ENVIRONEST CONSULTING

Operational Environmental Management Programme Amendment Report for Central and Eastern Basin

Prepared for:

Nafasi Water (Pty) Ltd-TCTA
Central and Eastern Basin
Water Treatment
Plants
August 2025

Contents

LIST OF ABBREVIATIONS

Abbreviation	Description
AMD	Acid Mine Drainage
TCTA	Trans-Caledon Tunnel Authority
DWS	Department of Water and Sanitation
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
SACNASP	South African Council for Natural Scientific Professions
EA	Environmental Authorisation
OEMPr / OEMPrs	Operational Environmental Management Programme / Programmes
RO	Reverse Osmosis
HDS	High-Density Sludge
TSF	Tailings Storage Facility
SWV	Southwest Vertical (shaft)
CBD	Central Business District
Ml/day or ML/day	Megalitres per day
mamsl	Metres above mean sea level
ECL	Environmental Critical Level
SMBS	Sodium Metabisulphite
CIP	Clean-In-Place
ERPM	East Rand Proprietary Mines
ERGO	East Rand Gold Operations (Brakpan TSF)

1 INTRODUCTION

1.1 Background

The Trans-Caledon Tunnel Authority (TCTA) was mandated by the National Government on 06 April 2011, through the then Minister of Water and Environmental Affairs, to implement urgent short-term interventions for the management of Acid Mine Drainage (AMD) in the Western, Central, and Eastern Basins of the Witwatersrand.

These interventions were initiated in response to the imminent threat of AMD surface decant and associated environmental risks. The strategy involved the abstraction of AMD from underground mine voids and its treatment using High-Density Sludge (HDS) technology, followed by controlled discharge into the natural watercourses. Due to the emergency nature of the situation, the project was fast-tracked through an expedited Environmental Authorisation (EA) process.

As the AMD treatment infrastructure in the Central and Eastern Basins reached completion, Operational Environmental Management Programmes (OEMPrs) were developed and submitted to the Department of Forestry, Fisheries and the Environment (DFFE). These OEMPrs, which were subsequently approved, provided comprehensive descriptions and layout diagrams of the treatment facilities, and served as guiding documents for environmental compliance during the operational phase.

The current intervention proposes to enhance the efficiency of the AMD treatment process through the installation of a 1 megalitre per day (ML/day) reverse osmosis (RO) skid at both the Central and Eastern Basin treatment plants. The addition of these RO units aims to:

- Improve the quality of treated water;
- Reduce reliance on potable water in the treatment process;
- Lower operational costs; and
- Promote sustainable water resource management.

To ensure that these upgrades are appropriately incorporated into the existing environmental management framework, TCTA has appointed Environest as the independent Environmental Assessment Practitioner (EAP). Environest is responsible for preparing an addendum to the approved OEMPrs for both the Eastern and Central Basins.

This addendum will:

- Reflect the proposed enhancements to the treatment infrastructure;
- Evaluate the potential environmental implications of the upgrades; and
- Ensure continued regulatory compliance and effective environmental management throughout the lifecycle of the AMD treatment operations.

2 REQUIRMENTS OF AN EAP

2.1 Details of the EAP

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Professional Affiliations:	• Environmental Assessment Practitioners Association of South Africa (EAPASA):2019/1111 • South African Council for Natural Scientific Professions (SACNASP):152937
Telephone Number:	+27 73 368 5731

2.2 Expertise of the EAP

Mr. Vukani Ngwabi is a registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA) and a professional member of the South African Council for Natural Scientific Professions (SACNASP). He is a dedicated Environmentalist and Project Manager with over a decade of experience delivering exceptional results across the fields of environmental science, waste management, and construction. Holding an Honours Degree in Geography and Environmental Management from the University of KwaZulu-Natal, Mr. Ngwabi has developed extensive expertise in environmental and waste management, housing development, beneficiary administration, and social facilitation.

His professional portfolio includes conducting environmental risk assessments, promoting resource optimisation, and facilitating inclusive stakeholder engagement processes. Mr. Ngwabi's work is rooted in a deep understanding of regulatory frameworks and sustainability principles, ensuring compliance with national legislation while promoting environmentally responsible development. His pragmatic and solutions-driven approach supports the advancement of Vukani's leadership in sustainable practices, integrated development planning, and environmentally sound project implementation.

3 LOCALITY AND ACTIVITIES AT THE ACID MINE DRAINAGE (AMD) TREATMENT PLANTS

3.1.1 Eastern Basin AMD Treatment Plant

The Eastern Basin AMD Treatment Plant is located approximately 4.6 km east of the Springs Central Business District (CBD), within the industrial-zoned area of Grootvlei Mine Shaft No. 3, please refer to Figure 3-1 illustrating the locality map. The surrounding natural environment has been significantly altered due to historical mining activities. In accordance with the EA Exemption, the following activities are undertaken at the Eastern Basin plant:

- **AMD Abstraction**: Acid mine drainage is abstracted via pumps from Grootvlei Shafts No. 3. This is done to maintain the water table below the Environmental Critical Level (ECL), set at 1,280 metres above mean sea level (mamsl), thereby preventing potential surface decant and groundwater contamination.
- **Water Treatment**: The plant treats an average of 106 megalitres per day (Ml/day), with a peak treatment capacity of 110 Ml/day, to neutralise acidity and remove heavy metals and other contaminants.
- **Waste Sludge Management**: The sludge is disposed of at Shaft no.4.
- **Treated Water Discharge**: A pipeline transports treated water to a discharge point on the Blesbokspruit, a natural watercourse that has been affected by past mining discharges. This ensures controlled and compliant water release into the environment.

