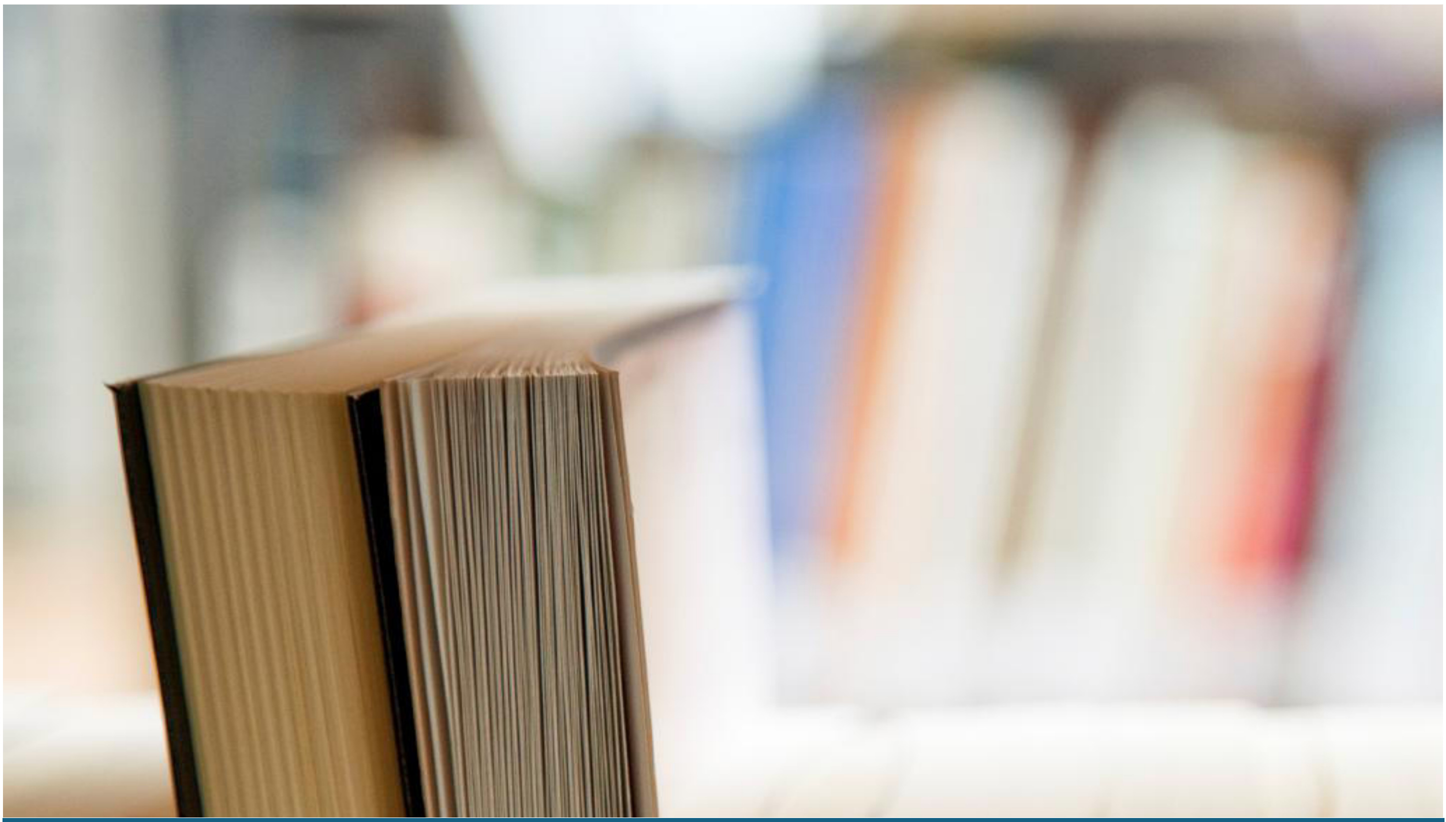

ENVIRONMENTAL SCOPING STUDY (ESS)ANDENVIRONMENTAL MANAGEMENT PLAN (EMP)FOR THE PROPOSED SMALL-SCALE PRECIOUS METALS (AU WITH CU AND AG AS BY PRODUCTS) OPERATION ON MINING CLAIMS MC76609, MC76610 AND MC76611KUNENE REGION, NAMIBIA

Application Number: 260413007310

ENVIRONMENTAL SCOPING STUDY (ESS)

AND

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

FOR THE PROPOSED SMALL-SCALE COPPER AND SILVER MINING OPERATION

ON MINING CLAIMS MC76609, MC76610 AND MC76611

KUNENE REGION, NAMIBIA

PREPARED FOR

Okondjamo Mining Investments CC

Application Number: 260413007310

PREPARED BY

Augite Environmental Consultants CC

Environmental Assessment Practitioner (EAP)

Dr. Ismael Kangueehi
PhD Earth Sciences (Environmental Geochemistry)
Environmental Assessment Practitioner
Senior Researcher & Exploration Geologist

PROJECT DESCRIPTION

This Environmental Scoping Study (ESS) and Environmental Management Plan (EMP) has been prepared for the proposed small-scale copper and silver mining operation located approximately 5 kilometres from the villages of Otjinanwa and Okakuara within the Kunene Region of Namibia.

The proposed operation involves small-scale open-pit mining, ore crushing, heap-leach processing utilizing sulphuric acid, temporary stockpiling, groundwater abstraction, ore transport, camp establishment, and progressive rehabilitation activities.

REPORT STATUS

FINAL ENVIRONMENTAL SCOPING STUDY REPORT

DATE

May 2026

CONTACT DETAILS

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DISCLAIMER

This Environmental Scoping Study (ESS) and Environmental Management Plan (EMP) has been prepared exclusively for Okondjamo Mining Investments CC for purposes of environmental assessment and regulatory review in accordance with the Environmental Management Act, 2007 (Act No. 7 of 2007) and applicable Namibian environmental legislation. The findings, conclusions, and recommendations contained herein are based on information available at the time of preparation and are intended solely for the proposed project described within this report

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EXECUTIVE SUMMARY

Okondjamo Mining Investments CC proposes to undertake a small-scale precious-metals mining operation on Mining Claims MC76609, MC76610 and MC76611 situated within the Kunene Region of north-western Namibia, approximately 5 kilometres from the villages of Otjinanwa and Okakuara. The proposed mining area is located within a rugged mountainous environment characterized by semi-arid climatic conditions, moderate vegetation cover, communal grazing land use, and structurally controlled mineralization associated with quartz and carbonate veining systems.

The proposed operation will focus primarily on the extraction and recovery of gold, while copper and silver will be recovered as secondary by-products where economically viable. Geological observations undertaken within the project area indicate the presence of sulphide-hosted and structurally controlled hard-rock gold mineralization associated with visible malachite, azurite, chalcopyrite, bornite, pyrite, quartz veins, and carbonate veining systems. Gold grades of up to approximately 5 g/t are anticipated within certain mineralized zones.

The proposed operation will consist of small-scale open-pit mining activities utilizing excavators, limited contractor-controlled blasting, manual ore sorting, temporary stockpiling, ore crushing, gravity-based mineral processing, and controlled precious-metals recovery systems. The operation is expected to process approximately 50 tonnes of ore per day within an estimated processing footprint of approximately 1 hectare.

The project has been specifically designed to minimize environmental impacts through the use of gravity-assisted physical separation methods as the primary gold recovery mechanism. Unlike conventional large-scale gold operations, the proposed project will not rely on mercury-based processing systems and will instead implement a mercury-free recovery approach utilizing predominantly physical separation techniques. Limited controlled chemical-assisted recovery methods may be utilized where operationally necessary, including the selective use of thiosulfate, thiourea, and minor cyanide application under strictly controlled environmental conditions. Sulphuric acid may additionally be utilized in limited controlled applications associated with sulphide-hosted mineralization processing.

The processing philosophy for the project is based on minimizing environmental risk through:

- Gravity-dominant gold recovery;
- Minimal chemical dependency;
- Controlled reagent handling;
- Dry-stack and reusable residue management;
- Zero-liquid-discharge operational principles;
- Progressive rehabilitation; and
- Small operational disturbance footprints.

The project will not involve the establishment of large conventional tailings-storage facilities. Process residues generated during physical separation and recovery activities will be managed through dry-stack handling methods and controlled reuse where feasible, thereby significantly reducing long-term environmental liabilities commonly associated with conventional gold-processing operations.

Water required for operational activities will be sourced from groundwater abstraction through local borehole systems. Water usage will be minimized through recycling and reuse systems integrated within the processing circuit. The operation will further establish groundwater-monitoring systems aimed at protecting surrounding communal groundwater resources throughout all phases of the project lifecycle.

Power supply for the operation will primarily be generated through diesel-powered generators supported by onsite fuel-storage infrastructure. Operational infrastructure will include temporary camps, prefabricated support structures, waste-storage areas, water-storage facilities, stockpile areas, controlled hazardous-material storage areas, and operational access roads utilizing mostly existing tracks and valleys in order to minimize land disturbance.

Potential environmental impacts identified during the Environmental Scoping Study include:

- Localized vegetation disturbance;
- Soil erosion and land degradation;
- Dust generation;
- Groundwater contamination risks;
- Hazardous-material handling risks;
- Noise and operational disturbance;
- Occupational health and safety risks;
- Waste-management challenges; and
- Long-term rehabilitation obligations.

However, the assessment determined that the majority of identified impacts are localized, manageable, and capable of being reduced to acceptable residual levels through the implementation of appropriate mitigation measures and environmental-management controls.

Key environmental mitigation measures proposed for the project include:

- HDPE-lined processing and containment infrastructure;
- Bunded hazardous-material storage systems;
- Controlled chemical-handling procedures;
- Groundwater-quality monitoring;
- Stormwater-diversion systems;

- Progressive rehabilitation;
- Dust-suppression measures;
- Controlled waste-management systems;
- Environmental monitoring programmes;
- Emergency-response procedures; and
- Ongoing environmental auditing.

The proposed project is expected to generate several positive socio-economic benefits for surrounding communities within the Kunene Region. These benefits include local employment creation, onsite skills development and training, support for local suppliers and service providers within Opuwo and surrounding settlements, regional economic stimulation, and tax and royalty contributions to the Government of the Republic of Namibia. Approximately 50 workers are expected to be employed during operational phases, with preference expected to be given to local community members where possible.

Public consultation undertaken during the Environmental Scoping Study process indicated general support for the proposed project from surrounding communities and the Ongango Traditional Authority. Community concerns raised during consultation primarily related to employment opportunities, skills transfer, local economic participation, and environmental protection. The Traditional Authority further provided consent support for the proposed project.

The Environmental Scoping Study concludes that the proposed small-scale precious-metals mining operation can proceed from an environmental perspective provided that all mitigation measures, monitoring programmes, environmental controls, rehabilitation commitments, and operational procedures outlined within the Environmental Management Plan (EMP) are fully implemented throughout all phases of the project lifecycle.

It is therefore recommended that the proposed project be considered for Environmental Clearance subject to compliance with the recommendations and environmental-management commitments contained within this Environmental Scoping Study and accompanying Environmental Management Plan.

1.1 BACKGROUND TO THE PROJECT

Okondjamo Mining Investments CC proposes to undertake a small-scale precious-metals mining operation on Mining Claims MC76609, MC76610 and MC76611 situated within the Kunene Region of north-western Namibia, approximately 5 kilometres from the villages of Otjinanwa and Okakuara. The proposed operation will focus primarily on the extraction and recovery of gold, while copper and silver will be recovered as secondary by-products where economically viable.

Figure 1. Location map for the mining claims shown as a rectangle on the south west corner of the map.

The project is situated within a rugged mountainous environment characterized by structurally controlled mineralization associated with quartz and carbonate veining systems, sulphide-hosted mineralization, and localized hydrothermal alteration. Preliminary field observations undertaken within the mining claims indicate the presence of visible gold-associated sulphide mineralization including chalcopyrite, bornite, pyrite, malachite, and azurite associated with quartz-rich structures and hard-rock mineralized zones. Gold grades of up to approximately 5 g/t are anticipated within certain mineralized areas.

The proposed mining operation forms part of the broader objective of promoting responsible small-scale mineral development within the Kunene Region while contributing toward local economic development, employment creation, skills transfer, and sustainable utilization of Namibia's mineral resources. The project further aims to support regional economic growth through local procurement opportunities, contractor participation, transport services, and support for surrounding communal communities.

Unlike conventional large-scale gold operations that rely heavily on intensive chemical processing and large tailings-storage facilities, the proposed project has been specifically designed around a reduced-impact operational philosophy emphasizing:

- Small operational footprints;
- Gravity-assisted mineral recovery;
- Mercury-free processing systems;
- Controlled reagent use;
- Minimal cyanide dependency;
- Dry-stack residue management;
- Zero-liquid-discharge operational principles; and
- Progressive rehabilitation throughout operational phases.

The proposed operation will primarily utilize gravity-based physical separation methods for gold recovery, thereby significantly reducing chemical dependency and long-term environmental risks commonly associated with conventional gold-processing operations. Limited controlled chemical-assisted recovery methods may be implemented where operationally necessary, including the selective use of thiosulfate, thiourea, and minimal cyanide application under strictly controlled environmental conditions. Sulphuric acid may further be utilized in limited applications associated with sulphide-hosted mineralization processing.

The mining activities are expected to involve small-scale open-pit excavation utilizing excavators, limited contractor-controlled blasting, temporary stockpiling, ore crushing, gravity concentration systems, and controlled residue management. Ore production is expected to remain relatively small-scale at approximately 50 tonnes per day, thereby limiting the overall disturbance footprint and reducing environmental pressures associated with large-scale mining developments.

The project area falls within communal land characterized predominantly by livestock grazing activities and low-density rural settlements. The surrounding environment is considered environmentally sensitive due to the semi-arid climatic conditions, groundwater dependency of surrounding communities, and ecological vulnerability associated with drought-prone environments within the Kunene Region. Consequently, groundwater protection, hazardous-material management, stormwater control, rehabilitation, and long-term environmental stability have been identified as priority environmental-management objectives for the proposed project.

In accordance with the Environmental Management Act, 2007 (Act No. 7 of 2007) and the Environmental Impact Assessment Regulations of Namibia, the proposed mining activities require environmental assessment and environmental authorization prior to commencement of operations. This Environmental Scoping Study (ESS) and accompanying Environmental Management Plan (EMP) have therefore been undertaken in order to identify potential environmental and socio-economic impacts associated with the proposed project, evaluate environmental risks, and develop appropriate mitigation and environmental-management measures applicable throughout all phases of the project lifecycle.

The ESS further aims to ensure that the proposed mining operation is undertaken in an environmentally responsible, socially acceptable, and operationally sustainable manner consistent with Namibian environmental legislation, responsible mining principles, and international environmental-management best practices applicable to small-scale precious-metals mining operations.

1.2 PROJECT LOCATION

The proposed small-scale precious-metals mining operation is situated within the Kunene Region of north-western Namibia on Mining Claims MC76609, MC76610 and MC76611. The project area is located approximately 5 kilometres from the villages of Otjinanwa and Okakuara within a predominantly communal rural environment characterized by semi-arid climatic conditions, rugged mountainous terrain, and low-density settlement patterns.

The project site is situated approximately 82 kilometres from the town of Opuwo, which serves as the nearest major service and logistical centre for the proposed operation. Opuwo is expected to provide support services including fuel supply, transport logistics, food supply, construction materials, waste disposal, and operational support activities associated with the project. Ore transported from the project area is expected to be routed through Opuwo before onward transport toward Walvis Bay for export purposes.

The mining claims are situated within a remote mountainous landscape characterized by rugged hills, broad valleys, rocky terrain, and localized structurally controlled mineralized zones associated with quartz and carbonate veining systems. Elevations within the project area average approximately 1,630 metres above sea level. The terrain is considered highly rugged in certain areas, although broad valleys and existing natural access corridors provide relatively accessible routes for operational movement and transport activities.

The surrounding environment is dominated primarily by communal grazing activities with livestock farming representing the predominant land-use activity within the broader area. Settlement density within the immediate vicinity of the proposed operation remains relatively low, with the nearest communities being situated several kilometres from the proposed mining footprint. The remote nature of the project area significantly reduces the potential for major visual, noise, traffic, and urban land-use conflicts commonly associated with larger mining developments located near densely populated areas.

Access to the proposed mining area is currently achieved through existing gravel roads and tracks connecting the surrounding communal settlements and regional transport routes. The project intends to utilize and upgrade existing access routes wherever possible in order to minimize unnecessary environmental disturbance and reduce land-clearing requirements. Existing valley systems and natural topographical corridors are expected to be utilized preferentially during road upgrades in order to minimize excavation, erosion potential, and vegetation disturbance. No major new access roads are anticipated as part of the proposed project.

The project area falls within a semi-arid climatic zone characterized by low and variable rainfall, periodic drought conditions, high summer temperatures, and groundwater dependency within surrounding communal communities. The area generally experiences seasonal rainfall during the period between November and April, while occasional easterly winds may occur during the dry winter months. Due to the arid environmental conditions and groundwater dependency of surrounding communities, groundwater protection and responsible water management have been identified as priority environmental-management considerations for the project.

The project area further falls within the broader Ombujokanguindi Conservancy region, which supports communal grazing activities and localized wildlife movement within the surrounding landscape. Wildlife species commonly observed within the broader area include springbok, kudu, oryx, smaller antelope species, reptiles, and occasional larger wildlife species such as elephants and lions migrating through surrounding communal landscapes. Vegetation within the area is generally moderate, consisting predominantly of shrubs, smaller trees, and sparse mountainous vegetation, with larger trees occurring mainly within valley systems and drainage areas.

No major perennial river systems occur within the immediate vicinity of the proposed mining operation. The mining claims are situated away from major drainage systems and ephemeral river channels, thereby reducing direct hydrological interaction with major surface-water systems. Broad valleys occur within the surrounding landscape; however, no significant flood scarring, permanent water pooling, springs, or seepage zones were observed during site investigations.

From an environmental and operational perspective, the relatively remote location, limited settlement density, small operational footprint, utilization of existing access routes, and controlled small-scale mining approach provide several environmental advantages by reducing the likelihood of significant cumulative visual, noise, traffic, and community disturbance impacts within the surrounding communal environment.

The location of the proposed project within a semi-arid communal environment nevertheless necessitates careful environmental management, particularly with respect to groundwater protection, erosion control, hazardous-material handling, biodiversity disturbance minimization, and progressive rehabilitation throughout all phases of the project lifecycle.

1.3 PURPOSE OF THE ENVIRONMENTAL SCOPING STUDY

This Environmental Scoping Study (ESS) has been undertaken for the proposed small-scale precious-metals mining operation to be conducted by Okondjamo Mining Investments CC on Mining Claims MC76609, MC76610 and MC76611 situated within the Kunene Region of north-western Namibia.

The proposed project involves small-scale hard-rock mining activities focused primarily on the extraction and recovery of gold, with copper and silver anticipated to occur as secondary by-products. The operation will involve small-scale open-pit mining, ore crushing, gravity-assisted mineral processing, controlled chemical-assisted recovery where operationally necessary, temporary stockpiling, groundwater abstraction, ore transport, camp establishment, and progressive rehabilitation activities.

In accordance with the Environmental Management Act, 2007 (Act No. 7 of 2007) and the Environmental Impact Assessment Regulations of Namibia (Government Notice No. 30 of 2012), mining and mineral-processing activities are listed activities requiring environmental assessment and environmental authorization prior to commencement of operations. Consequently, the proposed project requires an Environmental Clearance Certificate (ECC) from the Ministry of Environment, Forestry and Tourism (MEFT) before operational activities may proceed.

The primary purpose of this Environmental Scoping Study is therefore to:

- Identify potential environmental and socio-economic impacts associated with the proposed project;
- Evaluate environmental sensitivities within the receiving environment;
- Assess operational environmental risks associated with mining and mineral-processing activities;
- Develop appropriate environmental mitigation and management measures;
- Inform environmental decision-making by competent authorities;
- Support environmentally responsible project planning; and
- Establish an environmental-management framework applicable throughout all phases of the project lifecycle.

The ESS further aims to evaluate the potential impacts associated with:

- Land disturbance and vegetation clearing;
- Groundwater abstraction and groundwater protection;
- Dust generation and air quality;
- Hazardous-material handling and storage;
- Controlled reagent usage;
- Waste and residue management;
- Biodiversity disturbance;
- Community health and safety;
- Occupational health and safety;
- Traffic and transport activities;
- Rehabilitation and closure obligations.

Particular emphasis has been placed on groundwater protection and hazardous-material management due to the semi-arid environmental conditions and groundwater dependency of surrounding communal communities within the Kunene Region. The ESS further recognizes the ecological sensitivity associated with drought-prone environments and the importance of minimizing long-term environmental disturbance within communal landscapes.

The proposed project has been intentionally designed around a reduced-impact operational philosophy emphasizing:

- Small operational disturbance footprints;
- Gravity-assisted mineral recovery;
- Mercury-free processing systems;
- Reduced chemical dependency;
- Controlled reagent handling;
- Dry-stack and reusable residue management;
- Zero-liquid-discharge operational principles where feasible; and
- Progressive rehabilitation throughout operational phases.

Unlike conventional large-scale gold-processing operations, the proposed project will primarily utilize gravity-based physical separation methods as the principal mineral-recovery mechanism, thereby substantially reducing reliance on intensive chemical-processing systems and large conventional tailings-storage facilities. Limited controlled use of alternative reagents such as thiosulfate and thiourea may be implemented where operationally necessary, while cyanide usage is intended to remain minimal and strictly controlled under appropriate environmental-management procedures.

This Environmental Scoping Study further serves to ensure that the proposed mining operation is planned and implemented in a manner consistent with:

- Namibian environmental legislation;
- Responsible mining principles;
- International environmental-management best practices;
- Sustainable resource-development objectives; and
- Long-term environmental protection requirements.

The ESS is accompanied by a detailed Environmental Management Plan (EMP) which establishes mitigation measures, environmental controls, monitoring programmes, rehabilitation commitments, compliance requirements, and operational management procedures applicable throughout all phases of the project lifecycle.

Ultimately, the purpose of the Environmental Scoping Study is to determine whether the proposed small-scale precious-metals mining operation can proceed in an environmentally acceptable, socially responsible, and operationally sustainable manner within the receiving environment of the Kunene Region of Namibia.

1.4 SCOPE OF THE ENVIRONMENTAL SCOPING STUDY

This Environmental Scoping Study (ESS) has been undertaken to assess the potential environmental and socio-economic impacts associated with the proposed small-scale hard-rock precious-metals mining operation to be conducted by Okondjamo Mining Investments CC on Mining Claims MC76609, MC76610 and MC76611 within the Kunene Region of Namibia.

The scope of the assessment includes the evaluation of all major operational activities associated with the proposed mining project throughout the full project lifecycle, including:

- Site establishment;
- Construction and infrastructure development;
- Mining operations;
- Ore crushing and processing activities;
- Gravity-assisted mineral recovery;
- Controlled reagent handling and storage;
- Groundwater abstraction and water management;
- Waste and residue management;
- Ore transport and logistics;
- Progressive rehabilitation;
- Mine closure; and
- Post-closure environmental monitoring.

The ESS specifically focuses on the environmental implications associated with a small-scale gravity-assisted gold-recovery operation where gold represents the primary target commodity while copper and silver are anticipated to occur as secondary by-products. The assessment recognizes that the proposed project differs substantially from conventional large-scale gold-processing operations due to its:

- Reduced operational footprint;
- Gravity-dominant mineral processing philosophy;
- Mercury-free recovery approach;
- Limited and controlled reagent usage;
- Dry-stack and reusable residue management approach;
- Zero-liquid-discharge operational objectives where feasible; and
- Progressive rehabilitation commitments.

The Environmental Scoping Study evaluates the potential impacts associated with all major project components including:

- Open-pit mining activities;
- Excavation and blasting activities;
- Temporary ore stockpiling;
- Crushing and gravity-concentration systems;
- Water-storage infrastructure;
- Diesel-storage infrastructure;
- Hazardous-material storage areas;
- Camp and support infrastructure;
- Waste-management facilities;
- Access roads and transport corridors;
- Processing and recovery areas;
- Waste-rock storage areas; and
- Rehabilitation and closure areas.

The scope of the assessment further includes the evaluation of environmental sensitivities associated with the receiving environment surrounding the proposed project area. Environmental baseline components assessed as part of the ESS include:

- Climate and meteorological conditions;
- Topography and terrain;
- Geology and mineralization;
- Surface-water and drainage characteristics;
- Groundwater conditions;
- Biodiversity and vegetation;
- Land use and socio-economic conditions;
- Heritage and archaeological sensitivity;
- Community and occupational health and safety;
- Visual and landscape characteristics.

Particular emphasis has been placed on groundwater protection, hazardous-material management, erosion control, and rehabilitation planning due to the semi-arid environmental conditions and groundwater dependency associated with surrounding communal communities within the Kunene Region.

The ESS further evaluates potential environmental impacts associated with:

- Groundwater contamination risks;
- Dust generation and air quality;
- Hazardous-material spills;
- Soil erosion and land degradation;
- Biodiversity disturbance;
- Noise and vibration;
- Waste generation and residue management;
- Community health and safety;
- Occupational health and safety;
- Visual impacts;
- Traffic and transport impacts;
- Long-term rehabilitation liabilities;
- Closure and post-closure environmental stability.

The Environmental Scoping Study additionally includes:

- Environmental impact identification and evaluation;
- Numerical environmental risk scoring;
- Environmental significance assessment;
- Mitigation-measure development;
- Residual-impact evaluation;
- Cumulative-impact consideration;
- Environmental monitoring requirements; and
- Environmental-management planning.

A detailed Environmental Management Plan (EMP) accompanies this ESS and establishes:

- Environmental mitigation measures;
- Monitoring programmes;
- Operational environmental controls;

- Hazardous-material management procedures;
- Groundwater-monitoring requirements;
- Rehabilitation specifications;
- Emergency-response procedures;
- Environmental auditing requirements; and
- Closure-management commitments.

As part of the assessment process, site investigations and public consultation activities were undertaken in order to identify environmental sensitivities, operational concerns, and community expectations associated with the proposed project. Consultation undertaken with surrounding communities and the Ongango Traditional Authority formed an important component of the assessment process.

The assessment further recognizes that the project remains a relatively small-scale operation with evolving operational planning and conceptual infrastructure layouts. Consequently, certain engineering and operational details may continue to evolve during later project-development stages. The ESS therefore focuses on establishing an environmentally responsible framework capable of guiding operational planning, environmental management, regulatory compliance, and future environmental decision-making throughout all phases of the project lifecycle.

The overall scope of this Environmental Scoping Study is therefore intended to provide sufficient environmental information to:

- Support decision-making regarding the Environmental Clearance Certificate application;
- Evaluate the environmental feasibility of the proposed project;
- Establish environmental-management commitments;
- Identify environmental risks and mitigation requirements; and
- Ensure that the proposed operation can proceed in an environmentally responsible, socially acceptable, and operationally sustainable manner within the receiving environment of the Kunene Region of Namibia.

1.5 METHODOLOGY

This Environmental Scoping Study (ESS) was undertaken using a combination of site investigations, desktop assessments, public consultation, environmental baseline evaluation, and numerical environmental risk-assessment methodologies in order to evaluate the potential environmental and socio-economic impacts associated with the proposed small-scale hard-rock precious-metals mining operation within the Kunene Region of Namibia.

The methodology applied during the assessment process was designed to:

- Identify environmental sensitivities within the receiving environment;
- Evaluate potential operational impacts associated with the proposed project;
- Assess environmental risks and cumulative impacts;
- Develop practical mitigation and environmental-management measures;
- Support environmentally responsible project planning; and
- Provide sufficient environmental information to support environmental decision-making and Environmental Clearance Certificate (ECC) review processes.

The assessment methodology further considered the relatively small-scale nature of the proposed operation, the gravity-assisted mineral-processing philosophy, the limited and controlled use of chemical reagents, and the semi-arid communal environmental setting surrounding the project area.

1.5.1 Site Investigations and Field Assessments

Site investigations and field observations were undertaken within the proposed mining area and surrounding environment in order to evaluate:

- Topography and terrain;
- Geological conditions and mineralization;
- Vegetation and biodiversity characteristics;
- Drainage and hydrological conditions;
- Existing land-use activities;
- Environmental sensitivities;
- Access conditions;
- Potential infrastructure locations; and
- General environmental baseline conditions.

Field investigations included direct observations of:

- Structurally controlled mineralization;
- Quartz and carbonate veining systems;
- Sulphide-hosted mineralization;
- Visible chalcopyrite, bornite, pyrite, malachite, and azurite mineralization;
- Rocky mountainous terrain;
- Broad valley systems;
- Vegetation distribution patterns;
- Existing access tracks and communal land-use activities.

Particular attention was given to groundwater sensitivity, topographical constraints, erosion potential, and environmental-management considerations associated with the semi-arid communal environment.

The field investigations further assisted in identifying:

- Potential processing and infrastructure areas;
- Waste-management locations;
- Stormwater-management considerations;
- Rehabilitation constraints;
- Potential environmental receptors surrounding the project area.

1.5.2 Desktop Review and Data Collection

A desktop review of available environmental, geological, and regulatory information relevant to the project area was undertaken as part of the assessment process.

The desktop review included consideration of:

- Geological maps and regional geological information;
- Environmental legislation and regulatory requirements;
- Available climatic information;
- Topographical information;
- Satellite imagery and aerial imagery;
- Hydrological and groundwater information;
- Regional biodiversity information;
- Existing environmental-management guidelines applicable to mining operations.

The desktop review further assisted in establishing the broader environmental context applicable to the project area and supported identification of potential environmental sensitivities and operational risks.

1.5.3 Public Participation and Stakeholder Consultation

Public consultation formed an integral component of the Environmental Scoping Study process.

Consultation activities undertaken during the assessment process included:

- Community consultation meetings;
- Stakeholder engagement;
- Traditional Authority consultation; and
- Public discussions regarding the proposed project.

A formal public meeting was conducted with approximately 25 community members from surrounding areas, during which the proposed project and associated operational activities were discussed. The consultation process included engagement with the Ongango Traditional Authority, where consent support for the proposed project was provided by Chief Jackson Pasuvire Kaee.

Key issues raised during consultation included:

- Local employment opportunities;
- Skills transfer and training;
- Community participation;
- Local economic benefits;
- Environmental protection;
- Long-term community development opportunities.

The consultation process further assisted in identifying local environmental concerns, community expectations, and socio-economic priorities associated with the proposed operation.

1.5.4 Environmental Baseline Assessment

Baseline environmental conditions within the project area were evaluated through integration of field observations, desktop information, and environmental interpretation methods.

The environmental baseline assessment considered:

- Climate and meteorological conditions;
- Topography and terrain;

- Geological and mineralization characteristics;
- Surface-water and drainage conditions;
- Groundwater conditions;
- Biodiversity and vegetation characteristics;
- Land-use activities;
- Socio-economic conditions;
- Heritage and archaeological sensitivity;
- Visual and landscape characteristics.

The baseline assessment further evaluated environmental sensitivities associated with:

- Semi-arid climatic conditions;
- Groundwater dependency;
- Ecological vulnerability;
- Communal grazing activities; and
- Long-term environmental sustainability considerations.

1.5.5 Environmental Impact Assessment Methodology

Potential environmental impacts associated with the proposed project were evaluated using a semi-quantitative numerical environmental risk-assessment methodology commonly applied within environmental assessments for mining and infrastructure developments.

The impact-assessment methodology considered:

- Nature of the impact;
- Extent of impact;
- Duration of impact;
- Intensity or severity;
- Probability of occurrence;
- Reversibility;
- Cumulative impact potential; and
- Confidence level associated with the assessment.

Environmental impacts were assessed for:

- Construction and site-establishment phases;

- Operational mining phases;
- Processing and transport activities;
- Rehabilitation activities;
- Closure and post-closure phases.

The significance of identified impacts was evaluated both:

- Before mitigation; and
- After implementation of mitigation measures.

1.5.6 Numerical Impact Scoring System

Environmental impacts were evaluated using numerical scoring criteria in order to determine the relative environmental significance of identified impacts.

The assessment methodology incorporated consideration of:

- Probability of occurrence;
- Consequence severity;
- Environmental sensitivity;
- Duration;
- Geographic extent; and
- Potential cumulative impacts.

Environmental significance ratings were generally classified as:

- Very Low;
- Low;
- Moderate;
- High; or
- Very High.

The numerical scoring methodology assisted in:

- Prioritizing environmental-management measures;
- Identifying high-risk operational activities;
- Supporting mitigation development;
- Improving environmental decision-making consistency.

1.5.7 Confidence Ranking

Confidence rankings were applied to the impact assessment in order to indicate the level of confidence associated with baseline information, field observations, and impact predictions.

Confidence rankings generally included:

- Low confidence;
- Medium confidence; and
- High confidence.

Confidence levels were influenced by:

- Availability of baseline information;
- Site accessibility;
- Existing geological information;
- Environmental variability;
- Operational planning detail available at the time of assessment.

1.5.8 Specialist Inputs

The Environmental Scoping Study recognized the potential need for specialist environmental inputs associated with specific environmental components.

At the time of assessment, a Heritage Impact Assessment was being prepared in support of the project.

The ESS further recognizes that additional specialist investigations may be undertaken during future operational phases where necessary, including:

- Groundwater investigations;
- Hydrogeological monitoring;
- Additional biodiversity investigations;
- Geotechnical investigations;
- Specialist operational assessments where required.

1.5.9 Limitations of the Assessment

This Environmental Scoping Study was undertaken based on information available at the time of assessment and reflects the conceptual operational design and project planning available during the study period.

Certain operational details may continue to evolve during future planning and implementation phases due to:

- The small-scale nature of the operation;
- Evolving mine planning;
- Ongoing exploration activities;
- Future operational optimization;
- Progressive project development.

The assessment further recognizes that:

- Seasonal environmental variability may influence certain environmental conditions;
- Additional baseline information may become available during future project phases; and
- Future specialist investigations may refine certain environmental-management recommendations.

Despite these limitations, sufficient information was available at the time of assessment to evaluate the principal environmental and socio-economic impacts associated with the proposed project and to develop appropriate mitigation and environmental-management measures applicable to the proposed operation.

1.6 ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

This Environmental Scoping Study (ESS) and accompanying Environmental Management Plan (EMP) were prepared by Augite Environmental Consultants CC, an independent Namibian environmental and geological consulting firm specializing in environmental assessment, mining environmental management, exploration support, environmental compliance, and integrated environmental-scientific consulting services.

Augite Environmental Consultants CC was established in 2021 and provides professional environmental and geological consulting services to the mining, energy, infrastructure, logistics, aquaculture, and renewable-energy sectors within Namibia. The company has developed experience in the preparation and management of:

- Environmental Scoping Studies (ESS);
- Environmental Impact Assessments (EIA);
- Environmental Management Plans (EMP);
- Environmental Clearance Certificate (ECC) applications;
- Mining and exploration environmental compliance programmes;
- Baseline environmental studies;
- Environmental monitoring programmes;
- Rehabilitation and closure planning; and
- Environmental risk-management frameworks.

The Environmental Assessment Practitioner (EAP) responsible for this assessment is Dr. Ismael Kangueehi, an environmental geochemist, researcher, and exploration geologist with extensive experience in environmental sciences, mining, exploration geology, and environmental-management consulting within Namibia.

Dr. Kangueehi holds a Doctorate (PhD) in Earth Sciences specializing in Environmental Geochemistry from Stellenbosch University, with academic specialization in:

- Environmental geochemistry;
- Metal mobility and contamination;
- Hydrogeochemistry;
- Environmental monitoring;
- Geological systems;
- Environmental risk evaluation; and
- Mining-related environmental processes.

The academic and professional background of the EAP is considered highly relevant to the proposed project due to the environmental sensitivities associated with:

- Precious-metals mining;
- Sulphide-hosted mineralization;
- Groundwater protection;
- Hazardous-material management;
- Controlled reagent usage; and
- Long-term rehabilitation and environmental monitoring requirements.

The EAP further possesses:

- More than 10 years of experience in environmental sciences;
- More than 10 years of experience in mining and exploration activities;
- More than 5 years of experience in environmental consulting;
- More than 5 years of experience in ESS, EIA, and EMP preparation and environmental-management planning.

Professional experience includes involvement in numerous projects associated with:

- Exploration and prospecting licences (EPLs);
- Small-scale and large-scale mining projects;
- Oil and gas logistics infrastructure;
- Aquaculture developments;
- Renewable-energy projects;
- Infrastructure developments; and
- Environmental regulatory compliance programmes within Namibia.

The EAP has further been involved in environmental and geological work associated with:

- Mining and exploration operations throughout Namibia;
- Oil and gas logistics hub developments in Lüderitz;
- Solar-energy developments including Osona, Naruchas, and Witputz solar projects;
- Aquaculture projects within the Lüderitz coastal environment;
- Environmental baseline investigations;
- Environmental monitoring programmes;
- Environmental risk assessments; and

- Community consultation processes.

Responsibilities undertaken by the EAP during this Environmental Scoping Study included:

- Project coordination;
- Site investigations and field assessments;
- Environmental baseline assessment;
- Geological and environmental interpretation;
- Public consultation and stakeholder engagement;
- Environmental impact assessment;
- Numerical environmental risk evaluation;
- Mitigation-measure development;
- Environmental Management Plan preparation;
- Environmental monitoring framework development; and
- Compilation of the Environmental Scoping Study documentation.

The Environmental Assessment Practitioner confirms that this assessment has been undertaken independently and objectively in accordance with professional environmental-assessment principles and applicable Namibian environmental legislation.

The findings, conclusions, and recommendations presented within this Environmental Scoping Study are based on:

- Site investigations;
- Available baseline information;
- Professional environmental and geological interpretation;
- Environmental risk-assessment methodologies; and
- The operational information available at the time of assessment.

The EAP declares that no circumstances exist that may compromise the objectivity, professional independence, or integrity of this assessment process.

This Environmental Scoping Study and Environmental Management Plan were prepared in accordance with:

- The Environmental Management Act, 2007 (Act No. 7 of 2007);
- The Environmental Impact Assessment Regulations, 2012;
- Applicable Namibian environmental legislation;
- Environmental best-practice principles; and

- Professional environmental-assessment standards applicable to mining and mineral-processing operations within Namibia.

1.7 APPLICABLE LEGAL AND POLICY FRAMEWORK

The proposed small-scale precious-metals mining operation by Okondjamo Mining Investments CC is subject to a range of national environmental, mining, water, health and safety, heritage, and hazardous-material management legislation applicable within the Republic of Namibia.

This Environmental Scoping Study (ESS) and accompanying Environmental Management Plan (EMP) have therefore been prepared in consideration of the relevant legal and policy requirements governing:

- Mining and mineral-processing activities;
- Environmental authorization;
- Groundwater protection;
- Hazardous-material management;
- Occupational health and safety;
- Biodiversity protection;
- Heritage-resource management;
- Waste management;
- Transport and infrastructure activities; and
- Environmental rehabilitation and closure obligations.

The legal and policy framework applicable to the proposed project is summarized below.

1.7.1 Environmental Management Act, 2007 (Act No. 7 of 2007)

The Environmental Management Act, 2007 and the associated Environmental Impact Assessment Regulations (Government Notice No. 30 of 2012) provide the primary environmental regulatory framework governing environmental assessment and environmental authorization within Namibia.

The Act requires that listed activities likely to have significant effects on the environment undergo environmental assessment prior to commencement of operations. Mining, mineral processing, hazardous-material handling, waste management, and infrastructure development activities associated with the proposed project are considered listed activities requiring environmental authorization.

The objectives of the Environmental Management Act include:

- Protection of the environment;
- Prevention of environmental degradation;

- Promotion of sustainable development;
- Protection of ecological processes;
- Responsible natural-resource utilization; and
- Environmental accountability.

In accordance with the Act, the proposed project requires an Environmental Clearance Certificate (ECC) prior to commencement of mining and operational activities.

1.7.2 Environmental Impact Assessment Regulations, 2012

The Environmental Impact Assessment Regulations establish the procedural requirements applicable to environmental assessment processes within Namibia.

The regulations govern:

- Public consultation procedures;
- Environmental assessment requirements;
- Environmental reporting;
- Environmental authorization procedures;
- Environmental-management planning;
- Submission requirements for Environmental Clearance applications.

The ESS and EMP have therefore been prepared in accordance with the requirements of the EIA Regulations.

1.7.3 Minerals (Prospecting and Mining) Act, 1992 (Act No. 33 of 1992)

The Minerals (Prospecting and Mining) Act governs mineral rights, mining operations, and mineral-development activities within Namibia.

The Act regulates:

- Mining claims and mineral rights;
- Mining operations;
- Mineral extraction activities;
- Operational safety requirements;
- Environmental responsibilities associated with mining activities; and
- Rehabilitation obligations associated with mining disturbances.

The proposed operation on Mining Claims MC76609, MC76610 and MC76611 shall therefore be undertaken in compliance with the provisions of the Minerals (Prospecting and Mining) Act and associated regulatory requirements.

1.7.4 Water Resources Management Act, 2013 (Act No. 11 of 2013)

The Water Resources Management Act governs the protection, management, and sustainable utilization of water resources within Namibia.

The proposed project will rely on groundwater abstraction for operational water supply and therefore requires careful groundwater management and protection throughout all phases of the project lifecycle.

The Act promotes:

- Sustainable water-resource management;
- Groundwater protection;
- Prevention of water pollution;
- Responsible water abstraction; and
- Long-term water-resource sustainability.

Due to the semi-arid environmental setting and groundwater dependency of surrounding communal communities, groundwater protection has been identified as a priority environmental-management objective for the proposed project.

The project shall therefore implement:

- Groundwater-monitoring programmes;
- Controlled reagent management;
- Hazardous-material containment systems;
- Stormwater-management systems; and
- Spill-prevention procedures.

1.7.5 Hazardous Substances and Chemical Management Legislation

The proposed project will involve controlled handling and storage of:

- Diesel and hydrocarbons;
- Sulphuric acid;
- Thiosulfate and thiourea reagents; and
- Limited cyanide use where operationally necessary.

Consequently, hazardous-material management legislation and applicable chemical-handling regulations are relevant to the project.

The project shall implement:

- Bunded hazardous-material storage areas;
- Spill-containment systems;
- Controlled chemical-handling procedures;
- Emergency-response systems;
- Hazardous-material training programmes; and
- Environmental monitoring procedures.

The project has further committed to:

- Mercury-free processing methods;
- Reduced cyanide dependency;
- Controlled reagent handling;
- Minimal chemical usage where feasible; and
- Reduced environmental risk processing systems.

1.7.6 Labour Act, 2007 (Act No. 11 of 2007)

The Labour Act governs occupational health, worker safety, labour relations, and workplace conditions within Namibia.

The proposed project shall implement:

- Occupational health and safety procedures;
- Employee training programmes;
- Personal protective equipment (PPE);
- Emergency-response procedures;
- Worker safety protocols; and
- Hazardous-material handling procedures.

Particular attention shall be given to:

- Heavy-equipment operation;
- Chemical handling;
- Dust exposure;

- Heat stress;
- Blasting safety; and
- Operational hazard management.

1.7.7 National Heritage Act, 2004 (Act No. 27 of 2004)

The National Heritage Act governs the protection and management of archaeological, historical, and cultural heritage resources within Namibia.

A Heritage Impact Assessment is currently being prepared in support of the proposed project.

The project shall further implement:

- Chance-find procedures;
- Heritage reporting procedures;
- Work stoppage procedures where heritage materials are encountered.

No known graves, archaeological structures, or cultural heritage features were identified during preliminary site investigations.

1.7.8 Nature Conservation and Biodiversity Protection

The proposed project area falls within a communal semi-arid environment associated with the broader Ombujokanguindi Conservancy region.

Environmental-management measures shall therefore aim to:

- Minimize vegetation disturbance;
- Reduce habitat fragmentation;
- Prevent unnecessary wildlife disturbance;
- Protect surrounding ecological systems; and
- Support progressive rehabilitation.

The relatively small operational footprint and controlled operational design significantly reduce large-scale biodiversity disturbance potential compared to conventional large-scale mining developments.

1.7.9 Roads, Transport and Hazardous Material Transportation

The project will involve transport of:

- Ore materials;

- Diesel;
- Operational supplies;
- Limited controlled chemical reagents.

Transport activities shall therefore comply with applicable road-transport and hazardous-material transportation requirements.

The project shall implement:

- Controlled transport procedures;
- Speed limitations;
- Spill-response procedures;
- Driver safety requirements; and
- Hazardous-material transport controls where applicable.

No night driving is proposed as part of the operational transport strategy.

1.7.10 International Best-Practice Guidelines

In addition to Namibian legal requirements, the project has considered relevant international environmental-management principles and best-practice mining guidelines applicable to small-scale precious-metals mining operations.

These include:

- IFC Performance Standards on Environmental and Social Sustainability;
- IFC Environmental, Health and Safety Guidelines for Mining;
- Responsible mining principles;
- Sustainable mineral-development principles;
- Mercury-free gold-processing approaches;
- Environmental risk-minimization principles.

