced to acceptable levels. However, this is dependent on strict adherence to footprint restrictions, effective stormwater and pollution control, and the successful rehabilitation of disturbed wetland areas.

## 6.2 Specialist Opinion

It is the opinion of the specialist that the proposed Goldplat Reclamation Project may be considered for authorisation by the Competent Authority, provided that all recommended mitigation measures and wetland management requirements are implemented in full. Where feasible, the layout and construction methodology for the Proposed Slurry Pipeline, Proposed Process Water Pipeline, Lined Catchment Paddock, and Slurry Pumpstation should avoid delineated wetlands and their associated buffer areas, and infrastructure should be positioned within already disturbed areas as far as practicable.

All disturbed wetland areas should be rehabilitated as soon as practicable following disturbance, with the objective of restoring landform, soil stability, hydrological functioning, and indigenous vegetation cover as far as possible. Ongoing monitoring of wetland condition, erosion, stormwater management, and any leaks or spills associated with the pipeline infrastructure and reclamation areas should be undertaken for the duration of the project. Where direct impacts to delineated wetlands cannot be avoided, the affected systems should be rehabilitated in support of the REC / RMO target of Class D.

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# 8 Appendix Items

## 8.1 Appendix A – Methodology

### 8.1.1 Desktop Dataset Assessment

The desktop assessment was undertaken using Geographic Information System (GIS) to access, view and overlay the latest available related datasets with the project area. The information represented within the datasets was used to develop the relevant digital maps used to identify potentially environmentally sensitive areas. These datasets and their respective dates of publishing are provided below:

- Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018 & Mucina and Rutherford 2006);
- Soils and Geology - Land Types Database (Land Type Survey Staff, 1972 - 2006); and
- Topographical Inland Water Areas and River Lines (based on the 1994 1:500 000 topographic maps as per the Chief Directorate of the National Geo-spatial Information).

#### 8.1.1.1 Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland

The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) is the latest and updated version of the maps published in earlier time such as those presented by Mucina and Rutherford (2006) and those presented in the National Biodiversity Assessment (2011). The map provides spatial details on the representative vegetation of South Africa and is complemented in this report using information from Strelitzia (Mucina & Rutherford, 2006) to provide insight on the landscape features, biogeography, climate, geology, and soils of the project area.

#### 8.1.1.2 Soils and Geology - Land Type Database

The Land Type Survey provides information on the soils, terrain, climate, and geology of areas within South Africa. The data includes the pedological classification of soils and is used in this report to provide insight on the common soil forms associated with aquatic or freshwater systems of a particular area.

#### 8.1.1.3 Topographical River Lines and Inland Water Areas

Topographical Inland Water Areas and River Lines for South Africa are based on the topographic maps dated 1994 as per the National Geo-spatial Information. These datasets are used in this report to provide insight on potential wetland areas and serves to highlight the location and extent of drainage features, dams, wetlands, reservoirs and other relevant inland waterbodies.

#### 8.1.1.4 Ecologically Important Landscape Features

The datasets listed below were incorporated to establish the relation between the project and ecologically important or sensitive freshwater entities. Emphasis was placed around the following spatial datasets:

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Van Deventer et al. 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel et al. 2011);
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

#### 8.1.1.4.1 The South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the 2018 NBA, the SAIIAE 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.

#### 8.1.1.4.2 National Freshwater Ecosystem Priority Areas, Rivers and Wetlands

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).