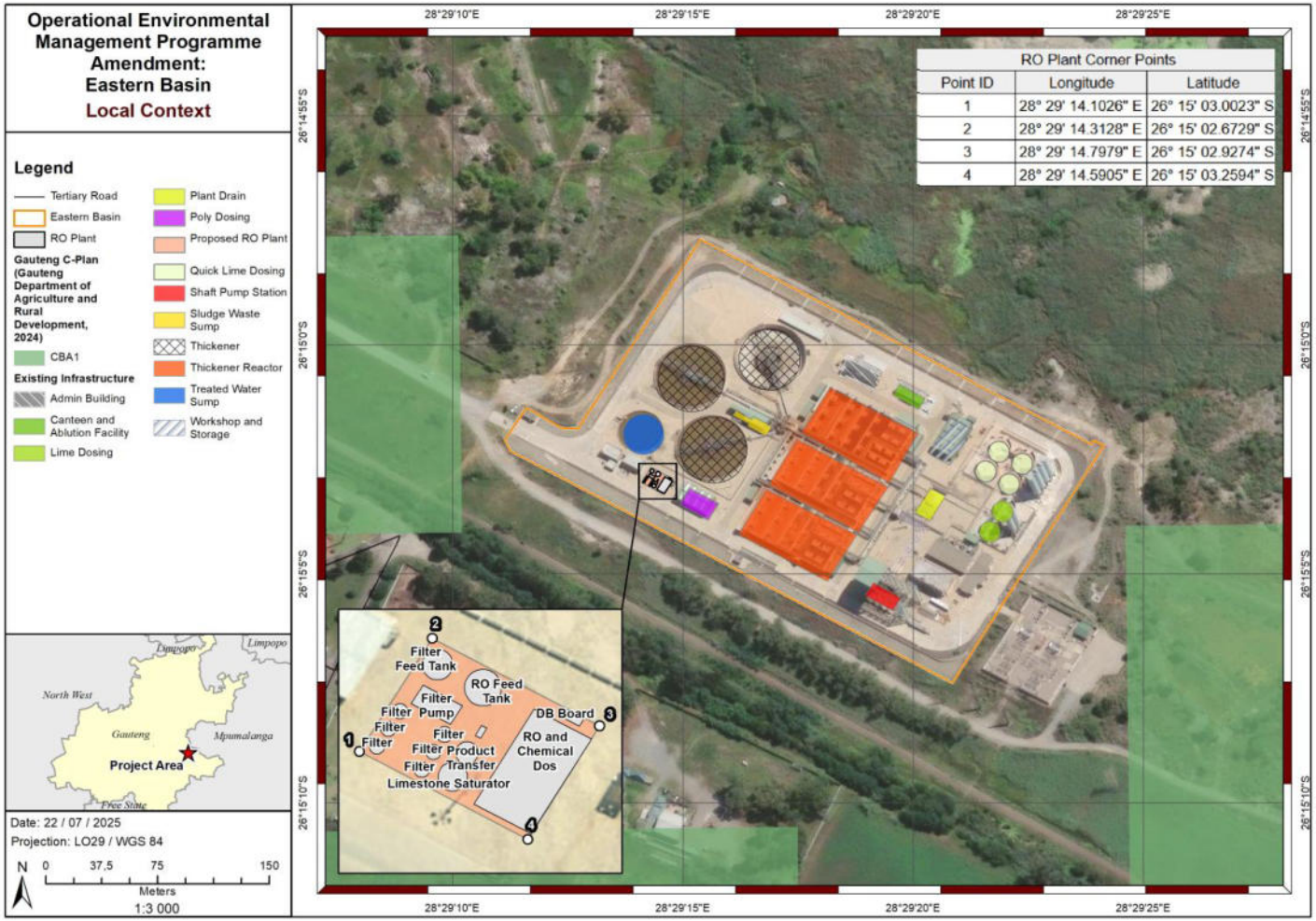

Figure 3-1:Map Depicting Eastern Basin and location of proposed Reverse Osmosis Plant

3.1.2 Central Basin AMD Treatment Plant

The Central Basin AMD Treatment Plant is situated approximately 1.8 km southeast of the Germiston CBD, within the industrial-zoned area of the East Rand Proprietary Mines (ERPM) South West Vertical (SWV) Shaft. Like the Eastern Basin, please refer to Figure 3-3 illustrating the locality map. The surrounding environment is heavily disturbed due to historical mining operations. The activities undertaken at the Central Basin facility include (illustrated in Figure 3-1):

- **AMD Abstraction**: AMD is pumped from the SWV Shaft.
- **Water Treatment**: The facility treats an average of **72 Ml/day**, with a peak capacity of **84 Ml/day**, using chemical and physical processes to reduce acidity and remove pollutants.
- **HDS Plant Construction**: A new High-Density Sludge treatment plant was constructed adjacent to the SWV Shaft to enhance the facility's operational efficiency and capacity.
- **Sludge Disposal Infrastructure**: A waste sludge pipeline was constructed to transport co-dispose of sludge at DRD Processing Facility.
- Treated **Water Discharge**: A treated water pipeline discharges clean water into the Elsburgspruit.