The proposed project has specifically been designed around:

- Reduced environmental footprints;
- Gravity-assisted mineral recovery;
- Mercury-free processing;
- Controlled reagent usage;
- Dry-stack residue management;

- Progressive rehabilitation; and
- Zero-liquid-discharge operational objectives where feasible.

1.7.11 Legal Compliance Commitment

Okondjamo Mining Investments CC commits to undertaking the proposed project in compliance with:

- Applicable Namibian environmental legislation;
- Mining and occupational safety requirements;
- Environmental authorization conditions;
- Environmental Management Plan commitments;
- Groundwater-protection obligations; and
- Environmental monitoring and rehabilitation requirements.

Environmental compliance shall further be supported through:

- Environmental auditing;
- Environmental monitoring programmes;
- Compliance reporting;
- Environmental inspections; and
- Ongoing environmental-management implementation throughout all phases of the project lifecycle.

Chapter 2- Project Description

2.1 OVERVIEW OF THE PROPOSED OPERATION

Okondjamo Mining Investments CC proposes to undertake a small-scale hard-rock precious-metals mining operation on Mining Claims MC76609, MC76610 and MC76611 situated within the Kunene Region of north-western Namibia. The proposed operation will focus primarily on the extraction and recovery of gold, while copper and silver will be recovered as secondary by-products where economically viable.

The project is designed as a relatively low-footprint, environmentally controlled mining operation utilizing predominantly gravity-assisted mineral-recovery systems in combination with limited controlled chemical-assisted recovery methods where operationally necessary. The operational philosophy of the project emphasizes reduced environmental disturbance, mercury-free mineral processing, controlled reagent usage, progressive rehabilitation, and minimization of long-term environmental liabilities commonly associated with conventional large-scale gold-mining operations.

The proposed mining activities will involve small-scale open-pit mining targeting structurally controlled and sulphide-hosted mineralized zones associated with quartz and carbonate veining systems. Mining activities will primarily utilize excavators, manual ore sorting, temporary stockpiling, limited contractor-controlled blasting, and haulage of ore materials to the processing area.

The operation is expected to process approximately 50 tonnes of ore per day through a combination of:

- Crushing and size reduction;
- Gravity concentration and physical separation systems;
- Controlled mineral recovery circuits; and
- Limited supplementary chemical-assisted recovery methods where necessary.

The proposed processing system has been intentionally designed to prioritize gravity-assisted physical separation techniques as the primary gold-recovery mechanism. This significantly reduces dependency on intensive chemical-processing systems and minimizes the generation of large conventional tailings streams.

Unlike conventional gold-processing operations that rely heavily on cyanide-intensive leaching systems and large wet tailings-storage facilities, the proposed operation intends to implement:

- Mercury-free processing methods;
- Reduced cyanide dependency;
- Controlled reagent use;
- Dry-stack and reusable residue handling;

- Minimal liquid process discharge;
- Small operational processing footprints; and
- Progressive environmental rehabilitation.

Controlled chemical-assisted recovery methods may occasionally be utilized where operationally necessary in order to improve gold recovery from sulphide-hosted mineralization. These methods may include limited and controlled use of:

- Thiosulfate;
- Thiourea;
- Minor cyanide applications under controlled conditions; and
- Sulphuric acid in limited applications associated with sulphide-hosted mineralized material.

The project intends to minimize environmental risks associated with chemical usage through:

- Controlled reagent storage;
- Bunded containment systems;
- HDPE-lined processing infrastructure;
- Spill-prevention systems;
- Controlled operational procedures;
- Groundwater monitoring; and
- Environmental auditing and inspection programmes.

The proposed operation will include several supporting infrastructure components necessary for operational activities. These include:

- Open-pit mining areas;
- Ore stockpile areas;
- Crushing and processing infrastructure;
- Gravity concentration systems;
- Water-storage facilities;
- Fuel-storage facilities;
- Hazardous-material storage areas;
- Waste-management areas;
- Camp and accommodation facilities;
- Operational access roads; and

- Temporary support infrastructure.

The processing area is expected to occupy an estimated footprint of approximately 1 hectare, while the heap-leach or controlled recovery area is expected to remain relatively small at approximately 50 metres by 50 metres. Temporary stockpiles are expected to remain relatively low-profile, generally between approximately 2 and 3 metres in height, in order to minimize visual and environmental disturbance.

Groundwater abstracted from local borehole systems will provide the primary water supply for operational activities. Water-management systems will prioritize water recycling and reuse throughout the processing circuit in order to reduce overall water demand within the semi-arid environment. A zero-liquid-discharge operational philosophy will further be pursued where feasible in order to minimize the risk of uncontrolled process-water release into the surrounding environment.

Operational power supply will primarily be generated through diesel-powered generators supported by above-ground fuel-storage infrastructure with appropriate containment systems. Operational activities are expected to occur throughout the year during daytime operational hours, generally between 07:00 and 17:00.

Ore produced from the operation will be transported periodically by truck through Opuwo and onward toward Walvis Bay for export purposes. Transport activities are expected to remain relatively small-scale, with approximately five 30-ton side-tipper truck movements anticipated per week. No night-time transport activities are proposed.

The project is expected to provide several positive socio-economic benefits to surrounding communal communities within the Kunene Region through:

- Employment creation;
- Skills transfer and operational training;
- Local procurement opportunities;
- Contractor participation;
- Regional economic stimulation; and
- Government tax and royalty contributions.

Approximately 10 workers are expected during initial operational phases, increasing progressively to approximately 50 employees during full operational stages. Preference is expected to be given to local employment opportunities where possible.

From an environmental perspective, the proposed operation has been intentionally designed to remain relatively small-scale, operationally controlled, and environmentally manageable through:

- Reduced disturbance footprints;
- Controlled mining activities;

- Gravity-assisted processing systems;
- Reduced chemical dependency;
- Groundwater protection systems;
- Controlled waste management;
- Progressive rehabilitation; and
- Long-term environmental monitoring commitments.

The overall operational approach adopted for the proposed project is therefore intended to support environmentally responsible and operationally sustainable small-scale precious-metals mining within the semi-arid communal environment of the Kunene Region.

2.2 PROJECT INFRASTRUCTURE AND LAYOUT

The proposed small-scale precious-metals mining operation has been designed around a relatively compact and environmentally controlled operational layout intended to minimize unnecessary land disturbance, reduce environmental risks, and improve operational efficiency within the rugged semi-arid environment of the Kunene Region.

The overall project infrastructure footprint will consist of several integrated operational components associated with mining, ore processing, water supply, fuel storage, hazardous-material management, waste management, accommodation, transport, and environmental-control systems. The operational layout has been planned to take advantage of existing topographical conditions, existing access routes, and naturally accessible valley systems in order to minimize excavation requirements and reduce unnecessary environmental disturbance.

The proposed infrastructure layout generally includes:

- Open-pit mining areas;
- Temporary ore stockpile areas;
- Waste-rock storage areas;
- Crushing and gravity-processing infrastructure;
- Controlled reagent handling and storage areas;
- Water-storage facilities;
- Fuel-storage facilities;
- Camp and support infrastructure;
- Waste-management areas;
- Operational access roads;
- Environmental-control infrastructure; and
- Rehabilitation areas.

The proposed infrastructure arrangement has further been designed to:

- Reduce environmental risk exposure;
- Improve stormwater management;
- Minimize contamination pathways;
- Separate hazardous operational areas;
- Reduce erosion potential; and
- Facilitate progressive rehabilitation throughout operational phases.

2.2.1 Mining Areas

Mining activities will be concentrated within relatively small open-pit excavation areas targeting structurally controlled and sulphide-hosted mineralized zones associated with quartz and carbonate veining systems.

The mining areas will include:

- Excavation zones;
- Temporary ore stockpile areas;
- Waste-rock handling areas;
- Topsoil-storage areas; and
- Haulage and operational movement corridors.

Operational excavation activities will primarily utilize:

- Excavators;
- Small-scale haulage equipment;
- Manual ore sorting; and
- Limited contractor-controlled blasting where required.

Waste rock generated during mining activities will be placed within designated low-profile waste-rock storage areas situated approximately 500 metres from the primary pit areas in locations selected to minimize drainage interaction and reduce erosion risks.

Topsoil removed during site preparation and excavation activities will be stripped separately and preserved for progressive rehabilitation and closure activities.

2.2.2 Processing Area

The proposed processing infrastructure will occupy an estimated footprint of approximately 1 hectare and will form the operational core of the mineral-recovery system.

The processing area will include:

- Crushing and screening infrastructure;
- Gravity concentration systems;
- Controlled mineral-recovery circuits;
- Temporary concentrate handling areas;
- Controlled reagent handling areas;
- Water-recycling infrastructure;

- Residue-management areas; and
- Environmental containment systems.

The operational design philosophy emphasizes gravity-assisted mineral recovery as the principal processing mechanism in order to reduce chemical dependency and minimize environmental risks associated with conventional gold-processing operations.

Ore-processing activities will therefore primarily involve:

- Crushing and size reduction;
- Physical separation and gravity concentration;
- Concentrate recovery; and
- Limited controlled chemical-assisted recovery where operationally necessary.

The processing layout has further been designed to:

- Reduce contamination risks;
- Improve operational containment;
- Support water recycling;
- Minimize liquid discharge;
- Improve operational housekeeping; and
- Reduce long-term environmental liabilities.

2.2.3 Controlled Reagent and Hazardous-Material Storage Areas

Controlled reagent storage and hazardous-material handling areas will be established within specifically designated operational zones separated from major drainage pathways and environmentally sensitive areas.

Hazardous materials anticipated onsite may include:

- Sulphuric acid;
- Thiosulfate reagents;
- Thiourea reagents;
- Limited cyanide quantities where operationally necessary;
- Diesel and hydrocarbons;
- Lubricants and operational chemicals.

The hazardous-material storage areas will incorporate:

- Bunded containment systems;

- Impermeable concrete flooring;
- Spill-containment systems;
- Controlled access;
- Emergency-response equipment;
- Safety signage; and
- Controlled chemical-handling procedures.

All hazardous-material storage infrastructure will be designed to minimize:

- Groundwater contamination risks;
- Soil contamination;
- Stormwater interaction;
- Spill migration pathways; and
- Operational safety risks.

The project further commits to:

- Mercury-free processing methods;
- Reduced cyanide dependency;
- Controlled reagent usage;
- Minimal onsite chemical storage volumes; and
- Strict hazardous-material management procedures.

2.2.4 Water Supply and Water-Storage Infrastructure

Operational water supply will primarily be sourced from groundwater abstraction through local borehole systems.

Water-storage infrastructure proposed for the project includes:

- A 100,000-litre operational water bladder;
- Additional 3 × 10,000-litre water-storage tanks for emergency and firewater supply; and
- Water-recycling and process-water management infrastructure.

The water-management system has been designed to:

- Minimize water consumption;
- Promote water recycling and reuse;

- Reduce groundwater abstraction pressure;
- Prevent uncontrolled water discharge; and
- Support zero-liquid-discharge operational objectives where feasible.

Water infrastructure will further be positioned to:

- Avoid major drainage pathways;
- Minimize erosion potential;
- Improve stormwater control; and
- Reduce contamination risks associated with operational activities.

2.2.5 Fuel Storage and Power Supply Infrastructure

Power supply for the proposed operation will primarily be generated through diesel-powered generators, including:

- A primary 100 kVA generator; and
- A secondary backup generator.

Diesel storage infrastructure will consist of above-ground fuel-storage tanks positioned on impermeable concrete slabs with appropriate spill-containment systems.

The fuel-storage areas will incorporate:

- Bunding systems;
- Spill kits;
- Fire-prevention equipment;
- Controlled access; and
- Operational safety signage.

Fuel infrastructure will be located away from major drainage pathways and environmentally sensitive areas in order to reduce contamination risks.

Most major machinery maintenance activities are expected to occur offsite where feasible, with only limited operational servicing and inspections anticipated onsite.

2.2.6 Camp and Support Infrastructure

Temporary camp and support infrastructure will be established to support operational personnel during mining activities.

The camp infrastructure is expected to occupy an estimated footprint of approximately 0.5 hectares and will include:

- Prefabricated accommodation structures;
- Temporary tented facilities where necessary;
- Kitchen and cooking facilities;
- Ablution and shower facilities;
- Operational offices;
- Storage areas;
- Security infrastructure; and
- Communication systems.

The camp area will be fenced and controlled in order to:

- Improve operational safety;
- Prevent unauthorized access;
- Improve waste management; and
- Reduce wildlife interaction with operational activities.

Communication infrastructure may include:

- Two-way radio systems;
- Satellite communication systems;
- Garmin inReach communication devices; and
- Cellular communication where coverage is available.

2.2.7 Access Roads and Transport Corridors

The proposed operation intends to utilize existing access roads and tracks wherever possible in order to minimize environmental disturbance and reduce unnecessary land-clearing requirements.

Operational road design will prioritize:

- Utilization of natural valley systems;
- Reduced excavation requirements;
- Minimal vegetation clearing;
- Reduced erosion potential; and

- Improved stormwater control.

Access roads are expected to remain relatively narrow, generally following existing disturbed pathways where feasible.

Operational speed limits onsite will generally not exceed 40 km/hr and speed-control measures including speed humps may be implemented where necessary to:

- Improve safety;
- Reduce dust generation;
- Reduce wildlife collision risks; and
- Improve operational traffic management.

No night-time transport activities are proposed.

2.2.8 Waste Management Areas

Designated waste-management areas will be established within controlled fenced operational zones.

Waste-management infrastructure will include:

- General waste-storage areas;
- Hazardous-waste storage areas;
- Scrap-metal storage areas;
- Used-oil storage facilities; and
- Residue-management areas.

Waste-management systems will incorporate:

- Waste segregation;
- Hazardous-material containment;
- Recycling where feasible;
- Controlled disposal procedures; and
- Weekly waste removal to approved disposal facilities within Opuwo.

The project further intends to implement:

- Dry-stack residue management;
- Minimal liquid waste generation;
- Controlled operational housekeeping; and

- Progressive rehabilitation of disturbed operational areas.

2.2.9 Environmental Infrastructure Design Philosophy

The overall infrastructure layout for the proposed project has been designed around an environmentally controlled operational philosophy emphasizing:

- Reduced disturbance footprints;
- Controlled operational zones;
- Groundwater protection;
- Reduced chemical dependency;
- Compartmentalized hazardous-material handling;
- Dry residue management;
- Stormwater control;
- Progressive rehabilitation; and
- Long-term environmental stability.

The relatively small operational footprint, controlled infrastructure placement, utilization of existing access routes, and environmentally conscious operational design significantly reduce the potential for large-scale environmental disturbance commonly associated with conventional mining developments.

2.3 Mining Methodology

The proposed mining operation will involve small-scale hard-rock open-pit mining targeting structurally controlled and sulphide-hosted precious-metals mineralization associated with quartz and carbonate veining systems within Mining Claims MC76609, MC76610 and MC76611.

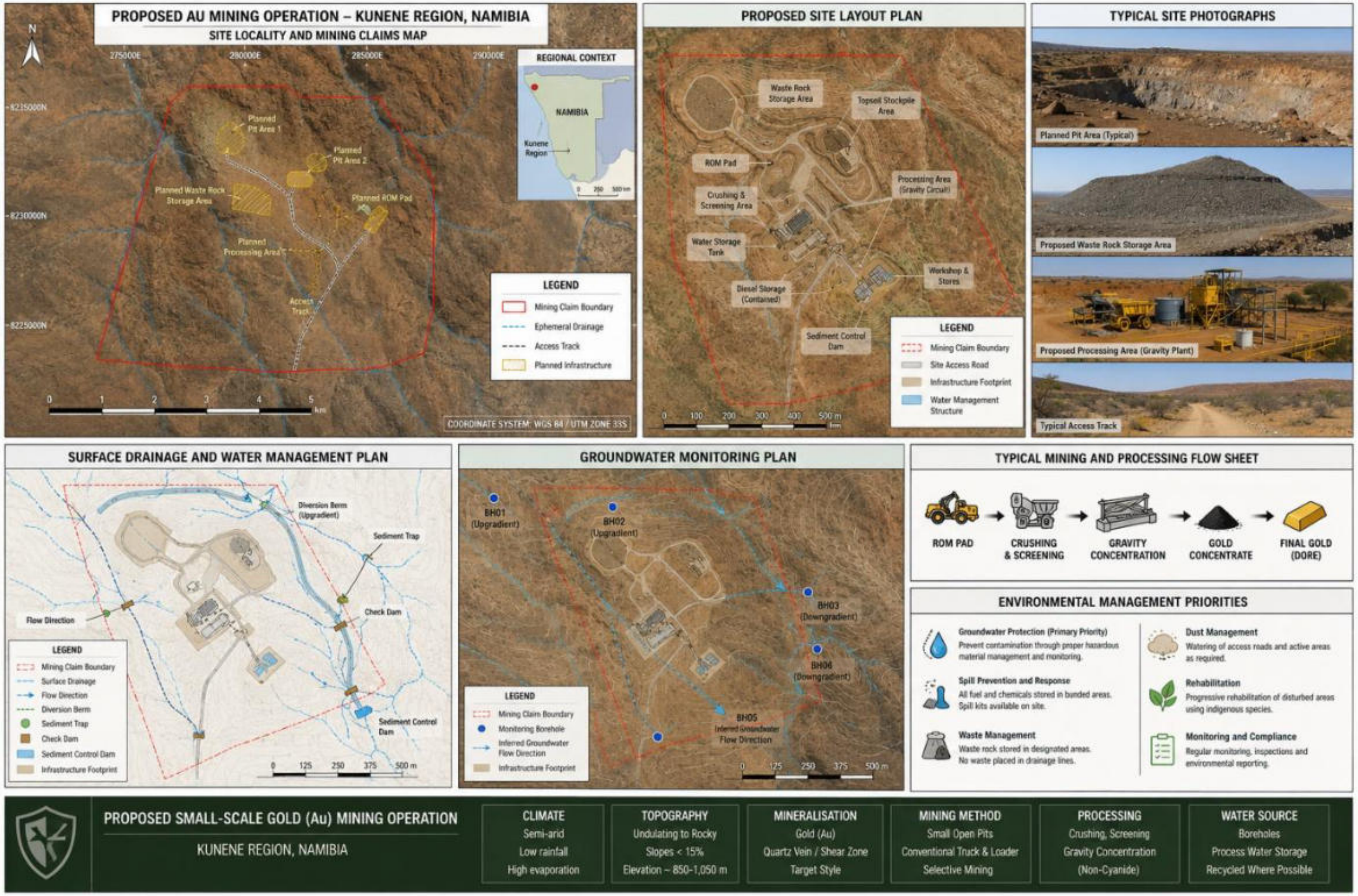

Figure 2. The mining operation for this mining claims, showing all the activities at different stages.

Mining activities will focus primarily on the extraction of gold-bearing mineralized material, while copper and silver may be recovered as secondary by-products where economically viable. The mining approach has been designed to remain relatively selective and low-impact in order to minimize unnecessary disturbance within the semi-arid communal environment of the Kunene Region.

The proposed operation will primarily utilize:

- Excavator-assisted mining;
- Manual ore sorting;
- Small-scale haulage activities;
- Temporary stockpiling;
- Controlled contractor-based blasting where necessary; and
- Selective mining methods targeting mineralized zones.

The operation is expected to mine and process approximately 50 tonnes of ore per day, thereby maintaining a relatively small operational footprint compared to conventional large-scale mining operations.

Mining activities will occur throughout the year during daytime operational hours, generally between 07:00 and 17:00.

2.3.1 Open-Pit Mining Approach

Mining activities will primarily be undertaken through shallow open-pit excavation methods following mineralized structures and ore-bearing zones identified during exploration and field investigations.

The mining philosophy emphasizes:

- Targeted extraction;
- Reduced overburden removal;
- Controlled excavation;
- Reduced waste generation;
- Minimal disturbance footprints; and
- Progressive rehabilitation.

The open pits are expected to remain relatively small-scale and operationally controlled throughout the life of the project.

Mining faces and excavation areas will be developed incrementally according to:

- Ore continuity;

- Geological controls;
- Structural orientation of mineralization;
- Operational safety considerations; and
- Environmental-management requirements.

Mining activities will utilize approximately 30-ton excavators for excavation and ore handling activities.

2.3.2 Blasting Activities

Limited blasting activities may occasionally be required where hard-rock conditions restrict mechanical excavation efficiency.

Blasting activities will:

- Be contractor-controlled;
- Utilize controlled blasting procedures;
- Be limited to operationally necessary areas only; and
- Be undertaken in accordance with applicable mining safety regulations.

Explosives storage facilities, where required, will be positioned within designated secure areas situated away from operational infrastructure, camp facilities, and environmentally sensitive areas.

Blasting activities are expected to remain relatively limited due to:

- The small-scale nature of the operation;
- Selective mining methods;
- Targeted extraction philosophy; and
- Operational preference for controlled excavation where feasible.

Operational controls associated with blasting activities will include:

- Controlled blasting schedules;
- Restricted access during blasting;
- Dust-control measures where feasible;
- Safety perimeter establishment; and
- Contractor safety compliance.

2.3.3 Ore Handling and Stockpiling

Excavated ore material will be transported from mining areas to temporary stockpile zones prior to crushing and processing activities.

Ore stockpiles will:

- Remain temporary in nature;
- Generally remain between approximately 2 and 3 metres in height;
- Be positioned within designated operational areas;
- Be managed to minimize runoff and erosion; and
- Be progressively processed where feasible.

The project aims to minimize prolonged ore accumulation onsite in order to:

- Reduce dust generation;
- Improve operational efficiency;
- Reduce visual impacts; and
- Minimize stormwater interaction with operational materials.

Ore handling activities will further include:

- Manual ore sorting;
- Selective grade control;
- Temporary material separation; and
- Controlled haulage to the processing area.

2.3.4 Waste Rock Management

Waste rock generated during excavation activities will be transported to designated waste-rock storage areas situated approximately 500 metres from active pit areas.

Waste-rock management areas have been selected in order to:

- Avoid major drainage pathways;
- Reduce erosion risks;
- Minimize stormwater interaction;
- Reduce visual impacts; and
- Facilitate future rehabilitation activities.

The waste-rock storage areas will remain relatively low-profile and controlled throughout operational phases.

Waste rock generated during mining activities is expected to remain relatively limited due to:

- The selective mining philosophy;
- Small operational scale;
- Structurally controlled mineralization targeting; and
- Reduced overburden-removal requirements.

Waste-rock areas will further be managed to:

- Reduce sediment movement;
- Improve slope stability;
- Minimize erosion;
- Prevent uncontrolled runoff; and
- Facilitate progressive rehabilitation.

2.3.5 Topsoil Management

Topsoil removal associated with pit development, road upgrades, processing infrastructure, and support facilities will be undertaken separately from waste-rock handling activities.

Preserved topsoil will be stockpiled within designated areas for future rehabilitation and closure activities.

The project recognizes the environmental importance of preserving topsoil resources within the semi-arid environment due to:

- Slow natural vegetation recovery;
- Low organic-matter content;
- Limited soil development; and
- Ecological sensitivity associated with drought-prone environments.

Topsoil stockpiles will therefore be:

- Clearly demarcated;
- Protected from unnecessary disturbance;
- Positioned away from drainage pathways where feasible; and
- Utilized progressively during rehabilitation activities.

2.3.6 Haulage and Operational Movement

Operational haulage activities within the mining area will primarily involve:

- Excavator movement;
- Small-scale ore transport;
- Material handling;
- Waste-rock movement; and
- Limited truck access to mining and stockpile areas.

Most operational traffic will occur between:

- Mining pits;
- Temporary stockpiles;
- Processing areas; and
- Waste-management areas.

Operational roads and haulage pathways will primarily utilize:

- Existing disturbed routes;
- Natural valley systems; and
- Existing access tracks where feasible.

Operational speed limits onsite will generally not exceed 40 km/hr in order to:

- Reduce dust generation;
- Improve safety;
- Reduce erosion potential; and
- Minimize wildlife disturbance.

No night-time mining or haulage activities are proposed.

2.3.7 Progressive Rehabilitation During Mining

The proposed operation adopts a progressive rehabilitation philosophy aimed at minimizing long-term environmental disturbance throughout operational phases.

Progressive rehabilitation measures may include:

- Recontouring disturbed surfaces;
- Stabilization of inactive operational areas;
- Topsoil redistribution;

- Surface drainage management;
- Vegetation re-establishment where feasible; and
- Removal of unnecessary operational disturbance.

The project intends to progressively rehabilitate disturbed areas where operationally practical rather than postponing rehabilitation entirely until closure.

This approach significantly reduces:

- Long-term erosion risks;
- Visual impacts;
- Dust generation;
- Surface instability; and
- Long-term environmental liabilities.

2.3.8 Mining Philosophy and Environmental Approach

The overall mining methodology has been designed around:

- Small-scale selective mining;
- Reduced environmental disturbance;
- Controlled operational footprints;
- Reduced waste generation;
- Progressive rehabilitation;
- Groundwater protection;
- Operational safety; and
- Long-term environmental sustainability.

The proposed mining approach therefore differs substantially from conventional large-scale mining operations due to its:

- Reduced production scale;
- Controlled excavation approach;
- Limited blasting requirements;
- Reduced infrastructure footprint;
- Lower waste-generation volumes; and
- Environmentally controlled operational philosophy.

2.4 Ore Processing and Recovery System

The proposed operation will utilize a predominantly gravity-assisted mineral-processing and precious-metals recovery system specifically designed to minimize environmental impacts, reduce chemical dependency, and support environmentally responsible small-scale gold recovery within the semi-arid environment of the Kunene Region.

The processing system will focus primarily on the recovery of gold from structurally controlled and sulphide-hosted hard-rock mineralization, while copper and silver may be recovered as secondary by-products where economically viable.

The overall processing philosophy has been intentionally designed around:

- Gravity-assisted physical separation;
- Mercury-free gold recovery;
- Reduced cyanide dependency;
- Controlled reagent usage;
- Dry-stack and reusable residue management;
- Water recycling and reuse;
- Zero-liquid-discharge operational objectives where feasible; and
- Reduced long-term environmental liabilities.

The proposed processing infrastructure is expected to occupy an estimated operational footprint of approximately 1 hectare and will include:

- Crushing and size-reduction infrastructure;
- Gravity concentration systems;
- Controlled mineral-recovery circuits;
- Temporary concentrate handling areas;
- Controlled reagent handling and storage areas;
- Water-recycling systems;
- Residue-management areas; and
- Environmental containment systems.

2.4.1 Crushing and Size Reduction

Excavated ore material transported from the mining pits will initially undergo crushing and size reduction prior to mineral recovery processes.

The crushing circuit is expected to operate at an approximate processing capacity of approximately 5 tonnes per hour (tph).

Crushing activities will:

- Improve mineral liberation;
- Increase gravity recovery efficiency;
- Improve concentrate separation;
- Enhance operational recovery performance.

The crushing system will primarily be powered through diesel-powered generators forming part of the onsite operational power infrastructure.

Dust suppression and operational housekeeping measures will be implemented throughout crushing activities in order to minimize:

- Dust generation;
- Wind dispersion of fine material;
- Worker exposure;
- Operational contamination risks.

Crushing infrastructure will further be positioned within controlled operational areas designed to:

- Reduce runoff interaction;
- Improve material containment;
- Improve stormwater management; and
- Facilitate progressive rehabilitation.

2.4.2 Gravity-Assisted Mineral Recovery

Gravity-assisted physical separation will form the principal mineral-recovery mechanism for the proposed operation.

The gravity-recovery system is intended to maximize gold recovery while minimizing environmental risks associated with conventional chemically intensive gold-processing operations.

The gravity concentration system may include:

- Gravity concentrators;
- Shaking tables;
- Physical separation systems;
- Concentrate recovery units; and

- Manual concentrate upgrading where necessary.

The gravity-processing philosophy significantly reduces:

- Chemical consumption;
- Liquid process waste;
- Tailings generation;
- Groundwater contamination risks;
- Long-term environmental liabilities.

The operation has further committed to:

- Mercury-free processing methods;
- Reduced reagent dependency;
- Small-scale controlled recovery systems; and
- Minimal process-water discharge.

Gravity-assisted recovery methods are considered particularly appropriate for the proposed operation due to:

- Structurally controlled mineralization;
- Sulphide-hosted gold occurrences;
- Relatively small operational scale;
- Reduced environmental footprint objectives; and
- Controlled production targets.

2.4.3 Controlled Chemical-Assisted Recovery

Although gravity concentration will remain the principal recovery mechanism, limited controlled chemical-assisted recovery methods may occasionally be utilized where operationally necessary in order to improve precious-metals recovery from sulphide-hosted mineralized material.

Controlled reagents that may be utilized include:

- Thiosulfate;
- Thiourea;
- Limited cyanide applications under controlled conditions; and
- Sulphuric acid in limited applications associated with sulphide-hosted ore treatment.

The project intends to minimize reliance on conventional cyanide-intensive recovery systems and instead prioritize environmentally lower-risk alternatives wherever operationally feasible.

The operational philosophy specifically emphasizes:

- Reduced cyanide dependency;
- Controlled reagent storage;
- Limited reagent volumes;
- Strict operational supervision;
- Environmental containment systems; and
- Groundwater protection.

Cyanide usage, where operationally necessary, is expected to remain:

- Limited in scale;
- Controlled operationally;
- Restricted to designated processing zones; and
- Subject to strict environmental-management procedures.

The operation further commits to:

- No mercury usage;
- Controlled chemical handling;
- Spill-prevention systems;
- Emergency-response procedures; and
- Environmental monitoring programmes.

2.4.4 Controlled Recovery and Containment Areas

The proposed controlled recovery area or small recovery pad is expected to occupy an estimated footprint of approximately 50 metres by 50 metres.

The processing and recovery areas will incorporate:

- HDPE-lined containment systems where necessary;
- Controlled drainage systems;
- Bunded operational areas;
- Spill-containment measures;
- Water-collection systems; and

- Stormwater-diversion infrastructure.

The operational design philosophy aims to:

- Prevent uncontrolled seepage;
- Protect groundwater resources;
- Reduce soil contamination risks;
- Improve operational containment; and
- Support zero-liquid-discharge objectives where feasible.

The relatively small processing footprint substantially reduces:

- Long-term contamination risks;
- Large-scale residue generation;
- Surface disturbance;
- Rehabilitation liabilities.

2.4.5 Water Recycling and Zero-Liquid-Discharge Philosophy

The proposed operation intends to maximize water recycling and reuse throughout the mineral-processing circuit.

Process water will be recirculated wherever operationally feasible in order to:

- Reduce groundwater demand;
- Minimize operational water consumption;
- Reduce wastewater generation;
- Improve environmental sustainability.

The processing system has been conceptually designed around a zero-liquid-discharge operational philosophy where feasible, meaning:

- Process water will remain within controlled operational circuits;
- Uncontrolled liquid discharge to the surrounding environment will be minimized;
- Water reuse and recycling will be prioritized throughout operational phases.

The proposed water-management philosophy significantly reduces:

- Groundwater contamination risks;
- Surface-water contamination risks;
- Process-water discharge liabilities;

- Long-term environmental impacts.

2.4.6 Residue and Material Management

The proposed operation does not intend to establish large conventional wet tailings-storage facilities commonly associated with large-scale gold operations.

Instead, residue management will focus primarily on:

- Dry-stack residue handling;
- Controlled material reuse where feasible;
- Reduced liquid waste generation;
- Small-scale residue containment systems.

Residue generated during gravity concentration and controlled recovery activities is expected to remain relatively limited due to:

- The gravity-dominant recovery philosophy;
- Small operational scale;
- Reduced processing throughput;
- Controlled reagent usage.

The residue-management philosophy has been designed to:

- Reduce environmental liabilities;
- Improve rehabilitation potential;
- Reduce seepage risks;
- Improve operational stability; and
- Support long-term environmental management objectives.

2.4.7 Environmental Processing Philosophy

The proposed processing and recovery system has been specifically designed around an environmentally controlled operational philosophy emphasizing:

- Gravity-assisted mineral recovery;
- Reduced chemical dependency;
- Mercury-free processing;
- Groundwater protection;

- Controlled reagent handling;
- Dry-stack residue management;
- Water recycling and reuse;
- Reduced environmental footprints; and
- Progressive rehabilitation.

The relatively small-scale and controlled nature of the proposed processing operation substantially reduces environmental risks commonly associated with conventional large-scale precious-metals processing facilities.

Consequently, the proposed recovery system is considered environmentally manageable provided that all environmental controls, mitigation measures, operational procedures, and monitoring requirements outlined within the Environmental Management Plan are fully implemented throughout operational phases.

2.5 Water Supply and Water Use

Water required for the proposed small-scale precious-metals mining operation will primarily be sourced from groundwater abstraction through local borehole systems within the broader project area. Groundwater will provide the principal water supply for:

- Ore processing activities;
- Dust suppression;
- Camp and domestic use;
- Equipment cleaning;
- Operational activities; and
- Emergency and firewater supply.

Due to the semi-arid climatic conditions and groundwater dependency associated with surrounding communal communities within the Kunene Region, responsible water management and groundwater protection have been identified as priority environmental-management objectives for the proposed operation.

The proposed operational water-management philosophy emphasizes:

- Reduced water consumption;
- Water recycling and reuse;
- Controlled water distribution;
- Groundwater protection;
- Minimal wastewater generation;
- Controlled process-water circulation; and
- Zero-liquid-discharge operational objectives where feasible.

2.5.1 Groundwater Supply

Operational water supply will primarily be abstracted from borehole infrastructure within the surrounding area.

Groundwater conditions within the project area are generally characterized by:

- Freshwater quality;
- Moderate to strong borehole yields;
- Groundwater dependency within surrounding communal areas; and
- Relatively deep groundwater occurrence estimated at approximately 100 metres below surface.

The proposed operational abstraction rate is expected to remain relatively moderate due to:

- The small-scale nature of the operation;
- Gravity-assisted processing methods;
- Water recycling systems;
- Reduced processing throughput; and
- Controlled operational water demand.

The operation recognizes the environmental importance of protecting groundwater resources within the drought-prone communal environment and therefore commits to:

- Controlled groundwater abstraction;
- Groundwater-quality monitoring;
- Spill-prevention systems;
- Controlled reagent handling;
- Water-use efficiency measures; and
- Long-term groundwater protection programmes.

2.5.2 Operational Water Use

Water will primarily be utilized within the following operational components:

- Crushing and processing activities;
- Gravity concentration systems;
- Controlled recovery circuits;
- Dust suppression;
- Domestic camp usage;
- Cleaning and operational maintenance;
- Emergency-response and firewater systems.

Water demand associated with the proposed operation is expected to remain relatively low compared to conventional large-scale gold-processing facilities due to:

- The relatively small operational scale;
- Gravity-assisted recovery philosophy;
- Reduced chemical-processing requirements;
- Dry-stack residue management;

- Reduced liquid tailings generation.

The proposed operation therefore substantially reduces operational water demand compared to conventional cyanide-intensive gold-processing operations.

2.5.3 Water Storage Infrastructure

Operational water storage infrastructure proposed for the project includes:

- One 100,000-litre operational water bladder; and
- Three additional 10,000-litre tanks designated for emergency and firewater supply.

Water-storage infrastructure will be positioned within controlled operational areas designed to:

- Reduce contamination risks;
- Improve operational safety;
- Facilitate controlled water distribution;
- Improve emergency preparedness; and
- Reduce uncontrolled runoff interaction.

The water-storage systems will further support:

- Water recycling and reuse;
- Emergency-response capability;
- Dust-suppression activities; and
- Controlled operational water management.

2.5.4 Water Recycling and Reuse

The proposed processing operation has been intentionally designed to maximize water recycling and reuse throughout operational phases.

Process water generated during ore recovery activities will be recirculated wherever operationally feasible in order to:

- Reduce groundwater abstraction requirements;
- Minimize operational water demand;
- Improve water-use efficiency;
- Reduce wastewater generation;
- Support long-term environmental sustainability.

Water recycling systems are expected to form an integral component of the gravity-assisted processing philosophy and significantly reduce:

- Process-water losses;
- Uncontrolled discharge potential;
- Groundwater pressure;
- Operational water consumption.

Wastewater generated from camp and domestic infrastructure may additionally be reused where operationally appropriate and environmentally acceptable.

2.5.5 Zero-Liquid-Discharge Philosophy

The proposed operation intends to implement a controlled zero-liquid-discharge operational philosophy where feasible.

This operational approach aims to:

- Retain process water within controlled operational systems;
- Minimize uncontrolled discharge to the surrounding environment;
- Prevent contamination of surrounding soils and groundwater;
- Reduce long-term environmental liabilities.

The proposed processing and recovery systems have therefore been designed around:

- Controlled containment infrastructure;
- HDPE-lined operational areas where necessary;
- Water recycling systems;
- Bunded hazardous-material areas;
- Controlled residue management systems.

The relatively small operational scale and gravity-assisted processing approach significantly improve the feasibility of maintaining controlled water circulation systems compared to large conventional gold-processing operations.

2.5.6 Groundwater Protection Measures

Groundwater protection forms a critical environmental-management objective for the proposed project due to:

- Semi-arid climatic conditions;

- Groundwater dependency of surrounding communities;
- Controlled reagent usage associated with processing activities;
- Long-term environmental sustainability considerations.

Groundwater protection measures proposed for the operation include:

- Controlled hazardous-material storage;
- Bunded fuel and chemical-storage systems;
- Spill-containment infrastructure;
- Controlled reagent handling;
- HDPE-lined operational areas where necessary;
- Groundwater-quality monitoring programmes;
- Controlled waste-management systems;
- Stormwater-diversion systems.

Groundwater monitoring devices and monitoring programmes are expected to be implemented during operational phases in order to:

- Monitor groundwater quality;
- Detect potential contamination pathways;
- Evaluate operational environmental performance; and
- Support long-term groundwater protection.

2.5.7 Stormwater and Surface Water Management

No major perennial river systems occur within the immediate vicinity of the proposed operation and no significant surface-water bodies occur directly within the mining footprint.

The project area is situated away from major ephemeral river systems and major drainage channels, thereby reducing direct hydrological interaction with regional surface-water systems.

Operational stormwater-management measures will nevertheless be implemented in order to:

- Reduce erosion;
- Prevent sediment transport;
- Minimize runoff contamination;
- Protect operational infrastructure;
- Improve water containment.

Stormwater-management measures may include:

- Surface drainage control;
- Diversion berms;
- Controlled runoff pathways;
- Erosion-control measures;
- Operational housekeeping practices.

The use of existing valleys and natural topographical corridors for access routes further reduces unnecessary disturbance and assists in minimizing uncontrolled runoff generation.

2.5.8 Water Management Philosophy

The overall water-management strategy for the proposed project has been designed around:

- Responsible groundwater utilization;
- Reduced operational water demand;
- Water recycling and reuse;
- Groundwater protection;
- Controlled process-water management;
- Minimal wastewater generation;
- Zero-liquid-discharge objectives where feasible; and
- Long-term environmental sustainability.

The relatively small-scale nature of the proposed operation, combined with gravity-assisted mineral recovery systems and controlled operational management, substantially reduces water-related environmental risks commonly associated with conventional large-scale gold-processing operations.

Provided that all water-management controls, groundwater-protection measures, monitoring programmes, and environmental-management commitments outlined within the Environmental Management Plan are fully implemented, the proposed operation is considered capable of operating within environmentally acceptable water-management parameters for the receiving environment of the Kunene Region.

2.6 Power Supply and Fuel Storage

Power supply for the proposed small-scale precious-metals mining operation will primarily be generated through diesel-powered generators designed to support mining, ore processing, camp infrastructure, lighting, water pumping, and operational activities associated with the project.

The proposed power infrastructure has been designed around a relatively small-scale and operationally controlled energy-supply philosophy appropriate for the size and operational requirements of the proposed mining operation.

The operational power system is expected to include:

- One primary 100 kVA diesel-powered generator; and
- One secondary backup generator intended to support operational continuity during maintenance periods or emergency situations.

The use of diesel-powered generators has been selected due to:

- The remote location of the project area;
- Absence of permanent grid electricity infrastructure;
- Operational flexibility requirements;
- Relatively small-scale operational power demand; and
- Controlled infrastructure requirements associated with the project.

2.6.1 Generator Infrastructure

The primary and backup generators will be positioned within designated operational areas specifically selected to:

- Reduce environmental contamination risks;
- Improve operational accessibility;
- Improve safety management;
- Minimize noise exposure to camp infrastructure; and
- Reduce interaction with natural drainage pathways.

Generator infrastructure will be established on prepared and stabilized surfaces designed to:

- Improve operational stability;
- Reduce erosion potential;
- Improve spill containment capability; and
- Facilitate environmental management and operational housekeeping.

Operational generator areas will further incorporate:

- Spill kits;
- Fire-prevention equipment;
- Controlled access systems;
- Emergency shutdown procedures; and
- Routine inspection and maintenance programmes.

Noise generated from generator infrastructure is expected to remain localized due to:

- The relatively small operational scale;
- Remote project location;
- Limited settlement density surrounding the operation; and
- Daytime operational scheduling.

2.6.2 Fuel Storage Infrastructure

Fuel required for operational activities will primarily consist of diesel utilized for:

- Generator operation;
- Excavators and mining equipment;
- Ore haulage activities;
- Water pumping systems;
- Operational transport vehicles.

Diesel-storage infrastructure will consist primarily of above-ground fuel-storage tanks positioned within designated operational fuel-storage areas.

The fuel-storage infrastructure has been intentionally designed around a controlled environmental-containment philosophy emphasizing:

- Spill prevention;
- Groundwater protection;
- Fire safety;
- Controlled fuel handling; and
- Environmental risk minimization.

Fuel tanks will be installed on impermeable concrete slabs designed to:

- Prevent direct seepage into surrounding soils;

- Improve spill containment capability;
- Improve operational stability; and
- Facilitate environmental inspections and maintenance activities.

The fuel-storage areas will further incorporate:

- Bunded containment systems;
- Spill-containment infrastructure;
- Drainage control measures;
- Fire extinguishers and emergency-response equipment;
- Controlled access and operational signage.

The bunded containment systems will be designed to contain accidental spills or tank leakages and minimize the risk of:

- Soil contamination;
- Groundwater contamination;
- Hydrocarbon migration;
- Operational fire hazards.

2.6.3 Fuel Handling and Refueling Procedures

Fuel for operational activities will primarily be sourced from Opuwo prior to transport to the project site.

The project does not intend to establish large-scale fuel-dispensing infrastructure onsite and operational fuel handling is expected to remain relatively controlled and limited in scale.

Refueling activities will be undertaken within designated operational areas utilizing controlled fuel-handling procedures intended to:

- Minimize spill risks;
- Improve operational safety;
- Prevent uncontrolled hydrocarbon discharge;
- Protect surrounding soils and groundwater resources.

Fuel-handling procedures will include:

- Controlled refueling activities;
- Spill-response preparedness;
- Routine inspection of hoses and fittings;

- Controlled fuel-transfer procedures;
- Emergency-response protocols.

Operational personnel handling fuels and hydrocarbons will receive training associated with:

- Spill prevention;
- Emergency response;
- Fire safety;
- Environmental protection procedures;
- Hazardous-material handling.

2.6.4 Machinery Maintenance

Major machinery maintenance and servicing activities are expected to occur offsite where operationally feasible, primarily within Opuwo or other designated service locations.

Only limited operational maintenance activities are expected to occur onsite and may include:

- Routine inspections;
- Minor servicing;
- Lubrication activities;
- Equipment cleaning;
- Basic operational repairs.

Limiting major onsite maintenance activities substantially reduces:

- Hydrocarbon contamination risks;
- Waste-oil generation;
- Hazardous-waste accumulation;
- Soil contamination potential.

Any minor onsite maintenance activities will be undertaken within controlled operational areas incorporating:

- Spill-containment systems;
- Waste-oil collection systems;
- Operational housekeeping procedures;
- Hazardous-waste segregation.

Used oils, filters, and hazardous maintenance waste generated onsite will be collected and removed to approved disposal or recycling facilities where feasible.

2.6.5 Fire Prevention and Emergency Preparedness

Due to the use of diesel fuel, generators, and operational machinery, fire prevention and emergency preparedness form important operational and environmental-management components of the proposed project.

The project intends to establish:

- Fire-prevention systems;
- Emergency-response procedures;
- Emergency water supply infrastructure;
- Fire-fighting equipment;
- Personnel emergency training programmes.

Additional emergency and firewater infrastructure proposed for the project includes:

- Three 10,000-litre emergency/firewater tanks; and
- Emergency water-storage capacity integrated into the operational water-management system.

Operational fire-prevention measures may include:

- Controlled smoking areas;
- Generator fire-protection systems;
- Hazardous-material segregation;
- Vegetation clearing around operational infrastructure where necessary;
- Routine safety inspections.

Emergency-response procedures will further include:

- Spill-response procedures;
- Fire-response procedures;
- Emergency communication systems;
- Evacuation procedures;
- Incident reporting systems.

2.6.6 Environmental Protection Measures

The proposed power and fuel infrastructure has been designed to minimize environmental risks associated with:

- Hydrocarbon contamination;
- Fuel spills;
- Fire hazards;
- Soil contamination;
- Groundwater contamination;
- Operational safety incidents.