#### 8.1.1.4.3 Strategic Water Source Areas

SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

### 8.1.2 Wetland Field Survey

#### 8.1.2.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 8-1. 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 practice the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

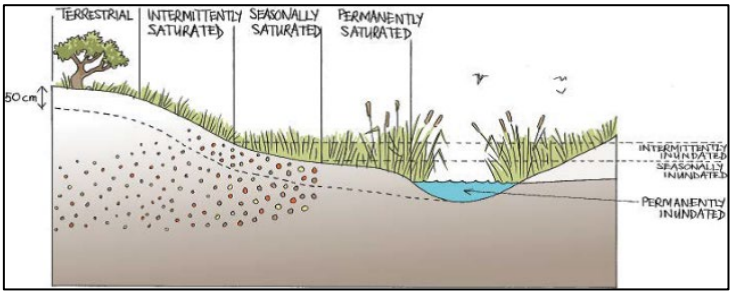



***Figure 8-1 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)***

#### 8.1.2.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

#### 8.1.2.3 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).

### 8.1.3 Wetland Functional and Ecological Assessment

#### 8.1.3.1 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; updated Version 2, Kotze et al. 2020). 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 8-1).

***Table 8-1 Classes for the supply of benefits (Kotze et al. 2009)***

| 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 |

***Table 8-2 The Importance categories assigned to the benefits (Kotze et al. 2020)***

| Importance Category | | Description |
|---|---|---|
| **Very Low** | 0-0.79 | The importance of services supplied is very low relative to that supplied by other wetlands. |
| **Low** | 0.8 – 1.29 | The importance of services supplied is low relative to that supplied by other wetlands. |
| **Moderately-Low** | 1.3 – 1.69 | The importance of services supplied is moderately-low relative to that supplied by other wetlands. |
| **Moderate** | 1.7 – 2.29 | The importance of services supplied is moderate relative to that supplied by other wetlands. |
| **Moderately-High** | 2.3 – 2.69 | The importance of services supplied is moderately-high relative to that supplied by other wetlands. |
| **High** | 2.7 – 3.19 | The importance of services supplied is high relative to that supplied by other wetlands. |
| **Very High** | 3.2 - 4.0 | The importance of services supplied is very high relative to that supplied by other wetlands. |

### 8.1.3.2 Present Ecological Status

The overall approach as described by Macfarlane et al. 2009 and 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 Status (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 8-3.

***Table 8-3 The Present Ecological Status 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 |

### 8.1.3.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order to identify 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 8-4.

***Table 8-4 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 |

#### 8.1.3.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 8-5) 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 8-5 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 |

### 8.1.4 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane et al. 2014) was used to determine the appropriate buffer zone for the proposed activity.

### 8.1.5 Site Sensitivity Verification

The baseline aquatic / freshwater sensitivity of the project area was obtained using the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended). The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas based on the specialist assigned Ecological Importance and Sensitivity of the different systems (where applicable), with consideration been given to the presence of observed or likely sensitive fauna and flora.

## 8.2 Appendix B - Risk and Impact Assessment

### 8.2.1 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 8-6.

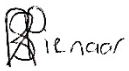
***Table 8-6 Significance ratings matrix***

| 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. |

### 8.3 Appendix C – Specialist Declaration of Independence

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

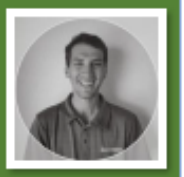
Freshwater Ecologist

The Biodiversity Company

July 2026

## 8.4 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

### EXPERIENCE

Environmental Impact Assessments (EIA)

Environmental Management Programmes (EMP)

Project Management

Logistics

### SKILLS

- ✓ Wetland functional assessments
- ✓ Ecology
- ✓ Rehabilitation
- ✓ Monitoring & Management Plans

### LANGUAGES

English – Proficient

Afrikaans – Proficient

Signed: Rian Pienaar

### ACADEMIC QUALIFICATIONS

**North-West University (2020): MASTER OF SCIENCE (MSc) – Environmental Sciences (Cum Lauda):**
**Title:** The use *Clarias gariepinus* 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

### PROFESSIONAL EXPERIENCE

Sept 2020 – Present **The Biodiversity Company**
Wetland Ecology

Jan 2018 – Dec 2018 **National Aquatic Bioassay Facility (NABF)**
Intern

### INTERNATIONAL EXPERIENCE

South Africa, Mozambique, Botswana, Eswatini