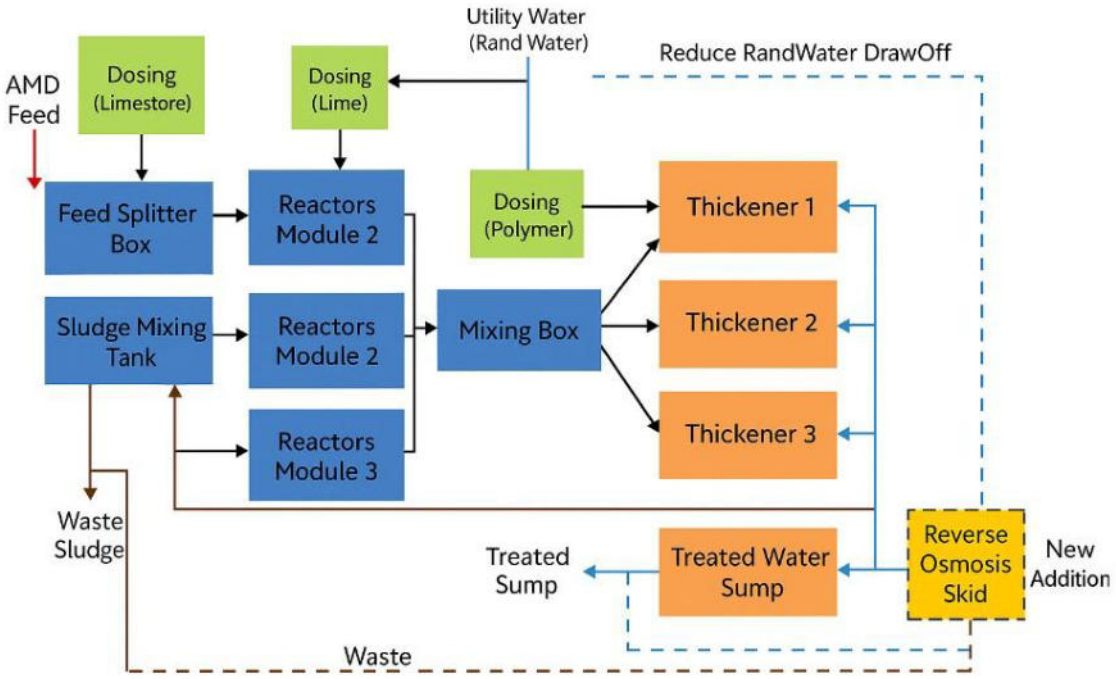

Figure 3-2: Schematic representation of the AMD treatment process

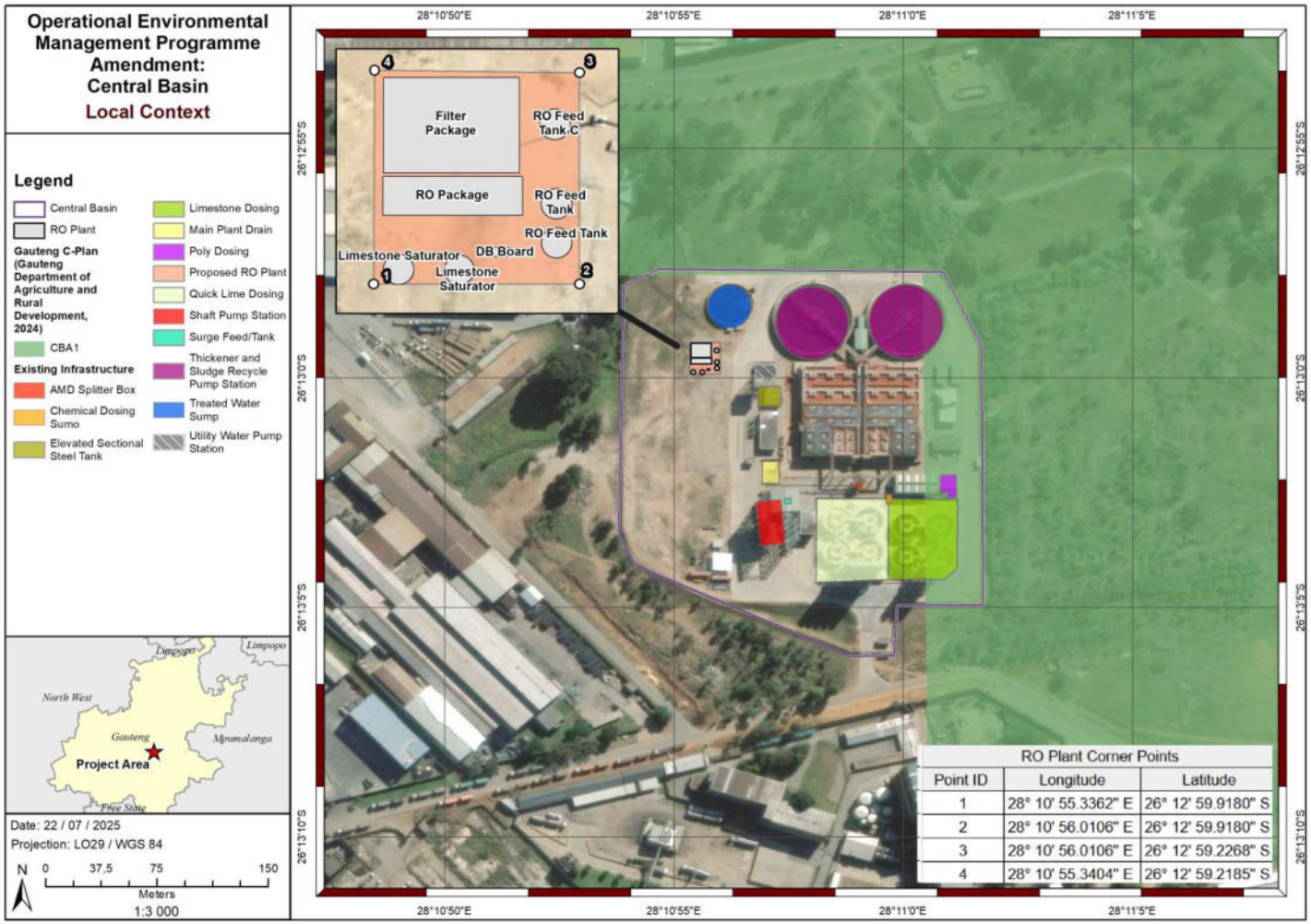

Figure 3-3: Map Depicting Central Basin and location of proposed Reverse Osmosis Plant

3.2 Purpose of the Addendum

The primary objective of this addendum is to amend the current Operational Environmental Management Programme Reports (OEMPrs) for both the Eastern and Central Basins. These amendments are necessary to accommodate planned upgrades aimed at enhancing the operational efficiency and sustainability of the AMD treatment processes at the respective sites. Specifically, the proposed amendment involves the installation of a 1 megalitre per day (Ml/day) packaged RO plant at both the Central Basin (Germiston) and the Eastern Basin (Grootvlei Mine area, Springs). These RO units are intended to supplement the existing HDS treatment systems currently in operation, thereby:

- Improving the quality of treated water to meet more stringent discharge or reuse standards.
- Enabling partial recovery and reuse of water for industrial or environmental purposes, promoting a circular water economy.
- Enhancing overall treatment capacity and operational resilience at both treatment facilities.

Importantly, the installation of the RO plants will be undertaken within the existing, authorised development footprints of the Central Basin site, ensuring that no additional land disturbance or deviation from the approved boundaries occurs.