Environmental-protection measures associated with the power and fuel systems will include:

- Above-ground fuel storage;
- Impermeable containment surfaces;
- Bunded fuel-storage systems;
- Spill kits and emergency-response equipment;
- Controlled fuel handling;
- Routine inspections and maintenance;
- Environmental monitoring and auditing.

Particular emphasis will be placed on groundwater protection due to:

- Semi-arid climatic conditions;
- Groundwater dependency within surrounding communal areas;
- Long-term environmental sustainability considerations.

2.6.7 Power and Fuel Management Philosophy

The overall power-supply and fuel-storage philosophy for the proposed operation has been designed around:

- Small-scale operational requirements;
- Controlled fuel handling;
- Groundwater protection;
- Fire prevention;
- Spill prevention;

- Operational safety;
- Environmental containment;
- Long-term environmental sustainability.

The relatively small operational scale, controlled infrastructure layout, limited fuel-storage volumes, and implementation of environmental containment systems significantly reduce environmental risks commonly associated with large-scale industrial fuel-storage facilities.

Provided that all fuel-handling procedures, spill-containment systems, environmental controls, and emergency-response measures outlined within the Environmental Management Plan are fully implemented, the proposed power and fuel infrastructure is considered environmentally manageable within the receiving environment of the Kunene Region.

2.7 Camp and Support Infrastructure

Temporary camp and support infrastructure will be established to support operational personnel associated with the proposed small-scale precious-metals mining operation within the Kunene Region.

The camp infrastructure has been designed around a relatively compact and environmentally controlled operational philosophy intended to:

- Minimize environmental disturbance;
- Support worker welfare and operational safety;
- Improve environmental management;
- Reduce unnecessary land disturbance; and
- Facilitate progressive rehabilitation following operational activities.

The proposed camp and support infrastructure is expected to occupy an estimated footprint of approximately 0.5 hectares and will include:

- Temporary accommodation facilities;
- Prefabricated operational structures;
- Kitchen and cooking facilities;
- Ablution and shower facilities;
- Administrative and storage facilities;
- Communication infrastructure;
- Waste-management areas;
- Security and access-control infrastructure.

The camp infrastructure will support both initial operational phases and future expanded operational activities as the project develops.

2.7.1 Accommodation Facilities

Accommodation for operational personnel will consist primarily of:

- Temporary tented accommodation units; and
- Prefabricated support structures where necessary.

The camp infrastructure has been intentionally designed to remain relatively small-scale and operationally flexible in order to:

- Reduce environmental disturbance;

- Minimize permanent infrastructure development;
- Facilitate future rehabilitation;
- Improve operational adaptability.

Approximately 10 personnel are expected during initial operational phases, with workforce numbers potentially increasing progressively to approximately 50 personnel during full operational stages.

Accommodation infrastructure will be positioned within designated operational areas selected to:

- Reduce erosion risks;
- Improve accessibility;
- Avoid drainage pathways;
- Improve environmental management and operational safety.

2.7.2 Kitchen and Domestic Facilities

A dedicated kitchen and cooking area will be established onsite in order to support operational personnel during mining activities.

Domestic support infrastructure may include:

- Cooking facilities;
- Food-storage facilities;
- Eating and communal areas;
- Refrigeration and food-handling infrastructure where necessary.

The kitchen and domestic areas will be managed in accordance with:

- Operational hygiene requirements;
- Waste-management procedures;
- Fire-prevention measures;
- Environmental housekeeping practices.

Measures will further be implemented to minimize:

- Food wastage;
- Attraction of wildlife to camp areas;
- Uncontrolled waste accumulation;
- Fire risks associated with cooking activities.

The project additionally intends to implement controlled food-waste management and composting measures where operationally feasible.

2.7.3 Ablution and Sanitation Facilities

The camp infrastructure will include designated ablution and shower facilities for operational personnel.

Sanitation infrastructure will be managed in order to:

- Protect surrounding soils and groundwater;
- Improve worker hygiene and welfare;
- Reduce environmental contamination risks;
- Maintain acceptable environmental-health conditions.

Wastewater generated from domestic and ablution facilities may be reused where environmentally acceptable and operationally feasible as part of the broader water-recycling philosophy adopted for the project.

Operational sanitation-management measures will include:

- Controlled wastewater management;
- Routine cleaning and maintenance;
- Environmental-health monitoring;
- Wastewater containment measures where necessary.

Particular emphasis will be placed on groundwater protection due to the groundwater dependency associated with surrounding communal areas.

2.7.4 Administrative and Communication Infrastructure

Support infrastructure associated with operational management may include:

- Temporary site offices;
- Storage facilities;
- Operational control areas;
- Communication systems;
- Security infrastructure.

Communication systems proposed for the operation may include:

- Two-way radio systems;

- Satellite communication devices;
- Garmin inReach communication systems;
- Cellular communication where network coverage is available.

The communication systems are considered important due to:

- The remote location of the operation;
- Variable network coverage within mountainous terrain;
- Emergency-response requirements;
- Operational safety considerations.

2.7.5 Security and Access Control

The proposed camp and support infrastructure will be established within a controlled fenced operational area designed to:

- Improve operational safety;
- Restrict unauthorized access;
- Protect operational infrastructure;
- Improve hazardous-material security;
- Reduce wildlife interaction with operational areas.

Access to the camp and operational infrastructure will be controlled through:

- Fencing;
- Controlled entry points;
- Operational supervision;
- Safety signage.

The relatively remote location of the project further assists in reducing:

- Public interaction with operational infrastructure;
- Unauthorized access risks;
- Community disturbance.

2.7.6 Camp Water and Utility Services

Water required for camp operations will be supplied through the operational groundwater and water-storage systems established for the project.

Camp water usage will primarily include:

- Domestic consumption;
- Cooking activities;
- Hygiene and sanitation;
- Cleaning and maintenance activities.

Water-management measures associated with camp operations will emphasize:

- Controlled water usage;
- Water recycling where feasible;
- Reduction of unnecessary water losses;
- Wastewater management;
- Environmental protection.

Power supply to camp infrastructure will primarily be provided through the operational diesel-generator systems established for the project.

2.7.7 Environmental Management of Camp Infrastructure

Environmental-management measures associated with camp and support infrastructure will include:

- Waste segregation and disposal;
- Controlled wastewater management;
- Spill-prevention measures;
- Dust-control measures;
- Fire-prevention systems;
- Environmental housekeeping;
- Controlled hazardous-material storage;
- Wildlife interaction management.

Operational camp areas will further be managed to minimize:

- Soil disturbance;
- Vegetation clearing;
- Surface contamination;
- Windblown litter;

- Visual impacts.

The temporary and relatively small-scale nature of the camp infrastructure substantially reduces long-term environmental disturbance compared to permanent large-scale mining accommodation facilities.

2.7.8 Rehabilitation of Camp Infrastructure

Upon closure or decommissioning of operational activities, temporary camp and support infrastructure will be dismantled and removed from the project area where feasible.

Closure and rehabilitation measures associated with camp infrastructure may include:

- Removal of temporary structures;
- Removal of waste materials;
- Surface rehabilitation;
- Topsoil redistribution;
- Re-vegetation where feasible;
- Site stabilization.

The project intends to progressively rehabilitate disturbed camp areas wherever operationally practical in order to reduce long-term environmental liabilities and support restoration of the surrounding communal environment.

2.7.9 Camp Infrastructure Management Philosophy

The overall camp and support infrastructure philosophy for the proposed operation has been designed around:

- Reduced disturbance footprints;
- Temporary and flexible infrastructure;
- Worker welfare and safety;
- Groundwater protection;
- Environmental containment;
- Waste minimization;
- Controlled operational management;
- Progressive rehabilitation.

The relatively compact operational footprint, temporary infrastructure approach, and implementation of environmental-management controls substantially reduce environmental impacts commonly associated with larger permanent mining accommodation facilities.

Provided that all sanitation measures, waste-management procedures, environmental controls, and rehabilitation commitments outlined within the Environmental Management Plan are fully implemented, the proposed camp and support infrastructure is considered environmentally manageable within the receiving environment of the Kunene Region.

2.8 Waste Management

The proposed small-scale precious-metals mining operation will generate a variety of waste streams associated with mining, ore processing, camp activities, maintenance operations, and general operational activities.

The waste-management philosophy for the proposed operation has been intentionally designed around:

- Waste minimization;
- Controlled waste handling;
- Waste segregation;
- Recycling and reuse where feasible;
- Reduced hazardous-material generation;
- Dry-stack residue management;
- Groundwater protection; and
- Long-term environmental sustainability.

The project intends to implement an integrated waste-management system aimed at minimizing environmental contamination risks and reducing long-term operational liabilities within the semi-arid communal environment of the Kunene Region.

The principal waste streams anticipated during operational phases may include:

- Waste rock;
- Dry processing residues;
- General domestic waste;
- Scrap metal;
- Used oils and lubricants;
- Hydrocarbon-contaminated materials;
- Chemical containers and reagent waste;
- Food waste;
- Sewage and domestic wastewater.

2.8.1 General Waste Management Philosophy

The proposed operation adopts a waste-management hierarchy emphasizing:

- Waste avoidance;

- Waste reduction;
- Reuse where feasible;
- Recycling where operationally practical;
- Controlled disposal of residual waste streams.

Waste-management activities will be undertaken in accordance with:

- Environmental protection principles;
- Operational housekeeping requirements;
- Groundwater-protection objectives;
- Hazardous-material management procedures;
- Applicable environmental-management commitments.

The relatively small-scale nature of the operation significantly reduces overall waste-generation volumes compared to conventional large-scale mining operations.

2.8.2 Waste Rock Management

Waste rock generated during mining activities will be transported to designated waste-rock storage areas situated approximately 500 metres from active pit areas.

Waste-rock management areas have been selected to:

- Avoid major drainage pathways;
- Reduce runoff interaction;
- Improve operational containment;
- Minimize erosion potential;
- Facilitate progressive rehabilitation.

The project anticipates relatively limited waste-rock generation due to:

- Selective mining methods;
- Structurally controlled mineralization targeting;
- Small operational scale;
- Reduced overburden-removal requirements.

Waste-rock stockpiles will remain relatively low-profile and operationally controlled throughout mining activities.

Environmental-management measures associated with waste-rock handling will include:

- Controlled placement;
- Surface stabilization;
- Erosion-control measures;
- Progressive rehabilitation where feasible;
- Stormwater-diversion measures.

2.8.3 Dry Residue and Processing Waste Management

The proposed operation does not intend to establish large conventional wet tailings-storage facilities commonly associated with large-scale gold operations.

Instead, processing residues generated during gravity-assisted mineral recovery activities will primarily be managed through:

- Dry-stack residue handling;
- Controlled material containment;
- Reuse where operationally feasible;
- Reduced liquid-waste generation.

The processing philosophy substantially reduces:

- Tailings-storage requirements;
- Process-water discharge;
- Long-term seepage risks;
- Groundwater contamination potential.

Dry processing residues will be managed within designated controlled operational areas incorporating:

- Surface containment systems;
- Controlled runoff management;
- Stormwater diversion;
- Erosion-control measures.

The relatively small operational throughput and gravity-assisted recovery approach significantly reduce overall residue volumes compared to conventional chemically intensive gold-processing facilities.

2.8.4 Hazardous Waste Management

Hazardous waste generated during operational activities may include:

- Used oils and lubricants;
- Hydrocarbon-contaminated materials;
- Spill-cleanup materials;
- Damaged reagent containers;
- Chemical residues;
- Fuel filters and maintenance waste.

The proposed project has committed to:

- Controlled hazardous-material handling;
- Reduced chemical dependency;
- Mercury-free processing methods;
- Limited controlled reagent use.

Hazardous wastes will be managed through:

- Segregated hazardous-waste storage;
- Controlled containment systems;
- Clearly designated storage areas;
- Spill-prevention procedures;
- Controlled removal and disposal procedures.

Hazardous-waste storage areas will:

- Be fenced and secured;
- Incorporate containment systems;
- Be positioned away from drainage pathways;
- Be routinely inspected.

Used oils and hazardous maintenance materials will be collected and transported to approved disposal or recycling facilities where feasible.

2.8.5 Chemical Container and Reagent Waste Management

Controlled reagent usage associated with processing activities may generate:

- Empty reagent containers;

- Residual reagent packaging;
- Chemical handling waste materials.

The operation intends to minimize reagent waste generation through:

- Controlled chemical procurement;
- Reduced reagent dependency;
- Controlled storage procedures;
- Efficient operational handling.

Chemical containers may be reused where operationally appropriate and where container integrity remains acceptable.

Containers unsuitable for reuse will be:

- Isolated;
- Properly cleaned where required;
- Stored within designated hazardous-waste areas;
- Disposed of through controlled waste-management procedures.

Particular emphasis will be placed on preventing:

- Soil contamination;
- Groundwater contamination;
- Windblown contamination;
- Uncontrolled public access to chemical waste materials.

2.8.6 Domestic Waste Management

Domestic waste generated from camp and support infrastructure may include:

- Food waste;
- Packaging materials;
- Plastic waste;
- Paper and cardboard;
- General domestic refuse.

Waste bins and designated waste-storage containers will be positioned throughout operational areas in order to:

- Improve waste segregation;

- Reduce littering;
- Improve operational housekeeping;
- Reduce wildlife attraction.

General domestic waste will be removed from site on a regular basis, generally on a weekly schedule, for disposal at approved waste-disposal facilities within Opuwo where feasible.

The project additionally intends to implement:

- Food-waste reduction measures;
- Composting initiatives where feasible;
- Recycling where operationally practical.

2.8.7 Sewage and Wastewater Management

Domestic wastewater and sewage generated from camp infrastructure will be managed through controlled sanitation systems designed to:

- Protect groundwater resources;
- Reduce environmental contamination;
- Improve worker hygiene and welfare.

Wastewater generated from domestic facilities may be reused where environmentally acceptable and operationally feasible in support of the broader water-recycling philosophy adopted for the project.

Wastewater-management systems will emphasize:

- Controlled containment;
- Reduced uncontrolled discharge;
- Environmental-health protection;
- Groundwater protection.

2.8.8 Waste Storage and Containment Areas

Designated waste-management areas will be established within fenced and controlled operational zones.

Waste-storage areas will be designed to:

- Improve waste segregation;
- Reduce contamination risks;

- Prevent uncontrolled access;
- Improve operational housekeeping;
- Facilitate waste removal and inspection activities.

The waste-management areas will further incorporate:

- Hazardous-waste segregation zones;
- General-waste storage;
- Spill-containment systems;
- Stormwater-diversion measures;
- Surface stabilization where necessary.

Waste areas will be routinely inspected in order to:

- Prevent uncontrolled accumulation;
- Identify contamination risks;
- Maintain environmental compliance;
- Improve operational safety.

2.8.9 Environmental Waste-Management Philosophy

The overall waste-management strategy for the proposed operation has been designed around:

- Waste minimization;
- Reduced environmental contamination;
- Controlled waste handling;
- Groundwater protection;
- Reduced chemical dependency;
- Dry residue management;
- Environmental containment;
- Progressive rehabilitation.

The proposed operation differs substantially from conventional large-scale precious-metals operations due to:

- Reduced waste volumes;
- Reduced liquid tailings generation;
- Gravity-assisted recovery philosophy;

- Controlled reagent usage;
- Dry-stack residue management approach.

Provided that all waste-management procedures, containment systems, environmental controls, and monitoring requirements outlined within the Environmental Management Plan are fully implemented, waste-related environmental impacts associated with the proposed operation are considered manageable within the receiving environment of the Kunene Region.

2.9 Transport and Logistics

Transport and logistical activities associated with the proposed small-scale precious-metals mining operation will involve the movement of:

Ore materials;

Operational equipment;

Fuel and hydrocarbons;

Controlled chemical reagents;

Water and operational supplies;

Personnel and camp supplies;

Waste materials.

The overall transport philosophy for the proposed operation has been designed around:

Reduced traffic intensity;

Controlled vehicle movement;

Operational safety;

Environmental protection;

Reduced community disturbance;

Dust minimization; and

Controlled hazardous-material handling.

Due to the relatively small-scale nature of the operation, transport volumes associated with the project are expected to remain substantially lower than those typically associated with large-scale mining operations.

2.9.1 Site Accessibility

The proposed mining operation is situated approximately 82 kilometres from Opuwo within the Kunene Region of north-western Namibia.

Access to the project area is currently achieved through existing gravel roads, communal tracks, and natural valley corridors connecting surrounding communal settlements and regional transport routes.

The project intends to utilize and upgrade existing access routes wherever operationally feasible in order to:

Reduce unnecessary environmental disturbance;

Minimize vegetation clearing;

Reduce construction-related impacts;

Improve environmental sustainability.

Road alignments will preferentially follow:

Existing disturbed routes;

Natural topographical corridors;

Broad valley systems where feasible.

This approach significantly reduces:

Land disturbance;

Earthworks requirements;

Erosion potential;

Visual impacts associated with road construction.

2.9.2 Ore Transport

Ore produced from mining activities will be transported periodically from the project site toward Opuwo and subsequently onward toward Walvis Bay for export purposes.

Ore transport activities are expected to involve approximately:

Five 30-ton side-tipper truck movements per week.

Ore transport volumes are considered relatively moderate due to:

The small-scale operational throughput;

Controlled production rates;

Selective mining philosophy;

Reduced processing scale.

Ore transport will generally occur during daytime operational periods only.

No night-time transport activities are proposed.

Restricting transport activities to daytime hours significantly reduces:

Community disturbance;

Wildlife collision risks;

Operational safety risks;

Visibility-related transport hazards.

2.9.3 Operational Vehicle Movement

Operational vehicle movement onsite will primarily involve:

Ore haulage;

Equipment transport;

Fuel delivery;

Personnel movement;

Waste removal;

Water transport where necessary.

Most onsite traffic will remain localized between:

Mining pits;

Temporary stockpile areas;

Processing infrastructure;

Camp and support facilities;

Waste-management areas.

Operational vehicle movement is expected to remain relatively limited due to:

The compact operational layout;

Small operational scale;

Controlled infrastructure footprint.

Operational speed limits onsite will generally not exceed 40 km/hr.

Additional traffic-control measures may include:

Speed humps;

Safety signage;

Controlled access points;

Vehicle movement supervision.

These measures are intended to:

Improve operational safety;

Reduce dust generation;

Minimize wildlife disturbance;

Reduce erosion associated with excessive vehicle speeds.

2.9.4 Fuel and Supply Logistics

Fuel, operational materials, food supplies, and construction materials required for the operation will primarily be sourced through Opuwo and surrounding regional suppliers where feasible.

The project intends to support local economic participation through:

Utilization of local suppliers;

Local transport services;

Regional procurement opportunities;

Contractor participation.

Fuel deliveries to site will primarily consist of diesel utilized for:

Generators;

Mining equipment;

Operational vehicles;

Water pumping systems.

Fuel transport activities will be undertaken using controlled fuel-handling procedures designed to:

Minimize spill risks;

Improve transport safety;

Reduce environmental contamination risks.

The relatively small operational fuel demand substantially reduces:

Large-scale hydrocarbon storage requirements;

High-volume transport frequency;

Major fuel-logistics risks.

2.9.5 Controlled Chemical Transport

Controlled chemical-assisted recovery activities associated with the project may require transport of:

Thiosulfate;

Thiourea;

Limited cyanide quantities where operationally necessary;

Sulphuric acid in limited applications associated with sulphide-hosted ore treatment.

The project has committed to:

Reduced chemical dependency;

Minimal cyanide usage;

Controlled reagent storage;

Controlled transport procedures.

Chemical transport activities will therefore remain relatively limited in scale compared to conventional chemically intensive gold-processing operations.

Sulphuric acid and other controlled reagents may be transported from Walvis Bay or approved suppliers utilizing regulated hazardous-material transport procedures where applicable.

Controlled reagent transport procedures will include:

Secure containerization;

Spill-response preparedness;

Hazardous-material handling protocols;

Driver safety requirements;

Emergency-response systems.

The reduced operational scale and limited reagent dependency substantially reduce hazardous-material transport risks associated with the proposed project.

2.9.6 Dust and Road Management

Vehicle movement along gravel roads and operational tracks may generate localized dust during dry conditions.

Dust-management measures associated with transport activities may include:

Controlled vehicle speeds;

Use of existing roads and tracks;

Water suppression where necessary;

Controlled traffic movement;

Reduced unnecessary vehicle activity.

The relatively low transport frequency and controlled operational scale substantially reduce:

Regional dust impacts;

Traffic congestion;

Road degradation;

Community transport disturbance.

The use of natural valley systems and existing access routes further assists in minimizing:

Surface disturbance;

Erosion potential;

Unnecessary vegetation clearing.

2.9.7 Transport Safety and Emergency Preparedness

Operational transport activities will be managed in accordance with:

Operational safety procedures;

Environmental-management requirements;

Hazardous-material handling procedures;

Emergency-response protocols.

Transport-related safety measures may include:

Driver safety training;

Vehicle inspections;

Controlled transport scheduling;

Emergency communication systems;

Spill-response procedures;

Vehicle speed controls.

Communication systems supporting operational logistics may include:

Two-way radio systems;

Satellite communication systems;

Garmin inReach communication devices;

Cellular communication where coverage is available.

These systems are considered important due to:

The remote operational environment;

Rugged mountainous terrain;

Variable network coverage conditions.

2.9.8 Environmental Transport Philosophy

The overall transport and logistics philosophy for the proposed project has been designed around:

Reduced transport intensity;

Controlled operational logistics;

Reduced environmental disturbance;

Groundwater protection;

Controlled hazardous-material movement;

Dust minimization;

Community safety;

Operational efficiency.

The relatively small operational scale, controlled transport frequency, use of existing access routes, and limited hazardous-material dependency substantially reduce transport-related environmental risks commonly associated with larger mining operations.

Provided that all operational controls, hazardous-material transport procedures, dust-management measures, and environmental-management commitments outlined within the Environmental Management Plan are fully implemented, transport-related impacts associated with the proposed project are considered environmentally manageable within the receiving environment of the Kunene Region.

2.10 Rehabilitation and Mine Closure Concept

The proposed small-scale precious-metals mining operation has been conceptually designed around a progressive rehabilitation and environmentally responsible closure philosophy intended to minimize long-term environmental liabilities and support restoration of disturbed areas following completion of mining activities.

The project recognizes that responsible mine closure forms an integral component of sustainable mining practice and environmental management within the semi-arid communal environment of the Kunene Region.

The overall closure philosophy for the proposed operation emphasizes:

- Progressive rehabilitation throughout operational phases;
- Reduction of long-term environmental disturbance;
- Stabilization of disturbed land surfaces;
- Groundwater protection;
- Removal of operational infrastructure;
- Controlled closure of mining areas;
- Restoration of ecological functionality where feasible; and
- Long-term environmental stability.

The relatively small-scale operational footprint, reduced infrastructure intensity, gravity-assisted processing philosophy, and dry-stack residue-management approach substantially reduce long-term environmental liabilities compared to conventional large-scale precious-metals operations.

2.10.1 Progressive Rehabilitation Philosophy

The proposed operation intends to implement progressive rehabilitation measures throughout the operational life of the project wherever operationally feasible.

Progressive rehabilitation refers to the rehabilitation of disturbed areas during active operational phases rather than postponing rehabilitation entirely until final closure.

This approach significantly reduces:

- Long-term erosion risks;
- Surface instability;
- Dust generation;
- Visual impacts;
- Long-term environmental liabilities.

Progressive rehabilitation activities may include:

- Recontouring disturbed surfaces;
- Stabilization of inactive operational areas;
- Topsoil redistribution;
- Surface drainage control;
- Vegetation re-establishment where feasible;
- Removal of unnecessary infrastructure.

The project recognizes the ecological sensitivity associated with semi-arid environments and therefore intends to minimize unnecessary long-term land disturbance throughout operational phases.

2.10.2 Open-Pit Closure and Backfilling

Upon completion of mining activities, open-pit excavation areas will undergo closure and rehabilitation measures aimed at improving long-term environmental stability and reducing public safety risks.

The project intends to:

- Backfill excavated pit areas where operationally feasible;
- Utilize suitable waste-rock material for pit backfilling;
- Recontour disturbed surfaces;
- Redistribute preserved topsoil;
- Stabilize rehabilitated landforms.

Backfilling of pit areas substantially reduces:

- Long-term public safety risks;
- Visual impacts;
- Surface instability;
- Uncontrolled erosion potential.

Following backfilling activities, rehabilitated surfaces may be prepared for:

- Natural vegetation recovery;
- Re-vegetation using locally occurring vegetation species where feasible;
- Surface stabilization and erosion control.

The project further intends to minimize the long-term presence of open excavations within the communal landscape.

2.10.3 Topsoil Replacement and Revegetation

Topsoil removed during operational activities will be preserved separately throughout the life of the project for future rehabilitation purposes.

The preservation of topsoil is considered environmentally important due to:

- Slow natural soil development within semi-arid environments;
- Low organic-matter content;
- Ecological sensitivity associated with drought-prone landscapes.

During closure and rehabilitation phases, preserved topsoil will be redistributed across rehabilitated surfaces where feasible in order to:

- Improve vegetation recovery;
- Support soil stabilization;
- Reduce erosion potential;
- Improve ecological recovery potential.

Rehabilitation activities may include re-establishment of locally occurring vegetation species previously present within the project area.

The rehabilitation philosophy recognizes that full restoration of pre-mining ecological conditions may require extended natural recovery periods due to the harsh climatic conditions of the region.

2.10.4 Closure of Processing and Hazardous-Material Areas

Processing infrastructure, hazardous-material storage facilities, fuel-storage systems, and operational support infrastructure will be dismantled and removed from the project area upon completion of operational activities where feasible.

Closure activities associated with processing and hazardous-material areas may include:

- Removal of generators and fuel tanks;
- Removal of chemical-storage infrastructure;
- Removal of temporary operational infrastructure;
- Cleaning and decontamination of operational surfaces where necessary;
- Removal of contaminated materials where required;

- Surface rehabilitation and stabilization.

Particular emphasis will be placed on:

- Groundwater protection;
- Removal of hydrocarbon contamination risks;
- Prevention of long-term soil contamination;
- Long-term environmental stability.

The relatively small operational scale and reduced chemical dependency substantially reduce long-term contamination liabilities compared to conventional large-scale gold-processing facilities.

2.10.5 Residue and Waste-Rock Rehabilitation

Dry processing residues and waste-rock areas will be rehabilitated and stabilized following operational closure.

Closure measures may include:

- Surface grading and recontouring;
- Erosion-control measures;
- Drainage stabilization;
- Topsoil redistribution where feasible;
- Surface stabilization and vegetation recovery.

Waste-rock storage areas are expected to remain relatively low-profile and manageable due to:

- Small operational scale;
- Selective mining philosophy;
- Reduced waste-generation volumes.

The dry-stack residue-management philosophy adopted for the project substantially reduces:

- Long-term seepage risks;
- Tailings-instability risks;
- Large-scale contamination liabilities;
- Closure complexity.

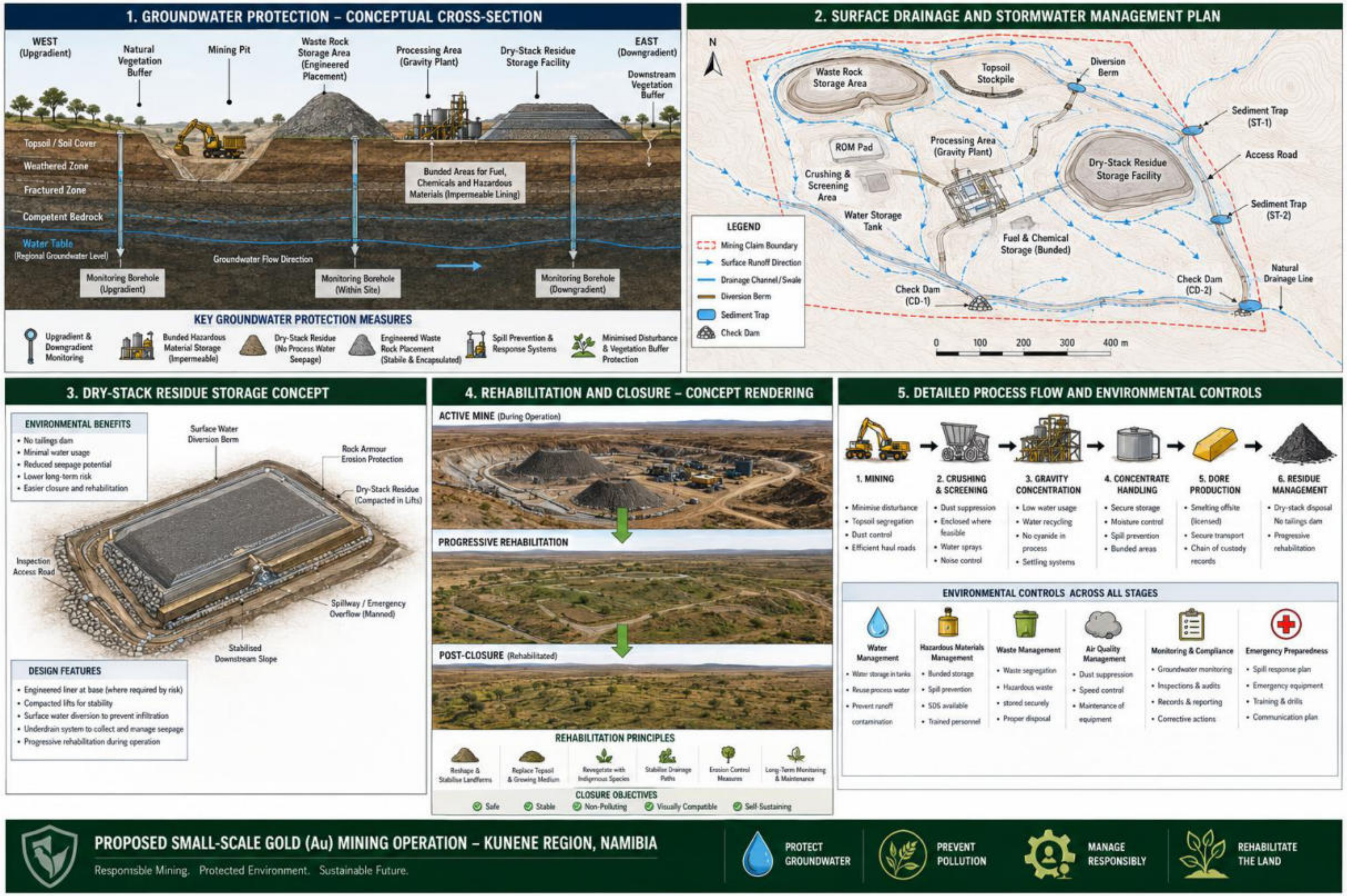

Figure 3. The proposed small scale gold (Au) mining operation in the Kunene region.

2.10.6 Groundwater Monitoring and Post-Closure Management

Groundwater protection forms a critical component of the mine closure philosophy due to:

- Semi-arid environmental conditions;
- Groundwater dependency within surrounding communal areas;
- Controlled reagent usage associated with processing activities.

Groundwater monitoring programmes are expected to continue following operational closure in order to:

- Monitor groundwater quality;
- Detect potential contamination pathways;
- Confirm environmental stability;
- Support post-closure environmental management.

Post-closure environmental inspections may further include:

- Erosion monitoring;
- Vegetation recovery assessment;
- Surface stability inspections;
- Infrastructure removal verification.

The project commits to implementing groundwater-protection measures throughout operational and closure phases in order to minimize long-term environmental risks.

2.10.7 Infrastructure Removal and Site Restoration

Temporary camp infrastructure, operational structures, storage facilities, and support infrastructure will be dismantled and removed where feasible following operational closure.

Closure activities may include:

- Removal of fencing where appropriate;
- Removal of temporary roads where feasible;
- Surface scarification and stabilization;
- Recontouring of disturbed areas;
- Waste removal and cleanup activities.

Infrastructure removal substantially reduces:

- Visual impacts;

- Long-term environmental disturbance;
- Public safety risks;
- Long-term maintenance liabilities.

The project intends to restore disturbed areas as close as reasonably practicable to surrounding natural landscape conditions.

2.10.8 Financial Provision and Closure Responsibility

The project recognizes the importance of establishing financial provisions and closure planning mechanisms capable of supporting long-term rehabilitation and environmental-management obligations.

The proponent intends to progressively allocate a portion of operational revenue toward future rehabilitation and closure requirements.

The closure philosophy further recognizes that:

- Rehabilitation obligations remain integral to responsible mining practice;
- Environmental liabilities should be minimized throughout operational phases;
- Closure planning should occur continuously during the operational life of the project.

2.10.9 Closure and Rehabilitation Philosophy

The overall rehabilitation and closure philosophy for the proposed operation has been designed around:

- Progressive rehabilitation;
- Reduced long-term environmental disturbance;
- Groundwater protection;
- Controlled infrastructure removal;
- Surface stabilization;
- Reduced contamination risks;
- Ecological recovery support;
- Long-term environmental sustainability.

The relatively small-scale operational footprint, gravity-assisted processing approach, reduced chemical dependency, dry-stack residue management, and progressive rehabilitation philosophy substantially reduce closure-related environmental risks compared to conventional large-scale precious-metals mining operations.

Provided that all rehabilitation measures, environmental controls, groundwater-monitoring programmes, and closure-management commitments outlined within the Environmental Management Plan are fully implemented, the proposed operation is considered capable of achieving environmentally manageable closure conditions within the receiving environment of the Kunene Region.

CHAPTER 3 — DESCRIPTION OF THE RECEIVING ENVIRONMENT

3.1 REGIONAL SETTING

The proposed small-scale precious-metals mining operation is situated within the Kunene Region of north-western Namibia, a region characterized by semi-arid climatic conditions, rugged mountainous landscapes, low population density, communal land-use systems, and groundwater dependency.

The project area falls within a remote communal environment located approximately 82 kilometres from the town of Opuwo, which serves as the primary regional administrative and logistical centre for the surrounding area. The broader region is characterized by extensive mountainous terrain, broad valley systems, sparse settlement distribution, and predominantly livestock-based communal land-use activities.

The proposed mining operation is located within Mining Claims MC76609, MC76610 and MC76611 near the villages of Otjinanwa and Okakuara within the broader Ombujokanguindi Conservancy region. The surrounding communal environment is primarily utilized for livestock grazing activities, with cattle, goats, and other domestic livestock forming important components of local livelihoods and subsistence economies.

The regional environment is strongly influenced by:

- Low and variable annual rainfall;
- Frequent drought conditions;
- High summer temperatures;
- Groundwater dependency;
- Sparse and semi-arid vegetation cover;
- Rugged topography and mountainous terrain.

The project area generally experiences seasonal rainfall during the period between November and April, while prolonged dry conditions commonly occur throughout much of the year. Persistent drought conditions have historically affected livestock grazing activities and rural livelihoods within the broader Kunene Region.

Topographically, the region surrounding the project area is characterized by rugged hills, mountainous terrain, broad valleys, rocky outcrops, and structurally controlled geological formations associated with mineralized systems. Elevations within the project area average approximately 1,630 metres above sea level.

The terrain is considered highly rugged in several areas, although broad valleys and natural topographical corridors provide relatively accessible routes for movement, access-road development, and operational infrastructure placement. Existing access tracks and gravel roads already occur within the surrounding communal environment and are expected to form the basis of operational access to the proposed mining areas.

Vegetation within the broader region generally consists of semi-arid shrubland and savanna vegetation characterized by:

- Shrubs and smaller woody vegetation;
- Scattered trees within valley systems;
- Sparse mountainous vegetation;
- Drought-adapted plant communities.

Larger trees are generally concentrated within valleys and localized drainage areas where moisture conditions are relatively more favorable.

The broader regional environment supports a variety of wildlife species commonly associated with north-western Namibian communal and conservancy environments. Wildlife species observed or expected within the broader area include:

- Springbok;
- Oryx;
- Kudu;
- Smaller antelope species;
- Wild cats;
- Reptiles including snakes and lizards;
- Occasional larger migratory wildlife such as elephants and lions moving through surrounding communal landscapes.

The project area falls within a region where communal land use and conservation-related activities coexist, and environmental management within the area therefore requires consideration of:

- Livestock grazing activities;
- Wildlife movement;
- Groundwater dependency;
- Semi-arid ecological sensitivity;
- Long-term land sustainability.

No major urban developments occur within the immediate vicinity of the proposed operation and settlement density within the surrounding environment remains relatively low. The remote location of the proposed operation significantly reduces:

- Urban land-use conflict;

- High-density community exposure;
- Visual sensitivity associated with major tourism corridors;
- Traffic-related disturbance.

The regional economy surrounding the project area is primarily supported by:

- Livestock farming;
- Informal and subsistence economic activities;
- Government services;
- Small-scale local trade;
- Limited artisanal mining activities within certain surrounding areas.

Artisanal mining activities are known to occur within parts of the broader regional environment, including areas near Otuani village, indicating existing regional awareness and familiarity with mining-related activities within portions of the Kunene Region.

Groundwater forms the primary water source for both communal communities and operational activities throughout much of the region due to the absence of reliable perennial surface-water systems. Consequently, groundwater protection represents a critical environmental-management priority within the receiving environment.

The proposed operation is situated away from major perennial river systems and no significant surface-water bodies occur directly within the project footprint. Broad valleys occur within the surrounding landscape, although no significant flood scarring, perennial seepage zones, or permanent water pooling areas were observed during site investigations.

From an environmental perspective, the receiving environment may therefore be characterized as:

- Semi-arid and drought-prone;
- Groundwater-dependent;
- Ecologically sensitive;
- Moderately vegetated;
- Topographically rugged;
- Relatively remote and sparsely populated.

The relatively small-scale nature of the proposed mining operation, combined with the controlled operational philosophy, gravity-assisted mineral recovery approach, reduced chemical dependency, and progressive rehabilitation commitments, substantially reduces the likelihood of large-scale regional environmental disturbance commonly associated with conventional large-scale mining developments.

Nevertheless, the environmental sensitivity associated with semi-arid communal environments requires careful management of:

- Groundwater resources;
- Hazardous materials;
- Surface disturbance;
- Erosion;
- Biodiversity impacts;
- Long-term rehabilitation obligations.

The receiving environment therefore provides both operational opportunities and environmental-management constraints that have been carefully considered throughout the Environmental Scoping Study and Environmental Management Plan preparation processes.

3.2 Climate

The climate of the proposed project area is characteristic of the semi-arid to arid conditions commonly associated with the Kunene Region of north-western Namibia. The broader regional climate is strongly influenced by low and variable rainfall, high evaporation rates, periodic drought conditions, elevated summer temperatures, and seasonal climatic variability typical of inland north-western Namibia.

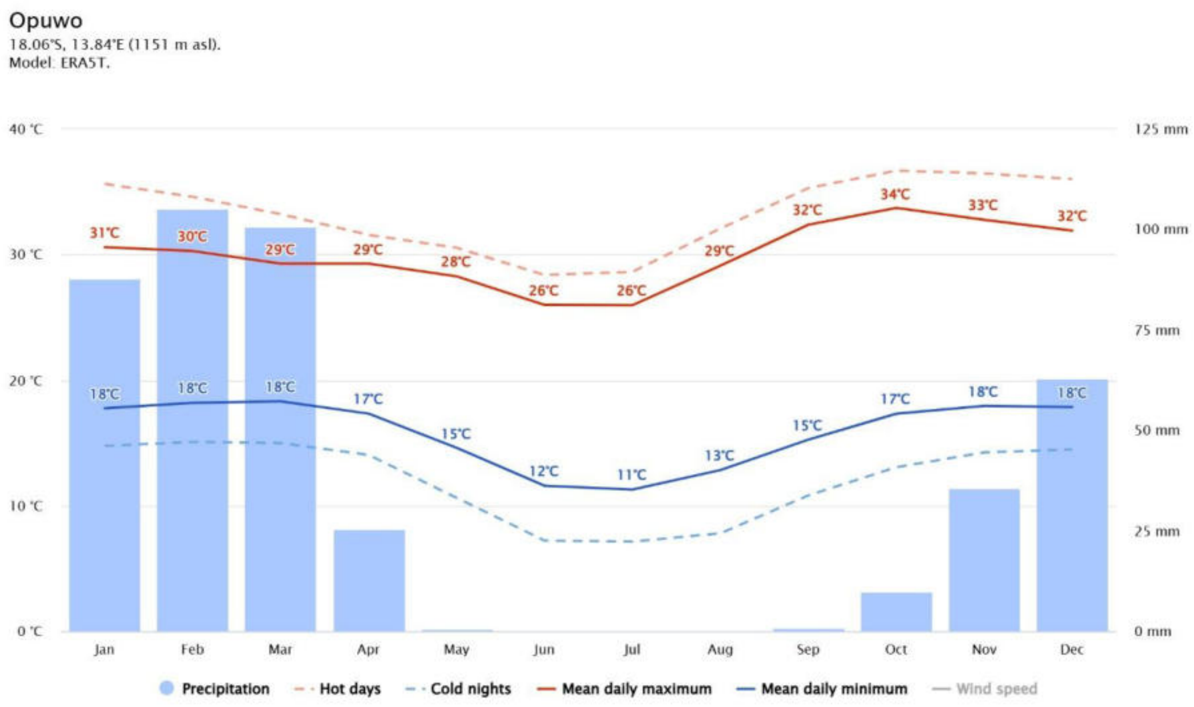

Figure 4. The long term climatic condition for the mining claims area.

The climatic conditions of the receiving environment play an important role in influencing:

- Vegetation distribution;

- Groundwater recharge;
- Surface-water occurrence;
- Soil moisture availability;
- Erosion susceptibility;
- Dust generation potential; and
- Rehabilitation capability within disturbed areas.

The project area generally experiences a distinct wet and dry seasonal cycle, with most rainfall occurring during the summer rainfall season between approximately November and April.

Rainfall within the region is typically:

- Seasonal;
- Highly variable;
- Spatially inconsistent; and
- Strongly influenced by periodic drought conditions.

Extended dry periods are common throughout much of the year and prolonged drought conditions have historically affected:

- Livestock grazing capacity;
- Vegetation cover;
- Groundwater reliance;
- Rural livelihoods within the surrounding communal environment.

The semi-arid climatic conditions contribute significantly to the ecological sensitivity of the receiving environment and increase the importance of:

- Responsible groundwater management;
- Dust suppression;
- Erosion control;
- Progressive rehabilitation;
- Vegetation preservation.

Temperatures within the project area are generally characterized by:

- Hot summer daytime conditions;
- Mild to warm winter daytime temperatures;
- Moderate diurnal temperature variation.

Summer daytime temperatures may commonly range between approximately 35°C and 40°C during hotter periods of the year, particularly during the late dry season preceding the onset of summer rainfall.

Winter temperatures within the area are generally milder compared to many inland regions of Namibia, with daytime temperatures commonly ranging between approximately 20°C and 25°C. Extremely cold winter conditions are considered relatively uncommon within the broader project area, although cooler night-time temperatures may occasionally occur due to the elevated mountainous terrain.

The climatic conditions associated with high summer temperatures and prolonged dry periods may influence operational activities through:

- Increased dust-generation potential;
- Elevated evaporation rates;
- Increased operational water demand;
- Heat-stress risks for personnel;
- Reduced natural vegetation recovery rates.

Wind conditions within the broader region are generally moderate, although occasional easterly winds may occur during the dry winter months, particularly between approximately July and September.

These seasonal wind conditions may influence:

- Dust dispersion;
- Surface erosion;
- Vegetation desiccation;
- Operational air-quality conditions.

The relatively open mountainous and valley terrain surrounding the project area may locally influence:

- Wind exposure;
- Dust transport pathways;
- Microclimatic conditions within valleys and elevated ridges.

Fog and mist conditions are generally limited within the project area due to its inland location; however, occasional atmospheric moisture influence associated with the Benguela Upwelling System along the Namibian coast may occasionally extend inland under specific climatic conditions.

Overall evaporation rates within the broader region are expected to remain relatively high due to:

- Elevated summer temperatures;
- Low humidity conditions;
- Prolonged dry periods;
- Semi-arid climatic characteristics.

The high evaporation conditions further reinforce the importance of:

- Water recycling and reuse;
- Controlled water management;
- Groundwater conservation;
- Minimization of unnecessary water losses.

From an operational perspective, the semi-arid climatic conditions of the project area present several environmental-management considerations requiring ongoing attention throughout the project lifecycle, including:

- Dust management;
- Water conservation;
- Stormwater management during rainfall events;
- Erosion control;
- Progressive rehabilitation;
- Worker heat-stress management.

The relatively low rainfall conditions and high evaporation rates may also provide certain operational advantages associated with:

- Reduced large-scale surface-water interaction;
- Reduced persistent waterlogging;
- Reduced large-scale flooding risks within operational areas.

No major evidence of historical flood scarring or persistent surface-water accumulation was observed within the immediate project area during site investigations, although localized runoff may occur within valley systems following seasonal rainfall events.

Climate variability and periodic drought conditions nevertheless remain important environmental considerations within the receiving environment and may influence:

- Groundwater availability;
- Vegetation recovery rates;
- Long-term rehabilitation success;

- Ecological resilience within disturbed areas.

The proposed project has therefore incorporated several operational and environmental-management measures intended to improve climate resilience and reduce climate-related environmental impacts, including:

- Water recycling and reuse systems;
- Reduced operational water demand;
- Controlled disturbance footprints;
- Progressive rehabilitation;
- Dust-management measures;
- Stormwater-management controls;
- Groundwater monitoring programmes.

Overall, the climatic conditions of the receiving environment are considered manageable for the proposed small-scale mining operation provided that appropriate environmental-management measures and operational controls are implemented throughout all phases of the project lifecycle.

3.3 Topography and Terrain

The proposed project area is situated within a rugged mountainous environment characteristic of portions of the Kunene Region of north-western Namibia. The broader landscape surrounding the mining claims is characterized by:

- Rocky hills and mountainous terrain;
- Broad valley systems;
- Moderately dissected topography;
- Structurally controlled ridges and slopes;
- Semi-arid drainage systems.

The terrain within the project area is generally considered highly rugged, although broad valleys and natural topographical corridors provide relatively accessible routes for operational movement and infrastructure development.

Figure 5. The topographical geomorphology for the mining claims area.

Elevations within the project area average approximately 1,630 metres above sea level, with localized topographical variation occurring between elevated rocky ridges, hills, and broad valley systems.

The topographical characteristics of the receiving environment strongly influence:

- Surface drainage patterns;

- Stormwater runoff;
- Erosion susceptibility;
- Vegetation distribution;
- Access-road placement;
- Infrastructure development potential;
- Visual exposure of operational infrastructure.

The rugged terrain has further influenced the proposed project layout and operational planning, particularly with respect to:

- Access-road alignments;
- Infrastructure positioning;
- Stormwater management;
- Erosion-control planning;
- Rehabilitation considerations.

The project intends to preferentially utilize existing natural valley systems and topographical corridors for operational access roads in order to:

- Reduce major earthworks requirements;
- Minimize vegetation disturbance;
- Reduce slope-cutting requirements;
- Minimize surface instability;
- Reduce erosion potential.

This operational approach significantly reduces environmental disturbance compared to extensive cut-and-fill road construction commonly associated with steeper mountainous developments.

The valleys within the project area are generally broad rather than narrow, thereby providing relatively stable and accessible operational corridors for controlled vehicle movement and infrastructure access.

No major cliff systems were observed within the immediate project area during site investigations, although localized rocky slopes and elevated ridges occur throughout portions of the mining claims.

The absence of major cliff systems and unstable escarpments reduces:

- Major slope-failure risks;
- Rockfall hazards;

- Large-scale geotechnical instability concerns.

No significant talus or loose scree slopes were observed during site investigations and most slopes appear relatively stable under existing environmental conditions.

The terrain is generally characterized by:

- Rocky and shallow surface conditions on elevated areas;
- Broad sandy valley systems;
- Occasional clay-rich valley floors;
- Structurally controlled rocky outcrops.

The broader terrain therefore reflects a combination of:

- Resistant bedrock-controlled ridges;
- Weathered mountainous surfaces;
- Alluvial valley infill systems;
- Semi-arid erosional landforms.

Exposed bedrock within the project area is relatively limited in some areas due to partial coverage by alluvial sands and weathered surficial materials. Nevertheless, localized outcrops of:

- Phyllites;
- Cherts;
- Siltstones;
- Mineralized vein systems

occur within portions of the project area and surrounding hills.

The partially sand-covered terrain influences:

- Surface runoff behavior;
- Infiltration characteristics;
- Erosion response;
- Vegetation distribution.

No major historical flood scarring or significant sediment-deposition features were observed within the broader valleys during site investigations, suggesting that large-scale destructive flood events may be relatively limited within the immediate project area under existing climatic conditions.

However, localized runoff and temporary surface flow may still occur within valley systems during seasonal rainfall events.

The relatively low rainfall conditions combined with broad valley systems generally reduce the likelihood of:

- Persistent flooding;
- Long-term surface-water accumulation;
- Major channel erosion within operational areas.

Despite this, the rugged mountainous terrain remains environmentally sensitive to:

- Surface disturbance;
- Vegetation clearing;
- Uncontrolled runoff;
- Poorly managed road construction;
- Improper stormwater management.

Consequently, careful environmental management will be required throughout operational phases to minimize:

- Soil erosion;
- Surface instability;
- Sediment transport;
- Visual scarring associated with excavation and road development.

The topographical setting of the project area also influences the visual character of the surrounding landscape. Elevated ridges and rocky hills create a visually prominent mountainous environment, although the relatively remote location and low population density substantially reduce high-sensitivity visual receptors within the surrounding area.

From an operational perspective, the rugged terrain presents both constraints and advantages for the proposed project.

Operational constraints associated with the terrain may include:

- More difficult equipment movement;
- Controlled road-design requirements;
- Localized slope-management considerations;
- Increased stormwater-management planning requirements.

Operational advantages may include:

- Natural topographical containment of infrastructure;
- Reduced visibility from distant receptors;

- Structurally controlled mineralization exposure;
- Natural separation of operational zones.

The relatively small-scale operational footprint, controlled infrastructure layout, utilization of natural valley systems, and progressive rehabilitation philosophy substantially reduce terrain-related environmental impacts compared to large-scale mining developments involving extensive landscape modification.

Provided that appropriate erosion-control measures, stormwater-management systems, slope-stabilization procedures, and rehabilitation commitments are implemented throughout operational phases, the topographical and terrain conditions of the project area are considered manageable for the proposed small-scale precious-metals mining operation.

3.4 Geology and Mineralization

The proposed project area is situated within a structurally complex mountainous geological environment within the Kunene Region of north-western Namibia. The broader geological setting is characterized by deformed metasedimentary and structurally controlled lithological units associated with mineralized vein systems and sulphide-hosted mineralization.

Geological conditions within the project area are considered favorable for structurally controlled precious-metals mineralization associated with quartz and carbonate veining systems occurring within altered and deformed host rocks.

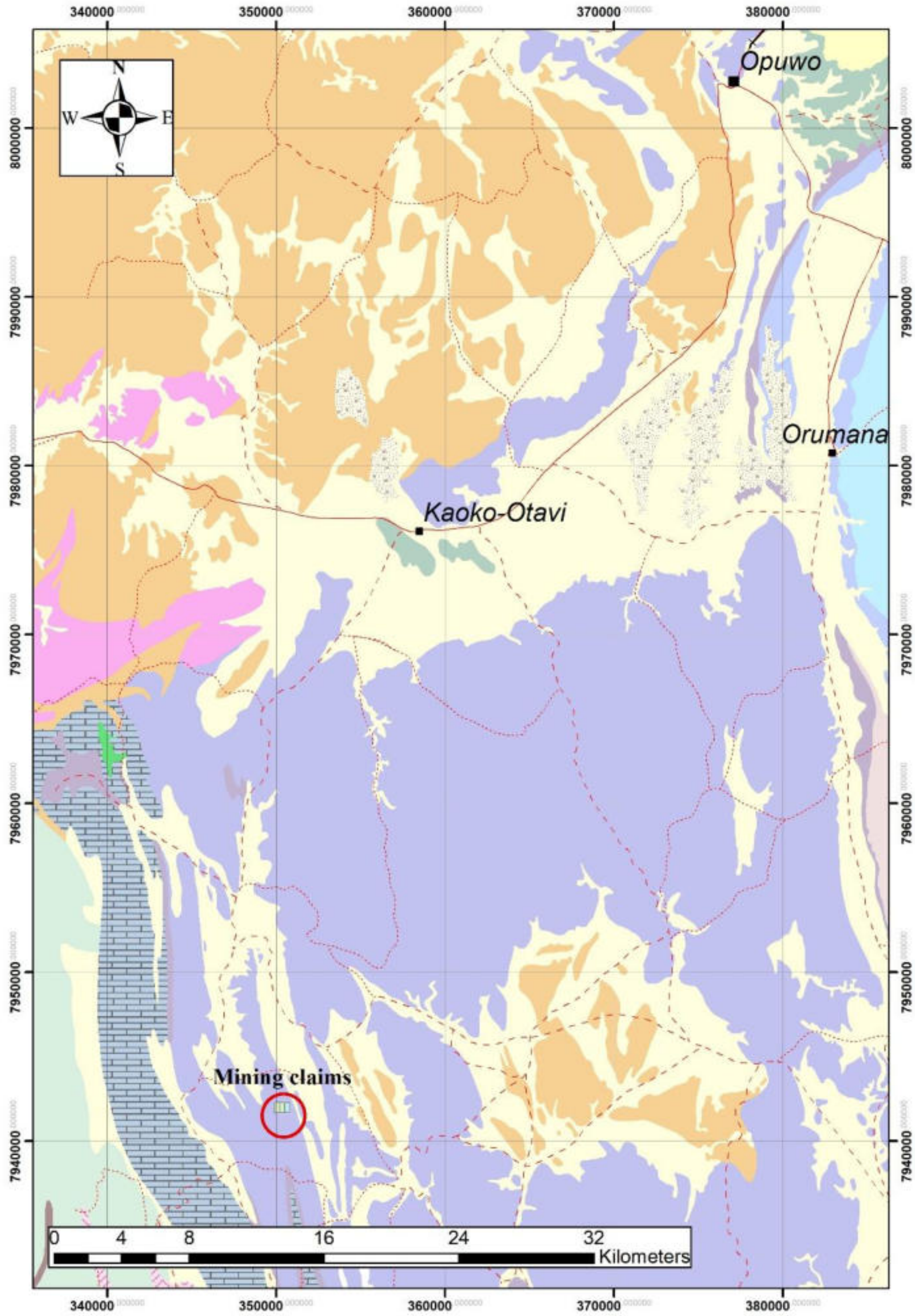

Figure 6. The geological map of the mining claims area.

The geological environment surrounding the mining claims is characterized by:

- Phyllitic lithologies;
- Chert horizons;
- Siltstone units;
- Structurally controlled quartz veins;

- Carbonate veining systems;
- Sulphide mineralization associated with fracture and shear systems.

Outcrop exposure within portions of the project area is relatively limited due to partial coverage by alluvial sands and weathered surficial material. Nevertheless, localized rocky outcrops and mineralized zones occur within elevated hills and structurally controlled areas throughout the mining claims.

The mineralization observed within the project area is interpreted to be predominantly:

- Structurally controlled;
- Stratabound in localized areas;
- Associated with quartz and carbonate veining systems;
- Sulphide-hosted in portions of the mineralized zones.

The mineralized systems appear to follow structurally favorable zones associated with:

- Fractures;
- Shear zones;
- Vein systems;
- Lithological contacts.

Field investigations identified widespread evidence of hydrothermal alteration and sulphide-associated mineralization throughout portions of the project area.

Visible mineralization observed during site investigations includes:

- Malachite;
- Azurite;
- Chalcopyrite;
- Bornite;
- Pyrite.

The occurrence of visible malachite and azurite indicates localized oxidation of copper-bearing sulphide mineralization within portions of the weathered near-surface environment.

Sulphide mineralization observed within the project area primarily consists of:

- Chalcopyrite;
- Bornite;
- Pyrite.

The presence of pyrite and sulphide-hosted mineralization is considered environmentally important due to potential implications associated with:

- Sulphide oxidation;
- Acid-generation potential;
- Metal mobility;
- Long-term waste-rock behavior;
- Groundwater protection considerations.

However, the relatively small-scale nature of the operation, selective mining philosophy, controlled waste management, and progressive rehabilitation approach substantially reduce the likelihood of large-scale acid-generating conditions commonly associated with major sulphide-mining operations.

Quartz and carbonate veins are widespread within portions of the project area and appear closely associated with structurally controlled mineralization zones. These vein systems likely represent important conduits for hydrothermal fluid movement and mineral deposition within the broader geological environment.

The observed mineralization style suggests a hydrothermal mineralizing system associated with structurally controlled fluid migration pathways within deformed host rocks.

Gold mineralization within the project area is interpreted to occur primarily as:

- Structurally controlled hard-rock gold mineralization;
- Sulphide-associated gold;
- Vein-hosted gold within quartz-carbonate systems.

The proposed mining operation is expected to target mineralized zones with anticipated grades of up to approximately 5 g/t gold within economically viable portions of the mineralized system.

Copper and silver occurring within portions of the mineralized material are expected to occur primarily as secondary by-products associated with the sulphide mineral assemblage.

No evidence of extensive historical artisanal workings or major historical mining disturbances was observed within the immediate project area during site investigations.

The geological and mineralization characteristics of the project area significantly influenced the proposed mining and processing philosophy adopted for the project, particularly with respect to:

- Selective mining methods;
- Gravity-assisted mineral recovery;
- Controlled sulphide processing;
- Reduced waste generation;

- Controlled reagent usage;
- Progressive rehabilitation planning.

The structurally controlled and relatively localized nature of the mineralized zones supports the proposed small-scale selective mining approach and reduces the need for extensive large-scale excavation or high-volume waste stripping commonly associated with bulk-tonnage mining operations.

From an environmental perspective, the geological setting presents several important environmental-management considerations requiring ongoing attention throughout operational phases, including:

- Sulphide oxidation potential;
- Waste-rock management;
- Groundwater protection;
- Controlled reagent management;
- Surface-water protection;
- Long-term rehabilitation planning.

The presence of sulphide-hosted mineralization further reinforces the importance of:

- Controlled processing systems;
- Dry-stack residue management;
- Groundwater monitoring;
- Progressive rehabilitation;
- Controlled waste-rock placement.

The proposed operational philosophy emphasizing:

- Small-scale selective mining;
- Reduced operational footprints;
- Gravity-assisted mineral recovery;
- Controlled chemical-assisted recovery;
- Reduced waste generation;
- Progressive rehabilitation

substantially reduces geological and geochemical environmental risks compared to conventional large-scale sulphide-hosted precious-metals operations.

Overall, the geological setting of the project area is considered favorable for the proposed small-scale precious-metals mining operation and compatible with the controlled mining and processing philosophy proposed for the project, provided that all environmental-management and groundwater-protection measures outlined within the Environmental Management Plan are fully implemented throughout operational phases.

3.5 Surface Water and Hydrology

The proposed project area is situated within a semi-arid hydrological environment characteristic of the Kunene Region of north-western Namibia. Surface-water resources within the broader region are generally limited and highly seasonal due to:

- Low and variable rainfall conditions;
- High evaporation rates;
- Prolonged dry periods;
- Semi-arid climatic characteristics.

The hydrological environment surrounding the project area is therefore dominated primarily by:

- Ephemeral surface runoff;
- Seasonal drainage activity;
- Broad dry valley systems;
- Groundwater dependency within surrounding communal areas.

No perennial rivers, major permanent water bodies, or significant wetlands occur within the immediate vicinity of the proposed mining operation.

The project area is situated away from major perennial drainage systems and no significant surface-watercourses occur directly within the proposed operational footprint.

The absence of major perennial surface-water systems substantially reduces:

- Direct operational interaction with permanent aquatic environments;
- Large-scale surface-water contamination risks;
- Long-term surface-water management complexity.

The broader project area is characterized by broad valleys and localized ephemeral drainage systems that may convey temporary runoff following seasonal rainfall events during the wet season between approximately November and April.

These drainage systems are generally inactive for extended periods during the dry season and surface-water flow within the broader area is expected to remain highly episodic and rainfall dependent.

No evidence of:

- Permanent water pooling;
- Springs;
- Seeps;
- Persistent surface saturation;
- Major flood scarring

was observed during site investigations within the immediate project area.

The absence of significant flood scarring and major erosional channels suggests that large-scale destructive flood events may be relatively limited within the immediate operational area under existing climatic conditions.

Nevertheless, localized runoff and temporary stormwater flow may still occur within:

- Broad valley systems;
- Drainage depressions;
- Natural topographical corridors

during seasonal rainfall events.

The topography and hydrological characteristics of the receiving environment strongly influence:

- Surface runoff pathways;
- Sediment transport potential;
- Erosion susceptibility;
- Infrastructure placement;
- Stormwater-management requirements.

The broad valleys occurring throughout portions of the project area may act as localized runoff-collection pathways during intense rainfall events and therefore require careful environmental management during operational phases.

The proposed operational layout has intentionally incorporated several hydrological management considerations aimed at minimizing disturbance to natural drainage behavior, including:

- Utilization of existing valleys and disturbed routes for access roads;
- Avoidance of major drainage pathways where feasible;
- Controlled infrastructure placement;
- Stormwater-diversion systems;
- Progressive rehabilitation;

- Erosion-control measures.

The relatively small-scale nature of the proposed operation significantly reduces:

- Large-scale catchment disturbance;
- Major hydrological modification;
- Extensive drainage alteration;
- Large-scale sediment mobilization.

No significant evidence of sediment deposition or major active erosion features was observed within the broader valleys during site investigations, suggesting relatively stable present-day surface conditions under existing land-use activities.

However, the semi-arid environment remains environmentally sensitive to:

- Vegetation removal;
- Poor stormwater management;
- Surface disturbance;
- Improper road construction;
- Uncontrolled runoff concentration.

Disturbance of natural surfaces without appropriate erosion-control measures may increase:

- Surface erosion;
- Sediment transport;
- Localized channel incision;
- Dust generation;
- Surface instability.

Consequently, careful stormwater and erosion management will be required throughout operational phases.

Potential stormwater-management measures associated with the project may include:

- Diversion berms;
- Surface-water channels;
- Controlled runoff pathways;
- Erosion-control structures;
- Surface stabilization measures;
- Progressive rehabilitation of disturbed areas.

The relatively low rainfall conditions and high evaporation rates within the project area may provide certain operational advantages by reducing:

- Persistent standing water;
- Continuous runoff conditions;
- Long-term waterlogging;
- Large-scale flood interaction with operational infrastructure.

Nevertheless, episodic high-intensity rainfall events typical of semi-arid environments may still generate localized runoff and temporary erosion within disturbed areas if appropriate management controls are not implemented.

The proposed operation further intends to implement:

- Water recycling systems;
- Controlled reagent containment systems;
- Bunded hazardous-material storage;
- HDPE-lined operational areas where necessary;
- Controlled waste-management systems

in order to minimize potential hydrological contamination pathways associated with mining and processing activities.

Groundwater protection remains a particularly important environmental-management objective due to the limited surface-water availability and groundwater dependency of surrounding communal communities.

The relatively small-scale operational footprint, controlled processing philosophy, dry-stack residue management approach, and reduced chemical dependency substantially reduce hydrological environmental risks commonly associated with conventional large-scale precious-metals mining operations.

Provided that all stormwater-management measures, erosion-control systems, groundwater-protection measures, and environmental-management commitments outlined within the Environmental Management Plan are fully implemented, surface-water and hydrological impacts associated with the proposed operation are considered environmentally manageable within the receiving environment of the Kunene Region.

3.6 Groundwater Environment

Groundwater forms the principal water resource within the broader project area and surrounding communal environment due to the absence of reliable perennial surface-water systems within much of the Kunene Region.

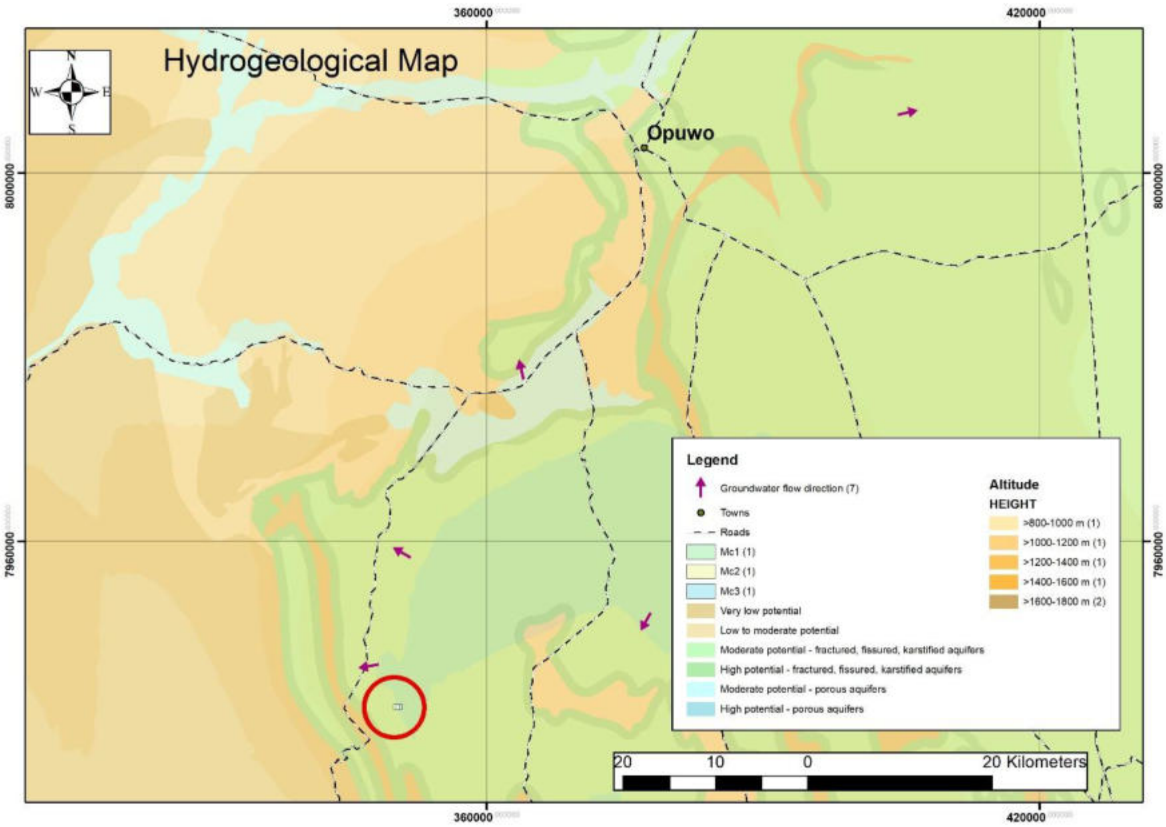

Figure 7. the hydrogeological map of the mining claims area.

The receiving environment surrounding the proposed mining operation is therefore considered highly dependent on groundwater resources for:

- Domestic water supply;
- Livestock watering;
- Operational activities;
- Long-term community sustainability.

The groundwater environment is strongly influenced by:

- Semi-arid climatic conditions;
- Low and variable rainfall;
- High evaporation rates;
- Structurally controlled geological conditions;
- Limited surface-water availability.

Groundwater within the broader project area is generally associated with:

- Fractured bedrock systems;
- Structurally controlled groundwater movement;

- Weathered bedrock zones;
- Localized secondary permeability associated with fractures and geological structures.

Groundwater occurrence within the region is therefore expected to be relatively variable and strongly influenced by:

- Structural geology;
- Fracture density;
- Lithological conditions;
- Local topography.

The estimated groundwater depth within the broader project area is approximately 100 metres below surface, although localized variations may occur depending on structural and hydrogeological conditions.

Available information and field observations indicate that groundwater within the area is generally characterized by:

- Freshwater quality;
- Relatively strong borehole yields;
- Continued groundwater availability throughout dry periods.

No evidence of saline or brackish groundwater conditions was reported within the immediate project area during site investigations.

Groundwater abstraction within the broader communal environment forms an important component of local livelihoods and community sustainability due to the absence of reliable perennial surface-water systems.

Several boreholes and groundwater-supply points occur within the broader surrounding area, including boreholes situated approximately 5 kilometres from portions of the proposed project area.

No significant evidence of:

- Springs;
- Permanent seepage zones;
- Artesian conditions;
- Groundwater-fed wetlands

was observed within the immediate project footprint during site investigations.

The hydrogeological environment surrounding the proposed operation is therefore considered moderately sensitive due to:

- Groundwater dependency within surrounding communal areas;

- Semi-arid climatic conditions;
- Limited alternative water resources;
- Long-term drought vulnerability.

Groundwater protection has consequently been identified as one of the primary environmental-management priorities for the proposed project.

The proposed mining and processing operation involves several activities that may present potential groundwater contamination risks if improperly managed, including:

- Controlled reagent handling;
- Sulphide-hosted ore processing;
- Fuel and hydrocarbon storage;
- Waste-rock storage;
- Dry residue management;
- Operational wastewater generation.

However, the relatively small-scale operational footprint, gravity-assisted processing philosophy, reduced chemical dependency, and controlled infrastructure layout substantially reduce groundwater contamination risks compared to conventional large-scale precious-metals mining operations.

Several operational characteristics of the proposed project further reduce groundwater vulnerability, including:

- Dry-stack residue management;
- Reduced liquid tailings generation;
- Zero-liquid-discharge operational objectives;
- Water recycling and reuse;
- Controlled reagent handling;
- Mercury-free processing philosophy;
- Reduced cyanide dependency.

The proposed project further intends to implement multiple groundwater-protection measures throughout all phases of the operation, including:

- Bunded hazardous-material storage areas;
- HDPE-lined operational areas where necessary;
- Controlled fuel-storage systems;
- Spill-containment infrastructure;

- Controlled waste-management systems;
- Stormwater-diversion measures;
- Progressive rehabilitation;
- Groundwater-monitoring programmes.

Groundwater-monitoring systems and monitoring devices are expected to be implemented during operational phases in order to:

- Monitor groundwater quality;
- Detect potential contamination pathways;
- Evaluate operational environmental performance;
- Support long-term environmental management.

Groundwater-quality monitoring may include assessment of:

- pH;
- Electrical conductivity;
- Sulphates;
- Dissolved metals;
- Hydrocarbon indicators;
- General groundwater chemistry parameters.

The presence of sulphide-hosted mineralization within portions of the orebody further reinforces the importance of:

- Controlled waste-rock placement;
- Controlled reagent usage;
- Surface-water management;
- Monitoring of acid-generation potential;
- Long-term groundwater surveillance.

The relatively limited scale of waste-rock generation and the selective mining philosophy adopted for the project substantially reduce the likelihood of large-scale acid-rock drainage conditions commonly associated with major sulphide-mining operations.

No major groundwater-dependent ecosystems or significant groundwater-fed wetlands were identified within the immediate project area during site investigations.

The project area further benefits from:

- Relatively low population density;

- Remote operational setting;
- Limited surrounding industrial development.

These factors reduce cumulative groundwater stress compared to more heavily industrialized regions.

Nevertheless, long-term groundwater sustainability remains environmentally important due to:

- Regional drought vulnerability;
- Groundwater dependency of surrounding communities;
- Climatic variability within the Kunene Region.

The project therefore intends to:

- Promote water-use efficiency;
- Maximize water recycling and reuse;
- Reduce unnecessary groundwater abstraction;
- Minimize contamination risks;
- Implement long-term groundwater monitoring.

The proposed operational philosophy emphasizing:

- Small-scale mining;
- Gravity-assisted mineral recovery;
- Reduced chemical dependency;
- Controlled hazardous-material handling;
- Progressive rehabilitation

substantially reduces groundwater-related environmental risks compared to conventional large-scale precious-metals mining operations.

Provided that all groundwater-protection measures, monitoring programmes, hazardous-material controls, and environmental-management commitments outlined within the Environmental Management Plan are fully implemented, groundwater-related impacts associated with the proposed operation are considered environmentally manageable within the receiving environment of the Kunene Region.

3.7 Biodiversity and Vegetation

The proposed project area is situated within a semi-arid communal savanna and mountainous environment characteristic of portions of the Kunene Region of north-western Namibia. The broader ecological environment is influenced by:

- Low and variable rainfall;
- Periodic drought conditions;
- Rocky mountainous terrain;
- Broad valley systems;
- Semi-arid vegetation communities.

Vegetation within the project area is generally characterized by moderate vegetation cover consisting predominantly of:

- Shrubs;
- Small trees;
- Drought-adapted savanna vegetation;
- Semi-arid woodland species.

Vegetation density varies according to:

- Topography;
- Soil depth;
- Moisture availability;
- Drainage conditions.

The mountainous hills and elevated rocky areas are generally characterized by:

- Sparse shrub vegetation;
- Smaller woody plant species;
- Rocky semi-arid vegetation communities.

Larger trees are generally concentrated within:

- Broad valleys;
- Localized drainage areas;
- Areas with relatively improved moisture conditions.

The vegetation communities within the broader project area are considered generally adapted to:

- Harsh climatic conditions;

- Low rainfall;
- Seasonal drought;
- Rocky and shallow soil conditions.

The broader ecological environment has additionally been influenced by:

- Livestock grazing activities;
- Periodic drought impacts;
- Long-term communal land-use pressures.

The surrounding communal environment is currently utilized predominantly for livestock grazing activities involving:

- Cattle;
- Goats;
- Other domestic livestock.

Field observations and community information indicate that prolonged drought conditions have historically reduced livestock numbers within portions of the broader region.

Although grazing pressure occurs within portions of the surrounding environment, no major large-scale vegetation degradation or severe active erosion was observed within the immediate project area during site investigations.

The soils within the project area generally consist of:

- Shallow rocky soils on elevated terrain;
- Sandy alluvial material within valleys;
- Occasional clay-rich valley floors.

The relatively shallow and drought-sensitive soils increase the ecological importance of:

- Vegetation preservation;
- Controlled surface disturbance;
- Progressive rehabilitation;
- Topsoil conservation.

No protected plant species were identified within the immediate project area during site investigations. Nevertheless, the semi-arid vegetation communities occurring within the broader environment remain ecologically important for:

- Grazing support;
- Wildlife habitat;

- Erosion control;
- Ecological stability within the communal landscape.

The broader project area supports a variety of wildlife species commonly associated with semi-arid north-western Namibian environments.

Wildlife species observed or expected within the broader surrounding area include:

- Springbok;
- Oryx;
- Kudu;
- Smaller antelope species;
- Wild cats;
- Reptiles including snakes and lizards;
- Occasional elephants and lions moving through surrounding communal landscapes.

Wildlife occurrence within the area is likely influenced by:

- Seasonal climatic conditions;
- Water availability;
- Grazing conditions;
- Human activity within surrounding communal areas.

No major wildlife migration corridors or concentrated wildlife movement pathways were identified within the immediate operational footprint during site investigations.

The absence of significant wildlife concentration zones within the immediate project area substantially reduces:

- Major habitat fragmentation risks;
- Large-scale wildlife displacement impacts;
- Severe ecological connectivity disruption.

Birdlife within the broader project area is characteristic of semi-arid savanna and rocky mountainous environments.

Bird species commonly observed or expected within the broader area include:

- Bare-cheeked Babbler (*Turdoides gymnogenys*);
- Rüppell’s Parrot (*Poicephalus rueppellii*);
- Monteiro’s Hornbill (*Tockus monteiri*);
- Rosy-faced Lovebird (*Agapornis roseicollis*);

- White-browed Sparrow-Weaver (*Plocepasser mahali*);
- Red-billed Spurfowl (*Pternistis adspersus*);
- Namaqua Sandgrouse (*Pterocles namaqua*);
- Black-faced Waxbill (*Brunhilda erythronotos*);
- Pale-winged Starling (*Onychognathus nabouroup*).

The rocky terrain, scattered trees, and valley systems provide suitable habitat for a range of:

- Small mammals;
- Reptiles;
- Avifauna;
- Semi-arid adapted wildlife species.

The proposed operation falls within a broader communal and conservancy-linked landscape and therefore requires careful management of:

- Vegetation clearing;
- Habitat disturbance;
- Noise and dust generation;
- Waste management;
- Wildlife interaction.

Despite this, the relatively small-scale operational footprint substantially reduces ecological disturbance compared to conventional large-scale mining developments.

The project has further adopted several operational approaches intended to reduce biodiversity impacts, including:

- Selective mining methods;
- Reduced disturbance footprints;
- Utilization of existing access routes;
- Progressive rehabilitation;
- Topsoil preservation;
- Controlled waste management;
- Reduced night-time disturbance.

The absence of night-time operational transport and limited operational lighting further reduces:

- Wildlife disturbance;

- Nocturnal ecological disruption;
- Attraction or disorientation of fauna.

The proposed operation additionally intends to implement environmental-management measures aimed at minimizing:

- Unnecessary vegetation clearing;
- Surface disturbance;
- Windblown waste;
- Wildlife interaction with hazardous materials;
- Long-term ecological degradation.

Rehabilitation activities planned for the project may include:

- Recontouring disturbed surfaces;
- Topsoil redistribution;
- Re-establishment of locally occurring vegetation where feasible;
- Surface stabilization and erosion control.

The relatively small-scale and controlled operational philosophy adopted for the project substantially improves the long-term rehabilitation potential of disturbed areas compared to large-scale open-pit mining operations.

Although the broader ecological environment remains environmentally sensitive due to:

- Semi-arid climatic conditions;
- Drought vulnerability;
- Slow vegetation recovery rates,

the proposed operation is considered capable of operating within environmentally manageable biodiversity parameters provided that all environmental-management measures, rehabilitation commitments, and ecological-protection procedures outlined within the Environmental Management Plan are fully implemented throughout all phases of the project lifecycle.

3.8 Land Use and Socio-Economic Environment

The proposed project area is situated within a rural communal environment of the Kunene Region in north-western Namibia. The broader socio-economic setting is characterized by:

- Low population density;
- Communal land-use systems;
- Livestock-based livelihoods;
- Groundwater dependency;
- Limited formal economic opportunities;
- Rural settlement patterns.

The surrounding environment is primarily utilized for:

- Livestock grazing;
- Rural settlement activities;
- Subsistence and communal land use;
- Limited small-scale economic activities.

The project area falls within a broader communal landscape associated with villages including:

- Otjinanwa;
- Okakuara;
- Kaoko Otavi;
- Warmquelle;
- Surrounding rural settlements.

The nearest major regional service centre is Opuwo, situated approximately 1 hour and 30 minutes travel distance from the project area. Opuwo serves as the primary:

- Administrative centre;
- Commercial hub;
- Fuel and supply centre;
- Transport and logistics node;
- Government service centre

for much of the surrounding Kunene Region.

Additional regional settlements including Sesfontein and surrounding communal villages provide localized community and support functions within the broader area.

The socio-economic environment surrounding the proposed operation is strongly influenced by:

- Semi-arid climatic conditions;
- Recurring drought periods;
- Livestock grazing dependency;
- Limited formal employment opportunities;
- Rural economic vulnerability.

Livestock farming forms one of the principal livelihood activities within the surrounding communal environment, with cattle, goats, and other domestic livestock contributing significantly to:

- Household income;
- Food security;
- Cultural and traditional practices;
- Rural economic stability.

The prolonged drought conditions historically experienced within portions of the Kunene Region have negatively affected:

- Grazing conditions;
- Livestock productivity;
- Household resilience;
- Rural economic sustainability.

The broader region therefore remains economically vulnerable to:

- Climatic variability;
- Drought impacts;
- Limited economic diversification;
- Infrastructure limitations.

Groundwater forms the primary water source within the surrounding communal environment due to the absence of reliable perennial surface-water systems.

Consequently, groundwater resources remain critically important for:

- Domestic water supply;
- Livestock watering;
- Long-term community sustainability;

- Rural settlement viability.

No schools, churches, or major public infrastructure occur immediately adjacent to the proposed mining footprint. Most major community infrastructure is concentrated within:

- Opuwo;
- Sesfontein;
- Kaoko Otavi;
- Warmquelle;
- Other surrounding regional settlements.

The relatively remote location of the proposed operation substantially reduces:

- High-density settlement interaction;
- Urban land-use conflict;
- Direct public exposure to operational activities.

Nevertheless, surrounding communal communities remain important environmental and socio-economic receptors due to:

- Groundwater dependency;
- Livestock grazing activities;
- Reliance on communal land resources.

The broader region has experienced limited mining-related activities historically, although artisanal mining activities are known to occur near Otuani village within portions of the surrounding regional environment.

The existence of artisanal mining activities within the broader region indicates:

- Existing regional familiarity with mining activities;
- Existing local interest in mineral-resource development;
- Potential cumulative land-use pressures associated with informal mining activities.

The proposed project is expected to generate several potential positive socio-economic benefits within the surrounding communal environment, including:

- Employment creation;
- Skills transfer;
- Operational training opportunities;
- Contractor participation;
- Local procurement opportunities;

- Regional economic stimulation.

The project intends to prioritize local employment opportunities where feasible, particularly during operational phases requiring:

- General labour;
- Operational support services;
- Transport assistance;
- Camp support activities;
- Environmental-management support.

Community consultations undertaken as part of the Environmental Scoping Study identified several key concerns and expectations raised by surrounding community members and stakeholders.

The principal issues raised during consultation activities included:

- Employment opportunities for local residents;
- Concerns regarding local people being overlooked during recruitment;
- Skills-transfer opportunities;
- Community participation in project benefits;
- Regional development expectations.

These concerns reflect broader socio-economic challenges commonly experienced within rural communal environments where:

- Formal employment opportunities remain limited;
- Economic vulnerability is elevated;
- Youth unemployment is significant;
- Infrastructure development remains constrained.

The proposed operation may therefore contribute positively toward:

- Localized income generation;
- Rural economic participation;
- Skills development;
- Community economic resilience.

However, potential socio-economic risks associated with the project may also include:

- Employment expectation pressure;
- Perceived inequitable benefit distribution;

- Localized land-use conflict if poorly managed;
- Increased pressure on local services and resources during operational phases.

The relatively small-scale nature of the proposed operation substantially reduces:

- Large-scale population influx;
- Major settlement expansion pressures;
- Significant regional infrastructure strain;
- Large-scale social disruption commonly associated with major mining developments.

The project further intends to maintain ongoing community engagement and stakeholder consultation throughout operational phases in order to:

- Improve communication;
- Address community concerns;
- Support local participation;
- Reduce potential conflict.

From a land-use perspective, the proposed operation is considered compatible with the broader communal and rural setting provided that:

- Environmental impacts remain controlled;
- Groundwater resources are protected;
- Grazing impacts are minimized;
- Progressive rehabilitation is implemented;
- Community engagement remains ongoing.

The relatively small operational footprint, controlled mining philosophy, reduced infrastructure intensity, and progressive rehabilitation approach substantially reduce long-term land-use conflict potential compared to conventional large-scale mining operations.

Provided that all environmental-management measures, stakeholder-engagement commitments, groundwater-protection measures, and rehabilitation obligations outlined within the Environmental Management Plan are fully implemented, socio-economic and land-use impacts associated with the proposed operation are considered environmentally and socially manageable within the receiving environment of the Kunene Region.

3.9 Heritage and Archaeological Environment

The proposed project area is situated within a remote communal mountainous environment of the Kunene Region characterized primarily by:

- Semi-arid landscapes;
- Rocky hills and valleys;
- Sparse rural settlement patterns;
- Livestock-based communal land use.

A preliminary assessment of the heritage and archaeological environment was undertaken as part of the Environmental Scoping Study process in order to identify any visible:

- Archaeological resources;
- Historical structures;
- Graves or burial sites;
- Cultural heritage features;
- Historical mining evidence;
- Sacred or culturally sensitive areas.

No visible graves, burial sites, or human remains were observed within the immediate project footprint during site investigations.

The absence of graves within the immediate operational footprint substantially reduces:

- Direct disturbance risks to burial sites;
- Community-related heritage conflict potential;
- Significant cultural displacement concerns.

No evidence of:

- Historical kraals;
- Stone-walled settlements;
- Archaeological ruins;
- Historical occupation structures;
- Traditional ceremonial areas

was identified within the immediate project area during site investigations.

Similarly, no evidence of:

- Historical mining infrastructure;

- Old mine workings;
- Historical prospecting trenches;
- Mining equipment remnants

was observed within the immediate operational footprint.

The project area therefore appears to have experienced relatively limited historical industrial or mining-related disturbance compared to certain historically mined regions within Namibia.

Community consultation undertaken during the Environmental Scoping Study process did not identify:

- Sacred sites;
- Traditional ceremonial areas;
- Known cultural heritage resources;
- Community heritage concerns

within the proposed operational footprint.

No significant heritage-related concerns were raised by surrounding stakeholders or community members during consultation activities.

The relatively remote nature of the project area and the absence of dense historical settlement patterns likely contribute to the relatively low observed concentration of visible archaeological and cultural heritage resources within the immediate project footprint.

Nevertheless, the broader Kunene Region remains culturally and historically important due to:

- Long-standing communal occupation;
- Traditional pastoral land use;
- Indigenous cultural heritage associated with rural communities.

Consequently, despite the relatively low observed heritage sensitivity within the immediate operational area, precautionary environmental-management measures remain important throughout operational phases.

Potential heritage risks associated with the proposed operation may include:

- Accidental disturbance of previously unidentified subsurface archaeological material;
- Discovery of isolated cultural artefacts during excavation activities;
- Chance discovery of graves or historical material during mining or road-construction activities.

The proposed operation therefore intends to implement a formal Chance Find Procedure throughout all excavation and operational phases.

The Chance Find Procedure will generally require:

- Immediate cessation of work within the affected area;
- Protection and isolation of the discovery site;
- Notification of relevant authorities;
- Heritage assessment where necessary;
- Controlled management of identified heritage resources.

Operational personnel and contractors may additionally be informed of:

- Heritage-protection requirements;
- Reporting procedures for unexpected discoveries;
- Environmental and cultural sensitivity obligations.

The relatively small-scale nature of the proposed mining operation substantially reduces:

- Large-scale landscape disturbance;
- Extensive excavation footprints;
- Widespread ground disturbance commonly associated with major mining developments.

The use of existing access routes and controlled infrastructure placement further reduces:

- Unnecessary surface disturbance;
- Potential disturbance of previously undisturbed areas;
- Regional heritage fragmentation.

From an environmental and heritage-management perspective, the receiving environment is therefore considered to exhibit:

- Relatively low visible heritage sensitivity within the immediate operational footprint;
- Limited evidence of historical industrial activity;
- Limited observed archaeological disturbance risk based on current site observations.

However, the possibility of isolated undocumented archaeological or cultural material occurring below surface cannot be completely excluded due to the remote and relatively under-investigated nature of portions of the surrounding landscape.

Provided that:

- Chance Find Procedures are implemented;
- Ground-disturbance activities remain controlled;
- Environmental-management measures are adhered to;

- Relevant authorities are notified where required,

heritage and archaeological impacts associated with the proposed operation are considered manageable and of relatively low significance within the receiving environment of the Kunene Region.

3.10 Visual and Landscape Environment

The proposed project area is situated within a rugged semi-arid mountainous landscape characteristic of portions of the Kunene Region of north-western Namibia. The broader visual environment is defined by:

- Rocky hills and mountainous terrain;
- Broad valleys;
- Semi-arid savanna vegetation;
- Sparse rural settlement patterns;
- Relatively undeveloped communal landscapes.

The visual character of the surrounding environment is strongly influenced by:

- Natural mountainous landforms;
- Rocky ridges and slopes;
- Semi-arid vegetation cover;
- Broad open valley systems;
- Low-density human development.

The project area is considered relatively remote and visually isolated compared to more densely populated or tourism-sensitive areas within Namibia.

No major tourism routes, formally recognized scenic viewpoints, or high-sensitivity tourism receptors were identified within the immediate vicinity of the proposed operation during site investigations.

The absence of significant tourism infrastructure and high-frequency public viewing areas substantially reduces:

- Visual sensitivity associated with the operation;
- Tourism-related visual conflict potential;
- High public visual exposure.

Similarly, no major residential settlements occur immediately adjacent to the operational footprint and surrounding settlement density remains relatively low.

The mountainous terrain and structurally controlled valleys further provide a degree of natural visual screening within portions of the surrounding landscape.

The proposed operation will nevertheless introduce several visual changes to the existing landscape during operational phases, including:

- Open-pit excavation areas;

- Temporary ore stockpiles;
- Low-profile waste-rock storage areas;
- Processing infrastructure;
- Camp and support facilities;
- Operational roads and vehicle movement.

The proposed operation has intentionally adopted a relatively compact and controlled infrastructure layout aimed at minimizing unnecessary visual disturbance within the surrounding communal environment.

The relatively small-scale operational footprint substantially reduces:

- Large-scale landscape transformation;
- Extensive landform modification;
- Major skyline disturbance;
- Regional visual intrusion.

Waste-rock storage areas associated with the operation are expected to remain relatively low-profile throughout operational phases.

The low-profile waste-rock philosophy substantially reduces:

- Long-distance visual exposure;
- Artificial topographical modification;
- Permanent visual scarring associated with large elevated waste dumps.

Infrastructure associated with the operation will primarily consist of:

- Temporary and prefabricated structures;
- Small-scale processing infrastructure;
- Limited operational support facilities;
- Compact fuel and water infrastructure.

No major permanent industrial infrastructure or large-scale high-rise facilities are proposed as part of the operation.

Operational lighting associated with the proposed project is expected to remain minimal.

The absence of extensive operational lighting significantly reduces:

- Night-time visual disturbance;
- Light pollution;
- Disturbance to surrounding wildlife;

- Long-distance visual exposure during nighttime conditions.

No brightly coloured infrastructure is proposed for the operation and operational structures are expected to remain relatively subdued and functional in appearance.

The use of existing access routes and natural valley systems for operational movement further assists in reducing:

- Extensive new road scarring;
- Large-scale vegetation clearing;
- Visual fragmentation of the surrounding landscape.

The semi-arid vegetation cover within the broader project area additionally contributes to partial visual integration of disturbed areas, particularly where:

- Surface disturbance remains localized;
- Infrastructure remains low-profile;
- Progressive rehabilitation is implemented.