The TCTA has an existing, approved OEMPr that will be implemented in conjunction with this addendum to guide environmental compliance and performance. An independent assessment undertaken by the EAP, which reviewed current monitoring practices, waste handling and disposal protocols, and existing mitigation measures, concluded that the proposed RO plant would not introduce any additional environmental risks beyond those currently managed under the existing environmental management framework. As such, all potential environmental impacts associated with the RO plant are considered to be adequately addressed by the ongoing practices and measures currently in place.

4 AMENDMENTS APPLIED FOR AND RELATED BACKGROUND

The Department of Water and Sanitation (DWS) is the implementing authority for the AMD Treatment Project. The current EA, Reference Number: 12/12/20/2403, was granted on 07 January 2013 by the then Department of Environmental Affairs (DEA). This EA authorises the establishment and operation of AMD treatment facilities at:

- The Grootvlei Mine site in the Eastern Basin, Springs; and
- The South West Vertical Shaft area in the Central Basin, Germiston.

DWS issued a Directive to the TCTA, mandating the implementation of the AMD Treatment Project in accordance with the approved environmental conditions and objectives.

4.1 Description of the Amendments Being Applied For

The proposed amendments to the original authorisation and OEMPr include the following:

- **Installation of a Packaged Reverse Osmosis (RO) Plant**:
  A modular, containerised RO unit with a treatment capacity of 1 Ml/day will be installed at each basin (Eastern and Central). These RO plants are designed to function as an additional treatment phase, providing advanced filtration of the AMD effluent post-HDS treatment.

This amendment is intended to enhance the treatment process by producing higher-quality effluent suitable for potential reuse, thus aligning with sustainable water resource management objectives and national water quality guidelines. Details of the amendments are indicated in Table 4-1 below.

Table 4-1: Proposed Amendments to the AMD Basin's Operational Environmental Management Programme

OEMPr Reference	Description in Original 2022 OEMPr	Amended / New Information (italics)
Eastern Basin OEMPr		
Chapter 5	• Abstraction of AMD via pumps to Grootvlei Shaft No. 3 or 4 to keep the water from rising above the Environmental Critical Level at 1 280 mamsl. • Pumping and treating an average of 106 Mℓ/day and a peak of 110 Ml/day. • Construction of a new HDS treatment plant adjacent to the Grootvlei No.3 shaft. • Investigation and planning for the possible construction of a waste sludge pipeline to the Daggafontein, Brakpan and/or Grootvlei TSFs. • Construction of a treated water pipeline to a suitable discharge point on the Blesbokspruit.	*Installation of a 1Ml/day packaged reverse osmosis plant*
Central Basin OEMPr		
Chapter 5	• Abstraction of AMD via pumps in the SWV Shaft to keep the water from rising above the Environmental Critical Level at 150 m below the ERPM Cinderella East Shaft collar level (1 617 m)	*Installation of a 1Ml/day packaged reverse osmosis plant*

	or 1 467 mamsl. • Construction of a new HDS plant adjacent to the SWV shaft. • Construction of a waste sludge pipeline to the Crown Knights Gold processing plant. • Construction of a treated water pipeline to a suitable discharge point on the Elsburgspruit. Investigation and planning for a future waste sludge pipeline to the ERGO Brakpan Tailings Storage Facility (TSF). • Pumping and treating an average of 72 Ml/day (peak of 84 Ml/day).	

5 TREATMENT PROCESS OVERVIEW

The proposed RO package plants at the Central and Eastern Basins are designed to enhance the final quality of 1ML/Day of treated water produced by the existing HDS AMD treatment systems. These RO systems will provide an additional level of purification, ensuring that some of the final effluent meets regulatory water quality standards suitable for reuse.

The treatment train comprises several advanced unit processes aimed at removing residual solids, heavy metals—particularly manganese—and dissolved salts, with an emphasis on sulphates. The RO permeate (treated water) will subsequently undergo remineralisation via limestone saturation to stabilise the water chemistry before integration into the existing utility water storage and distribution system.

The major stages of the RO package treatment process are detailed below:

5.1 Plant Feed System

The RO package plant will abstract feed water from the existing treated water sump, which contains water previously processed through the HDS system. This water still contains trace levels of dissolved metals and has a high calcium sulphate concentration.

To mitigate the risk of scaling in the media filter caused by the precipitation of calcium sulphate— a portion of the RO permeate is recycled and blended with the feedwater at the suction of the media filter pump. This dilution strategy helps reduce the scaling potential and extends the operational lifespan of the filtration media.

5.2 Manganese Filtration

Treated water from the HDS system may still contain elevated levels of **manganese** and **iron**, which must be removed to protect the RO membranes and ensure system efficiency. This is achieved through:

- Pressurised filtration using Manganese Dioxide (MnO_2) media housed in steel vessels.
- The filters are designed to handle influent concentrations of up to 0.62 mg/L of iron and 6.38 mg/L of manganese, as specified in the Basis of Design.
- Water is pumped through a self-cleaning strainer prior to filtration to eliminate residual solids and protect the filter media.
- Media performance is maintained through periodic backwashing, and an estimated attrition loss of 2% per annum is expected.
- When necessary, performance restoration is achieved through acid soaking using dilute hydrochloric acid, delivered via the RO system's Clean-In-Place (CIP) tank and pump.

5.3 Sand Filtration

Following manganese removal, the water passes through **pressurised sand filters**, which:

- Remove precipitates formed during manganese filtration.
- Receive feedwater directly via a common manifold from the manganese filters.
- Address pH elevation resulting from metal removal—hydrochloric acid dosing is employed to lower the pH and prevent carbonate scaling on the RO membranes.

Each sand filter is equipped with a backwash system, utilising filtered water from a parallel unit. Backwash effluent is discharged to the plant drain sump.

5.4 Reverse Osmosis (RO)

The final stage of treatment involves high-pressure reverse osmosis, which:

- Separates water into a permeate stream (clean water) and a brine stream (concentrated waste).
- Sends the brine stream to the desalination plant drain sump, which discharges by gravity to the main plant drain system via an integrated pipeline.