The rugged mountainous topography surrounding the project area naturally limits long-distance visibility from many surrounding areas and assists in visually containing portions of the operational footprint.

Potential visual impacts associated with the operation may nevertheless include:

- Localized excavation visibility;
- Surface disturbance and exposed soils;
- Dust generation during dry conditions;
- Temporary visual contrast associated with infrastructure and stockpiles.

These impacts are expected to remain largely localized due to:

- The relatively small operational scale;
- Remote setting of the project;
- Limited surrounding receptors;
- Controlled operational layout.

Progressive rehabilitation and closure activities proposed for the project will further assist in reducing long-term visual impacts through:

- Recontouring disturbed areas;
- Backfilling of pits where feasible;
- Topsoil redistribution;

- Vegetation re-establishment;
- Removal of temporary infrastructure.

The rehabilitation philosophy adopted for the operation aims to restore disturbed areas as close as reasonably practicable to surrounding natural landscape conditions following completion of mining activities.

The relatively limited operational footprint, temporary infrastructure philosophy, reduced waste-rock volumes, and progressive rehabilitation commitments substantially reduce long-term visual impacts compared to conventional large-scale mining operations.

From a visual and landscape perspective, the receiving environment is therefore considered moderately sensitive due to:

- The natural scenic character of the mountainous environment;
- Relatively undeveloped landscape conditions;
- Semi-arid ecological setting.

However, the overall visual impact significance associated with the proposed operation is expected to remain relatively low to moderate due to:

- The remote location of the project;
- Absence of major tourism receptors;
- Limited surrounding settlement density;
- Small-scale operational footprint;
- Controlled infrastructure design;
- Progressive rehabilitation commitments.

Provided that all environmental-management measures, progressive rehabilitation activities, waste-rock management procedures, and closure commitments outlined within the Environmental Management Plan are fully implemented, visual and landscape impacts associated with the proposed operation are considered environmentally manageable within the receiving environment of the Kunene Region.

Chapter 4 — Public Participation and Stakeholder Consultation

4.1 Introduction

Public participation and stakeholder consultation form an integral component of the Environmental Scoping Study (ESS) process in accordance with the requirements of:

- The Environmental Management Act, 2007 (Act No. 7 of 2007);
- The Environmental Impact Assessment Regulations, 2012;
- Principles of environmental transparency and stakeholder engagement.

The purpose of the public participation process is to:

- Inform Interested and Affected Parties (I&APs) about the proposed project;
- Provide stakeholders with an opportunity to raise concerns and comments;
- Identify potential social and environmental issues;
- Promote transparent decision-making;
- Support inclusive environmental planning.

The consultation process undertaken for the proposed small-scale precious-metals mining operation sought to engage stakeholders within the surrounding communal environment of the Kunene Region in a manner appropriate to the rural and semi-arid setting of the project area.

The consultation process further aimed to:

- Promote awareness of the proposed project;
- Encourage local participation;
- Identify community expectations;
- Facilitate information exchange between the proponent and surrounding stakeholders.

4.2 Objectives of the Public Participation Process

The principal objectives of the public participation process included:

- Notification of stakeholders regarding the proposed project;
- Identification of Interested and Affected Parties;
- Collection of stakeholder concerns and comments;
- Identification of environmental and socio-economic sensitivities;
- Facilitation of stakeholder input into the environmental assessment process;

- Promotion of environmental transparency and accountability.

The consultation process further aimed to identify:

- Community expectations;
- Potential social impacts;
- Land-use concerns;
- Employment-related concerns;
- Environmental-management expectations.

4.3 Stakeholder Identification

Stakeholders identified during the Environmental Scoping Study process included:

- Local communal residents;
- Traditional authorities where applicable;
- Surrounding livestock farmers and land users;
- Community members from nearby villages;
- Government authorities;
- Regional stakeholders;
- Interested community members.
- Kunene Regional authorities where applicable.

4.4 Public Participation Methodology

The consultation process undertaken for the proposed operation included:

- Stakeholder engagement;
- Community consultation;
- Distribution of project information;
- Recording of stakeholder comments and concerns;
- Environmental awareness discussions.

The consultation process was undertaken in a manner intended to accommodate the rural communal setting of the project area and included direct interaction with local stakeholders and surrounding community members.

Consultation activities aimed to:

- Explain the proposed project;

- Discuss the proposed mining and processing methods;
- Explain environmental-management measures;
- Discuss potential environmental and socio-economic impacts;
- Provide stakeholders with an opportunity to raise concerns.

The public participation process was undertaken in accordance with principles of:

- Transparency;
- Inclusivity;
- Accessibility;
- Respect for community participation.

Figure 8. Community members during the public consultation meeting.'

4.5 Issues and Concerns Raised During Consultation

Consultation undertaken during the Environmental Scoping Study identified several recurring socio-economic themes and concerns raised by surrounding community members and stakeholders.

The primary issues raised during consultation included:

- Employment opportunities for local residents;
- Concerns regarding local people being overlooked during recruitment;
- Skills-transfer opportunities;
- Community participation in project benefits;
- Expectations regarding local economic development.

Community members generally expressed interest in:

- Job creation;
- Local procurement opportunities;
- Skills development and training;
- Economic opportunities associated with mining activities.

Several stakeholders emphasized the importance of:

- Prioritizing local employment;
- Fair recruitment processes;
- Community inclusion during operational phases.

The concerns raised during consultation largely reflected broader socio-economic challenges commonly experienced within rural communal environments where:

- Formal employment opportunities remain limited;
- Economic vulnerability is elevated;
- Drought conditions affect livelihoods;
- Infrastructure and development opportunities remain constrained.

No major objections to the proposed project were raised during consultation activities.

Similarly, no major concerns were raised regarding:

- Heritage resources;
- Sacred sites;
- Community displacement;
- Major land-use incompatibility;
- Tourism impacts.

No known graves, sacred areas, or culturally sensitive sites were identified within the proposed operational footprint during consultation activities.

Figure 9. Community members during the public meeting consultation including law enforment officers to mantain law and order.

4.6 Stakeholder Expectations and Project Response

The consultation process identified a strong expectation among surrounding communities that the proposed operation should contribute positively toward local socio-economic development.

In response to stakeholder concerns and expectations, the project intends to:

- Prioritize local employment where feasible;
- Promote local contractor participation;
- Encourage skills-transfer opportunities;
- Maintain ongoing community engagement throughout operational phases.

The project further commits to:

- Continued stakeholder communication;
- Environmental-management transparency;
- Community consultation during operational phases;
- Ongoing environmental compliance.

The relatively small-scale nature of the proposed operation substantially reduces:

- Large-scale social disruption;
- Population influx pressure;
- Community displacement risks;
- Major infrastructure strain.

4.7 Ongoing Stakeholder Engagement

The project recognizes that stakeholder consultation should remain an ongoing process throughout the life of the operation rather than being limited only to the Environmental Scoping Study phase.

The proponent therefore intends to maintain ongoing communication with surrounding stakeholders through:

- Community engagement activities;
- Operational communication;
- Environmental reporting where appropriate;
- Ongoing consultation regarding major operational developments.

Stakeholder engagement during operational phases may further assist in:

- Identifying emerging concerns;
- Improving environmental-management performance;
- Supporting conflict prevention;
- Improving community participation.

4.8 Conclusion of the Public Participation Process

The public participation process undertaken for the proposed small-scale precious-metals mining operation identified generally moderate community interest in the project, primarily associated with:

- Employment creation;
- Skills development;
- Local economic opportunities.

No major environmental, social, heritage, or land-use objections were identified during the consultation process.

The relatively small-scale operational footprint, controlled mining philosophy, reduced infrastructure intensity, and progressive rehabilitation commitments substantially reduce potential social and environmental conflict associated with the proposed project.

The consultation process further indicated that surrounding stakeholders generally expect:

- Responsible environmental management;
- Community participation;
- Fair employment opportunities;
- Ongoing communication throughout operational phases.

Provided that stakeholder engagement continues throughout the project lifecycle and all environmental-management commitments outlined within the Environmental Management Plan are implemented, the proposed operation is considered socially manageable within the surrounding communal environment of the Kunene Region.

CHAPTER 5 — IMPACT ASSESSMENT

5.1 INTRODUCTION

This chapter presents the environmental and socio-economic impact assessment for the proposed small-scale precious-metals mining operation to be undertaken by Okondjamo Mining Investments CC within Mining Claims MC76609, MC76610 and MC76611 in the Kunene Region of north-western Namibia.

The impact assessment evaluates the potential environmental and socio-economic impacts associated with:

- Site establishment activities;
- Open-pit mining operations;
- Ore processing and mineral recovery activities;
- Controlled reagent handling;
- Water abstraction and usage;
- Waste generation and management;
- Fuel and hazardous-material storage;
- Transport and logistics activities;
- Rehabilitation and closure activities.

The purpose of the impact assessment is to:

- Identify potential environmental and socio-economic impacts associated with the proposed project;
- Evaluate the significance of identified impacts;
- Assess cumulative environmental risks;
- Identify appropriate mitigation measures;
- Determine residual environmental impacts following mitigation;
- Evaluate the overall environmental acceptability of the proposed operation.

The impact assessment has been undertaken in accordance with:

- The Environmental Management Act, 2007 (Act No. 7 of 2007);
- The Environmental Impact Assessment Regulations, 2012;
- Accepted environmental-assessment principles;

- Relevant international environmental-management guidelines including IFC Performance Standards and associated Environmental, Health and Safety Guidelines where applicable.

The proposed operation involves a relatively small-scale hard-rock precious-metals mining project focusing primarily on the recovery of gold from structurally controlled and sulphide-hosted mineralization associated.

5.2 Impact Assessment Methodology

The environmental and socio-economic impact assessment for the proposed small-scale precious-metals mining operation was undertaken using a structured numerical impact-assessment methodology specifically adapted for:

- Semi-arid communal environments;
- Small-scale mining operations;
- Groundwater-sensitive environments;
- Controlled hazardous-material handling systems;
- Precious-metals processing activities.

The methodology adopted for this Environmental Scoping Study (ESS) combines:

- Namibian Environmental Management Act requirements;
- MEFT environmental assessment expectations;
- International Finance Corporation (IFC) environmental risk-management principles;
- Standard environmental impact-assessment methodologies commonly applied within the mining sector.

The assessment methodology was designed to:

- Systematically identify environmental and socio-economic impacts;
- Evaluate impact significance before mitigation;
- Assess the effectiveness of mitigation measures;
- Determine residual environmental risks following mitigation;
- Evaluate cumulative environmental impacts;
- Incorporate confidence rankings associated with available baseline information and impact predictions.

The methodology further aims to:

- Improve consistency within the assessment process;
- Support transparent environmental decision-making;
- Facilitate regulatory review;
- Support development of targeted mitigation measures and environmental-management controls.

5.2.1 Impact Identification

Potential impacts associated with the proposed project were identified through:

- Site investigations;
- Baseline environmental assessments;
- Stakeholder consultation;
- Review of project design and operational activities;
- Professional environmental assessment experience;
- Review of relevant mining and environmental literature.

Potential impacts were evaluated for all major project phases, including:

- Site establishment and construction;
- Operational mining activities;
- Ore processing and recovery activities;
- Hazardous-material handling;
- Waste generation and management;
- Rehabilitation and closure phases.

5.2.2 Numerical Impact Assessment Methodology

Each identified impact was assessed using a numerical significance-rating system incorporating the following assessment criteria:

- Extent;
- Duration;
- Intensity;
- Probability;
- Reversibility;
- Irreplaceability;
- Cumulative impact potential.

Each criterion was assigned a numerical score according to the anticipated severity and environmental sensitivity associated with the identified impact.

The overall significance of each impact was subsequently calculated both:

- Before mitigation (inherent impact); and

- After mitigation (residual impact).

5.2.3 Impact Assessment Criteria

(a) Extent

Extent describes the geographical scale over which an impact may occur.

Extent Rating	Description
1	Site-specific impact limited to immediate operational footprint
2	Localized impact within surrounding project area
3	Regional impact extending beyond immediate operational area
4	National-scale impact
5	International or transboundary impact

(b) Duration

Duration describes the expected time period over which an impact may persist.

Duration Rating	Description
1	Short-term impact (days to months)
2	Temporary impact during operational phase
3	Medium-term impact extending several years
4	Long-term impact persisting beyond closure
5	Permanent or irreversible impact

(c) Intensity

Intensity describes the severity or magnitude of the impact on the receiving environment.

Intensity Rating	Description
1	Negligible disturbance
2	Minor disturbance with limited environmental effect
3	Moderate disturbance requiring mitigation
4	High disturbance causing significant environmental change
5	Severe environmental degradation or irreversible damage

(d) Probability

Probability describes the likelihood of the impact occurring.

Probability Rating	Description
1	Highly unlikely
2	Unlikely
3	Possible
4	Probable
5	Definite or highly probable

(e) Reversibility

Reversibility describes the ability of the environment to recover following disturbance.

Reversibility Rating	Description
1	Fully reversible
2	Mostly reversible
3	Partially reversible
4	Difficult to reverse
5	Irreversible

(f) Irreplaceability

Irreplaceability evaluates the importance and uniqueness of affected environmental resources.

Irreplaceability Rating	Description
1	Easily replaceable environmental resource
2	Moderately replaceable
3	Moderately sensitive resource
4	Highly sensitive resource
5	Critical or irreplaceable resource

5.2.4 Significance Calculation

Overall environmental significance was determined using the following generalized formula:

$$\text{Significance} = (\text{Extent} + \text{Duration} + \text{Intensity} + \text{Probability} + \text{Reversibility} + \text{Irreplaceability})$$

The resulting numerical score was used to classify impacts according to significance categories.

5.2.5 Significance Classification

Significance Score	Significance Category	Interpretation
0–8	Very Low	Minimal environmental concern
9–14	Low	Manageable with standard mitigation
15–20	Moderate	Requires active mitigation and monitoring
21–26	High	Significant environmental management required
27–30	Very High	Potentially unacceptable without major intervention

5.2.6 Colour-Coded Impact Ranking System

A colour-coded environmental risk-ranking system was adopted in order to improve:

- Regulatory readability;

- Visual interpretation;
- Environmental risk communication;
- Environmental-management prioritization.

Colour Category	Significance Level
Blue	Very Low
Green	Low
Yellow	Moderate
Orange	High
Red	Very High

The colour-coded system further supports:

- Environmental dashboards;
- Heatmaps;
- Compliance matrices;
- Monitoring frameworks;
- Environmental reporting systems.

5.2.7 Residual Impact Assessment

Residual impacts refer to environmental impacts remaining after implementation of proposed mitigation and management measures.

Residual impact assessment therefore evaluates:

- The effectiveness of mitigation measures;
- Remaining environmental risk levels;
- Long-term environmental acceptability of the proposed operation.

The assessment specifically considered the influence of:

- Progressive rehabilitation;
- Controlled hazardous-material handling;
- Groundwater-protection systems;
- Water recycling;

- Reduced chemical dependency;
- Dry-stack residue management;
- Environmental monitoring programmes.

5.2.8 Cumulative Impact Assessment

Cumulative impacts refer to impacts resulting from:

- Combined project activities;
- Existing regional land-use activities;
- Artisanal mining activities;
- Livestock grazing;
- Long-term drought pressure;
- Regional environmental stressors.

The cumulative impact assessment considered:

- Groundwater dependency within the region;
- Semi-arid ecological sensitivity;
- Existing communal land use;
- Regional climatic vulnerability;
- Existing mining-related activities within surrounding areas.

Particular attention was given to cumulative impacts associated with:

- Groundwater abstraction;
- Vegetation disturbance;
- Dust generation;
- Land degradation;
- Regional socio-economic expectations.

5.2.9 Confidence Ranking

Each impact assessment was assigned a confidence ranking reflecting:

- Quality of baseline information;
- Site investigation coverage;

- Reliability of available environmental data;
- Predictability of environmental responses.

Confidence rankings were categorized as follows:

Confidence Ranking	**Description**
High Confidence	Extensive baseline information and strong impact predictability
Medium Confidence	Moderate baseline information with acceptable predictability
Low Confidence	Limited information or uncertainty regarding environmental response

Higher confidence levels were generally associated with:

- Site-specific environmental observations;
- Operational design information;
- Existing regional environmental conditions.

Lower confidence levels may apply to:

- Long-term climatic variability;
- Future groundwater response;
- Long-term ecological recovery rates.

5.2.10 Environmental Risk Management Philosophy

The overall environmental risk-management philosophy adopted for the proposed operation emphasizes:

- Impact avoidance where feasible;
- Minimization of environmental disturbance;
- Controlled operational management;
- Groundwater protection;
- Progressive rehabilitation;
- Reduced chemical dependency;
- Long-term environmental sustainability.

The relatively small-scale operational footprint, gravity-assisted mineral recovery philosophy, dry-stack residue-management approach, reduced cyanide dependency, and controlled reagent handling substantially reduce environmental risk levels compared to conventional large-scale precious-metals mining operations.

The impact assessment therefore aims to ensure that:

- Environmental impacts remain manageable;
- Mitigation measures remain practical and enforceable;
- Residual environmental risks remain within acceptable limits;
- Long-term environmental sustainability objectives are supported throughout all phases of the project lifecycle.

5.3 Construction and Site Establishment Impacts

5.3.1 Introduction

Site establishment and construction activities associated with the proposed small-scale precious-metals mining operation will involve the preparation and development of operational infrastructure necessary for mining, ore processing, camp establishment, water supply, fuel storage, access roads, and associated support facilities.

Construction and site establishment activities are expected to include:

- Vegetation clearing;
- Minor earthworks and surface preparation;
- Access-road upgrading and preparation;
- Camp establishment;
- Installation of processing infrastructure;
- Fuel and water infrastructure installation;
- Temporary stockpile development;
- Equipment mobilization.

Due to the relatively small-scale operational footprint and controlled project design, construction-related impacts are expected to remain relatively localized and manageable compared to conventional large-scale mining developments.

Nevertheless, several environmental impacts may occur during site establishment phases if appropriate mitigation and environmental-management measures are not implemented.

5.3.2 Vegetation Clearing and Habitat Disturbance

Impact Description

Site preparation and infrastructure development activities will require localized vegetation clearing associated with:

- Camp establishment;
- Access-road preparation;
- Processing infrastructure placement;
- Mining and stockpile areas;
- Water and fuel-storage infrastructure.

Vegetation disturbance may result in:

- Loss of localized vegetation cover;

- Habitat disturbance;
- Surface destabilization;
- Increased erosion susceptibility;
- Localized ecological fragmentation.

The semi-arid environment of the project area is considered moderately sensitive due to:

- Slow vegetation recovery rates;
- Drought vulnerability;
- Shallow soils within mountainous areas.

However, the relatively small operational footprint substantially reduces large-scale habitat-loss potential.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	3
Probability	4
Reversibility	2
Irreplaceability	2

Total Score: 16

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

The following mitigation measures are recommended:

- Minimize unnecessary vegetation clearing;
- Restrict disturbance to approved operational footprints;
- Utilize existing access routes where feasible;

- Clearly demarcate disturbance boundaries;
- Preserve topsoil separately for rehabilitation;
- Implement progressive rehabilitation throughout operational phases;
- Avoid unnecessary disturbance within valley vegetation zones.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	3
Reversibility	1
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 Low

Residual Confidence: High

5.3.3 Soil Disturbance and Erosion

Impact Description

Construction activities involving:

- Surface clearing;
- Road preparation;
- Excavation activities;
- Infrastructure installation

may result in localized soil disturbance and increased erosion susceptibility.

The rugged mountainous terrain and semi-arid conditions increase sensitivity to:

- Surface destabilization;
- Sediment transport;

- Localized runoff concentration.

Although no major active erosion systems were identified during site investigations, poorly controlled disturbance may increase erosion potential within disturbed areas.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Minimize unnecessary earthworks;
- Utilize natural valley systems for road alignments where feasible;
- Install stormwater-diversion measures;
- Stabilize disturbed surfaces;
- Preserve topsoil separately;
- Rehabilitate inactive disturbed areas progressively;
- Restrict off-road vehicle movement.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 Low

Residual Confidence: High

5.3.4 Dust Generation During Construction

Impact Description

Construction activities including:

- Vehicle movement;
- Surface clearing;
- Road preparation;
- Earthworks;
- Material handling

may generate localized dust within operational areas and surrounding access routes.

Dust generation may affect:

- Local air quality;
- Worker comfort and visibility;
- Nearby vegetation;
- Localized visual conditions.

The semi-arid climatic conditions and occasional easterly winds increase dust-generation potential during dry periods.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	2
Intensity	2
Probability	4
Reversibility	1
Irreplaceability	1

Total Score: 12

Significance: **Low**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Enforce onsite speed limits below 40 km/hr;
- Utilize existing roads where feasible;
- Apply water suppression where necessary;
- Minimize unnecessary vehicle movement;
- Stabilize disturbed surfaces progressively;
- Schedule major disturbance activities where operationally practical.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	1
Intensity	1
Probability	2
Reversibility	1

Impact Criterion	Rating
Irreplaceability	1

Total Score: 7

Residual Significance: 🟦 **Very Low**

Residual Confidence: High

5.3.5 Waste Generation During Site Establishment

Impact Description

Construction and camp establishment activities may generate:

- Packaging waste;
- Scrap material;
- Hydrocarbon waste;
- Domestic waste;
- Construction debris.

Improper waste management may result in:

- Soil contamination;
- Visual disturbance;
- Wildlife attraction;
- Windblown litter.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	3
Reversibility	1

Impact Criterion	Rating
Irreplaceability	1

Total Score: 10

Significance: 🟩 **Low**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Establish designated waste-storage areas;
- Segregate hazardous and general waste;
- Fence waste-management areas;
- Remove waste regularly to approved disposal facilities;
- Maintain proper housekeeping throughout construction;
- Prevent uncontrolled littering.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	1

Total Score: 6

Residual Significance: 🟦 **Very Low**

Residual Confidence: High

5.3.6 Traffic and Safety Impacts

Impact Description

Construction and mobilization activities may temporarily increase:

- Vehicle movement;
- Heavy-equipment transport;
- Fuel transport activities;
- Localized road usage.

Potential impacts may include:

- Dust generation;
- Increased traffic risk;
- Wildlife collision risk;
- Road-surface degradation.

The relatively low operational scale substantially reduces regional traffic impacts compared to large-scale mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	2
Intensity	2
Probability	3
Reversibility	1
Irreplaceability	1

Total Score: 11

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Enforce onsite speed limits;
- Prohibit night-time driving;
- Utilize designated transport routes;
- Implement vehicle safety inspections;
- Install traffic signage where necessary;
- Restrict unnecessary vehicle movement.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	1
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 7

Residual Significance: 🟦 **Very Low**

Residual Confidence: Medium

5.3.7 Overall Construction Impact Statement

Construction and site establishment impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Localized;
- Temporary to medium-term;
- Environmentally manageable.

The relatively small operational footprint, controlled infrastructure layout, utilization of existing access routes, progressive rehabilitation philosophy, and environmentally conscious project design substantially reduce construction-related environmental impacts compared to conventional large-scale mining developments.

Provided that all mitigation measures, environmental controls, rehabilitation commitments, and monitoring procedures outlined within the Environmental Management Plan are fully implemented, construction and site-establishment impacts associated with the proposed project are considered environmentally acceptable within the receiving environment of the Kunene Region.

5.4 Mining Impacts

5.4.1 Introduction

Operational mining activities associated with the proposed small-scale precious-metals mining operation will involve selective hard-rock open-pit mining targeting structurally controlled and sulphide-hosted mineralized zones within Mining Claims MC76609, MC76610 and MC76611.

Mining activities are expected to include:

- Ore excavation;
- Drilling and localized blasting where necessary;
- Ore loading and transport;
- Temporary stockpile management;
- Waste-rock handling;
- Surface excavation and pit development.

The proposed operation adopts a relatively selective and controlled mining philosophy emphasizing:

- Reduced disturbance footprints;
- Targeted mineral extraction;
- Reduced waste generation;
- Progressive rehabilitation;
- Environmental containment.

The relatively small operational scale substantially reduces large-scale environmental impacts commonly associated with conventional bulk-tonnage mining operations.

Nevertheless, several operational environmental impacts may occur during active mining phases and therefore require careful management and mitigation.

5.4.2 Surface Disturbance and Land Degradation

Impact Description

Open-pit mining activities will result in localized disturbance of:

- Surface soils;
- Rocky outcrops;
- Vegetation;
- Natural topography.

Mining activities may further result in:

- Localized land degradation;
- Surface destabilization;
- Increased erosion susceptibility;
- Temporary loss of ecological functionality within disturbed areas.

The rugged mountainous terrain and shallow semi-arid soils increase sensitivity to:

- Surface scarring;
- Erosion;
- Long-term disturbance visibility.

However, the selective mining philosophy and relatively compact operational footprint substantially reduce large-scale land-transformation impacts.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	4
Probability	5
Reversibility	3
Irreplaceability	2

Total Score: 20

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Restrict disturbance to approved mining areas;
- Preserve topsoil separately for rehabilitation;
- Implement progressive rehabilitation;
- Recontour inactive disturbed areas;
- Minimize unnecessary excavation footprints;
- Utilize controlled mining layouts;
- Stabilize disturbed surfaces where feasible.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 14

Residual Significance: 🟩 Low

Residual Confidence: High

5.4.3 Drilling, Blasting, Noise and Vibration

Impact Description

Localized drilling and controlled blasting activities may occasionally be required during excavation of harder mineralized zones associated with:

- Quartz veins;

- Sulphide-hosted mineralization;
- Structurally controlled hard-rock systems.

Potential impacts associated with drilling and blasting activities may include:

- Noise generation;
- Ground vibration;
- Temporary dust generation;
- Wildlife disturbance;
- Worker safety risks.

The relatively small operational scale and selective mining approach substantially reduce blasting intensity compared to large-scale open-pit operations.

No major settlements occur immediately adjacent to the project area and surrounding population density remains relatively low.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	2
Intensity	3
Probability	3
Reversibility	1
Irreplaceability	1

Total Score: 12

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict blasting to daytime periods only;
- Utilize controlled blasting techniques;

- Limit blast size where feasible;
- Maintain blasting safety exclusion zones;
- Notify personnel prior to blasting activities;
- Conduct routine equipment maintenance to minimize excessive noise.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 8

Residual Significance: 🟦 Very Low

Residual Confidence: Medium

5.4.4 Dust Generation During Mining Operations

Impact Description

Mining activities including:

- Drilling;
- Excavation;
- Ore handling;
- Vehicle movement;
- Waste-rock transport

may generate localized dust within operational areas.

Dust generation may influence:

- Air quality;

- Worker visibility and comfort;
- Local vegetation;
- Visual conditions within the surrounding environment.

Semi-arid climatic conditions, low vegetation cover, and dry seasonal conditions increase dust-generation potential during operational phases.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	3
Intensity	3
Probability	4
Reversibility	1
Irreplaceability	1

Total Score: 14

Significance: Low

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Enforce operational speed limits;
- Minimize unnecessary vehicle movement;
- Stabilize inactive disturbed areas;
- Conduct progressive rehabilitation;
- Utilize controlled ore-handling procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 9

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.4.5 Waste-Rock Generation and Management

Impact Description

Mining activities will generate waste rock associated with:

- Overburden removal;
- Non-economic host material;
- Excavation development.

Potential environmental impacts associated with waste-rock handling may include:

- Surface disturbance;
- Erosion;
- Visual impacts;
- Sediment transport;
- Sulphide oxidation risk in localized areas.

The presence of sulphide mineralization, including pyrite, introduces potential long-term geochemical management considerations associated with sulphide oxidation.

However, the relatively limited waste-rock volumes and selective mining philosophy substantially reduce acid-generation risks compared to major sulphide-mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	3
Reversibility	3
Irreplaceability	2

Total Score: 17

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Utilize designated low-profile waste-rock areas;
- Avoid placement within drainage pathways;
- Implement stormwater-diversion systems;
- Conduct routine inspection of waste-rock stability;
- Progressively stabilize inactive waste-rock areas;
- Monitor sulphide-bearing waste where necessary;
- Conduct rehabilitation progressively.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2

Impact Criterion	**Rating**
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: 🟩 **Low**

Residual Confidence: Medium

5.4.6 Slope Stability and Excavation Safety

Impact Description

Open-pit excavation activities may create localized slope-instability risks associated with:

- Excavated pit walls;
- Weathered rock conditions;
- Structural discontinuities;
- Surface runoff during rainfall events.

Although no major unstable cliffs or talus slopes were identified during baseline investigations, localized excavation instability may still occur if slopes are improperly managed.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	3
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	1

Total Score: 13

Significance: 🟩 **Low**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Utilize controlled slope angles;
- Conduct routine geotechnical inspections;
- Prevent uncontrolled undercutting;
- Maintain drainage control around excavations;
- Restrict unauthorized access to active pits;
- Backfill pits progressively where feasible.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.4.7 Biodiversity Disturbance During Mining

Impact Description

Mining activities may result in localized disturbance to:

- Semi-arid vegetation communities;
- Small mammals;
- Reptiles;

- Avifauna;
- Local wildlife movement.

Noise, vibration, vehicle movement, and habitat disturbance may temporarily displace wildlife from localized operational areas.

However, no major wildlife migration corridors or highly sensitive ecological receptors were identified within the immediate project footprint.

The relatively small-scale operational footprint substantially reduces large-scale habitat fragmentation risks.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 14

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Minimize unnecessary vegetation clearing;
- Restrict operational disturbance areas;
- Prohibit hunting or wildlife harassment by personnel;
- Maintain proper waste management;
- Minimize night-time operational disturbance;
- Conduct progressive rehabilitation.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.4.8 Overall Mining Impact Statement

Mining impacts associated with the proposed small-scale precious-metals operation are generally expected to remain:

- Localized;
- Operationally controlled;
- Environmentally manageable.

The selective mining philosophy, reduced operational footprint, progressive rehabilitation approach, controlled waste-rock management, and reduced infrastructure intensity substantially reduce environmental impacts compared to conventional large-scale open-pit mining operations.

Although moderate impacts associated with:

- Surface disturbance;
- Waste-rock generation;
- Excavation activities

may occur during operational phases, implementation of appropriate environmental-management measures substantially reduces residual environmental risk.

Provided that all mitigation measures, groundwater-protection systems, stormwater controls, rehabilitation commitments, and environmental-management procedures outlined within the Environmental Management Plan are fully implemented, mining-related impacts associated with the proposed operation are considered environmentally acceptable within the receiving environment of the Kunene Region.

5.5 Ore Processing and Hazardous Material Impacts

5.5.1 Introduction

The proposed small-scale precious-metals mining operation will utilize a predominantly gravity-assisted mineral recovery system designed to recover gold from structurally controlled and sulphide-hosted mineralized material.

The proposed processing philosophy emphasizes:

- Reduced chemical dependency;
- Gravity-based mineral separation;
- Mercury-free recovery systems;
- Controlled reagent handling;
- Dry-stack residue management;
- Zero-liquid-discharge principles where feasible.

Ore processing activities associated with the proposed operation may include:

- Crushing and screening;
- Gravity concentration;
- Controlled chemical-assisted recovery where necessary;
- Ore stockpile management;
- Water recycling and reuse;
- Dry residue handling.

Controlled reagent-assisted recovery methods may occasionally be utilized for treatment of sulphide-hosted gold mineralization where gravity recovery alone is insufficient for acceptable gold recovery performance.

The project has committed to prioritizing:

- Thiosulfate-based systems;
- Thiourea-based systems;
- Reduced cyanide dependency;
- Controlled reagent usage.

Mercury amalgamation processes will not be utilized at any stage of the operation.

The proposed processing philosophy substantially reduces environmental risks commonly associated with conventional chemically intensive gold-processing operations.

Nevertheless, ore processing and hazardous-material handling activities may still present environmental risks requiring careful management and mitigation.

5.5.2 Chemical Handling and Hazardous Material Risks

Impact Description

Controlled processing activities may involve handling and storage of:

- Thiosulfate;
- Thiourea;
- Limited cyanide quantities where operationally necessary;
- Sulphuric acid associated with sulphide-hosted ore treatment;
- Hydrocarbons and lubricants.

Potential environmental risks associated with hazardous-material handling may include:

- Soil contamination;
- Groundwater contamination;
- Chemical spills;
- Worker exposure risks;
- Localized ecological impacts.

The groundwater-dependent and semi-arid nature of the receiving environment increases sensitivity to chemical contamination.

However, the relatively small operational scale and reduced chemical dependency substantially reduce hazardous-material risks compared to conventional large-scale gold-processing operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	4
Probability	3

Impact Criterion	Rating
Reversibility	3
Irreplaceability	4

Total Score: 20

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize bunded and lined chemical-storage areas;
- Store all hazardous materials within controlled fenced areas;
- Utilize HDPE-lined containment systems where necessary;
- Maintain spill-response kits onsite;
- Implement chemical-handling protocols;
- Train personnel in hazardous-material management;
- Maintain emergency-response procedures;
- Conduct routine inspection of storage infrastructure;
- Limit onsite chemical volumes to operational requirements only.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.5.3 Groundwater Contamination Risks from Processing Activities

Impact Description

Ore processing activities involving:

- Controlled reagent systems;
- Sulphide-hosted mineralization;
- Fuel handling;
- Water recycling systems;
- Residue management

may present localized groundwater contamination risks if improperly managed.

Potential contamination pathways may include:

- Chemical spills;
- Hydrocarbon seepage;
- Process-water leakage;
- Sulphide oxidation;
- Uncontrolled residue runoff.

The hydrogeological environment is considered moderately sensitive due to:

- Groundwater dependency of surrounding communities;
- Semi-arid climatic conditions;
- Limited alternative water resources.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	5

Impact Criterion	Rating
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 23

Significance: High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize lined processing areas;
- Implement bunded reagent-storage systems;
- Maximize water recycling and reuse;
- Prevent uncontrolled discharge of process water;
- Implement groundwater-monitoring programmes;
- Utilize dry-stack residue management;
- Conduct routine environmental inspections;
- Maintain spill-response infrastructure;
- Minimize chemical usage volumes.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2

Impact Criterion	Rating
Irreplaceability	4

Total Score: 13

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.5.4 Sulphide Oxidation and Acid Generation Potential

Impact Description

The presence of sulphide minerals including:

- Pyrite;
- Chalcopyrite;
- Bornite

introduces potential geochemical risks associated with:

- Sulphide oxidation;
- Acid generation;
- Metal mobilization;
- Long-term residue reactivity.

Exposure of sulphide-bearing material to oxygen and moisture may potentially generate acidic conditions capable of mobilizing dissolved metals under unfavorable environmental conditions.

However, the relatively limited operational scale, selective mining philosophy, reduced waste volumes, and dry-stack residue-management approach substantially reduce large-scale acid-generation potential compared to conventional sulphide-mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4
Probability	3

Impact Criterion	Rating
Reversibility	4
Irreplaceability	4

Total Score: 22

Significance: High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Separate sulphide-bearing waste where feasible;
- Minimize exposure of reactive material;
- Implement controlled waste-rock placement;
- Utilize dry-stack residue systems;
- Conduct groundwater-quality monitoring;
- Conduct periodic geochemical assessment where necessary;
- Implement progressive rehabilitation and stabilization;
- Minimize uncontrolled runoff interaction with sulphide-bearing material.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3
Irreplaceability	3

Total Score: 14

Residual Significance: Low

Residual Confidence: Medium

5.5.5 Residue and Process-Waste Management Impacts

Impact Description

Ore processing activities will generate:

- Dry processing residues;
- Fine crushed material;
- Process waste;
- Minor hazardous-material waste streams.

Potential impacts associated with residue management may include:

- Windblown dust;
- Localized contamination;
- Surface instability;
- Sediment transport;
- Long-term waste-management liabilities.

The project does not propose conventional wet tailings dams and instead adopts a dry-stack residue-management philosophy emphasizing:

- Reduced liquid waste generation;
- Reduced seepage potential;
- Improved environmental containment.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	3
Reversibility	3

Impact Criterion	Rating
Irreplaceability	3

Total Score: 18

Significance: Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize designated residue-management areas;
- Stabilize residue surfaces where feasible;
- Prevent uncontrolled runoff interaction;
- Implement dry-stack residue placement procedures;
- Conduct progressive rehabilitation;
- Restrict residue placement near drainage systems;
- Monitor residue stability periodically.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: Low

Residual Confidence: High

5.5.6 Hydrocarbon and Fuel Contamination Risks

Impact Description

Fuel storage, generator operation, and machinery maintenance activities associated with ore processing infrastructure may result in:

- Hydrocarbon spills;
- Soil contamination;
- Localized groundwater contamination;
- Fire hazards.

Potential contamination sources may include:

- Diesel storage;
- Lubricants;
- Fuel transfer activities;
- Maintenance operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	4

Total Score: 17

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize bunded fuel-storage systems;

- Install impermeable storage surfaces;
- Maintain spill-response equipment onsite;
- Conduct routine fuel-storage inspections;
- Train personnel in spill-response procedures;
- Remove contaminated material immediately following spills;
- Restrict maintenance activities to controlled operational areas.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: 🟩 Low

Residual Confidence: High

5.5.7 Occupational Exposure to Hazardous Materials

Impact Description

Operational personnel involved in ore processing and reagent handling may be exposed to:

- Chemical reagents;
- Dust;
- Hydrocarbons;
- Acidic substances;
- Process-related hazards.

Potential impacts may include:

- Chemical exposure;
- Respiratory irritation;
- Skin contact hazards;
- Occupational health risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	4
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Provide appropriate PPE to all operational personnel;
- Conduct hazardous-material training;
- Implement emergency-response procedures;
- Install eyewash and emergency wash stations;
- Restrict access to hazardous-material areas;
- Maintain Safety Data Sheets onsite;
- Conduct routine occupational-health monitoring.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: **Low**

Residual Confidence: High

5.5.8 Overall Ore Processing and Hazardous Material Impact Statement

Ore processing and hazardous-material impacts associated with the proposed small-scale precious-metals mining operation represent some of the more environmentally sensitive aspects of the project due to:

- Controlled reagent usage;
- Sulphide-hosted mineralization;
- Groundwater dependency within the receiving environment;
- Hazardous-material handling requirements.

Nevertheless, several important operational characteristics substantially reduce environmental risks compared to conventional large-scale gold-processing operations, including:

- Gravity-assisted recovery systems;
- Reduced chemical dependency;
- Mercury-free processing;
- Controlled reagent use;
- Dry-stack residue management;
- Zero-liquid-discharge operational philosophy;
- Progressive rehabilitation commitments.

Although certain impacts associated with:

- Groundwater contamination risk;
- Sulphide oxidation potential;
- Hazardous-material handling

initially exhibit moderate to high significance prior to mitigation, implementation of robust environmental-management controls substantially reduces residual impacts to manageable levels.

Provided that all hazardous-material management procedures, groundwater-protection measures, monitoring programmes, residue-management systems, and emergency-response procedures outlined within the Environmental Management Plan are fully implemented, ore processing and hazardous-material impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.6 Groundwater and Hydrological Impacts

5.6.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a semi-arid groundwater-dependent environment where groundwater forms the primary water resource for:

- Domestic use;
- Livestock watering;
- Operational activities;
- Long-term communal sustainability.

Groundwater protection therefore represents one of the most important environmental-management priorities associated with the proposed project.

Potential groundwater and hydrological impacts associated with the operation may arise from:

- Ore processing activities;
- Hazardous-material handling;
- Fuel and hydrocarbon storage;
- Waste-rock placement;
- Residue management;
- Stormwater interaction with disturbed areas;
- Groundwater abstraction activities.

The proposed project has nevertheless adopted several operational approaches specifically intended to reduce groundwater and hydrological risks, including:

- Gravity-assisted processing systems;
- Reduced chemical dependency;
- Water recycling and reuse;
- Dry-stack residue management;
- Controlled reagent handling;
- Zero-liquid-discharge principles where feasible.

The relatively small-scale operational footprint substantially reduces hydrological risks compared to conventional large-scale precious-metals mining operations.

5.6.2 Groundwater Abstraction and Water Resource Pressure

Impact Description

The proposed operation will require groundwater abstraction to support:

- Ore processing activities;
- Dust suppression;
- Domestic camp usage;
- Equipment cleaning;
- Emergency water storage.

Potential impacts associated with groundwater abstraction may include:

- Localized groundwater-level decline;
- Increased pressure on local groundwater resources;
- Reduced groundwater availability during drought periods.

The surrounding communal environment is heavily dependent on groundwater resources due to the absence of reliable perennial surface-water systems.

However, the relatively limited operational scale and controlled water-management philosophy substantially reduce large-scale groundwater-demand pressure.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	5

Total Score: 19

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maximize water recycling and reuse;
- Minimize unnecessary water consumption;
- Monitor groundwater abstraction volumes;
- Conduct routine borehole monitoring;
- Repair leaks immediately;
- Utilize water-efficient processing systems;
- Conduct periodic groundwater-level assessments.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2

Impact Criterion	Rating
Reversibility	2
Irreplaceability	4

Total Score: 13

Residual Significance: Low

Residual Confidence: Medium

5.6.3 Groundwater Contamination from Hazardous Materials

Impact Description

Potential groundwater contamination pathways associated with the proposed operation may include:

- Chemical spills;
- Fuel leakage;
- Hydrocarbon seepage;
- Process-water leakage;
- Sulphide oxidation;
- Improper waste management.

The semi-arid and groundwater-dependent nature of the receiving environment increases sensitivity to contamination events.

Potential contaminants may include:

- Sulphates;
- Dissolved metals;
- Hydrocarbons;
- Reagent residues;
- Acidic drainage associated with sulphide oxidation.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2

Impact Criterion	Rating
Duration	5
Intensity	5
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 24

Significance: High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize bunded and lined hazardous-material storage areas;
- Install HDPE-lined process areas where necessary;
- Maintain spill-response kits onsite;
- Conduct routine inspection of tanks and pipelines;
- Utilize controlled fuel-transfer procedures;
- Prevent uncontrolled discharge of process water;
- Implement groundwater-monitoring programmes;
- Conduct routine environmental audits.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2

Impact Criterion	Rating
Reversibility	2
Irreplaceability	4

Total Score: 13

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.6.4 Stormwater, Runoff and Erosion Impacts

Impact Description

Mining and infrastructure development activities may alter localized surface runoff behavior through:

- Surface disturbance;
- Excavation activities;
- Road construction;
- Vegetation removal;
- Stockpile development.

Potential hydrological impacts may include:

- Increased erosion;
- Sediment transport;
- Concentrated runoff;
- Localized drainage alteration.

Although no major perennial surface-water systems occur within the project area, broad valleys and ephemeral drainage systems may convey temporary runoff during seasonal rainfall events.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3

Impact Criterion	Rating
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 16

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Install stormwater-diversion berms;
- Utilize controlled drainage channels;
- Stabilize disturbed surfaces;
- Conduct progressive rehabilitation;
- Avoid infrastructure placement within drainage pathways;
- Restrict uncontrolled runoff interaction with operational areas;
- Maintain erosion-control structures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.6.5 Acid Generation and Seepage Risks

Impact Description

The occurrence of sulphide minerals including:

- Pyrite;
- Chalcopyrite;
- Bornite

introduces potential long-term geochemical risks associated with:

- Acid generation;
- Seepage;
- Dissolved metal mobilization.

Exposure of sulphide-bearing waste and residues to oxygen and moisture may potentially generate acidic drainage conditions under unfavorable environmental conditions.

However, several operational characteristics substantially reduce large-scale acid-drainage risk, including:

- Selective mining philosophy;
- Reduced waste-rock volumes;
- Dry-stack residue management;
- Progressive rehabilitation;
- Controlled stormwater management.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4

Impact Criterion	Rating
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 23

Significance: 🟧 High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Separate sulphide-bearing waste where feasible;
- Minimize exposure of reactive material;
- Conduct geochemical monitoring where necessary;
- Implement groundwater-quality monitoring;
- Stabilize residue-storage areas;
- Conduct progressive rehabilitation;
- Restrict uncontrolled runoff interaction with reactive materials.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3
Irreplaceability	4

Total Score: 15

Residual Significance: 🟧 **Moderate**

Residual Confidence: Medium

5.6.6 Surface-Water Contamination Risks

Impact Description

Although no major perennial surface-water systems occur within the immediate project area, localized runoff during seasonal rainfall events may potentially transport:

- Sediment;
- Hydrocarbons;
- Fine residues;
- Dissolved contaminants

from disturbed operational areas into surrounding ephemeral drainage systems.

Potential impacts may include:

- Localized sedimentation;
- Temporary water-quality deterioration;
- Surface contamination within ephemeral drainage pathways.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	2
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 15

Significance: 🟧 **Moderate**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Implement stormwater-control infrastructure;
- Install sediment-control measures where necessary;
- Maintain bunded hazardous-material areas;
- Prevent uncontrolled runoff from operational zones;
- Stabilize disturbed surfaces progressively;
- Maintain proper housekeeping throughout operational areas.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	1
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.6.7 Groundwater Monitoring and Long-Term Hydrological Management

Impact Description

Failure to implement adequate environmental monitoring and hydrological management may reduce the ability to:

- Detect contamination pathways;
- Monitor groundwater quality trends;
- Evaluate operational environmental performance;

- Identify long-term environmental risks.