Key operational considerations for RO:

- Scaling prevention is critical. An antiscalant is dosed into the feedwater upstream of the RO feed pumps.
- Chlorine sensitivity of the membranes necessitates the use of sodium metabisulphite (SMBS) dosing to neutralise any residual chlorine in the feed.
- Routine chemical cleaning (CIP) is anticipated due to membrane fouling and scaling. The CIP process is manual and uses a dedicated pump and chemical tank to circulate cleaning solutions through the membranes.

A portion of the permeate is recycled to the filter feed pump suction (for dilution), while the remaining flow proceeds to the stabilisation stage.

5.5 Stabilisation via Limestone Saturators

To ensure chemical stability and prevent corrosiveness of the treated water, the RO permeate is passed through two limestone saturators operating in parallel. These units:

- Operate as upflow packed beds, consisting of a gravel base layer topped with limestone chips.
- Allow sufficient contact time between the water and limestone to enable remineralisation, particularly the addition of calcium and bicarbonates, thus improving water stability for

storage and distribution.

5.6 Product Water Transfer

The stabilised water from the saturators overflows into a product transfer tank. A low-pressure transfer pump conveys the product water to a tie-in point at the existing utility water line, previously connected to the treated water sump.

From there, the water is distributed to the utility water tank, completing the treatment process and integrating seamlessly with the broader water reuse and supply infrastructure

6 RATIONALE FOR UPDATING THE OPERATIONAL ENVIRONMENTAL MANAGEMENT PROGRAMMES (OEMPRS)

The proposed updates to the OEMPrs for the Central and Eastern Basin AMD Treatment Plants are informed by operational, financial, and environmental performance considerations, particularly relating to the sustainability and efficiency of the lime neutralisation process. The key motivations for this update are outlined below:

- **High Operational Costs of Lime Mixing**:
  A cost-benefit assessment has identified that the use of potable water from Rand Water for lime preparation contributes significantly to the operational cost of the AMD treatment process. Lime is a critical reagent in the HDS process, used for neutralising acidic mine water. The consistent need for large volumes of potable water to achieve optimal lime slurry mixing concentrations has proven financially unsustainable. As such, alternative water sources have been investigated to alleviate this burden.
- **On-site Production of High-Quality Water for Reagent Preparation**:
  A technically viable solution identified is the installation of a 1 ML/day RO skid at both the Central and Eastern Basin treatment plants. The primary function of these systems will be to produce high-quality, low-salinity water suitable for lime mixing, directly from the partially treated AMD effluent. This will substantially reduce the dependency on municipal potable water sources, specifically Rand Water, for operational use and thereby reduce the operational costs.
- **Inadequate Quality of Treated AMD for Neutralisation Processes**:
  The current quality of treated AMD effluent—post-HDS treatment—is not suitable for reuse in the neutralisation circuit due to elevated concentrations of dissolved solids and residual metals. The RO systems will polish this effluent, reducing its sulphate and metal content to acceptable thresholds for reuse in reagent preparation. This optimisation represents a significant step toward closing the loop on internal water use within the treatment plant.

6.1 Expected Benefits of the RO-Based Optimisation Intervention

Implementation of the proposed RO systems at both treatment plants is anticipated to deliver

multiple operational, economic, and environmental benefits, including:

- **Promotion of Circular Water Use**:
  The intervention supports principles of the circular economy by enabling the recycling and reuse of treated effluent within the plant. Water that is otherwise unsuitable for environmental discharge or external use will be reclaimed for internal process needs, thus minimising waste and resource consumption.
- **Reduction in Water Utility Costs**:
  Substituting purchased potable water with on-site RO-generated water for lime mixing will substantially reduce utility bills associated with water procurement, improving the long-term financial sustainability of the AMD management programme.
- **Pilot-Scale Demonstration of RO Technology**:
  The proposed intervention also serves as a pilot project to demonstrate the efficacy of RO technology within the AMD treatment context. Originally intended for earlier implementation, this demonstration phase is critical for validating design assumptions, optimising process integration, and informing decisions regarding potential full-scale deployment across all AMD basins.

7 ROLES AND RESPONSIBILITIES

The Operator will be responsible for ensuring overall compliance with the provisions of the Operational Environmental Management Programme (OEMPr). Effective implementation is critical to the success of the OEMPr and its associated mitigation measures. To facilitate this, roles and responsibilities must be clearly defined, documented, and communicated prior to the commencement of any activities.

This section provides guidance on the typical allocation of responsibilities among relevant parties involved in the implementation of the OEMPr. Specific roles and duties are outlined within the detailed environmental management and mitigation requirements contained in this document. The following subsection illustrates the relationships, reporting lines, and responsibilities of key role-players involved in the execution of the OEMPr. Figure 7-1 illustrates the reporting relationships for the implementation of the OEMPr.

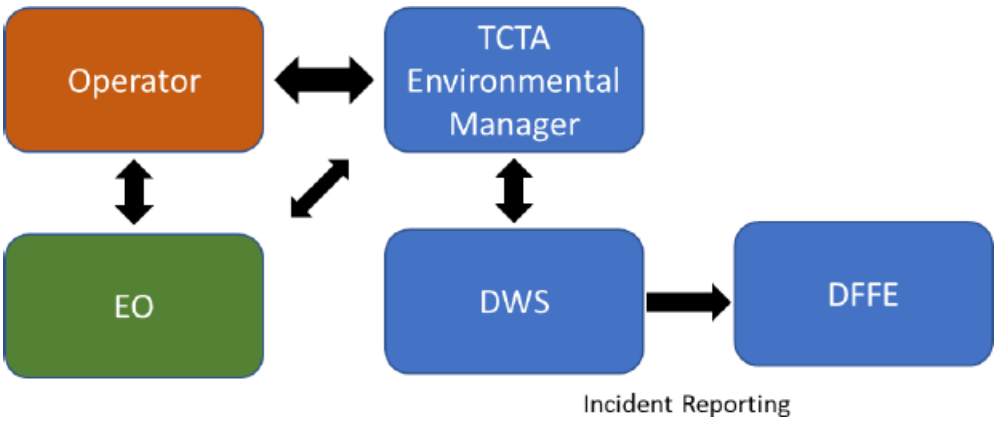

Figure 7-1: Reporting Relationships

7.1 Operator Responsibilities

The Operator is accountable for ensuring full compliance with the provisions of the Operational Environmental Management Programme (OEMPr), the EA, and all applicable legislative requirements. The Operator must take corrective action should non-compliance with these obligations occur. Key responsibilities include:

- Ensuring adherence to the OEMPr and EA conditions;
- Appointing a suitably qualified and experienced Environmental Officer (EO);
- Managing all relevant legal and contractual frameworks;
- Minimising impacts on and preserving the integrity of affected water resources;
- Monitoring, operating, and maintaining stormwater infrastructure;

- Exercising overall environmental control during the operational and maintenance phases;
- Providing adequate human and financial resources for effective management and operation of the Water Treatment Works; and
- Addressing and responding to project-related complaints.