The long-term nature of groundwater systems within semi-arid environments increases the importance of proactive environmental monitoring.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 23

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Implement long-term groundwater-monitoring programmes;
- Monitor groundwater chemistry routinely;
- Monitor borehole water levels;
- Maintain environmental-monitoring records;
- Conduct periodic environmental audits;
- Continue groundwater monitoring post-closure;
- Implement adaptive environmental-management procedures where necessary.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	4

Total Score: 13

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.6.8 Overall Groundwater and Hydrological Impact Statement

Groundwater and hydrological impacts represent some of the more environmentally sensitive aspects of the proposed small-scale precious-metals mining operation due to:

- Regional groundwater dependency;
- Semi-arid climatic conditions;
- Sulphide-hosted mineralization;
- Controlled reagent usage;
- Long-term water-resource sensitivity.

Nevertheless, several important operational characteristics substantially reduce groundwater and hydrological risks compared to conventional large-scale precious-metals mining operations, including:

- Reduced operational scale;
- Gravity-assisted processing systems;
- Reduced chemical dependency;
- Dry-stack residue management;
- Water recycling and reuse;
- Zero-liquid-discharge operational philosophy;
- Progressive rehabilitation commitments.

Although certain impacts associated with:

- Groundwater contamination;
- Sulphide oxidation;
- Acid-generation potential

initially exhibit moderate to high significance prior to mitigation, implementation of robust groundwater-protection systems, environmental controls, and monitoring programmes substantially reduces residual environmental risk.

Provided that all groundwater-protection measures, stormwater-management systems, residue-management procedures, monitoring programmes, and rehabilitation commitments outlined within the Environmental Management Plan are fully implemented, groundwater and hydrological impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.7 Biodiversity and Ecological Impacts

5.7.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a semi-arid communal savanna and mountainous environment characterized by:

- Moderate vegetation cover;
- Drought-adapted ecological systems;
- Rocky mountainous terrain;
- Broad valley systems;
- Semi-arid wildlife communities.

The receiving environment supports a variety of:

- Shrubland vegetation;
- Small trees;
- Semi-arid adapted fauna;
- Avifauna associated with rocky and savanna environments.

Potential biodiversity and ecological impacts associated with the proposed operation may arise from:

- Vegetation clearing;
- Surface disturbance;
- Mining and excavation activities;
- Dust generation;
- Noise and vibration;
- Vehicle movement;
- Waste generation;
- Habitat fragmentation.

The relatively small operational footprint, selective mining philosophy, reduced infrastructure intensity, and progressive rehabilitation approach substantially reduce ecological impacts compared to conventional large-scale mining operations.

5.7.2 Vegetation Loss and Habitat Disturbance

Impact Description

Mining and infrastructure development activities will require localized vegetation clearing associated with:

- Open-pit mining areas;
- Processing infrastructure;
- Camp establishment;
- Access roads;
- Waste-rock areas.

Potential ecological impacts may include:

- Localized habitat loss;
- Vegetation removal;
- Disturbance of ecological functionality;
- Surface destabilization.

The semi-arid vegetation communities of the project area are relatively sensitive due to:

- Slow natural recovery rates;
- Low rainfall conditions;
- Drought vulnerability;
- Shallow rocky soils.

However, no protected plant species were identified during baseline investigations.

The relatively small-scale operational footprint substantially reduces large-scale habitat fragmentation risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4

Impact Criterion	Rating
Reversibility	3
Irreplaceability	2

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Minimize unnecessary vegetation clearing;
- Restrict disturbance to approved operational footprints;
- Preserve topsoil separately for rehabilitation;
- Conduct progressive rehabilitation;
- Avoid unnecessary disturbance within valley vegetation zones;
- Utilize existing access routes where feasible;
- Clearly demarcate operational disturbance areas.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 Low

Residual Confidence: High

5.7.3 Wildlife Disturbance and Displacement

Impact Description

Operational activities including:

- Vehicle movement;
- Noise generation;
- Human activity;
- Blasting;
- Lighting;
- Habitat disturbance

may temporarily disturb wildlife occurring within the surrounding environment.

Wildlife species potentially affected may include:

- Springbok;
- Oryx;
- Kudu;
- Smaller antelope species;
- Reptiles;
- Small mammals;
- Avifauna.

Potential impacts may include:

- Temporary displacement from operational areas;
- Behavioral disturbance;
- Reduced habitat usage near active infrastructure.

No major wildlife migration corridors or concentrated wildlife movement pathways were identified within the immediate operational footprint during site investigations.

The relatively remote location and low surrounding population density reduce broader regional ecological fragmentation risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 14

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict unnecessary operational disturbance;
- Limit night-time activities where feasible;
- Minimize unnecessary lighting;
- Prohibit hunting or wildlife harassment by personnel;
- Maintain proper waste management to avoid attracting wildlife;
- Enforce operational speed limits.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1

Impact Criterion	Rating
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 **Low**

Residual Confidence: Medium

5.7.4 Dust Impacts on Vegetation and Ecological Systems

Impact Description

Dust generated from:

- Mining activities;
- Vehicle movement;
- Ore handling;
- Waste-rock transport

may settle on surrounding vegetation and localized ecological receptors.

Potential impacts may include:

- Reduced photosynthetic efficiency;
- Vegetation stress;
- Reduced plant vigor near operational areas;
- Localized air-quality deterioration.

Semi-arid vegetation communities may exhibit moderate sensitivity to prolonged dust exposure during extended dry periods.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	4

Impact Criterion	Rating
Reversibility	2
Irreplaceability	2

Total Score: 15

Significance: 🟧 **Moderate**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Enforce onsite speed limits;
- Minimize unnecessary vehicle movement;
- Stabilize disturbed surfaces progressively;
- Conduct progressive rehabilitation;
- Maintain controlled ore-handling procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 **Low**

Residual Confidence: Medium

5.7.5 Habitat Fragmentation and Ecological Connectivity

Impact Description

Development of mining infrastructure and access routes may result in localized habitat fragmentation and reduced ecological connectivity within portions of the operational area.

Potential impacts may include:

- Interruption of localized wildlife movement;
- Reduction of contiguous vegetation cover;
- Increased edge disturbance.

However, several factors substantially reduce large-scale fragmentation risks, including:

- Small operational footprint;
- Limited infrastructure density;
- Use of existing access routes;
- Absence of major migration corridors within the project footprint.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 13

Significance: 🟩 Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Minimize unnecessary infrastructure expansion;

- Restrict disturbance footprints;
- Utilize existing roads and disturbed corridors;
- Conduct progressive rehabilitation;
- Maintain natural drainage and valley systems where feasible.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.7.6 Invasive Species and Ecological Degradation Risks

Impact Description

Operational disturbance and vehicle movement may increase the risk of:

- Introduction of invasive plant species;
- Disturbance-related ecological degradation;
- Localized vegetation destabilization.

Disturbed semi-arid environments may become more vulnerable to invasive species establishment where:

- Vegetation cover is removed;
- Surface disturbance remains unmanaged;
- Rehabilitation is delayed.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 12

Significance: 🟩 Low

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation;
- Minimize long-term exposed disturbed areas;
- Monitor rehabilitated surfaces periodically;
- Maintain proper housekeeping and waste management;
- Stabilize disturbed areas promptly.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	1
Reversibility	1

Impact Criterion	Rating
Irreplaceability	2

Total Score: 8

Residual Significance: 🟦 **Very Low**

Residual Confidence: Low

5.7.7 Rehabilitation and Ecological Recovery Potential

Impact Description

The semi-arid climatic conditions and shallow rocky soils of the project area may influence long-term ecological rehabilitation success.

Potential rehabilitation challenges may include:

- Slow vegetation recovery;
- Drought-related rehabilitation stress;
- Surface instability within disturbed areas.

However, several operational characteristics substantially improve rehabilitation potential, including:

- Relatively small operational footprint;
- Progressive rehabilitation philosophy;
- Topsoil preservation;
- Reduced infrastructure intensity;
- Controlled waste management.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	3

Impact Criterion	Rating
Reversibility	3
Irreplaceability	2

Total Score: 17

Significance: Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Preserve topsoil separately for rehabilitation;
- Conduct progressive rehabilitation throughout operational phases;
- Recontour disturbed surfaces;
- Re-establish locally occurring vegetation where feasible;
- Stabilize disturbed areas against erosion;
- Conduct post-closure rehabilitation monitoring.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: Low

Residual Confidence: Medium

5.7.8 Overall Biodiversity and Ecological Impact Statement

Biodiversity and ecological impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Localized;
- Moderate prior to mitigation;
- Environmentally manageable following mitigation.

The receiving environment exhibits moderate ecological sensitivity due to:

- Semi-arid climatic conditions;
- Slow vegetation recovery rates;
- Drought vulnerability;
- Ecological dependence on limited vegetation cover.

Nevertheless, several important project characteristics substantially reduce ecological risks compared to conventional large-scale mining developments, including:

- Small operational footprint;
- Selective mining philosophy;
- Reduced infrastructure intensity;
- Progressive rehabilitation commitments;
- Utilization of existing access routes;
- Limited night-time disturbance.

No major protected plant communities, critical habitats, or major wildlife migration corridors were identified within the immediate operational footprint during baseline investigations.

Although localized impacts associated with:

- Vegetation clearing;
- Habitat disturbance;
- Dust generation

may occur during operational phases, implementation of appropriate environmental-management measures substantially reduces residual ecological risk.

Provided that all ecological mitigation measures, rehabilitation commitments, dust-control measures, and environmental-management procedures outlined within the Environmental Management Plan are fully implemented, biodiversity and ecological impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.8 Socio-Economic Impacts

5.8.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a rural communal environment of the Kunene Region characterized by:

- Limited formal employment opportunities;
- Livestock-based livelihoods;
- Semi-arid climatic vulnerability;
- Groundwater dependency;
- Rural settlement patterns.

The socio-economic environment surrounding the proposed project remains economically sensitive due to:

- Recurring drought conditions;
- Limited economic diversification;
- Rural poverty pressures;
- Infrastructure limitations;
- Youth unemployment within surrounding communities.

The proposed operation therefore has the potential to contribute both:

- Positive socio-economic benefits; and
- Certain localized social and economic pressures requiring careful management.

Potential socio-economic impacts associated with the project may include:

- Employment creation;
- Skills development;
- Local procurement opportunities;
- Increased regional economic activity;
- Community expectations and benefit-sharing concerns;
- Pressure on local resources and infrastructure.

The relatively small-scale operational footprint substantially reduces large-scale social disruption risks commonly associated with major mining developments.

5.8.2 Employment Creation and Economic Opportunities

Impact Description

The proposed operation is expected to generate localized employment opportunities during:

- Site establishment;
- Mining operations;
- Ore processing;
- Camp support services;
- Environmental-management activities;
- Transport and logistics activities.

Employment opportunities may include:

- General labour positions;
- Machine operators;
- Drivers;
- Security personnel;
- Environmental-monitoring personnel;
- Camp-support personnel.

The project intends to prioritize local employment opportunities where feasible, particularly from surrounding communal villages and settlements.

The surrounding socio-economic environment exhibits relatively high sensitivity to employment opportunities due to:

- Limited formal economic opportunities;
- High unemployment levels;
- Drought-related economic pressure;
- Livelihood vulnerability within surrounding communities.

The proposed operation therefore has potential to contribute positively toward:

- Household income generation;
- Rural economic participation;
- Localized poverty reduction;
- Economic resilience within surrounding communities.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	4
Probability	5
Reversibility	1
Irreplaceability	3

Total Score: 20

Significance: 🟩 Positive High Benefit

Confidence Ranking: High

Enhancement Measures

Recommended enhancement measures include:

- Prioritize local recruitment where feasible;
- Advertise employment opportunities transparently;
- Promote fair recruitment practices;
- Provide operational training opportunities;
- Encourage local contractor participation;
- Promote skills-transfer initiatives.

Residual Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	5
Probability	5

Impact Criterion	Rating
Reversibility	1
Irreplaceability	3

Total Score: 21

Residual Significance: 🟩 Strong Positive Benefit

Residual Confidence: High

5.8.3 Skills Transfer and Capacity Development

Impact Description

The proposed operation may contribute positively toward:

- Technical skills development;
- Operational training;
- Mining-related experience;
- Environmental-management awareness;
- Occupational health and safety training.

Skills development opportunities may improve:

- Local employability;
- Long-term economic participation;
- Community technical capacity.

The relatively limited formal industrial opportunities within the surrounding region increase the socio-economic importance of operational training opportunities.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4

Impact Criterion	Rating
Reversibility	1
Irreplaceability	3

Total Score: 17

Significance: Positive Moderate Benefit

Confidence Ranking: Medium

Enhancement Measures

Recommended enhancement measures include:

- Conduct onsite training programmes;
- Promote local skills development;
- Provide environmental and safety training;
- Encourage mentorship and operational learning;
- Support practical operational exposure for local workers.

Residual Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	4
Probability	5
Reversibility	1
Irreplaceability	3

Total Score: 20

Residual Significance: Strong Positive Benefit

Residual Confidence: Medium

5.8.4 Community Expectations and Social Pressure

Impact Description

Community consultation undertaken during the Environmental Scoping Study identified several community expectations associated with:

- Employment opportunities;
- Local economic participation;
- Skills transfer;
- Community development;
- Inclusion of local residents within project activities.

Potential social risks may arise if:

- Employment expectations are not managed appropriately;
- Communities perceive exclusion from project benefits;
- Recruitment processes are viewed as inequitable.

The relatively high unemployment levels within surrounding communal environments increase sensitivity to perceived unequal benefit distribution.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4
Reversibility	2
Irreplaceability	3

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Maintain transparent communication with communities;
- Clearly communicate recruitment procedures;
- Continue stakeholder engagement throughout operational phases;
- Promote fair and transparent employment practices;
- Address community concerns proactively;
- Maintain grievance-reporting mechanisms.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 Low

Residual Confidence: High

5.8.5 Pressure on Local Resources and Services

Impact Description

Operational activities may create localized pressure on:

- Groundwater resources;
- Local transport routes;
- Waste-management systems;
- Limited local service infrastructure.

However, the relatively small-scale nature of the proposed operation substantially reduces:

- Large-scale population influx;
- Major settlement expansion;
- Regional infrastructure overload.

No major urban centres occur immediately adjacent to the project area and the operation is not expected to generate large-scale permanent migration into the surrounding communal environment.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Promote water-use efficiency;
- Utilize controlled waste-management systems;
- Maintain operational self-sufficiency where feasible;
- Conduct routine infrastructure maintenance;
- Continue groundwater monitoring programmes.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: Low

Residual Confidence: Medium

5.8.6 Land Use Compatibility

Impact Description

The proposed mining operation will occur within a communal rural environment primarily utilized for:

- Livestock grazing;
- Rural settlement activities;
- Communal land use.

Potential impacts may include:

- Localized disturbance of grazing areas;
- Temporary access limitations;
- Increased vehicle movement within portions of the surrounding area.

However, the relatively compact operational footprint substantially reduces:

- Large-scale land-use conflict;
- Permanent grazing displacement;
- Regional land fragmentation.

No relocation of communities or settlements will be required as part of the proposed project.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict disturbance to approved operational areas;
- Maintain access routes where feasible;
- Continue stakeholder engagement with surrounding communities;
- Conduct progressive rehabilitation;
- Avoid unnecessary operational expansion.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: **Low**

Residual Confidence: Medium

5.8.7 Cumulative Socio-Economic Impacts

Impact Description

The proposed project may contribute cumulatively to broader regional socio-economic changes associated with:

- Existing artisanal mining activities;
- Rural economic pressures;
- Employment expectations;
- Groundwater dependency within communal environments.

Positive cumulative impacts may include:

- Increased economic participation;
- Improved local income generation;
- Enhanced operational skills within surrounding communities.

Potential negative cumulative impacts may include:

- Increased pressure on groundwater resources;
- Elevated employment expectations;
- Competition for local opportunities if poorly managed.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	3
Probability	4
Reversibility	2

Impact Criterion	Rating
Irreplaceability	3

Total Score: 19

Significance: 🟧 Moderate to Positive

Confidence Ranking: Medium

Mitigation / Enhancement Measures

Recommended measures include:

- Continue stakeholder engagement;
- Promote transparent recruitment;
- Support local procurement where feasible;
- Maintain groundwater-monitoring programmes;
- Coordinate operational planning responsibly.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	3
Probability	3
Reversibility	1
Irreplaceability	2

Total Score: 14

Residual Significance: 🟩 Positive Manageable Outcome

Residual Confidence: Medium

5.8.8 Overall Socio-Economic Impact Statement

The proposed small-scale precious-metals mining operation is expected to generate several positive socio-economic benefits within the surrounding communal environment, particularly through:

- Employment creation;
- Skills transfer;
- Local economic participation;
- Operational training opportunities.

The socio-economic environment surrounding the project remains economically vulnerable due to:

- Limited formal employment opportunities;
- Drought-related pressures;
- Rural economic constraints.

Consequently, the proposed project may contribute positively toward localized economic resilience and community participation if appropriately managed.

Potential socio-economic risks associated with:

- Community expectations;
- Resource pressure;
- Perceived inequitable benefit distribution

remain manageable through:

- Transparent stakeholder engagement;
- Fair recruitment procedures;
- Ongoing communication with surrounding communities;
- Continued environmental and social management.

The relatively small operational scale, absence of community displacement, limited infrastructure intensity, and controlled operational philosophy substantially reduce large-scale social disruption risks commonly associated with major mining developments.

Provided that all stakeholder-engagement commitments, groundwater-protection measures, employment-management procedures, and environmental-management obligations outlined within the Environmental Management Plan are fully implemented, socio-economic impacts associated with the proposed operation are considered socially and environmentally acceptable within the receiving environment of the Kunene Region.

5.9 Heritage and Archaeological Impacts

5.9.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a remote semi-arid communal environment of the Kunene Region characterized primarily by:

- Rocky mountainous terrain;
- Broad valleys;
- Sparse rural settlement patterns;
- Livestock-based communal land use.

A baseline heritage and archaeological assessment undertaken during the Environmental Scoping Study did not identify significant visible:

- Archaeological resources;
- Graves or burial sites;
- Historical structures;
- Sacred areas;
- Historical mining infrastructure

within the immediate operational footprint.

Nevertheless, all ground-disturbing activities associated with the proposed operation may still present a potential risk of accidental disturbance to undocumented or subsurface heritage resources.

Potential heritage impacts associated with the operation may arise from:

- Excavation activities;
- Road development;
- Surface disturbance;
- Open-pit mining activities;
- Infrastructure installation.

The relatively small operational footprint substantially reduces large-scale heritage disturbance risks compared to conventional large-scale mining developments.

5.9.2 Disturbance of Archaeological and Cultural Resources

Impact Description

Mining and excavation activities may potentially disturb:

- Undocumented archaeological material;
- Isolated artefacts;
- Subsurface cultural resources;
- Historical material not visible during baseline investigations.

The remote and relatively under-investigated nature of portions of the surrounding landscape means that the possibility of isolated undocumented heritage material cannot be completely excluded.

However, no visible archaeological structures, stone-walled settlements, or historical occupation features were identified during site investigations.

The overall archaeological sensitivity of the immediate project footprint is therefore considered relatively low.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3
Irreplaceability	4

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict disturbance to approved operational areas;
- Avoid unnecessary excavation outside operational footprints;
- Implement a formal Chance Find Procedure;

- Immediately stop work if heritage material is identified;
- Notify relevant heritage authorities where necessary;
- Train operational personnel regarding heritage-awareness procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	2
Irreplaceability	3

Total Score: 9

Residual Significance: Low

Residual Confidence: Medium

5.9.3 Disturbance of Graves and Burial Sites

Impact Description

No graves, burial sites, or human remains were observed within the immediate project footprint during baseline investigations and stakeholder consultation activities.

No community concerns regarding burial sites or ancestral areas were raised during the public consultation process.

However, accidental discovery of previously undocumented graves during excavation activities remains possible within any ground-disturbing project.

Potential impacts associated with grave disturbance may include:

- Cultural conflict;
- Emotional distress within communities;
- Legal non-compliance;
- Heritage-management complications.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	4
Intensity	4
Probability	1
Reversibility	4
Irreplaceability	5

Total Score: 19

Significance: 🟧 Moderate

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Implement strict Chance Find Procedures;
- Immediately cease work if graves or remains are discovered;
- Protect and isolate discovery areas;
- Notify relevant authorities immediately;
- Engage surrounding communities where necessary;
- Avoid disturbance until authorization is obtained.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1

Impact Criterion	Rating
Probability	1
Reversibility	2
Irreplaceability	4

Total Score: 10

Residual Significance: Low

Residual Confidence: Low

5.9.4 Disturbance of Cultural and Sacred Areas

Impact Description

No sacred sites, ceremonial areas, or culturally sensitive locations were identified within the immediate operational footprint during:

- Baseline investigations;
- Community consultation activities;
- Stakeholder engagement processes.

No concerns relating to sacred landscapes or traditional ceremonial areas were raised by surrounding communities during consultation.

Potential impacts on cultural heritage are therefore considered limited within the immediate project area.

Nevertheless, culturally respectful operational practices remain important within communal environments of the Kunene Region.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	1
Reversibility	2

Impact Criterion	Rating
Irreplaceability	4

Total Score: 12

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Continue stakeholder engagement throughout operational phases;
- Respect community concerns if raised;
- Restrict unnecessary disturbance outside approved operational areas;
- Maintain culturally respectful operational conduct.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	3

Total Score: 8

Residual Significance: Very Low

Residual Confidence: Medium

5.9.5 Heritage Impacts Associated with Infrastructure Development

Impact Description

Construction of:

- Access roads;
- Processing infrastructure;
- Camp facilities;
- Excavation areas

may increase the extent of surface disturbance within previously undisturbed portions of the project area.

Potential impacts may include:

- Disturbance of unknown subsurface heritage resources;
- Permanent modification of localized landscape features.

However, the relatively small operational footprint and utilization of existing access routes substantially reduce:

- Extensive new surface disturbance;
- Large-scale landscape modification.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 13

Significance: 🟩 Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Utilize existing access routes where feasible;

- Restrict unnecessary operational expansion;
- Maintain controlled infrastructure footprints;
- Implement progressive rehabilitation;
- Apply Chance Find Procedures throughout construction and mining activities.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	2

Total Score: 7

Residual Significance: 🟦 Very Low

Residual Confidence: Medium

5.9.6 Cumulative Heritage Impacts

Impact Description

Cumulative heritage impacts associated with the proposed operation are expected to remain limited due to:

- The absence of known major heritage resources onsite;
- Limited surrounding industrial development;
- Relatively low-density infrastructure development within the area.

Potential cumulative impacts may nevertheless arise from:

- Increased regional mining activity;
- Progressive land disturbance within communal environments;
- Expanded infrastructure development over time.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 14

Significance: 🟩 Low

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Continue controlled operational management;
- Restrict unnecessary disturbance;
- Implement rehabilitation progressively;
- Maintain stakeholder engagement;
- Apply heritage-protection procedures consistently.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	1
Reversibility	1

Impact Criterion Rating

Irreplaceability 2

Total Score: 8

Residual Significance: 🟦 **Very Low**

Residual Confidence: Low

5.9.7 Overall Heritage and Archaeological Impact Statement

Heritage and archaeological impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Localized;
- Low in significance;
- Environmentally and culturally manageable.

Baseline investigations and stakeholder consultation did not identify:

- Graves or burial sites;
- Sacred areas;
- Archaeological structures;
- Historical mining infrastructure

within the immediate operational footprint.

The overall heritage sensitivity of the project area is therefore considered relatively low.

Nevertheless, precautionary heritage-management procedures remain important due to the possibility of undocumented subsurface heritage resources occurring within portions of the project area.

The implementation of:

- Formal Chance Find Procedures;
- Controlled operational disturbance;
- Ongoing stakeholder engagement;
- Progressive rehabilitation

substantially reduces heritage-related risks associated with the proposed operation.

Provided that all heritage-management procedures and environmental-management measures outlined within the Environmental Management Plan are fully implemented, heritage and archaeological impacts associated with the proposed operation are considered environmentally and culturally acceptable within the receiving environment of the Kunene Region.

5.10 Visual and Landscape Impacts

5.10.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a rugged semi-arid mountainous landscape characteristic of portions of the Kunene Region of north-western Namibia.

The surrounding visual environment is characterized by:

- Rocky mountainous terrain;
- Broad valleys;
- Semi-arid savanna vegetation;
- Sparse rural settlement patterns;
- Relatively undeveloped communal landscapes.

Potential visual and landscape impacts associated with the proposed operation may arise from:

- Open-pit excavation;
- Waste-rock placement;
- Ore stockpiles;
- Processing infrastructure;
- Access roads;
- Dust generation;
- Surface disturbance.

The relatively small operational footprint, remote setting, low-density surrounding development, and controlled infrastructure philosophy substantially reduce visual impacts compared to conventional large-scale mining operations.

5.10.2 Visual Disturbance from Mining Excavations

Impact Description

Mining activities will result in localized modification of the natural landscape through:

- Open-pit excavation;
- Removal of surface material;
- Exposure of disturbed rock surfaces;
- Alteration of localized topography.

Potential visual impacts may include:

- Landscape scarring;
- Increased visibility of disturbed surfaces;
- Visual contrast between natural and disturbed terrain.

The rugged mountainous terrain naturally contains portions of the operational footprint and limits long-distance visibility from surrounding areas.

No major scenic viewpoints or tourism-sensitive receptors were identified overlooking the project area during baseline investigations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	5
Reversibility	3
Irreplaceability	2

Total Score: 19

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Minimize excavation footprints where feasible;
- Maintain controlled pit design;
- Conduct progressive rehabilitation;
- Recontour disturbed surfaces where practical;
- Restrict unnecessary disturbance outside approved operational areas;
- Utilize natural topographical screening where feasible.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 13

Residual Significance: 🟩 Low

Residual Confidence: High

5.10.3 Visual Impacts Associated with Waste-Rock and Stockpile Areas

Impact Description

Operational activities will generate:

- Waste-rock stockpiles;
- Ore stockpiles;
- Residue-placement areas.

Potential visual impacts may include:

- Artificial landform development;
- Visual contrast with surrounding natural terrain;
- Surface colour variation;
- Long-term disturbance visibility.

The proposed operation intends to maintain:

- Low-profile waste-rock placement;
- Controlled stockpile management;
- Compact operational layouts.

The relatively small waste volumes substantially reduce large-scale visual intrusion associated with elevated waste dumps commonly observed at large mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4
Reversibility	3
Irreplaceability	2

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Maintain low-profile waste-rock placement;
- Stabilize inactive stockpile surfaces;
- Conduct progressive rehabilitation;
- Recontour inactive waste areas where feasible;
- Restrict unnecessary stockpile expansion;
- Utilize natural topographical screening.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2

Impact Criterion	Rating
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: **Low**

Residual Confidence: High

5.10.4 Dust and Airborne Visual Impacts

Impact Description

Mining and operational activities including:

- Vehicle movement;
- Ore handling;
- Drilling;
- Excavation;
- Stockpile handling

may generate localized dust within operational areas.

Potential visual impacts associated with dust may include:

- Reduced localized visibility;
- Temporary visual haze;
- Surface dust deposition;
- Temporary degradation of landscape quality.

Semi-arid climatic conditions and dry seasonal periods increase dust-generation potential.

However, the relatively remote location and low surrounding population density substantially reduce broader public visual exposure.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	2
Intensity	2
Probability	4
Reversibility	1
Irreplaceability	1

Total Score: 12

Significance: Low

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Enforce onsite speed limits;
- Minimize unnecessary vehicle movement;
- Stabilize disturbed surfaces progressively;
- Conduct progressive rehabilitation;
- Utilize controlled ore-handling procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	2
Reversibility	1

Impact Criterion	Rating
Irreplaceability	1

Total Score: 7

Residual Significance: 🟦 **Very Low**

Residual Confidence: High

5.10.5 Visual Impacts Associated with Infrastructure and Lighting

Impact Description

Operational infrastructure associated with the proposed project may include:

- Processing facilities;
- Temporary camp structures;
- Fuel-storage infrastructure;
- Water-storage facilities;
- Access roads.

Potential visual impacts may include:

- Introduction of artificial structures into natural landscapes;
- Localized industrial appearance;
- Temporary night-time visibility where lighting is used.

The proposed operation will maintain:

- Minimal operational lighting;
- Relatively compact infrastructure layouts;
- Temporary and functional infrastructure design.

No brightly coloured infrastructure is proposed as part of the operation.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3

Impact Criterion	Rating
Intensity	2
Probability	4
Reversibility	2
Irreplaceability	1

Total Score: 13

Significance: Low

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Maintain minimal night-time lighting;
- Utilize low-profile infrastructure design;
- Restrict unnecessary lighting;
- Utilize neutral infrastructure colours where feasible;
- Remove temporary infrastructure during closure;
- Conduct progressive rehabilitation of inactive areas.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 8

Residual Significance: 🟦 Very Low

Residual Confidence: High

5.10.6 Landscape Rehabilitation and Long-Term Visual Recovery

Impact Description

Failure to rehabilitate disturbed operational areas may result in:

- Long-term visual scarring;
- Persistent surface disturbance;
- Reduced landscape quality;
- Long-term visibility of excavated areas.

Semi-arid climatic conditions and slow vegetation recovery rates may increase the time required for visual recovery following closure.

However, the relatively small-scale operational footprint substantially improves long-term rehabilitation potential compared to major mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	5
Intensity	3
Probability	3
Reversibility	3
Irreplaceability	2

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation throughout operational phases;
- Recontour disturbed surfaces;
- Preserve and redistribute topsoil;
- Re-establish locally occurring vegetation where feasible;
- Remove temporary infrastructure during closure;
- Stabilize disturbed surfaces against erosion.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: Low

Residual Confidence: Medium

5.10.7 Cumulative Visual and Landscape Impacts

Impact Description

Cumulative visual impacts associated with the proposed operation may arise from:

- Existing artisanal mining activities;
- Regional land disturbance;
- Increasing infrastructure development within communal environments.

Potential cumulative impacts may include:

- Gradual landscape modification;
- Increased regional disturbance visibility;

- Expanded surface scarring over time.

However, the relatively low density of industrial development within the broader project area substantially reduces large-scale cumulative visual pressure.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	2
Probability	3
Reversibility	2
Irreplaceability	2

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Maintain compact operational layouts;
- Conduct progressive rehabilitation;
- Limit unnecessary operational expansion;
- Continue environmental monitoring;
- Maintain controlled waste-rock management.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2

Impact Criterion	Rating
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: Low

Residual Confidence: Low

5.10.8 Overall Visual and Landscape Impact Statement

Visual and landscape impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Localized;
- Moderate prior to mitigation;
- Environmentally manageable following mitigation.

The receiving environment exhibits moderate visual sensitivity due to:

- The scenic mountainous terrain;
- Semi-arid natural landscape character;
- Relatively undeveloped surrounding environment.

Nevertheless, several important project characteristics substantially reduce visual impacts compared to conventional large-scale mining developments, including:

- Small operational footprint;
- Remote location;
- Absence of major tourism receptors;
- Low-profile waste-rock placement;
- Minimal operational lighting;
- Progressive rehabilitation commitments.

Although localized visual impacts associated with:

- Excavation activities;

- Surface disturbance;
- Waste-rock placement

will occur during operational phases, implementation of appropriate environmental-management measures substantially reduces long-term visual risk.

Provided that all rehabilitation commitments, waste-rock management procedures, infrastructure controls, and environmental-management measures outlined within the Environmental Management Plan are fully implemented, visual and landscape impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.11 Waste Management Impacts

5.11.1 Introduction

The proposed small-scale precious-metals mining operation will generate several waste streams during:

- Construction activities;
- Mining operations;
- Ore processing activities;
- Camp and operational support activities;
- Equipment maintenance activities.

Potential waste streams associated with the operation may include:

- Waste rock;
- Dry process residues;
- Hydrocarbon-contaminated material;
- Hazardous chemical containers;
- Domestic waste;
- Scrap metal;
- General operational waste.

Improper waste management may result in:

- Soil contamination;
- Groundwater contamination;
- Surface-water contamination;
- Wildlife attraction;
- Visual degradation;
- Long-term environmental liabilities.

The proposed operation has nevertheless adopted several operational approaches specifically intended to reduce waste-management risks, including:

- Dry-stack residue management;
- Reduced chemical dependency;
- Water recycling and reuse;
- Controlled hazardous-material handling;

- Progressive rehabilitation;
- Zero-liquid-discharge operational philosophy where feasible.

The relatively small operational footprint substantially reduces waste-generation volumes compared to conventional large-scale precious-metals mining operations.

5.11.2 Waste-Rock Management Impacts

Impact Description

Mining activities will generate waste rock associated with:

- Overburden stripping;
- Non-economic host rock;
- Excavation development.

Potential impacts associated with waste-rock management may include:

- Surface disturbance;
- Erosion;
- Sediment transport;
- Visual impacts;
- Sulphide oxidation in localized areas.

The occurrence of pyrite-bearing material introduces potential geochemical considerations associated with:

- Acid generation;
- Metal mobilization;
- Long-term weathering behavior.

However, the relatively limited waste-rock volumes and selective mining philosophy substantially reduce large-scale geochemical risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4

Impact Criterion	Rating
Intensity	3
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 18

Significance: 🟧 **Moderate**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Utilize designated low-profile waste-rock areas;
- Avoid placement within drainage pathways;
- Conduct progressive stabilization of inactive waste-rock areas;
- Separate sulphide-bearing material where feasible;
- Install stormwater-diversion measures;
- Conduct routine geotechnical inspections;
- Conduct progressive rehabilitation.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 **Low**

Residual Confidence: Medium

5.11.3 Process Residue and Dry-Stack Management Impacts

Impact Description

Ore processing activities will generate dry process residues associated with:

- Gravity concentration;
- Crushing and screening;
- Controlled chemical-assisted recovery activities.

Potential environmental impacts associated with residue management may include:

- Dust generation;
- Surface instability;
- Localized contamination;
- Windblown fine material;
- Long-term residue-management liabilities.

The project does not propose conventional wet tailings storage facilities and instead adopts a dry-stack residue-management philosophy emphasizing:

- Reduced seepage potential;
- Reduced water usage;
- Improved residue containment;
- Reduced catastrophic failure risk.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3

Impact Criterion	Rating
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Utilize designated dry-stack residue areas;
- Stabilize residue surfaces progressively;
- Restrict residue placement near drainage systems;
- Prevent uncontrolled runoff interaction;
- Conduct routine residue inspections;
- Conduct progressive rehabilitation of inactive residue areas;
- Maintain stormwater-diversion infrastructure.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: Low

Residual Confidence: High

5.11.4 Hazardous Waste Management Impacts

Impact Description

Operational activities involving:

- Fuel storage;
- Reagent handling;
- Equipment maintenance;
- Chemical-assisted recovery systems

may generate hazardous waste including:

- Hydrocarbon-contaminated material;
- Used oil;
- Chemical containers;
- Contaminated PPE;
- Spill-cleanup material.

Potential impacts associated with hazardous waste may include:

- Soil contamination;
- Groundwater contamination;
- Fire hazards;
- Worker exposure risks.

The groundwater-dependent nature of the receiving environment increases sensitivity to hazardous-material mismanagement.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4

Impact Criterion	Rating
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 23

Significance: High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Store hazardous waste within bunded containment areas;
- Utilize labelled hazardous-waste containers;
- Remove hazardous waste to approved disposal facilities;
- Maintain spill-response kits onsite;
- Train personnel in hazardous-waste handling;
- Conduct routine inspection of hazardous-waste areas;
- Prevent mixing of hazardous and general waste streams.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	4

Total Score: 13

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.11.5 Domestic and General Waste Impacts

Impact Description

Camp and operational activities may generate:

- Food waste;
- Packaging waste;
- Plastic waste;
- Scrap material;
- Domestic refuse.

Improper management of domestic waste may result in:

- Windblown litter;
- Wildlife attraction;
- Visual degradation;
- Localized contamination.

The semi-arid and windy conditions of the project area increase sensitivity to uncontrolled waste dispersion.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	3
Reversibility	1
Irreplaceability	1

Total Score: 10

Significance: 🟩 **Low**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Provide designated waste-storage containers;
- Conduct regular waste collection;
- Fence waste-storage areas where necessary;
- Remove waste to approved disposal facilities;
- Maintain proper housekeeping throughout operational areas;
- Prevent uncontrolled littering.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	1

Total Score: 6

Residual Significance: 🟦 **Very Low**

Residual Confidence: High

5.11.6 Waste Transportation and Offsite Disposal Impacts

Impact Description

Certain waste streams may require transportation to approved offsite disposal or recycling facilities.

Potential impacts associated with waste transportation may include:

- Accidental spills during transport;
- Dust generation;
- Increased traffic movement;
- Road-safety risks.

The relatively small operational scale substantially reduces transport volumes compared to large-scale mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 11

Significance: Low

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Utilize approved waste-transport contractors where necessary;
- Secure waste loads properly;
- Maintain spill-response equipment during transport;
- Conduct routine vehicle inspections;
- Enforce transport safety procedures;
- Restrict unnecessary transport activities.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	1

Total Score: 6

Residual Significance: 🟦 Very Low

Residual Confidence: Medium

5.11.7 Long-Term Waste Liability and Closure Risks

Impact Description

Failure to adequately manage operational waste during the life of mine may create long-term environmental liabilities associated with:

- Residual contamination;
- Waste-rock instability;
- Long-term surface scarring;
- Ongoing contamination pathways.

Semi-arid climatic conditions and slow ecological recovery rates may increase long-term closure sensitivity.

However, the relatively small-scale operational footprint substantially improves closure and rehabilitation potential.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2

Impact Criterion	Rating
Duration	5
Intensity	4
Probability	3
Reversibility	4
Irreplaceability	4

Total Score: 22

Significance: High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation throughout operational phases;
- Stabilize inactive waste areas;
- Remove hazardous materials during closure;
- Conduct long-term groundwater monitoring;
- Implement post-closure monitoring programmes;
- Recontour disturbed areas where feasible;
- Remove temporary infrastructure during closure.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3

Impact Criterion	Rating
Irreplaceability	3

Total Score: 14

Residual Significance: Low

Residual Confidence: Medium

5.11.8 Cumulative Waste Management Impacts

Impact Description

Cumulative waste-management impacts may arise from:

- Existing artisanal mining activities;
- Increasing regional mining activity;
- Long-term surface disturbance;
- Multiple waste-generation sources within the broader region.

Potential cumulative impacts may include:

- Increased regional land degradation;
- Increased contamination risk;
- Expanded visual disturbance.

However, the relatively low industrial density within the broader project area substantially reduces cumulative waste-management pressure.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	2
Reversibility	3
Irreplaceability	3

Total Score: 17

Significance: 🟧 Moderate

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Maintain strict waste-management controls;
- Continue groundwater monitoring;
- Conduct progressive rehabilitation;
- Restrict unnecessary operational expansion;
- Continue environmental auditing.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	1
Reversibility	2
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Low

5.11.9 Overall Waste Management Impact Statement

Waste-management impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Operationally manageable;

- Localized;
- Moderate to high prior to mitigation;
- Low following implementation of mitigation measures.

The principal environmental sensitivities associated with waste management relate to:

- Groundwater protection;
- Hazardous-material handling;
- Sulphide-bearing waste;
- Long-term residue stability.

Nevertheless, several important project characteristics substantially reduce waste-related environmental risks compared to conventional large-scale precious-metals mining operations, including:

- Reduced operational scale;
- Dry-stack residue management;
- Reduced chemical dependency;
- Mercury-free processing;
- Water recycling and reuse;
- Progressive rehabilitation commitments.

Provided that all waste-management procedures, hazardous-material controls, groundwater-protection measures, rehabilitation commitments, and monitoring programmes outlined within the Environmental Management Plan are fully implemented, waste-management impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.12 Occupational Health and Safety Impacts

5.12.1 Introduction

The proposed small-scale precious-metals mining operation will involve operational activities that may expose workers to occupational health and safety risks associated with:

- Mining and excavation activities;
- Drilling and blasting;
- Ore processing;
- Hazardous-material handling;
- Vehicle movement;
- Equipment operation;
- Dust and noise exposure;
- Remote operational conditions.

Occupational health and safety management therefore represents a critical operational requirement throughout all phases of the proposed project.

Potential occupational risks associated with the operation may include:

- Physical injury;
- Equipment-related accidents;
- Dust inhalation;
- Noise exposure;
- Chemical exposure;
- Heat stress;
- Fatigue;
- Fire hazards;
- Emergency-response limitations associated with remote conditions.

The relatively small operational footprint and reduced workforce size substantially reduce occupational exposure intensity compared to conventional large-scale mining operations.

Nevertheless, strict occupational health and safety management remains essential to ensure:

- Worker protection;
- Legal compliance;
- Operational safety;

- Environmental emergency preparedness.

5.12.2 Physical Injury and Equipment-Related Safety Risks

Impact Description

Mining and operational activities involving:

- Excavators;
- Crushers;
- Vehicles;
- Mobile equipment;
- Hand tools;
- Ore-handling infrastructure

may expose workers to:

- Collision risks;
- Crushing injuries;
- Falls;
- Entrapment hazards;
- Equipment malfunction risks.

Potential safety incidents may arise during:

- Excavation activities;
- Loading and hauling;
- Equipment maintenance;
- Material handling.

The rugged mountainous terrain and uneven operational surfaces may further increase operational safety risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4

Impact Criterion	Rating
Intensity	4
Probability	4
Reversibility	3
Irreplaceability	4

Total Score: 21

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Conduct routine equipment inspections;
- Implement operational safety procedures;
- Restrict unauthorized access to operational areas;
- Maintain designated pedestrian and vehicle movement zones;
- Conduct operator competency training;
- Install safety signage;
- Enforce PPE usage;
- Conduct routine safety briefings.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2

Impact Criterion	Rating
Irreplaceability	3

Total Score: 12

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.12.3 Dust Exposure and Respiratory Health Risks

Impact Description

Mining and ore-processing activities may generate dust associated with:

- Drilling;
- Excavation;
- Crushing;
- Ore handling;
- Vehicle movement.

Potential occupational health impacts may include:

- Respiratory irritation;
- Chronic dust exposure;
- Reduced worker comfort;
- Long-term respiratory health risks.

The presence of sulphide-bearing material and fine crushed ore may increase dust sensitivity within processing areas.

Semi-arid climatic conditions and dry seasonal periods further increase dust-generation potential.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	4

Impact Criterion	Rating
Probability	4
Reversibility	3
Irreplaceability	3

Total Score: 20

Significance: 🟧 **Moderate to High**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Provide respiratory PPE;
- Enclose high-dust processing areas where feasible;
- Conduct routine dust monitoring;
- Enforce speed limits within operational areas;
- Conduct regular occupational-health monitoring.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.12.4 Chemical Exposure and Hazardous-Material Risks

Impact Description

Operational personnel involved in ore processing and reagent handling may be exposed to:

- Thiosulfate;
- Thiourea;
- Limited cyanide where operationally necessary;
- Sulphuric acid;
- Hydrocarbons and lubricants.

Potential occupational impacts may include:

- Chemical burns;
- Skin irritation;
- Inhalation hazards;
- Eye injuries;
- Acute exposure incidents.

The handling of hazardous materials within remote operational environments increases the importance of emergency preparedness and operational training.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	5
Probability	3
Reversibility	3
Irreplaceability	4

Total Score: 21

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Provide appropriate chemical-resistant PPE;
- Maintain Safety Data Sheets onsite;
- Install emergency eyewash and wash stations;
- Conduct hazardous-material training;
- Restrict access to chemical-storage areas;
- Maintain spill-response infrastructure;
- Conduct routine chemical-handling inspections;
- Maintain emergency medical-response procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: 🟩 Low

Residual Confidence: High

5.12.5 Noise and Vibration Exposure

Impact Description

Operational activities involving:

- Crushing;
- Drilling;
- Blasting;
- Mobile equipment;
- Generators

may expose workers to elevated noise levels and localized vibration.

Potential occupational impacts may include:

- Hearing impairment;
- Worker fatigue;
- Reduced concentration;
- Communication difficulties within operational zones.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	3
Intensity	3
Probability	4
Reversibility	2
Irreplaceability	2

Total Score: 16

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Provide hearing-protection PPE;
- Conduct routine equipment maintenance;

- Restrict unnecessary exposure durations;
- Conduct periodic occupational-noise monitoring;
- Utilize controlled blasting procedures;
- Maintain operational safety distances.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 Low

Residual Confidence: High

5.12.6 Heat Stress, Fatigue and Remote Operational Risks

Impact Description

The semi-arid climatic conditions and remote operational environment may expose workers to:

- Heat stress;
- Dehydration;
- Fatigue;
- Reduced emergency-response accessibility;
- Remote operational safety risks.

Long working hours and physically demanding activities may further increase occupational fatigue risks.