7.2 Environmental Officer (EO) Responsibilities

The EO supports the Operator in implementing and overseeing environmental compliance. The EO's core responsibilities include:

- Identifying environmentally responsible solutions to emerging issues;
- Verifying that environmental awareness training is conducted for all new site personnel;
- Confirming acquisition of all required permits and authorisations, and maintaining a permit register with relevant details (description, issuing authority, issue and expiry dates);
- Facilitating and maintaining effective communication with neighbouring landowners;
- Maintaining a photographic environmental progress record, including descriptions of site activities or observations;
- Keeping registers of audit findings, incidents, and public complaints, and ensuring timely responses;
- Monitoring and verifying that environmental impacts remain within acceptable limits;
- Reviewing the OEMPr on an ongoing basis and recommending updates as necessary;
- Conducting site audits and reporting on compliance with the OEMPr and legislation. Monthly consolidated internal audit reports must be submitted to TCTA.

Plans and Procedures to be Developed and Implemented by the EO

The EO will also be responsible for developing and implementing the following management plans and procedures, as appropriate:

- Air Quality (Odour) Management Plan;
- Emergency Response Plans and Procedures;
- Fire Management Plan;
- Hazardous Materials Management Plan;
- Noise Management Plan;
- Stormwater Management Plan;
- Traffic Management Procedure;
- Training Plan, Schedule, and Training Materials;

- Waste Management Plan;
- Any additional plans or actions as required by the Operator;
- Reporting to the TCTA on audit outcomes and site activities.

7.3 Involvement of Regulatory Authorities

Key regulatory bodies include the DWS and the DFFE. Their roles may include:

- Reviewing monitoring and audit reports, where applicable;
- Assessing the Operator's compliance with OEMPr requirements and permit/licenc conditions, and offering guidance where necessary;
- Conducting random inspections to verify compliance; and
- Taking appropriate action in cases of persistent non-compliance by the Operator.

8 ENVIRONMENTAL AWARENESS AND TRAINING

To ensure effective implementation of the proposed upgrades and continued environmental compliance, the training and environmental awareness programme must be aligned with the existing operational framework outlined in the approved OEMPrs and their associated addendum. As highlighted in the proposed intervention, the installation of the RO units at both the Central and Eastern Basins is not anticipated to introduce any new environmental risks beyond those already addressed by current management practices. However, this necessitates that all site personnel remain well-informed and capable of maintaining these standards through targeted training and awareness initiatives. Accordingly:

- Training must specifically incorporate the operational procedures, mitigation measures, and environmental obligations associated with the new RO infrastructure, as described in the addendum to the OEMPrs.
- Staff should be sensitised to the outcomes of theaudit findings, particularly the continuation of established monitoring and waste management protocols that support the effective operation of the RO systems.
- Awareness training should emphasise the integration of the RO technology into the existing HDS treatment systems and ensure personnel understand how to operate and maintain the RO units in a manner that upholds environmental safeguards.
- Employees must be made aware of the regulatory implications and environmental sensitivities associated with both the Eastern and Central Basin sites, particularly in relation to sludge handling, water discharge routes (e.g., Blesbokspruit and Elsburgspruit), and compliance with Environmental Authorisations.

- All training content must be adapted to reflect site-specific environmental conditions and translated into the predominant languages spoken by site workers, where applicable, to ensure clear understanding and operational compliance.

By aligning training programmes with the specific requirements of the OEMPr addendum and ensuring staff are aware of both existing and new operational risks, the Operator can maintain a high standard of environmental performance and regulatory compliance throughout the life of the AMD treatment operations.

9 MANAGEMENT AND MITIGATION MEASURES

The introduction of RO technology at the Eastern and Central Basin AMD Treatment Plants, while not expected to introduce new or significant environmental risks beyond those already managed under the existing environmental framework, necessitates the careful consideration of site-specific operational impacts to ensure continued compliance and best practice.

In support of this, Table 9-1 outlines the key environmental aspects and potential impacts specifically associated with the installation and operation of the RO plant units. It further provides corresponding management and mitigation measures, aligned with the commitments set out in the amended Operational Environmental Management Programme Reports (OEMPrs).

Table 9-2 illustrates a Monitoring Plan that has been included as part of the updated Operational Environmental Management Programme (OEMPr) for the Acid Mine Drainage (AMD) Treatment Project. The plan outlines key environmental parameters to be monitored, the frequency of monitoring, responsible parties, and reporting procedures. It is intended to track the effectiveness of mitigation measures, detect any potential non-compliance, and support adaptive management throughout the operation of the AMD treatment facilities, including the proposed reverse osmosis (RO) installations

These measures are designed to complement existing environmental controls and monitoring protocols and serve as a practical tool for ensuring proactive environmental management throughout the operational phase of the RO infrastructure.