Potential impacts may include:

- Reduced worker concentration;

- Increased accident potential;
- Heat-related illness;
- Reduced operational safety performance.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4
Reversibility	2
Irreplaceability	3

Total Score: 18

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Provide adequate potable water onsite;
- Implement work-rest schedules;
- Conduct heat-stress awareness training;
- Maintain shaded rest areas;
- Restrict excessive overtime;
- Maintain emergency medical-response capability;
- Conduct regular fatigue-management supervision.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 Low

Residual Confidence: High

5.12.7 Fire, Explosion and Emergency-Response Risks

Impact Description

Operational activities involving:

- Fuel storage;
- Chemical handling;
- Generators;
- Blasting materials;
- Mobile equipment

may present fire and emergency-response risks.

Potential impacts may include:

- Fire outbreaks;
- Explosions;
- Chemical-release incidents;
- Injury to personnel;
- Environmental contamination.

The remote location of the project increases sensitivity to emergency-response delays.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	5
Probability	3
Reversibility	3
Irreplaceability	4

Total Score: 21

Significance: 🟧 High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maintain fire-fighting equipment onsite;
- Conduct emergency-response training;
- Maintain emergency assembly points;
- Store fuel and chemicals within controlled areas;
- Conduct routine emergency drills;
- Maintain communication systems onsite;
- Restrict smoking within hazardous areas.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2

Impact Criterion	Rating
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: Low

Residual Confidence: Medium

5.12.8 Occupational Health Monitoring and Regulatory Compliance

Impact Description

Failure to maintain adequate occupational-health monitoring and safety compliance may result in:

- Increased workplace incidents;
- Regulatory non-compliance;
- Reduced emergency preparedness;
- Long-term occupational-health liabilities.

The use of controlled hazardous materials and mining-related activities increases the importance of structured occupational-health systems.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4
Probability	3
Reversibility	3
Irreplaceability	4

Total Score: 21

Significance: 🟧 **High**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Implement formal occupational-health and safety systems;
- Conduct routine medical monitoring where necessary;
- Maintain incident-reporting procedures;
- Conduct periodic safety audits;
- Maintain worker training programmes;
- Ensure compliance with Namibian labour and mining safety legislation;
- Maintain environmental-health monitoring records.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.12.9 Overall Occupational Health and Safety Impact Statement

Occupational health and safety impacts associated with the proposed small-scale precious-metals mining operation represent important operational risks due to:

- Mining and excavation activities;
- Controlled hazardous-material usage;
- Dust exposure;
- Remote operational conditions;
- Equipment-related hazards.

Nevertheless, several important project characteristics substantially reduce occupational risk compared to conventional large-scale mining operations, including:

- Small operational scale;
- Reduced workforce size;
- Controlled reagent systems;
- Mercury-free processing;
- Reduced infrastructure intensity;
- Compact operational layout.

Although certain occupational risks associated with:

- Chemical exposure;
- Equipment operation;
- Fire hazards;
- Dust exposure

initially exhibit moderate to high significance prior to mitigation, implementation of comprehensive occupational-health and safety systems substantially reduces residual risk.

Provided that all occupational-health procedures, emergency-response systems, PPE requirements, environmental-monitoring programmes, and worker-training obligations outlined within the Environmental Management Plan are fully implemented, occupational health and safety impacts associated with the proposed operation are considered operationally manageable and acceptable within the receiving environment of the Kunene Region.

5.13 Community Health and Safety Impacts

5.13.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a rural communal environment characterized by:

- Low population density;
- Livestock-based livelihoods;
- Semi-arid environmental conditions;
- Groundwater dependency;
- Limited infrastructure and emergency-response capacity.

Potential community health and safety impacts associated with the proposed operation may arise from:

- Vehicle movement and transport activities;
- Dust generation;
- Noise and blasting activities;
- Hazardous-material handling;
- Fire and emergency incidents;
- Interaction between communities and operational activities;
- Groundwater contamination risks.

The relatively remote setting and compact operational footprint substantially reduce large-scale community exposure risks compared to conventional large-scale mining developments.

Nevertheless, maintaining community health and safety remains an important operational obligation throughout all phases of the proposed project.

5.13.2 Traffic and Road Safety Risks

Impact Description

Operational activities may increase vehicle movement associated with:

- Ore transport;
- Fuel transport;
- Equipment mobilization;
- Worker transportation;
- Supply and logistics activities.

Potential community health and safety impacts may include:

- Increased road accident risk;
- Dust generation along access roads;
- Livestock collisions;
- Reduced road safety within communal areas.

The use of gravel roads and rural access routes increases sensitivity to vehicle-related incidents, particularly where livestock movement occurs.

However, the relatively small operational scale substantially reduces traffic intensity compared to major mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	3
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 16

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Enforce operational speed limits;
- Restrict unnecessary vehicle movement;
- Conduct driver safety training;
- Utilize designated transport routes;
- Prohibit reckless driving;

- Restrict night-time driving where feasible;
- Maintain vehicle roadworthiness inspections.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.13.3 Dust and Air-Quality Impacts on Surrounding Communities

Impact Description

Mining and transport activities may generate localized dust associated with:

- Excavation activities;
- Crushing and ore handling;
- Vehicle movement;
- Waste-rock transport.

Potential impacts on surrounding communities may include:

- Reduced air quality;
- Respiratory irritation;
- Reduced visibility along roads;
- Dust deposition on vegetation and infrastructure.

The semi-arid climatic conditions and dry seasonal periods increase dust-generation potential.

However, no major settlements occur immediately adjacent to the operational footprint and surrounding settlement density remains relatively low.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	4
Reversibility	1
Irreplaceability	2

Total Score: 14

Significance: 🟩 Low to Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Enforce speed limits on gravel roads;
- Minimize unnecessary vehicle movement;
- Stabilize disturbed operational areas progressively;
- Conduct progressive rehabilitation;
- Maintain controlled ore-handling procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1

Impact Criterion	Rating
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 7

Residual Significance: Very Low

Residual Confidence: High

5.13.4 Hazardous-Material and Chemical Exposure Risks to Communities

Impact Description

The proposed operation will involve controlled handling of:

- Thiosulfate;
- Thiourea;
- Limited cyanide quantities where operationally necessary;
- Sulphuric acid;
- Hydrocarbons and fuels.

Potential community risks associated with hazardous materials may include:

- Accidental spills during transport;
- Fire incidents;
- Groundwater contamination;
- Unauthorized community access to hazardous-material areas.

The groundwater-dependent nature of surrounding communities increases sensitivity to contamination-related impacts.

However, the relatively small operational scale and reduced chemical dependency substantially reduce public exposure risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	5
Probability	2
Reversibility	4
Irreplaceability	5

Total Score: 23

Significance: High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Store hazardous materials within secured controlled areas;
- Maintain bunded chemical-storage facilities;
- Restrict unauthorized access to operational areas;
- Maintain emergency-response procedures;
- Train personnel in spill-response procedures;
- Conduct routine environmental inspections;
- Maintain groundwater-monitoring programmes;
- Implement transport emergency-response protocols.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2

Impact Criterion	Rating
Probability	2
Reversibility	2
Irreplaceability	4

Total Score: 13

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.13.5 Noise, Blasting and Disturbance Impacts on Communities

Impact Description

Operational activities involving:

- Drilling;
- Crushing;
- Vehicle movement;
- Controlled blasting

may generate localized noise and vibration.

Potential impacts on surrounding communities may include:

- Temporary disturbance;
- Reduced acoustic comfort;
- Localized vibration concerns.

The relatively remote location of the operation and low surrounding settlement density substantially reduce broader community exposure to operational noise.

No schools, hospitals, or high-density residential areas occur immediately adjacent to the proposed operation.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2

Impact Criterion	Rating
Duration	2
Intensity	2
Probability	3
Reversibility	1
Irreplaceability	1

Total Score: 11

Significance: 🟩 **Low**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict blasting to daytime periods;
- Maintain operational equipment properly;
- Notify personnel prior to blasting activities;
- Restrict unnecessary night-time operations;
- Utilize controlled blasting procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	1

Total Score: 7

Residual Significance: 🟦 **Very Low**

Residual Confidence: Medium

5.13.6 Public Access and Interaction with Operational Areas

Impact Description

Unauthorized public access to:

- Excavations;
- Processing areas;
- Hazardous-material storage zones;
- Waste-rock areas

may create safety risks to surrounding communities and livestock.

Potential impacts may include:

- Injury;
- Accidental exposure to hazardous areas;
- Livestock incidents;
- Community safety concerns.

The communal rural setting increases the importance of operational access control and community-awareness measures.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	4
Intensity	4
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 19

Significance: 🟧 **Moderate**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Fence hazardous operational areas where necessary;
- Install warning signage;
- Restrict unauthorized access;
- Conduct community-awareness engagement where necessary;
- Maintain operational security measures;
- Backfill inactive excavations where feasible.

Residual Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 **Low**

Residual Confidence: High

5.13.7 Communicable Disease and Workforce Interaction Risks

Impact Description

Operational workforce activities and interaction between workers and surrounding communities may increase potential risks associated with:

- Communicable disease transmission;
- Public-health pressure;
- Sanitation-related concerns.

However, the relatively small workforce size substantially reduces large-scale social-health pressures commonly associated with major mining developments.

The remote rural setting and low-density settlement patterns further reduce large-scale disease-transmission risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 14

Significance: Low

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Maintain adequate sanitation facilities onsite;
- Conduct workforce health-awareness programmes;
- Maintain potable-water supply systems;
- Promote hygiene and sanitation awareness;
- Conduct medical screening where necessary;
- Maintain proper camp-management procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	2

Total Score: 7

Residual Significance: 🟦 Very Low

Residual Confidence: Low

5.13.8 Emergency Preparedness and Community Safety

Impact Description

Potential operational emergencies associated with:

- Chemical spills;
- Fire outbreaks;
- Fuel incidents;
- Blasting activities;
- Traffic accidents

may potentially affect surrounding communities if improperly managed.

The remote setting of the project increases the importance of proactive emergency preparedness and communication systems.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4

Impact Criterion	Rating
Intensity	5
Probability	2
Reversibility	3
Irreplaceability	4

Total Score: 20

Significance: Moderate to High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maintain emergency-response plans onsite;
- Conduct emergency-response training;
- Maintain communication systems;
- Maintain spill-response infrastructure;
- Conduct periodic emergency drills;
- Coordinate with relevant authorities where necessary;
- Maintain first-aid and fire-fighting equipment onsite.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 12

Residual Significance: Low

Residual Confidence: Medium

5.13.9 Overall Community Health and Safety Impact Statement

Community health and safety impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Localized;
- Operationally manageable;
- Moderate prior to mitigation;
- Low following implementation of mitigation measures.

The principal community sensitivities associated with the project relate to:

- Groundwater dependency;
- Hazardous-material management;
- Traffic and transport activities;
- Public access to operational areas.

Nevertheless, several important project characteristics substantially reduce community exposure risks compared to conventional large-scale mining developments, including:

- Small operational footprint;
- Remote project location;
- Low surrounding population density;
- Reduced chemical dependency;
- Controlled reagent systems;
- Progressive rehabilitation commitments.

Although certain risks associated with:

- Hazardous-material handling;
- Public access;
- Emergency-response scenarios

initially exhibit moderate to high significance prior to mitigation, implementation of robust operational controls, emergency-response systems, groundwater-protection measures, and stakeholder-engagement procedures substantially reduces residual risk.

Provided that all community-protection measures, emergency-response procedures, groundwater-monitoring programmes, traffic-management systems, and environmental-management commitments outlined within the Environmental Management Plan are fully implemented, community health and safety impacts associated with the proposed operation are considered socially and environmentally manageable within the receiving environment of the Kunene Region.

5.14 Cumulative Impacts

5.14.1 Introduction

Cumulative impacts refer to environmental and socio-economic impacts resulting from:

- The combined effect of multiple project activities;
- Existing regional land-use activities;
- Historical and ongoing environmental disturbance;
- Long-term environmental stressors within the receiving environment.

Cumulative impacts may occur where individually manageable impacts interact over time and space to produce broader regional environmental change.

The proposed small-scale precious-metals mining operation is situated within a semi-arid communal environment characterized by:

- Groundwater dependency;
- Livestock-based land use;
- Ecological drought sensitivity;
- Limited infrastructure;
- Increasing artisanal mining activities within portions of the surrounding region.

Potential cumulative impacts associated with the proposed operation may therefore interact with:

- Existing artisanal mining disturbance;
- Long-term grazing pressure;
- Regional groundwater dependency;
- Semi-arid ecological vulnerability;
- Climatic variability and drought conditions.

The cumulative impact assessment therefore evaluates the extent to which the proposed operation may contribute to broader long-term environmental and socio-economic change within the receiving environment of the Kunene Region.

5.14.2 Cumulative Land Disturbance and Surface Degradation

Impact Description

The proposed operation will contribute additional localized land disturbance associated with:

- Excavation activities;

- Waste-rock placement;
- Access-road usage;
- Surface clearing;
- Infrastructure development.

Potential cumulative impacts may include:

- Gradual landscape degradation;
- Increased erosion susceptibility;
- Expanded disturbed surface area;
- Incremental loss of vegetation cover.

Existing artisanal mining activities and livestock grazing within portions of the surrounding region already contribute to localized environmental disturbance.

However, the relatively small-scale operational footprint and selective mining philosophy substantially reduce cumulative land-disturbance intensity compared to conventional large-scale mining developments.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	3
Probability	4
Reversibility	3
Irreplaceability	3

Total Score: 20

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Restrict disturbance to approved operational areas;
- Conduct progressive rehabilitation;
- Preserve and redistribute topsoil;
- Stabilize disturbed surfaces;
- Limit unnecessary operational expansion;
- Utilize existing disturbed access routes where feasible.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 13

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.14.3 Cumulative Groundwater and Water-Resource Impacts

Impact Description

Groundwater forms the primary water resource within the surrounding communal environment and is already subject to:

- Livestock demand;
- Domestic usage;
- Climatic drought pressure;
- Limited natural recharge conditions.

Potential cumulative impacts associated with the proposed operation may include:

- Incremental groundwater abstraction pressure;

- Increased contamination vulnerability;
- Long-term groundwater-quality sensitivity.

The occurrence of existing artisanal mining activities may further increase cumulative groundwater vulnerability where environmental controls are limited.

However, the proposed operation adopts several important groundwater-protection measures including:

- Water recycling and reuse;
- Reduced chemical dependency;
- Dry-stack residue management;
- Controlled hazardous-material handling;
- Zero-liquid-discharge operational philosophy where feasible.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	5
Intensity	4
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 24

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Maintain groundwater-monitoring programmes;
- Maximize water recycling and reuse;
- Conduct routine groundwater-quality monitoring;

- Maintain lined hazardous-material storage areas;
- Restrict uncontrolled discharge of process water;
- Conduct routine environmental audits;
- Implement long-term groundwater-management procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	4

Total Score: 15

Residual Significance: 🟧 Moderate

Residual Confidence: High

5.14.4 Cumulative Biodiversity and Ecological Impacts

Impact Description

The semi-arid ecological systems of the Kunene Region are naturally sensitive due to:

- Low rainfall;
- Slow vegetation recovery;
- Drought vulnerability;
- Shallow soils.

Potential cumulative ecological impacts may include:

- Incremental habitat fragmentation;
- Long-term vegetation degradation;
- Increased dust exposure;

- Gradual reduction of ecological functionality.

Existing livestock grazing pressure and artisanal disturbance may already contribute to localized ecological stress within portions of the surrounding environment.

However, no major critical habitats or migration corridors were identified within the immediate project footprint.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	3
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 19

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation;
- Minimize unnecessary vegetation clearing;
- Restrict disturbance footprints;
- Stabilize disturbed areas;
- Conduct environmental monitoring;
- Restrict unnecessary infrastructure expansion.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 13

Residual Significance: Low

Residual Confidence: Medium

5.14.5 Cumulative Socio-Economic Impacts

Impact Description

The proposed operation may contribute cumulatively toward:

- Increased local employment opportunities;
- Expanded regional economic participation;
- Skills development;
- Local procurement opportunities.

Potential positive cumulative impacts may therefore include:

- Improved household income generation;
- Enhanced technical skills within surrounding communities;
- Increased local economic resilience.

Potential negative cumulative impacts may include:

- Increased employment expectations;
- Competition for local opportunities;
- Pressure on groundwater resources if multiple mining activities expand regionally.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	4
Probability	4
Reversibility	2
Irreplaceability	3

Total Score: 20

Significance: 🟩 Positive Moderate to High Benefit

Confidence Ranking: Medium

Enhancement Measures

Recommended enhancement measures include:

- Prioritize local employment;
- Promote transparent recruitment;
- Support skills-transfer programmes;
- Continue stakeholder engagement;
- Encourage responsible operational planning.

Residual Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	4
Intensity	5
Probability	4
Reversibility	1
Irreplaceability	3

Total Score: 20

Residual Significance: 🟩 Strong Positive Benefit

Residual Confidence: Medium

5.14.6 Cumulative Visual and Landscape Impacts

Impact Description

Potential cumulative visual impacts may arise from:

- Existing artisanal mining disturbance;
- Expanded surface disturbance over time;
- Multiple disturbed operational areas within the broader landscape.

Potential cumulative impacts may include:

- Gradual landscape modification;
- Increased surface scarring;
- Reduced natural landscape character.

However, the relatively low density of industrial development within the broader region substantially limits cumulative visual pressure.

The proposed operation's:

- Low-profile infrastructure;
- Minimal lighting philosophy;
- Progressive rehabilitation commitments

substantially reduce cumulative visual impact intensity.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	2
Probability	3

Impact Criterion	Rating
Reversibility	2
Irreplaceability	2

Total Score: 15

Significance: 🟧 Moderate

Confidence Ranking: Low

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation;
- Maintain low-profile waste-rock placement;
- Minimize unnecessary operational expansion;
- Restrict excessive night-time lighting;
- Remove temporary infrastructure during closure.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 9

Residual Significance: 🟩 Low

Residual Confidence: Low

5.14.7 Climate Variability and Environmental Resilience

Impact Description

The broader Kunene Region is highly vulnerable to:

- Drought conditions;
- Climatic variability;
- Water scarcity;
- Ecological stress.

Potential cumulative environmental risks may therefore increase under prolonged drought conditions through:

- Reduced groundwater recharge;
- Increased vegetation stress;
- Increased dust generation;
- Reduced rehabilitation success.

The proposed operation may contribute incrementally to environmental stress if water and land resources are not carefully managed.

However, the operation's:

- Water recycling philosophy;
- Reduced operational footprint;
- Progressive rehabilitation commitments

substantially improve long-term environmental resilience compared to conventional mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	5
Intensity	3
Probability	4
Reversibility	3

Impact Criterion	Rating
Irreplaceability	4

Total Score: 22

Significance: High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maximize water conservation;
- Conduct progressive rehabilitation;
- Maintain groundwater monitoring;
- Stabilize disturbed surfaces;
- Minimize unnecessary operational expansion;
- Maintain adaptive environmental-management procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 14

Residual Significance: Low

Residual Confidence: Medium

5.14.8 Overall Cumulative Impact Statement

Cumulative impacts associated with the proposed small-scale precious-metals mining operation are generally expected to remain:

- Moderate prior to mitigation;
- Localized to regional in extent;
- Environmentally manageable following mitigation.

The principal cumulative sensitivities associated with the receiving environment relate to:

- Groundwater dependency;
- Semi-arid ecological vulnerability;
- Existing artisanal mining activities;
- Long-term climatic variability;
- Surface disturbance within communal environments.

Nevertheless, several important project characteristics substantially reduce cumulative environmental pressure compared to conventional large-scale mining developments, including:

- Small operational footprint;
- Reduced chemical dependency;
- Dry-stack residue management;
- Water recycling and reuse;
- Progressive rehabilitation commitments;
- Controlled hazardous-material management;
- Minimal infrastructure intensity.

Although cumulative impacts associated with:

- Groundwater pressure;
- Land disturbance;
- Ecological stress;
- Climate vulnerability

may initially exhibit moderate to high significance, implementation of robust environmental-management systems substantially reduces long-term cumulative environmental risk.

Provided that all groundwater-protection systems, rehabilitation commitments, monitoring programmes, stakeholder-engagement procedures, and environmental-management measures outlined within the Environmental Management Plan are fully implemented, cumulative impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.15 Closure, Rehabilitation and Decommissioning Impacts

5.15.1 Introduction

Closure, rehabilitation and decommissioning represent critical components of the environmental-management strategy for the proposed small-scale precious-metals mining operation.

The purpose of closure and rehabilitation planning is to:

- Minimize long-term environmental liabilities;
- Stabilize disturbed areas;
- Reduce contamination risks;
- Restore ecological functionality where feasible;
- Promote long-term environmental sustainability;
- Reduce post-closure public safety risks.

Potential closure-related impacts associated with the proposed operation may include:

- Residual land disturbance;
- Long-term waste-rock stability;
- Residual contamination pathways;
- Pit safety concerns;
- Erosion and sedimentation;
- Long-term visual scarring;
- Slow ecological recovery within semi-arid environments.

The proposed operation has nevertheless adopted several operational approaches specifically intended to reduce long-term closure liabilities, including:

- Progressive rehabilitation;
- Reduced infrastructure intensity;
- Dry-stack residue management;
- Controlled hazardous-material handling;
- Water recycling and reuse;
- Reduced chemical dependency.

The relatively small operational footprint substantially improves rehabilitation feasibility compared to conventional large-scale mining developments.

5.15.2 Residual Land Disturbance and Surface Scarring

Impact Description

Mining activities will result in residual surface disturbance associated with:

- Excavation areas;
- Access roads;
- Waste-rock placement;
- Processing infrastructure;
- Stockpile areas.

Potential long-term impacts may include:

- Persistent surface scarring;
- Disturbed landforms;
- Reduced landscape quality;
- Localized erosion susceptibility.

Semi-arid climatic conditions and slow vegetation recovery rates may prolong visible disturbance following closure.

However, the relatively compact operational footprint substantially reduces large-scale post-closure land degradation risks.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	4
Probability	4
Reversibility	3
Irreplaceability	3

Total Score: 21

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation throughout operational phases;
- Recontour disturbed surfaces where feasible;
- Redistribute preserved topsoil;
- Stabilize disturbed slopes;
- Re-establish locally occurring vegetation where feasible;
- Minimize unnecessary disturbance during operations.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: 🟩 Low

Residual Confidence: High

5.15.3 Waste-Rock and Residue Stability After Closure

Impact Description

Residual waste-rock and dry-stack residue areas may present long-term risks associated with:

- Surface instability;
- Erosion;

- Sulphide oxidation;
- Wind erosion;
- Sediment transport.

The occurrence of sulphide-bearing material introduces potential long-term geochemical considerations associated with:

- Acid generation;
- Metal mobilization;
- Weathering of reactive material.

However, the relatively limited waste volumes and dry-stack residue philosophy substantially reduce long-term instability risks compared to conventional wet-tailings systems.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	5
Intensity	4
Probability	3
Reversibility	4
Irreplaceability	4

Total Score: 22

Significance: 🟧 High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Stabilize inactive waste-rock areas progressively;
- Recontour residue-storage surfaces;
- Conduct post-closure groundwater monitoring;
- Restrict uncontrolled runoff interaction;

- Conduct geochemical monitoring where necessary;
- Cover or stabilize reactive material where feasible;
- Maintain erosion-control structures post-closure.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3
Irreplaceability	3

Total Score: 14

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.15.4 Groundwater and Long-Term Contamination Risks

Impact Description

Residual contamination risks following closure may potentially arise from:

- Sulphide-bearing waste;
- Residual hydrocarbons;
- Historical reagent contamination;
- Unrehabilitated operational areas.

Potential impacts may include:

- Groundwater-quality deterioration;
- Long-term seepage pathways;
- Residual contamination hotspots.

The groundwater-dependent nature of the surrounding communal environment substantially increases long-term environmental sensitivity.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	5
Intensity	5
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 24

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Remove hazardous materials during closure;
- Conduct groundwater-quality monitoring post-closure;
- Stabilize contaminated operational areas;
- Conduct environmental audits during closure;
- Implement long-term monitoring programmes;
- Maintain stormwater-control systems where necessary.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2

Impact Criterion	Rating
Probability	2
Reversibility	3
Irreplaceability	4

Total Score: 15

Residual Significance: 🟧 Moderate

Residual Confidence: High

5.15.5 Pit Safety and Public Access Risks After Closure

Impact Description

Residual excavations and disturbed operational areas may create post-closure public safety risks associated with:

- Unstable pit walls;
- Open excavations;
- Unauthorized public access;
- Livestock incidents.

The communal rural setting increases the importance of post-closure landform stabilization and public-safety management.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	4
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 19

Significance: 🟧 **Moderate**

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Backfill excavations where feasible;
- Restrict unauthorized access to hazardous areas;
- Stabilize pit slopes;
- Install warning signage where necessary;
- Conduct closure safety inspections;
- Remove unsafe infrastructure during closure.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 11

Residual Significance: 🟩 **Low**

Residual Confidence: Medium

5.15.6 Infrastructure Decommissioning Impacts

Impact Description

Closure activities will involve:

- Removal of temporary infrastructure;

- Decommissioning of fuel-storage systems;
- Removal of processing equipment;
- Closure of operational support facilities.

Potential impacts may include:

- Temporary surface disturbance;
- Hydrocarbon contamination during dismantling;
- Waste generation associated with demolition activities.

However, the relatively temporary and low-intensity infrastructure philosophy substantially reduces large-scale decommissioning complexity.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	1
Duration	2
Intensity	2
Probability	3
Reversibility	1
Irreplaceability	2

Total Score: 11

Significance: 🟩 Low

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Remove hazardous materials prior to dismantling;
- Conduct controlled infrastructure removal;
- Segregate demolition waste appropriately;
- Conduct contamination inspections during closure;

- Remove temporary infrastructure completely where feasible;
- Conduct final site cleanup procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	1
Intensity	1
Probability	1
Reversibility	1
Irreplaceability	1

Total Score: 6

Residual Significance: Very Low

Residual Confidence: High

5.15.7 Rehabilitation Success and Ecological Recovery

Impact Description

Long-term ecological recovery within semi-arid environments may be influenced by:

- Low rainfall;
- Drought conditions;
- Shallow soils;
- Slow vegetation recovery rates.

Potential rehabilitation challenges may include:

- Delayed vegetation establishment;
- Surface instability;
- Wind erosion;
- Reduced ecological functionality.

However, several project characteristics substantially improve rehabilitation feasibility, including:

- Small operational footprint;
- Progressive rehabilitation philosophy;
- Topsoil preservation;
- Reduced infrastructure intensity.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	5
Intensity	3
Probability	3
Reversibility	3
Irreplaceability	3

Total Score: 19

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation throughout operational phases;
- Preserve and redistribute topsoil;
- Re-establish locally occurring vegetation where feasible;
- Stabilize disturbed areas against erosion;
- Conduct post-closure environmental monitoring;
- Maintain adaptive rehabilitation procedures where necessary.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	2

Total Score: 12

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.15.8 Long-Term Environmental Liability and Post-Closure Management

Impact Description

Failure to implement adequate closure planning and post-closure management may result in:

- Persistent contamination risks;
- Long-term land degradation;
- Ongoing public-safety risks;
- Regulatory non-compliance;
- Increased long-term environmental liability.

The long-term nature of groundwater systems and semi-arid ecological recovery substantially increases the importance of post-closure environmental monitoring and management.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	5
Intensity	4

Impact Criterion	Rating
Probability	3
Reversibility	4
Irreplaceability	5

Total Score: 24

Significance: 🟧 High

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Implement formal closure-management planning;
- Maintain post-closure groundwater monitoring;
- Conduct environmental audits during closure;
- Maintain long-term rehabilitation monitoring;
- Conduct periodic stability inspections;
- Maintain regulatory compliance reporting where necessary.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	3
Intensity	2
Probability	2
Reversibility	3
Irreplaceability	4

Total Score: 15

Residual Significance: 🟨 Moderate

Residual Confidence: High

5.15.9 Overall Closure, Rehabilitation and Decommissioning Impact Statement

Closure, rehabilitation and decommissioning impacts associated with the proposed small-scale precious-metals mining operation represent important long-term environmental considerations due to:

- Residual land disturbance;
- Sulphide-bearing material;
- Groundwater dependency within the receiving environment;
- Semi-arid ecological sensitivity.

Nevertheless, several important operational characteristics substantially reduce long-term environmental liability compared to conventional large-scale mining operations, including:

- Small operational footprint;
- Progressive rehabilitation philosophy;
- Dry-stack residue management;
- Reduced chemical dependency;
- Temporary infrastructure philosophy;
- Water recycling and reuse;
- Reduced waste volumes.

Although certain long-term impacts associated with:

- Residual contamination;
- Waste-rock stability;
- Ecological recovery;
- Post-closure groundwater protection

initially exhibit moderate to high significance prior to mitigation, implementation of robust closure-management systems and progressive rehabilitation substantially reduces residual environmental risk.

Provided that all closure commitments, rehabilitation measures, groundwater-monitoring programmes, environmental audits, and post-closure management procedures outlined within the Environmental Management Plan are fully implemented, closure and rehabilitation impacts associated with the proposed operation are considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

5.16 Climate Change, Climate Resilience and Environmental Sustainability Impacts

5.16.1 Introduction

The proposed small-scale precious-metals mining operation is situated within a semi-arid environment of the Kunene Region characterized by:

- Low and variable rainfall;
- High evaporation rates;
- Recurring drought conditions;
- Groundwater dependency;
- Climate-sensitive ecological systems.

Climate variability and long-term climate change therefore represent important environmental considerations influencing:

- Water-resource sustainability;
- Ecological resilience;
- Rehabilitation success;
- Operational safety;
- Long-term environmental stability.

Potential climate-related impacts associated with the proposed operation may include:

- Increased water stress;
- Dust intensification during drought periods;
- Reduced rehabilitation success;
- Increased erosion associated with intense rainfall events;
- Heat-related operational risks;
- Long-term environmental vulnerability.

The proposed operation has nevertheless adopted several operational approaches specifically intended to improve environmental sustainability and climate resilience, including:

- Water recycling and reuse;
- Dry-stack residue management;
- Reduced chemical dependency;
- Progressive rehabilitation;

- Reduced infrastructure intensity;
- Reduced operational footprint.

The relatively small operational scale substantially reduces greenhouse-gas intensity and environmental pressure compared to conventional large-scale mining developments.

5.16.2 Water Scarcity and Drought Vulnerability

Impact Description

The Kunene Region is highly vulnerable to:

- Drought conditions;
- Low groundwater recharge;
- Variable rainfall;
- Long-term water scarcity.

Groundwater forms the primary operational and communal water resource within the surrounding environment.

Potential climate-related impacts associated with the proposed operation may include:

- Increased groundwater pressure during drought periods;
- Reduced water availability;
- Increased environmental sensitivity during prolonged dry conditions.

However, the proposed operation incorporates:

- Water recycling and reuse systems;
- Controlled water-management procedures;
- Reduced water-demand operational philosophy.

These measures substantially improve long-term water sustainability compared to conventional wet-processing mining operations.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	5

Impact Criterion	Rating
Intensity	4
Probability	4
Reversibility	3
Irreplaceability	5

Total Score: 24

Significance: 🟧 **High**

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Maximize water recycling and reuse;
- Monitor groundwater abstraction routinely;
- Minimize unnecessary water consumption;
- Conduct groundwater-level monitoring;
- Maintain leak-detection procedures;
- Maintain adaptive water-management strategies during drought periods.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	4

Total Score: 15

Residual Significance: 🟧 Moderate

Residual Confidence: High

5.16.3 Climate Effects on Rehabilitation and Ecological Recovery

Impact Description

Semi-arid climatic conditions and climate variability may influence long-term rehabilitation success through:

- Reduced vegetation establishment;
- Drought-related plant mortality;
- Wind erosion;
- Reduced ecological recovery rates.

Potential impacts may include:

- Delayed rehabilitation success;
- Increased disturbed-surface persistence;
- Long-term ecological vulnerability.

The naturally slow ecological recovery rates characteristic of semi-arid environments increase climate sensitivity within rehabilitated areas.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	3
Duration	5
Intensity	3
Probability	4
Reversibility	3
Irreplaceability	4

Total Score: 22

Significance: 🟧 High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Conduct progressive rehabilitation;
- Preserve and redistribute topsoil;
- Stabilize disturbed surfaces promptly;
- Utilize locally adapted vegetation where feasible;
- Conduct post-closure rehabilitation monitoring;
- Maintain adaptive rehabilitation-management procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2
Irreplaceability	3

Total Score: 14

Residual Significance: Low

Residual Confidence: Medium

5.16.4 Extreme Weather, Erosion and Stormwater Risks

Impact Description

Although the project area is predominantly arid to semi-arid, occasional intense rainfall events may occur during seasonal storm periods.

Potential climate-related impacts may include:

- Increased erosion;
- Stormwater runoff concentration;

- Sediment transport;
- Infrastructure damage;
- Localized flooding within drainage pathways.

Disturbed surfaces and waste-rock areas may exhibit increased vulnerability during high-intensity rainfall events.

However, the relatively compact operational footprint substantially reduces large-scale stormwater-management complexity.

Pre-Mitigation Impact Assessment

Impact Criterion	**Rating**
Extent	2
Duration	4
Intensity	3
Probability	3
Reversibility	2
Irreplaceability	3

Total Score: 17

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Install stormwater-diversion infrastructure;
- Stabilize disturbed slopes;
- Restrict infrastructure placement within drainage pathways;
- Maintain erosion-control structures;
- Conduct routine stormwater inspections;
- Conduct progressive rehabilitation.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	2
Probability	2
Reversibility	1
Irreplaceability	2

Total Score: 10

Residual Significance: 🟩 Low

Residual Confidence: Medium

5.16.5 Dust Intensification Under Dry Climatic Conditions

Impact Description

Extended dry periods and drought conditions may increase:

- Dust generation;
- Surface instability;
- Wind erosion;
- Reduced air quality.

Potential impacts may include:

- Increased occupational dust exposure;
- Reduced vegetation health;
- Increased visual disturbance;
- Reduced local air quality.

The semi-arid environment naturally exhibits elevated dust sensitivity during prolonged dry periods.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	3
Probability	4
Reversibility	2
Irreplaceability	2

Total Score: 17

Significance: 🟧 Moderate

Confidence Ranking: High

Mitigation Measures

Recommended mitigation measures include:

- Apply water suppression where necessary;
- Stabilize disturbed surfaces;
- Conduct progressive rehabilitation;
- Enforce operational speed limits;
- Minimize unnecessary exposed disturbed areas;
- Maintain dust-monitoring procedures.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1

Impact Criterion	Rating
Irreplaceability	1

Total Score: 8

Residual Significance: 🟦 **Very Low**

Residual Confidence: High

5.16.6 Energy Usage and Greenhouse-Gas Considerations

Impact Description

Operational activities involving:

- Mobile equipment;
- Transport vehicles;
- Generators;
- Ore processing infrastructure

will contribute to:

- Fuel consumption;
- Greenhouse-gas emissions;
- Energy demand.

Potential impacts may include:

- Incremental contribution to greenhouse-gas emissions;
- Long-term carbon-related environmental pressure.

However, several project characteristics substantially reduce greenhouse-gas intensity compared to conventional large-scale mining operations, including:

- Small operational scale;
- Reduced infrastructure intensity;
- Compact operational layout;
- Reduced processing intensity;
- Limited heavy industrial infrastructure.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	4
Intensity	2
Probability	4
Reversibility	2
Irreplaceability	2

Total Score: 16

Significance: 🟧 Moderate

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maintain fuel-efficient operational practices;
- Conduct routine equipment maintenance;
- Minimize unnecessary vehicle movement;
- Optimize transport logistics;
- Utilize energy-efficient infrastructure where feasible;
- Maintain compact operational layouts.

Residual Impact Assessment

Impact Criterion	Rating
Extent	1
Duration	2
Intensity	1
Probability	2
Reversibility	1

Impact Criterion	Rating
Irreplaceability	1

Total Score: 8

Residual Significance: 🟦 **Very Low**

Residual Confidence: Medium

5.16.7 Long-Term Environmental Sustainability

Impact Description

Long-term environmental sustainability depends on:

- Responsible resource utilization;
- Groundwater protection;
- Controlled hazardous-material management;
- Rehabilitation success;
- Adaptive environmental management.

Potential long-term sustainability risks may arise if:

- Environmental controls are poorly implemented;
- Groundwater systems become contaminated;
- Rehabilitation is delayed;
- Waste management remains inadequate.

However, the proposed operation incorporates several sustainability-oriented operational principles including:

- Progressive rehabilitation;
- Water recycling and reuse;
- Dry-stack residue management;
- Reduced chemical dependency;
- Reduced operational footprint.

Pre-Mitigation Impact Assessment

Impact Criterion	Rating
Extent	3
Duration	5
Intensity	4
Probability	3
Reversibility	3
Irreplaceability	5

Total Score: 23

Significance: 🟧 High

Confidence Ranking: Medium

Mitigation Measures

Recommended mitigation measures include:

- Maintain adaptive environmental-management systems;
- Continue environmental monitoring programmes;
- Conduct progressive rehabilitation;
- Maintain groundwater-protection systems;
- Conduct environmental audits;
- Maintain stakeholder engagement throughout operational phases.

Residual Impact Assessment

Impact Criterion	Rating
Extent	2
Duration	3
Intensity	2
Probability	2
Reversibility	2

Impact Criterion	Rating
Irreplaceability	4

Total Score: 15

Residual Significance: 🟧 **Moderate**

Residual Confidence: Medium

5.16.8 Overall Climate Change, Climate Resilience and Environmental Sustainability

Impact Statement

Climate change, climate resilience and environmental sustainability considerations represent important long-term environmental factors influencing the proposed small-scale precious-metals mining operation due to:

- Semi-arid climatic conditions;
- Groundwater dependency;
- Drought vulnerability;
- Slow ecological recovery rates;
- Long-term environmental sensitivity.

Nevertheless, several important project characteristics substantially improve climate resilience and environmental sustainability compared to conventional large-scale mining operations, including:

- Small operational footprint;
- Water recycling and reuse;
- Dry-stack residue management;
- Progressive rehabilitation commitments;
- Reduced chemical dependency;
- Reduced infrastructure intensity;
- Controlled operational philosophy.

Although certain climate-related impacts associated with:

- Water scarcity;
- Rehabilitation vulnerability;

- Long-term environmental sustainability

initially exhibit moderate to high significance prior to mitigation, implementation of adaptive environmental-management systems substantially reduces long-term environmental risk.

Provided that all groundwater-protection measures, rehabilitation commitments, monitoring programmes, water-conservation systems, and environmental-management procedures outlined within the Environmental Management Plan are fully implemented, climate-related and long-term sustainability impacts associated with the proposed operation are considered environmentally manageable and sustainable within the receiving environment of the Kunene Region.

5.17 Environmental Impact Significance Summary and Overall Environmental Acceptability

5.17.1 Introduction

This section provides a consolidated summary of the environmental impact assessment undertaken for the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The purpose of the consolidated impact evaluation is to:

- Summarize the principal environmental and socio-economic impacts associated with the proposed operation;
- Evaluate residual environmental significance following mitigation;
- Identify key environmental sensitivities;
- Assess long-term environmental acceptability;
- Determine whether any fatal environmental flaws exist that may prevent implementation of the proposed project.

The environmental assessment evaluated impacts associated with:

- Mining and excavation activities;
- Ore processing operations;
- Controlled hazardous-material usage;
- Groundwater abstraction and protection;
- Waste generation and residue management;
- Biodiversity disturbance;
- Socio-economic interaction;
- Occupational and community health and safety;
- Closure and rehabilitation;
- Climate resilience and long-term sustainability.

The impact assessment methodology incorporated:

- Numerical environmental scoring systems;
- Pre- and post-mitigation significance evaluation;
- Residual impact assessment;
- Cumulative impact evaluation;
- Long-term environmental sustainability considerations.

5.17.2 Summary of Key Environmental Impacts

The environmental assessment identified several environmental and socio-economic impacts associated with the proposed operation.

The principal impacts identified during the assessment include:

- Groundwater contamination risks;
- Hazardous-material handling risks;
- Waste-rock and residue-management impacts;
- Dust generation;
- Surface disturbance and vegetation clearing;
- Occupational health and safety risks;
- Long-term closure and rehabilitation considerations.

Several impacts initially exhibited:

- Moderate significance; or
- High significance

prior to mitigation, particularly those associated with:

- Groundwater protection;
- Hazardous-material management;
- Sulphide-bearing material;
- Long-term closure liability.

However, implementation of robust environmental-management measures substantially reduces residual environmental risk.

Positive impacts identified during the assessment include:

- Employment creation;
- Skills development;
- Localized economic participation;
- Increased regional economic activity.

5.17.3 Environmental Sensitivities Identified

The environmental assessment identified several important environmental sensitivities associated with the receiving environment, including:

- Groundwater dependency within surrounding communal environments;
- Semi-arid climatic conditions;
- Drought vulnerability;
- Slow ecological recovery rates;
- Long-term groundwater sensitivity;
- Surface erosion vulnerability.

Groundwater protection represents the most environmentally sensitive component of the proposed operation due to:

- Regional reliance on borehole water;
- Semi-arid recharge conditions;
- Potential sulphide-related contamination pathways;
- Controlled hazardous-material usage.

Ecological sensitivity within the project area is considered moderate due to:

- Semi-arid vegetation systems;
- Shallow soils;
- Drought-adapted ecological communities.

However, no:

- Critical biodiversity areas;
- Major migration corridors;
- Protected plant communities;
- Significant heritage resources;
- Dense settlement areas

were identified within the immediate operational footprint.

5.17.4 Residual Environmental Impact Evaluation

Following implementation of recommended mitigation measures, the majority of identified impacts reduce to:

- Low significance; or
- Low to moderate significance.

Residual impacts considered low following mitigation include:

- Dust impacts;
- Noise impacts;
- Visual impacts;
- Traffic impacts;
- Domestic waste impacts;
- Ecological disturbance;
- Community disturbance;
- Infrastructure-related impacts.

Residual impacts remaining moderate following mitigation primarily relate to:

- Long-term groundwater protection;
- Climate variability;
- Long-term rehabilitation success;
- Residual sulphide-related contamination sensitivity.

These impacts are considered manageable through:

- Long-term environmental monitoring;
- Groundwater-management systems;
- Progressive rehabilitation;
- Environmental auditing;
- Adaptive environmental management.

No impacts were identified that are considered:

- Unmanageable;
- Irreversible at regional scale;
- Environmentally prohibitive;
- Or fatal to project implementation.

5.17.5 Environmental Advantages of the Proposed Operational Philosophy

The proposed operation incorporates several important environmental-management approaches that substantially reduce environmental risk compared to conventional large-scale precious-metals mining operations.

These include:

- Small operational footprint;
- Gravity-assisted processing systems;
- Reduced chemical dependency;
- Mercury-free processing philosophy;
- Controlled reagent handling;
- Dry-stack residue management;
- Water recycling and reuse;
- Zero-liquid-discharge philosophy where feasible;
- Progressive rehabilitation commitments;
- Reduced infrastructure intensity.

The absence of:

- Conventional wet tailings dams;
- Large-scale cyanide dependency;
- Major industrial processing infrastructure

substantially reduces long-term environmental liability.

The proposed operational philosophy therefore aligns favorably with:

- Environmental sustainability principles;
- Reduced environmental-risk objectives;
- Responsible small-scale mining approaches;
- Modern environmental-management expectations.

5.17.6 Cumulative Environmental Acceptability

The cumulative impact assessment determined that the proposed operation is unlikely to contribute significantly toward unacceptable regional environmental degradation provided that:

- Operational scale remains controlled;

- Groundwater-protection measures are implemented;
- Hazardous-material management remains effective;
- Progressive rehabilitation is maintained;
- Environmental monitoring programmes continue throughout operational phases.

Although the receiving environment remains environmentally sensitive due to:

- Semi-arid climatic conditions;
- Groundwater dependency;
- Drought vulnerability,

the relatively small operational scale substantially limits cumulative environmental pressure compared to conventional mining developments.

5.17.7 Long-Term Sustainability Evaluation

The proposed operation demonstrates several characteristics supportive of long-term environmental sustainability, including:

- Reduced operational scale;
- Controlled processing systems;
- Water-conservation philosophy;
- Reduced waste generation;
- Progressive rehabilitation commitments;
- Reduced infrastructure intensity.

Long-term sustainability nevertheless remains dependent upon:

- Effective environmental management;
- Ongoing groundwater monitoring;
- Proper hazardous-material management;
- Responsible operational practices;
- Effective closure implementation.

Provided that these environmental-management commitments are maintained throughout the life of mine, the proposed operation is considered capable of operating within acceptable environmental sustainability limits.

5.17.8 Overall Environmental Acceptability Statement

The Environmental Scoping Study concludes that the proposed small-scale precious-metals mining operation is environmentally acceptable provided that all mitigation measures, monitoring requirements, closure commitments, and environmental-management procedures outlined within the Environmental Management Plan are fully implemented.

The environmental assessment determined that:

- No fatal environmental flaws were identified;
- No irreversible regional-scale impacts are anticipated;
- The majority of impacts reduce to low significance following mitigation;
- Residual moderate impacts remain environmentally manageable through long-term monitoring and adaptive management.