Table 9-1:Management and Mitigation Measures

Environmental Aspect	Potential Impact	Phase	Mitigation Measures /Management Measures	Responsible Party	Timeframe Period for Implementation	Compliance with Standards
Groundwater	Contamination from brine leakage or Reverse Osmosis system failure.	Operational	• Conduct baseline groundwater quality monitoring before operations. • Implement routine inspections and scheduled maintenance of RO membranes, pipelines and brine tanks. • Install automatic leak detection and shut-off valves. • Ensure proper lining and secondary containment for all sumps and brine tanks. • Develop an emergency response plan with spill kits and train staff. • Maintain a log of inspections and remedial actions.	Plant Operator/Environmental Officer	• Baseline monitoring before start-up. • Inspections weekly. • Maintenance quarterly. • Emergency drills annually.	• National Water Act (Act 36 of 1998) (NWA) • National Environmental Management Act (Act 107 of 1998) (NEMA) • SANS 241
Surface Water	Discharge of non-compliant treated water into natural watercourses.	Operational	• Install calibrated online monitoring systems for discharge quality (pH, TDS, heavy metals). • Maintain clear SOPs for immediate shutdown if limits are exceeded. • Maintain buffer zones between discharge points and watercourses. • Develop stormwater management plan to prevent accidental discharges during rain events. • Report exceedances immediately to authorities.	Plant Operator / Water Quality Technician	• Continuous online monitoring. • Monthly sampling. • Annual EA compliance report.	• NWA • Water Use Licence (WUL) conditions • NEMA
Air Quality	Fugitive emissions during	Operational	• Maintain the vegetation cover and apply soil binders or mulch	Environmental Control Officer / Site Supervisor	Daily inspections; equipment service quarterly; dust	• NEMA

Environmental Aspect	Potential Impact	Phase	Mitigation Measures /Management Measures	Responsible Party	Timeframe Period for Implementation	Compliance with Standards
	plant operation.		to exposed stockpiles. • Schedule wetting of roads and working areas during dry windy conditions. • Install HEPA filters or scrubbers where appropriate. Develop complaints register for community feedback.		suppression during dry months	• National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NAAQS)
Wetlands	Hydrological disruption and sedimentation from construction activities.	Construction	• Demarcate wetlands clearly with fencing and signage prior to works. • Use geotextiles, silt fences and sediment traps. • Schedule high-risk earthworks for dry seasons only. • Train contractors on wetland sensitivity. Rehabilitate disturbed areas immediately after construction.	Environmental Control Officer / Contractor	• Pre-construction site preparation. • Monitoring throughout construction. • Rehabilitation immediately post-construction.	• NWA • NEMA • GN704 Regulations • National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)
Waste Management	Improper disposal of chemical waste.	Operational	• Segregate general, hazardous, and recyclable waste streams at source. • Use sealed, lined waste storage areas with secondary containment. • Keep updated manifests, weighbridge slips and disposal certificates. • Audit waste contractors for compliance. • Conduct refresher training for staff every year.	Waste Management Coordinator / Plant Manager	• Inspections weekly. • Manifests updated monthly. contractor audits annually. • Training annually.	• NEMWA • NEMA • National Health Act, 2003 (Act No. 61 of 2003) Regulations Regarding the Management of Health Care Risk Waste (HCRW)
Energy & Resource Use	High Electricity and potable water consumption for RO.	Operational	• Install sub-metering to monitor sectional energy use. Use variable speed drives (VSDs) on pumps. • Reuse treated effluent for plant	Plant Engineer / Sustainability/Environmental Officer	• Sub-meter installation before commissioning. • Audits annually.	• NEMA • ISO 50001 (Energy Management) • ISO 14001 (Environmental

Environmental Aspect	Potential Impact	Phase	Mitigation Measures /Management Measures	Responsible Party	Timeframe Period for Implementation	Compliance with Standards
			washdown or cooling. Implement water leak detection and repair programme. • Explore renewable energy options where feasible.		• Efficiency actions quarterly.	Management)

Table 9-2:Environmental Management Programme Monitoring Plan

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Action
Reverse Osmosis system operation & brine management.	Groundwater contamination from leaks or failures.	• Baseline borehole sampling pre-commissioning. • Monthly groundwater quality monitoring (upstream & downstream). • Routine inspections of pipelines, sumps, liners. • Immediate leak detection alarms.	Plant Operator / Environmental Officer	• Baseline before start Inspections weekly • Quarterly groundwater sampling. • Annual groundwater report to DWS/DFFE
Treated water discharge.	Non-compliant water quality in receiving watercourses.	• Online monitoring for pH, TDS, metals. • Monthly grab samples for lab analysis. • Keep records for audit. • Immediate corrective measures for non-compliance.	Plant Operator / Water Quality Technician	• Continuous monitoring monthly sampling • Quarterly performance report
Earthworks near wetlands	Siltation & wetland disturbance.	• Inspect silt fences, traps, buffer zones after rainfall events. • Photo records before and after works. • Non-compliance incidents recorded & rectified.	Environmental Control Officer / Contractor	• Weekly during construction after heavy rainfall • Closure inspection after construction
Waste handling & disposal.	Pollution from incorrect disposal.	• Inspect waste storage and signage. • Verify disposal certificates & manifests. • Annual audit of waste	Waste Management Coordinator / Plant Manager	• Waste area inspections weekly • Monthly Manifests • Audits annually • Refresher training

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Action
		service providers. • Check staff training records.		annually
RO energy & water use.	Inefficient resource consumption.	• Monthly sub-meter readings. • Quarterly RO system efficiency checks. • Annual energy and water use audit.	Plant Engineer / Sustainability Office	• Sub-meter readings monthly • Audit annually • Optimisation plan reviewed quarterly

9.1 EAP Declaration

I confirm that the above information contained in the CV is an accurate description of my experience and qualifications and that, at the time of signature.

Vukani Ngwabi Digitally signed by Vukani Ngwabi Date: 2025.08.05 15:19:21 +02'00'

Signature

APPENDIX A: ENVIROMENTAL ASSESSMENT PRACTITIONER CV

PRIVATE AND CONFIDENTIAL PROFILE

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PROFILE OF HOPEWELL VUKANI NGWABI

Surname	Ngwabi	
First Names	Vukani	Hopewell
Citizenship	South African	
Identity No	890315646089	
Gender	Male	
Residing in	Klaarwater	
Languages Spoken	IsiZulu and English	
EPASA REG	2019/1111	
SACNASP REG	152937	

OVERVIEW

Mr Ngwabi is a dedicated Environmentalist and Project Manager with over 10 years of experience delivering exceptional results in environmental sciences and construction. Holding an Honours Degree in Geography and Environmental Management from the University of KwaZulu-Natal, he excels in environmental and waste management, housing development, beneficiary administration, and social facilitation. With expertise in risk assessments, resource optimization, and stakeholder engagement, Mr Ngwabi drives impactful solutions aligned with sustainable goals. His pragmatic approach ensures regulatory compliance while advancing Vukanih's leadership in sustainable practices and integrated development planning.

ACQUIRED SKILLS / ABILITIES

Sound Knowledge of Environmental Management legislations	**feasibility studies**	**Research skills**	**Computer literacy (Microsoft – Word, Excel, Power Point, Outlook and Internet)**
Project management	**environmental awareness and education**	**facilitation skills**	**client liaison**
Basic ArcGis	**Administrative and coordination skills**	**Interpersonal Skills**	**Adaptability**
Sound Knowledge in Environmental Impact Assessment	**Independent worker**	**Organizational Skills**	**Strong attention to detail**
Good teamwork skills	**Supervisory Skills**	**Communication Skills**	**Work Under Pressure**
Report Writing	**Environmental Compliance & Monitoring**	**Presentation Skills**	**Mentor and coach**
Diligent and Reliable	**Disciplined & Fast Learner**	**Self-motivated and Assertive**	**Team leader & Team member**

EDUCATION DETAILS

Highest Grade	Grade 12	**Institution**	St Francis College
Year Passed	2006	**Subjects**	

Qualification	Bachelor of Social Science: Geography and Environmental Management	**Institution**	University of KwaZulu-Natal
Year Passed	2009	**Subjects**	
Qualification	Bachelor of Social Science Honours: Geography and Environmental Management	**Institution**	University of KwaZulu-Natal
Year Passed	2010	**Subjects**	
Research Topic	**An investigation of solid waste disposal in the informal settlement; A case study of Banana City, Westville, Durban.**		

CAREER DETAILS

Name of Employer	**Vukanih Consultants and Contractors**
Designation / Title	**Environmental Assessment Practitioner**
Period of Employment	**August 2019 to date**
Division	**Environmental compliance**

DUTIES & RESPONSIBILITIES

- Environmental Authorisation Applications.
- Ensure that the requirements of the EMPr and the associated documents are compiled on the construction site
- Approve Environmental Training Programs and other awareness initiatives
- Compile and submit Environmental Audit Report to government authorities as required
- Participate in scheduled external audits and inspections on contractor's performance on site, with subsequent report back to management
- Responsible for staff schedules
- Project Management
- Water Use License
- Water Monitoring

Projects Overview

- **Rehabilitation of Water Infrastructure in the Greater Edenvale Areas – Phase 1** eMzansi Engineers (PTY) LTD appointed G-E-N Construction SA as contractors responsible for Environmental Control on site.
- **Musa Special School**, Department of Education, responsible for Environmental Authorisation and Environmental Control on site.
- **School Himmelberg Intermediate,** Department of Education, responsible for Environmental Authorisation and Environmental Control on site.
- **Makhokhoba Bridge,** Mkhambathini Local Municipality, responsibilities include Environmental Authorisation and General Authorisation for Water Use .

- **Mdloti Bridge,** Ndwedwe Local Municipality, responsible for Environmental Authorisation and General Authorisation for Water Use.

- **Imbali Student Accommodation Facility, Retail Shops and Associated Shops,** ZMM Investments, responsible include Environmental Authorisation.

- **Imbali Filling Station Facility, Retail Shops, and a Restaurant,** ZMM Investments, responsible include Environmental Authorisation.

- **Pomeroy Township Housing Project,** Msinga Municipality Environmental Authorisation and General Authorisation for Water Use License.

- **Bhobhonono/Masomini Housing Project**, Msunduzi Local Municipality, responsibilities include Environmental Authorisation and Water Use License.

- **Ncandu Extension Housing Project**, Newcastle Local Municipality, responsibilities include Environmental Authorisation and Water Use License.

- **Bayview Housing Project**, eThekwini Municipality (TPS Development Projects), responsible for Environmental Authorisation and Environmental Control on site.

- **Ilovu 259 Housing Project**, eThekwini Municipality (Ubuhlebesu Projects), responsible for Environmental Authorisation and Environmental Control on site.

- **Mzingwenya Housing Project,** Mhlathuze Local Municipality (on behalf of Black Balance), responsible for Preliminary Environmental Report.

- **Vulindlela Housing Project,** Mhlathuze Local Municipality (on behalf of Black Balance), responsible for Preliminary Environmental Report.

- **Mandlanzini Housing Project,** Mhlathuze Local Municipality (on behalf of Black Balance), responsible for Preliminary Environmental Report.

- **Nseleni Housing Project,** Mhlathuze Local Municipality (on behalf of Black Balance), responsible for Environmental Preliminary Report.

- **Bakerville Housing Project,** Msunduzi Local Municipality (on behalf of Imendo Project Managers), responsible include Environmental Preliminary Report.

- **Inkandla Landfill Site Monitoring,** Inkandla Local Municipality, responsible for *Ground Water, Surface Water, Storm Water and* Air Space and Stability

- **Khanya Village Hall**, Umngeni Local Municipality (on behalf of SA SHEQ Consultants, responsible for Environmental Preliminary Report and ECO.

- **THE REHABILITATION ON NATIONAL ROUTE 5, SECTION 2, VALS RIVER (KM 52.6) TO BETHLEHEM WEST (KM 70.6)52KM** Sanral (on behalf of TPA Consulting), responsible for Environmental Planning and Environmental Control on site.

- **Karkloof Pipe Jerking**, Umgeni Municipality responsible for Section 30 Application and General Water Use Authorisation.

- **Replacement of Existing Low level Bridge**, ACME SHIVA TRADING responsible for section 30 Application.

Environmental Assessment Practitioners Association of South Africa

Registration No. 2019/1111

Herewith certifies that

VUKANI NGWABI

is registered as an

Environmental Assessment Practitioner

Registered in accordance with the prescribed criteria of Regulation 15. (1) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).

Effective: 01 March 2025

Expires: 31 March 2026

Chairperson

Registrar

SAQA
SOUTH AFRICAN QUALIFICATIONS AUTHORITY