The project's:

- Small operational footprint;
- Gravity-assisted processing philosophy;
- Reduced chemical dependency;
- Dry-stack residue-management system;
- Progressive rehabilitation commitments;
- Water-conservation approach

substantially reduce environmental risk compared to conventional large-scale mining operations.

The proposed operation is therefore considered environmentally manageable and suitable for consideration of Environmental Clearance Certificate approval within the receiving environment of the Kunene Region, subject to implementation of all environmental-management obligations and regulatory requirements outlined within this Environmental Scoping Study and the accompanying Environmental Management Plan.

6.2 Environmental Management Responsibilities and Institutional Arrangements

6.2.1 Introduction

Effective environmental management requires clearly defined:

- Roles;
- Responsibilities;
- Reporting structures;
- Accountability mechanisms;
- Environmental oversight systems.

This section establishes the institutional and operational framework through which the Environmental Management Plan (EMP) will be implemented, monitored, and enforced throughout all phases of the proposed small-scale precious-metals mining operation.

Environmental management responsibilities will apply to:

- Project management;
- Environmental personnel;
- Operational supervisors;
- Contractors;
- Employees;
- Service providers.

All personnel associated with the proposed operation will be required to comply with the environmental-management obligations and procedures outlined within this EMP.

6.2.2 Environmental Management Structure

Environmental management for the proposed operation will be coordinated through a structured environmental-management hierarchy consisting of:

- The Project Proponent;
- Site Management;
- Environmental Control Personnel;
- Operational Supervisors;
- Contractors and Employees.

The environmental-management structure will ensure:

- Environmental accountability;
- Effective communication;
- Rapid incident response;
- Monitoring and reporting efficiency;
- Continuous environmental oversight.

The overall environmental-management structure shall remain integrated directly into daily operational activities throughout the life of mine.

6.2.3 Responsibility of the Project Proponent

The Project Proponent shall retain overall legal and environmental accountability for implementation of the Environmental Management Plan.

Primary responsibilities of the Project Proponent shall include:

- Ensuring compliance with environmental legislation;
- Ensuring implementation of all EMP commitments;
- Provision of adequate environmental resources;
- Appointment of competent environmental personnel where necessary;
- Ensuring environmental monitoring is conducted;
- Ensuring environmental incidents are addressed appropriately;
- Ensuring rehabilitation obligations are implemented;
- Submission of regulatory reports where required.

The Project Proponent shall further ensure that:

- Sufficient financial resources are allocated for environmental management;
- Environmental responsibilities are incorporated into operational planning;
- Contractors comply with EMP requirements.

6.2.4 Responsibilities of Site Management

Site management personnel shall be responsible for:

- Daily implementation of environmental-management procedures;
- Operational environmental compliance;
- Supervision of environmental controls;

- Coordination of environmental reporting;
- Enforcement of environmental procedures onsite.

Specific site-management responsibilities shall include:

- Ensuring operational compliance with EMP requirements;
- Ensuring environmental incidents are reported immediately;
- Ensuring corrective actions are implemented;
- Coordinating environmental inspections;
- Supervising rehabilitation activities;
- Ensuring hazardous materials are managed appropriately.

Site management shall further ensure that:

- Employees receive environmental awareness training;
- Environmental risks are communicated to operational personnel;
- Environmental monitoring activities are facilitated.

6.2.5 Responsibilities of Environmental Personnel

Environmental personnel or designated environmental officers shall be responsible for:

- Environmental monitoring;
- Environmental inspections;
- Environmental reporting;
- Incident investigation;
- Environmental auditing support;
- Rehabilitation monitoring.

Environmental personnel shall further be responsible for:

- Monitoring groundwater protection measures;
- Monitoring waste-management systems;
- Monitoring hazardous-material handling procedures;
- Maintaining environmental records;
- Conducting environmental-awareness training;
- Advising management on environmental-risk reduction.

Environmental personnel shall maintain authority to:

- Recommend corrective actions;
- Report environmental non-compliance;
- Recommend suspension of environmentally unsafe practices where necessary.

6.2.6 Responsibilities of Contractors

All contractors engaged for operational activities shall be required to:

- Comply fully with EMP requirements;
- Conduct activities in an environmentally responsible manner;
- Prevent environmental contamination;
- Report environmental incidents immediately;
- Follow hazardous-material handling procedures;
- Participate in environmental-awareness training.

Contractors shall remain responsible for:

- Environmental damage resulting from contractor negligence;
- Waste generated through contractor activities;
- Compliance with operational environmental procedures.

All contractor agreements should include:

- Environmental-compliance obligations;
- Incident-reporting requirements;
- Rehabilitation responsibilities where applicable.

6.2.7 Responsibilities of Employees

All employees associated with the proposed operation shall be responsible for:

- Following environmental procedures;
- Reporting environmental incidents;
- Preventing unnecessary environmental damage;
- Utilizing PPE appropriately;
- Participating in environmental and safety training;

- Maintaining proper housekeeping standards.

Employees shall further be required to:

- Avoid unnecessary vegetation disturbance;
- Prevent pollution incidents;
- Handle hazardous materials appropriately;
- Follow waste-management procedures;
- Cooperate with environmental inspections and monitoring activities.

6.2.8 Environmental Communication and Reporting Structure

Environmental communication and reporting systems shall be established to ensure:

- Efficient environmental management;
- Rapid incident response;
- Effective regulatory communication;
- Timely corrective action implementation.

Environmental reporting procedures shall include:

- Incident reporting;
- Environmental monitoring reports;
- Inspection reports;
- Groundwater monitoring results;
- Waste-management records;
- Rehabilitation progress reports.

Environmental incidents requiring immediate reporting may include:

- Chemical spills;
- Fuel spills;
- Groundwater contamination;
- Fire incidents;
- Major environmental non-compliance;
- Injury or environmental emergencies.

Environmental records shall be:

- Maintained systematically;
- Stored securely;
- Made available for regulatory inspection where required.

6.2.9 Environmental Training and Awareness

Environmental training and awareness programmes shall be implemented to ensure that all personnel:

- Understand environmental obligations;
- Understand environmental risks associated with operations;
- Are aware of emergency-response procedures;
- Understand pollution-prevention measures;
- Understand rehabilitation requirements.

Training programmes shall include:

- Hazardous-material handling;
- Spill-response procedures;
- Waste management;
- Groundwater protection;
- Dust-control procedures;
- Rehabilitation responsibilities;
- Occupational health and safety awareness.

Environmental refresher training should be conducted periodically throughout operational phases.

6.2.10 Environmental Non-Compliance and Corrective Actions

Environmental non-compliance may include:

- Failure to implement mitigation measures;
- Unauthorized environmental disturbance;
- Improper waste disposal;
- Hazardous-material mismanagement;
- Failure to report environmental incidents;

- Violation of operational environmental procedures.

Where environmental non-compliance is identified:

- Corrective actions shall be implemented immediately;
- Environmental incidents shall be documented;
- Root causes shall be investigated;
- Preventative measures shall be strengthened where necessary.

Repeated or severe environmental non-compliance may result in:

- Disciplinary action;
- Contractor penalties;
- Operational suspension where necessary;
- Regulatory enforcement action.

6.2.11 Environmental Accountability and Continuous Improvement

Environmental management shall operate according to principles of:

- Continuous improvement;
- Adaptive environmental management;
- Accountability;
- Risk reduction;
- Environmental sustainability.

Environmental-management systems shall therefore be reviewed periodically to:

- Evaluate environmental performance;
- Identify operational weaknesses;
- Improve mitigation effectiveness;
- Strengthen monitoring systems;
- Improve rehabilitation performance.

Environmental monitoring and auditing results shall be utilized to guide:

- Operational adjustments;
- Corrective actions;
- Environmental-management improvements.

6.2.12 Overall Institutional Management Statement

The environmental-management responsibilities and institutional arrangements established within this EMP provide the operational and administrative framework necessary to ensure effective implementation of environmental-management commitments throughout all phases of the proposed operation.

The defined management structure establishes:

- Clear environmental accountability;
- Operational environmental oversight;
- Environmental reporting systems;
- Monitoring responsibilities;
- Corrective-action procedures;
- Contractor and employee obligations.

Provided that all personnel, contractors, supervisors, and management structures comply fully with the environmental-management responsibilities outlined within this EMP, the proposed operation is considered capable of maintaining environmentally responsible and legally compliant operational performance within the receiving environment of the Kunene Region.

6.3 Environmental Management Mitigation Matrix

6.3.1 Introduction

This section presents the Environmental Management Mitigation Matrix developed for the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The mitigation matrix forms the operational core of the Environmental Management Plan (EMP) and translates the environmental and socio-economic impact assessment findings into:

- Practical environmental controls;
- Operational mitigation measures;
- Monitoring requirements;
- Compliance obligations;
- Environmental accountability procedures.

The mitigation matrix establishes the specific environmental-management actions required to:

- Prevent environmental contamination;
- Minimize environmental degradation;
- Reduce operational environmental risks;
- Protect groundwater resources;
- Promote occupational and community safety;
- Support progressive rehabilitation;
- Ensure long-term environmental sustainability.

The matrix further establishes:

- Environmental responsibilities;
- Monitoring indicators;
- Inspection frequencies;
- Compliance evidence requirements;
- Corrective-action triggers.

6.3.2 Purpose of the Mitigation Matrix

The purpose of the mitigation matrix is to ensure that:

- Environmental commitments identified during the Environmental Scoping Study are fully implemented;

- Mitigation measures are operationally enforceable;
- Environmental responsibilities remain clearly defined;
- Environmental performance can be monitored and audited;
- Environmental compliance can be demonstrated to regulatory authorities.

The matrix therefore serves as:

- An environmental implementation tool;
- An environmental monitoring framework;
- A compliance management system;
- An environmental auditing reference;
- A corrective-action framework.

The mitigation matrix applies throughout all phases of the project, including:

- Site establishment;
- Construction;
- Mining operations;
- Ore processing;
- Waste management;
- Rehabilitation;
- Closure and decommissioning.

6.3.3 Environmental Management Philosophy

The mitigation measures contained within this matrix are based upon the following environmental-management principles:

- Prevention rather than remediation;
- Risk reduction at source;
- Continuous environmental monitoring;
- Progressive rehabilitation;
- Adaptive environmental management;
- Long-term environmental sustainability.

The environmental-management philosophy adopted for the proposed operation specifically emphasizes:

- Groundwater protection;
- Controlled hazardous-material management;
- Reduced chemical dependency;
- Dry-stack residue management;
- Water recycling and reuse;
- Reduced operational footprint;
- Reduced long-term environmental liability.

Environmental management shall therefore remain integrated directly into:

- Daily operational planning;
- Mining activities;
- Ore-processing procedures;
- Waste-management systems;
- Rehabilitation activities.

6.3.4 Structure of the Mitigation Matrix

The Environmental Management Mitigation Matrix has been structured to provide clear and measurable environmental-management requirements.

Each matrix table includes the following components:

Matrix Component	**Description**
Environmental Aspect	The environmental component or operational activity being managed
Potential Impact	The environmental or socio-economic impact requiring mitigation
Mitigation / Management Measure	Specific environmental-control action required
Responsibility	Person or operational group responsible for implementation
Monitoring Indicator	Measurable parameter used to evaluate compliance
Monitoring Frequency	Required inspection or monitoring interval

Matrix Component	Description
Compliance Evidence	Records or documentation required for compliance verification

This structure ensures that:

- Environmental controls remain measurable;
- Monitoring obligations remain auditable;
- Environmental accountability remains clearly defined;
- Corrective actions can be implemented where necessary.

6.3.5 Implementation Requirements

All mitigation measures contained within this EMP shall be considered mandatory operational requirements for the proposed project.

The Project Proponent shall ensure that:

- Environmental controls are implemented fully;
- Environmental monitoring programmes are maintained;
- Environmental incidents are reported immediately;
- Corrective actions are implemented where required;
- Environmental records are maintained systematically.

Environmental-management measures shall apply to:

- Employees;
- Contractors;
- Service providers;
- Operational supervisors;
- Project management personnel.

No operational activity shall proceed without implementation of the relevant environmental controls outlined within the mitigation matrix.

6.3.6 Environmental Monitoring and Compliance Verification

Compliance with the mitigation matrix shall be verified through:

- Routine environmental inspections;

- Environmental monitoring programmes;
- Environmental audits;
- Incident investigations;
- Regulatory inspections where applicable.

Monitoring indicators may include:

- Groundwater-quality measurements;
- Dust levels;
- Waste-management inspections;
- Hazardous-material inspections;
- Rehabilitation progress;
- Incident records;
- Environmental training records.

Environmental non-compliance identified during inspections or monitoring shall trigger:

- Immediate corrective action;
- Incident investigation where necessary;
- Strengthening of mitigation measures where applicable.

6.3.7 Adaptive Environmental Management

Environmental conditions and operational risks may change during the life of mine due to:

- Operational expansion;
- Climatic variability;
- Monitoring results;
- Groundwater fluctuations;
- Rehabilitation performance.

The mitigation matrix shall therefore operate according to an adaptive environmental-management philosophy whereby:

- Mitigation measures may be strengthened where necessary;
- Monitoring requirements may be adjusted;
- Additional environmental controls may be introduced;
- Environmental procedures may be updated based on operational performance.

Environmental monitoring results shall therefore be reviewed periodically to evaluate:

- Environmental effectiveness;
- Operational compliance;
- Long-term environmental trends;
- Rehabilitation success.

6.3.8 Environmental Accountability

Environmental accountability for implementation of the mitigation matrix shall remain with:

- The Project Proponent;
- Site Management;
- Environmental Personnel;
- Operational Supervisors;
- Contractors.

Environmental responsibilities shall include:

- Implementation of mitigation measures;
- Environmental inspections;
- Environmental monitoring;
- Incident reporting;
- Corrective-action implementation;
- Rehabilitation supervision.

Failure to comply with mitigation requirements may result in:

- Environmental non-compliance;
- Operational penalties;
- Corrective-action directives;
- Regulatory enforcement action where necessary.

6.3.9 Overall Mitigation Matrix Statement

The Environmental Management Mitigation Matrix establishes the operational environmental-control framework through which environmental impacts associated with the proposed small-scale precious-metals mining operation will be:

- Prevented;
- Minimized;
- Monitored;
- Controlled;
- Audited throughout the life of mine.

The mitigation matrix provides:

- Clear environmental responsibilities;
- Measurable environmental controls;
- Monitoring requirements;
- Compliance indicators;
- Environmental accountability mechanisms.

Provided that all mitigation measures, monitoring programmes, corrective-action procedures, and environmental-management obligations contained within this matrix are fully implemented, the proposed operation is considered capable of maintaining environmentally responsible and legally compliant operational performance within the receiving environment of the Kunene Region.

6.3.1 Air Quality and Dust Management Mitigation Matrix

6.3.1 Introduction

Air quality and dust management represent important environmental-management components associated with the proposed small-scale precious-metals mining operation due to:

- Semi-arid climatic conditions;
- Low vegetation cover;
- Fine material handling;
- Vehicle movement on gravel roads;
- Mining and ore-processing activities.

Potential dust-generation sources associated with the operation include:

- Excavation activities;
- Drilling activities;
- Crushing and screening;
- Ore handling;
- Waste-rock handling;
- Vehicle movement;
- Wind erosion from disturbed surfaces.

Potential impacts associated with dust generation may include:

- Reduced air quality;
- Vegetation dust deposition;
- Worker respiratory exposure;
- Reduced visibility;
- Localized nuisance impacts.

The proposed operation nevertheless incorporates several operational approaches intended to reduce dust generation and air-quality impacts, including:

- Reduced operational footprint;
- Controlled ore-handling procedures;
- Water suppression measures;
- Progressive rehabilitation;
- Controlled traffic movement.

This mitigation matrix establishes the operational air-quality management measures required throughout all phases of the project.

6.3.1 Air Quality and Dust Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Vehicle movement on gravel roads	Dust generation and reduced air quality	Enforce onsite speed limits on all operational roads	Site Manager / Drivers	Visible dust levels and speed compliance	Daily	Inspection records and site logs
Vehicle movement on gravel roads	Dust deposition on surrounding vegetation	Apply water suppression on heavily utilized roads where necessary	Environmental Officer / Site Supervisor	Dust suppression activities conducted	Daily during dry periods	Watering records
Ore transport and handling	Windblown fine material	Cover or control fine-material transport where feasible	Site Supervisor	Visible material loss during transport	Daily	Transport inspection records
Crushing and screening activities	Airborne particulate generation	Apply localized dust suppression within crushing areas	Plant Operator / Environmental Officer	Dust levels within processing areas	Daily	Dust-control inspection logs
Drilling activities	Dust exposure to workers	Provide respiratory PPE to operational personnel	Site Management	PPE availability and usage	Daily	PPE inspection records
Drilling and excavation	Worker respiratory exposure	Restrict unnecessary exposure within high-dust operational zones	Site Supervisor	Worker exposure observations	Daily	Safety inspection reports

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Disturbed operational surfaces	Wind erosion and airborne dust	Stabilize inactive disturbed areas progressively	Environmental Officer	Surface stabilization condition	Weekly	Rehabilitation inspection reports
Stockpile areas	Dust generation from exposed material	Maintain compact and stable stockpile configurations	Site Supervisor	Stockpile stability condition	Weekly	Stockpile inspection records
Dry-stack residue areas	Windblown residue material	Conduct progressive stabilization of residue surfaces	Environmental Officer	Residue surface condition	Weekly	Residue inspection reports
General operational activities	Poor housekeeping and dust accumulation	Maintain proper housekeeping throughout operational areas	All Personnel	Operational cleanliness	Daily	Housekeeping inspection records
Prolonged drought conditions	Increased dust-generation potential	Increase dust suppression frequency during severe dry conditions	Site Management	Dust conditions during drought periods	As Required	Environmental monitoring reports
Dust impacts on surrounding vegetation	Vegetation stress and dust deposition	Minimize unnecessary disturbance outside approved operational areas	Site Supervisor	Disturbance footprint condition	Weekly	Environmental inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Excessive dust complaints	Community nuisance and operational non-compliance	Investigate and address dust complaints immediately	Environmental Officer	Complaint-response records	As Required	Incident and complaint records
Failure of dust controls	Increased environmental exposure	Conduct routine inspection of dust-control measures	Environmental Officer	Effectiveness of dust controls	Weekly	Inspection reports
Long-term disturbed areas	Persistent dust generation	Conduct progressive rehabilitation throughout operational phases	Site Management / Environmental Officer	Rehabilitation progress	Monthly	Rehabilitation monitoring records

6.3.1 Monitoring and Compliance Requirements

Air-quality and dust-management compliance shall be verified through:

- Routine environmental inspections;
- Dust-control inspections;
- Visual dust monitoring;
- PPE inspections;
- Rehabilitation monitoring;
- Incident and complaint investigations.

Dust-management inspections shall specifically evaluate:

- Visible dust emissions;
- Effectiveness of suppression measures;
- Worker PPE compliance;
- Wind erosion from disturbed areas;
- Stockpile stability;
- Surface stabilization effectiveness.

Any significant dust-related non-compliance identified during inspections shall require:

- Immediate corrective action;
- Strengthening of suppression measures;
- Additional monitoring where necessary.

6.3.2 Corrective Actions

Where excessive dust generation or air-quality deterioration is identified, corrective actions may include:

- Increased water suppression;
- Reduced operational traffic speed;
- Temporary restriction of high-dust activities;
- Additional stabilization of disturbed areas;
- Strengthening of PPE requirements;
- Improved housekeeping procedures.

Corrective actions shall be documented within environmental inspection and incident records.

6.3.1 Overall Air Quality Management Statement

Provided that all air-quality and dust-management measures outlined within this mitigation matrix are fully implemented, dust-related impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Low in residual significance.

The relatively small operational footprint, controlled operational philosophy, progressive rehabilitation commitments, and reduced infrastructure intensity substantially reduce air-quality impacts compared to conventional large-scale mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring environmentally responsible air-quality management throughout the life of mine within the receiving environment of the Kunene Region.

6.3.2 Groundwater Protection and Water Management Mitigation Matrix

6.3.2 Introduction

Groundwater protection represents the most environmentally sensitive component associated with the proposed small-scale precious-metals mining operation due to:

- Regional groundwater dependency;
- Semi-arid climatic conditions;
- Low natural groundwater recharge;
- Controlled reagent usage;
- Sulphide-bearing geological material;
- Potential contamination pathways associated with mining activities.

Groundwater resources within the surrounding communal environment are utilized primarily for:

- Domestic consumption;
- Livestock watering;
- Operational water supply.

Potential groundwater-related risks associated with the proposed operation may include:

- Hydrocarbon contamination;
- Reagent contamination;
- Acid-generating sulphide oxidation;
- Seepage from operational areas;
- Poor stormwater management;
- Improper hazardous-material handling.

The proposed operation nevertheless incorporates several operational approaches intended to significantly reduce groundwater-related environmental risks, including:

- Dry-stack residue management;
- Water recycling and reuse;
- Reduced chemical dependency;
- Controlled reagent systems;
- Bunded hazardous-material storage;
- Zero-liquid-discharge philosophy where feasible;
- Progressive rehabilitation.

This mitigation matrix establishes the operational groundwater-protection and water-management requirements applicable throughout all phases of the project.

6.3.2 Groundwater Protection and Water Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Fuel and hydrocarbon storage	Groundwater contamination from spills	Store fuel within bunded containment areas	Site Manager / Environmental Officer	Condition of bunded areas	Weekly	Inspection records
Hazardous-material storage	Seepage and chemical contamination	Store chemicals within impermeable secured containment areas	Environmental Officer	Integrity of containment systems	Weekly	Hazardous-material inspection records
Sulphide-bearing waste rock	Acid generation and metal leaching	Separate and manage reactive sulphide-bearing material where feasible	Site Supervisor	Sulphide material management condition	Weekly	Waste-rock inspection records
Dry-stack residue areas	Seepage and residue contamination	Maintain controlled dry-stack residue placement and stabilization	Environmental Officer	Residue stability and drainage condition	Weekly	Residue management records
Process-water handling	Uncontrolled discharge of contaminated water	Recycle and reuse process water wherever feasible	Plant Operator	Water recycling activities	Daily	Water-management records
Process-water storage	Seepage from water-storage infrastructure	Inspect tanks, pipelines and water-storage systems routinely	Site Supervisor	Infrastructure integrity	Weekly	Maintenance inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Operational stormwater runoff	Contaminated runoff entering surrounding environment	Install stormwater-diversion channels around operational areas	Site Management	Functionality of diversion systems	Weekly and after rainfall	Stormwater inspection records
Excavation and mining activities	Increased infiltration pathways	Restrict unnecessary excavation outside approved operational areas	Site Supervisor	Disturbance footprint condition	Weekly	Environmental inspection records
Chemical-assisted processing	Groundwater contamination from reagent exposure	Conduct controlled reagent handling under supervised operational procedures	Plant Supervisor	Chemical handling compliance	Daily	Operational monitoring records
Sulphuric acid handling	Acid contamination risk	Maintain acid storage within controlled bunded areas	Environmental Officer	Acid storage condition	Weekly	Hazardous-material inspection records
Limited cyanide usage where necessary	Groundwater contamination risk	Restrict cyanide use to controlled operational conditions only	Plant Management	Cyanide handling procedures	Daily during usage	Operational records
Water abstraction	Excessive groundwater abstraction	Monitor groundwater abstraction volumes routinely	Environmental Officer	Water abstraction records	Weekly	Water-usage records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Borehole performance	Groundwater depletion	Monitor borehole yield and water levels periodically	Environmental Officer	Borehole water levels	Monthly	Groundwater monitoring records
Groundwater quality	Long-term contamination	Conduct routine groundwater-quality monitoring	Environmental Officer	Groundwater analytical results	Quarterly	Laboratory analysis reports
Spill incidents	Soil and groundwater contamination	Maintain spill-response equipment onsite	Site Management	Availability of spill kits	Weekly	Spill-response inspection records
Spill incidents	Delayed emergency response	Implement immediate spill-containment and cleanup procedures	All Personnel	Spill-response time	As Required	Incident records
Wastewater generation	Contaminated discharge	Prevent uncontrolled wastewater discharge	Site Supervisor	Presence of uncontrolled discharge	Daily	Inspection records
Vehicle maintenance areas	Hydrocarbon contamination	Conduct maintenance within designated controlled areas only	Site Supervisor	Condition of maintenance areas	Weekly	Maintenance-area inspection reports
Long-term disturbed areas	Groundwater vulnerability	Conduct progressive rehabilitation throughout operational phases	Environmental Officer	Rehabilitation progress	Monthly	Rehabilitation monitoring records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Environmental monitoring failure	Undetected contamination pathways	Maintain structured groundwater-monitoring programme	Environmental Officer	Monitoring compliance	Quarterly	Monitoring reports

6.3.2 Groundwater Monitoring Requirements

Groundwater monitoring shall be undertaken to evaluate:

- Groundwater quality;
- Water abstraction trends;
- Borehole performance;
- Potential contamination pathways;
- Long-term groundwater stability.

Groundwater monitoring parameters may include:

- pH;
- Electrical conductivity;
- Sulphates;
- Total dissolved solids;
- Hydrocarbon indicators;
- Heavy metals where necessary;
- Cyanide indicators where applicable.

Groundwater monitoring boreholes should be inspected routinely to ensure:

- Accessibility;
- Structural integrity;
- Sampling suitability.

All groundwater-monitoring results shall be:

- Recorded systematically;
- Reviewed periodically;
- Compared against baseline conditions where available.

6.3.2 Spill Prevention and Emergency Response

All personnel handling:

- Fuel;
- Hydrocarbons;
- Reagents;

- Hazardous chemicals

shall receive spill-response training.

Spill-response equipment shall include:

- Spill kits;
- Absorbent materials;
- Neutralization material where necessary;
- Emergency PPE;
- Emergency communication systems.

Any spill incident shall require:

- Immediate containment;
- Incident reporting;
- Cleanup implementation;
- Environmental inspection;
- Corrective-action review.

Major spills with potential groundwater contamination risk shall be reported immediately to relevant authorities where required.

6.3.2 Corrective Actions

Where groundwater contamination risks or water-management failures are identified, corrective actions may include:

- Strengthening containment systems;
- Additional groundwater monitoring;
- Suspension of unsafe operational activities;
- Rehabilitation of contaminated areas;
- Improved stormwater controls;
- Additional environmental training.

Corrective actions shall be documented within environmental monitoring and incident records.

6.3.2 Overall Groundwater Protection Statement

Provided that all groundwater-protection and water-management measures outlined within this mitigation matrix are fully implemented, groundwater-related impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Environmentally controllable.

The proposed operational philosophy incorporating:

- Dry-stack residue management;
- Water recycling and reuse;
- Reduced chemical dependency;
- Controlled reagent handling;
- Zero-liquid-discharge principles where feasible

substantially reduces groundwater-related environmental risk compared to conventional mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring responsible long-term groundwater stewardship and environmentally sustainable water management throughout the life of mine within the receiving environment of the Kunene Region.

6.3.3 Hazardous Materials and Chemical Management Mitigation Matrix

6.3.3 Introduction

Hazardous-material and chemical management represent critical environmental and operational-management components associated with the proposed small-scale precious-metals mining operation due to:

- Controlled reagent usage;
- Sulphuric acid handling;
- Hydrocarbon storage;
- Fuel handling;
- Potential contamination risks associated with mining and processing activities.

Potential hazardous materials associated with the proposed operation may include:

- Thiosulfate;
- Thiourea;
- Limited cyanide where operationally necessary;
- Sulphuric acid;
- Fuels and hydrocarbons;
- Lubricants;
- Cleaning agents;
- Contaminated waste material.

Potential environmental and safety risks associated with hazardous materials may include:

- Soil contamination;
- Groundwater contamination;
- Chemical exposure;
- Fire hazards;
- Spill incidents;
- Worker injury;
- Long-term contamination pathways.

The proposed operation nevertheless incorporates several important environmental-management approaches specifically intended to reduce hazardous-material risk, including:

- Mercury-free processing philosophy;
- Reduced chemical dependency;
- Controlled reagent systems;
- Bunded storage infrastructure;
- Dry-stack residue management;
- Water recycling and reuse;
- Controlled operational footprint.

This mitigation matrix establishes the hazardous-material management requirements applicable throughout all phases of the proposed operation.

6.3.3 Hazardous Materials and Chemical Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Fuel storage	Hydrocarbon contamination	Store fuel within bunded impermeable containment areas	Site Manager / Environmental Officer	Condition of bunded storage areas	Weekly	Inspection records
Fuel handling	Spill incidents during transfer	Conduct fuel transfer under supervised controlled conditions	Site Supervisor	Fuel transfer compliance	Daily	Operational inspection records
Hydrocarbon storage	Fire and explosion hazards	Maintain fire-fighting equipment near storage areas	Site Management	Availability of fire equipment	Weekly	Safety inspection records
Sulphuric acid storage	Acid leakage and contamination	Store acid within secured acid-resistant bunded containment systems	Environmental Officer	Integrity of acid-storage systems	Weekly	Hazardous-material inspection records
Sulphuric acid handling	Worker chemical exposure	Provide acid-resistant PPE during handling activities	Site Supervisor	PPE availability and usage	Daily during handling	PPE inspection records
Thiosulfate and thiourea handling	Chemical exposure and contamination	Conduct reagent handling within controlled designated operational areas	Plant Supervisor	Controlled handling compliance	Daily	Operational monitoring records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Limited cyanide usage where necessary	Groundwater and worker exposure risk	Restrict cyanide usage to supervised controlled operational conditions only	Plant Manager	Cyanide handling compliance	Daily during use	Operational records
Hazardous-material storage areas	Unauthorized access	Restrict access to hazardous-material storage areas	Site Management	Security and access control condition	Weekly	Security inspection records
Hazardous-material containers	Leakage and environmental contamination	Maintain properly labelled sealed chemical containers	Environmental Officer	Container condition and labelling	Weekly	Inspection records
Chemical transport onsite	Spill and exposure risk	Utilize secure transport procedures for hazardous materials	Site Supervisor	Chemical transport condition	Daily during transport	Transport inspection records
Spill incidents	Soil and groundwater contamination	Maintain spill-response kits in all hazardous-material areas	Environmental Officer	Availability of spill-response equipment	Weekly	Spill-kit inspection records
Spill incidents	Delayed emergency response	Implement immediate spill containment and cleanup procedures	All Personnel	Spill-response effectiveness	As Required	Incident records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Chemical handling areas	Contaminated runoff generation	Prevent uncontrolled runoff from chemical-storage areas	Environmental Officer	Drainage and containment condition	Weekly	Environmental inspection reports
Hazardous waste generation	Improper disposal of contaminated material	Segregate hazardous waste from general waste	Environmental Officer	Waste segregation condition	Weekly	Waste-management records
Used oil and lubricants	Groundwater contamination	Store used oil within designated containment areas	Site Supervisor	Used-oil storage condition	Weekly	Hazardous-waste inspection records
Hazardous-material exposure	Worker injury and health risks	Conduct hazardous-material awareness training	Site Management	Training participation	Quarterly	Training attendance records
Emergency chemical incidents	Inadequate emergency preparedness	Conduct periodic emergency-response drills	Site Management	Emergency drill performance	Quarterly	Emergency drill records
Chemical-storage failure	Environmental contamination	Conduct routine inspection of storage infrastructure	Environmental Officer	Storage integrity condition	Weekly	Inspection reports

Environmental Aspect	**Potential Impact**	**Mitigation / Management Measure**	**Responsibility**	**Monitoring Indicator**	**Monitoring Frequency**	**Compliance Evidence**
Hazardous-material inventories	Poor chemical accountability	Maintain updated hazardous-material inventory records	Environmental Officer	Inventory accuracy	Monthly	Inventory records
Closure phase	Residual contamination risk	Remove all hazardous materials during closure activities	Site Management	Removal completion status	During Closure	Closure inspection reports

6.3.3 Hazardous Material Handling Procedures

All hazardous materials utilized onsite shall be:

- Clearly labelled;
- Stored securely;
- Handled by trained personnel only;
- Managed according to manufacturer safety requirements.

Safety Data Sheets (SDS) shall be:

- Available onsite at all times;
- Accessible to operational personnel;
- Reviewed during training programmes.

Personnel handling hazardous materials shall utilize appropriate PPE including:

- Gloves;
- Respiratory protection where necessary;
- Eye protection;
- Protective clothing;
- Chemical-resistant footwear where applicable.

No hazardous materials shall be stored:

- Near drainage pathways;
- Within flood-prone areas;
- Near uncontrolled public-access areas.

6.3.3 Spill Prevention and Emergency Response

Spill prevention shall remain a priority operational requirement throughout the life of mine.

All operational areas involving:

- Fuel;
- Hydrocarbons;
- Reagents;
- Hazardous chemicals

shall maintain:

- Spill-response kits;
- Absorbent material;
- Emergency PPE;
- Fire-fighting equipment;
- Emergency communication systems.

Any hazardous-material spill shall require:

- Immediate containment;
- Immediate reporting;
- Environmental inspection;
- Cleanup implementation;
- Corrective-action review.

Major spill incidents with potential environmental contamination risk shall be reported immediately to relevant authorities where required.

6.3.3 Monitoring and Compliance Requirements

Hazardous-material management compliance shall be verified through:

- Routine environmental inspections;
- Hazardous-material storage inspections;
- Spill-response inspections;
- PPE inspections;
- Waste-management inspections;
- Environmental audits.

Monitoring activities shall evaluate:

- Storage integrity;
- Spill-prevention effectiveness;
- Chemical inventory control;
- Hazardous-waste segregation;
- Worker safety compliance;
- Emergency preparedness.

Any hazardous-material non-compliance identified during inspections shall require:

- Immediate corrective action;
- Incident investigation where necessary;
- Strengthening of environmental controls.

6.3.3 Corrective Actions

Where hazardous-material management failures or contamination risks are identified, corrective actions may include:

- Immediate spill containment;
- Additional containment infrastructure;
- Temporary suspension of unsafe operational activities;
- Additional environmental training;
- Hazardous-material removal and cleanup;
- Strengthening of monitoring programmes.

Corrective actions shall be documented within environmental inspection and incident records.

6.3.3 Overall Hazardous Materials Management Statement

Provided that all hazardous-material and chemical-management measures outlined within this mitigation matrix are fully implemented, hazardous-material-related impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Environmentally controllable.

The proposed operational philosophy incorporating:

- Mercury-free processing;
- Reduced cyanide dependency;
- Controlled reagent systems;
- Bunded containment infrastructure;
- Dry-stack residue management;
- Water recycling and reuse

substantially reduces hazardous-material environmental risk compared to conventional precious-metals mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring environmentally responsible hazardous-material management and long-term groundwater protection throughout the life of mine within the receiving environment of the Kunene Region.

6.3.4 Waste Management and Residue Management Mitigation Matrix

6.3.4 Introduction

Waste management and residue management represent critical environmental-management components associated with the proposed small-scale precious-metals mining operation due to:

- Mining-related waste generation;
- Sulphide-bearing material;
- Ore-processing residues;
- Hazardous waste generation;
- Long-term environmental stability requirements.

Potential waste streams associated with the proposed operation may include:

- Waste rock;
- Dry process residues;
- Hydrocarbon-contaminated waste;
- Hazardous waste;
- Domestic refuse;
- Scrap metal;
- General operational waste.

Potential environmental risks associated with poor waste management may include:

- Groundwater contamination;
- Soil contamination;
- Surface instability;
- Windblown contamination;
- Visual degradation;
- Long-term environmental liability.

The proposed operation nevertheless incorporates several important environmental-management approaches intended to reduce waste-related environmental risk, including:

- Dry-stack residue management;
- Reduced waste volumes;
- Progressive rehabilitation;
- Controlled hazardous-material handling;

- Waste segregation procedures;
- Reduced infrastructure intensity.

This mitigation matrix establishes the waste-management and residue-management requirements applicable throughout all phases of the proposed operation.

6.3.4 Waste Management and Residue Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Waste-rock generation	Surface instability and erosion	Place waste rock within designated controlled low-profile areas	Site Supervisor	Waste-rock placement condition	Weekly	Waste-rock inspection records
Sulphide-bearing waste rock	Acid generation and metal leaching	Separate reactive sulphide-bearing material where feasible	Environmental Officer	Segregation effectiveness	Weekly	Waste-rock management records
Waste-rock stockpiles	Wind and water erosion	Stabilize inactive waste-rock areas progressively	Environmental Officer	Surface stability condition	Weekly	Rehabilitation inspection reports
Dry-stack process residue	Windblown residue dispersion	Maintain compact stabilized dry-stack residue placement	Plant Supervisor	Residue stability condition	Weekly	Residue inspection records
Dry-stack residue areas	Seepage and contamination risk	Prevent uncontrolled runoff interaction with residue areas	Environmental Officer	Drainage-control condition	Weekly and after rainfall	Stormwater inspection reports
Hazardous waste generation	Soil and groundwater contamination	Segregate hazardous waste from general waste	Environmental Officer	Waste segregation condition	Weekly	Waste-management inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Used oil and hydrocarbon waste	Hydrocarbon contamination	Store hydrocarbon waste within designated containment systems	Site Supervisor	Condition of hydrocarbon-storage areas	Weekly	Hazardous-waste inspection reports
Domestic refuse	Litter and wildlife attraction	Maintain designated waste-storage containers onsite	Site Management	Waste-container condition	Daily	Housekeeping inspection records
Domestic waste accumulation	Poor housekeeping and visual degradation	Remove domestic waste routinely to approved disposal facilities	Site Supervisor	Waste removal frequency	Weekly	Waste disposal records
Scrap metal generation	Surface clutter and visual impacts	Store scrap metal within designated collection areas	Site Supervisor	Scrap storage condition	Weekly	Site inspection records
Chemical containers	Residual contamination risk	Dispose of contaminated chemical containers appropriately	Environmental Officer	Chemical-container management condition	Weekly	Hazardous-waste records
General operational waste	Uncontrolled waste disposal	Prohibit unauthorized dumping onsite	All Personnel	Presence of illegal dumping	Daily	Environmental inspection records
Waste transport activities	Spill and litter risks	Secure waste during transport activities	Site Supervisor	Transport condition	Daily during transport	Transport inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Residue-storage areas	Long-term stability risks	Conduct routine inspection of residue-placement areas	Environmental Officer	Residue stability performance	Weekly	Residue monitoring reports
Stormwater interaction with waste areas	Contaminated runoff generation	Install stormwater-diversion infrastructure around waste areas	Site Management	Diversion-system functionality	Weekly and after rainfall	Stormwater inspection records
Waste-management failures	Environmental contamination	Conduct routine environmental waste inspections	Environmental Officer	Compliance status	Weekly	Inspection reports
Closure phase waste risks	Long-term contamination liability	Remove hazardous waste during closure activities	Site Management	Closure cleanup progress	During Closure	Closure inspection records
Long-term disturbed waste areas	Persistent environmental degradation	Conduct progressive rehabilitation of inactive waste areas	Environmental Officer	Rehabilitation progress	Monthly	Rehabilitation monitoring records
Poor waste-management awareness	Increased environmental risk	Conduct waste-management awareness training	Site Management	Training participation	Quarterly	Training attendance records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Uncontrolled waste accumulation	Regulatory non-compliance	Maintain structured waste-management record system	Environmental Officer	Record completeness	Monthly	Waste-management registers

6.3.4 Waste Segregation and Storage Requirements

All waste generated onsite shall be segregated according to:

- Hazardous waste;
- Hydrocarbon waste;
- Domestic waste;
- Scrap metal;
- General operational waste;
- Recyclable material where feasible.

Hazardous waste shall:

- Be stored separately from general waste;
- Be clearly labelled;
- Remain within controlled containment areas;
- Be removed by approved disposal contractors where necessary.

No waste shall be:

- Disposed of within drainage pathways;
- Burned uncontrolled onsite;
- Buried indiscriminately;
- Dumped outside approved operational areas.

Waste-storage areas shall remain:

- Clearly designated;
- Accessible for inspection;
- Protected from runoff interaction;
- Maintained in clean and orderly condition.

6.3.4 Residue and Waste-Rock Stability Monitoring

Residue-storage and waste-rock areas shall be inspected routinely to evaluate:

- Surface stability;
- Wind erosion;
- Stormwater erosion;

- Surface runoff interaction;
- Vegetation establishment where rehabilitation occurs;
- Evidence of instability or contamination.

Monitoring inspections shall increase:

- Following heavy rainfall events;
- During prolonged drought conditions;
- Following operational expansion;
- Where instability is identified.

Corrective stabilization measures may include:

- Recontouring;
- Surface compaction;
- Erosion-control installation;
- Surface stabilization;
- Progressive rehabilitation.

6.3.4 Monitoring and Compliance Requirements

Waste-management compliance shall be verified through:

- Routine environmental inspections;
- Waste-storage inspections;
- Residue stability monitoring;
- Waste-disposal audits;
- Housekeeping inspections;
- Rehabilitation monitoring.

Monitoring programmes shall evaluate:

- Waste segregation effectiveness;
- Hazardous-waste management;
- Residue stability;
- Waste-storage conditions;
- Operational cleanliness;

- Rehabilitation performance.

Any waste-management non-compliance identified during inspections shall require:

- Immediate corrective action;
- Environmental investigation where necessary;
- Strengthening of waste-management controls.

6.3.4 Corrective Actions

Where waste-management failures or residue instability are identified, corrective actions may include:

- Removal of improperly disposed waste;
- Strengthening containment systems;
- Additional stabilization measures;
- Additional environmental training;
- Increased environmental monitoring;
- Temporary restriction of unsafe operational activities.

Corrective actions shall be documented within environmental monitoring and incident records.

6.3.4 Overall Waste Management Statement

Provided that all waste-management and residue-management measures outlined within this mitigation matrix are fully implemented, waste-related impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Environmentally controllable.

The proposed operational philosophy incorporating:

- Dry-stack residue management;
- Reduced waste generation;
- Progressive rehabilitation;
- Reduced chemical dependency;
- Controlled hazardous-material handling

substantially reduces long-term environmental liability compared to conventional precious-metals mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring environmentally responsible waste management and long-term environmental stability throughout the life of mine within the receiving environment of the Kunene Region.

6.3.5 Biodiversity, Vegetation and Ecological Management Mitigation Matrix

6.3.5 Introduction

Biodiversity and ecological management represent important environmental-management components associated with the proposed small-scale precious-metals mining operation due to:

- Semi-arid ecological sensitivity;
- Slow vegetation recovery rates;
- Shallow soils;
- Erosion vulnerability;
- Disturbance associated with mining activities.

The receiving environment is characterized by:

- Semi-arid savanna vegetation;
- Rocky mountainous terrain;
- Sparse vegetation cover;
- Drought-adapted ecological systems.

Potential ecological impacts associated with the proposed operation may include:

- Vegetation clearing;
- Habitat disturbance;
- Surface erosion;
- Dust deposition on vegetation;
- Disturbance to fauna;
- Long-term ecological degradation where rehabilitation is inadequate.

The proposed operation nevertheless incorporates several operational approaches intended to reduce ecological disturbance, including:

- Reduced operational footprint;
- Controlled disturbance areas;
- Progressive rehabilitation;
- Reduced infrastructure intensity;
- Controlled access routes;
- Reduced operational expansion philosophy.

No critical biodiversity areas, major wildlife migration corridors, or highly sensitive protected ecological systems were identified within the immediate operational footprint during baseline investigations.

This mitigation matrix establishes the biodiversity and ecological-management requirements applicable throughout all phases of the proposed operation.

6.3.5 Biodiversity, Vegetation and Ecological Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Vegetation clearing	Loss of vegetation cover	Restrict vegetation clearing to approved operational areas only	Site Supervisor	Disturbance footprint condition	Weekly	Environmental inspection records
Unnecessary land disturbance	Habitat degradation	Minimize unnecessary operational expansion	Site Management	Extent of disturbance	Weekly	Site inspection reports
Surface disturbance	Increased erosion vulnerability	Stabilize disturbed surfaces progressively	Environmental Officer	Surface stability condition	Weekly	Rehabilitation inspection reports
Topsoil removal	Reduced rehabilitation success	Preserve and stockpile topsoil separately for rehabilitation purposes	Site Supervisor	Topsoil stockpile condition	Weekly	Topsoil management records
Vehicle movement	Vegetation damage outside operational areas	Restrict vehicles to designated access routes	Drivers / Site Supervisor	Evidence of off-road driving	Daily	Vehicle inspection records
Dust generation	Dust deposition on vegetation	Apply dust-suppression measures where necessary	Environmental Officer	Visible dust levels	Daily during dry periods	Dust-control records
Operational activities	Disturbance to fauna	Restrict unnecessary disturbance and noise where feasible	Site Management	Wildlife disturbance observations	Weekly	Environmental inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Open excavations	Faunal injury risk	Restrict unnecessary open excavation exposure	Site Supervisor	Excavation management condition	Weekly	Safety and environmental inspection reports
Waste accumulation	Wildlife attraction and ecological disturbance	Maintain proper housekeeping and waste management	All Personnel	Operational cleanliness	Daily	Housekeeping inspection records
Invasive species introduction	Ecological imbalance	Avoid introduction of alien plant material where feasible	Environmental Officer	Presence of invasive vegetation	Monthly	Ecological inspection records
Stormwater runoff	Erosion and habitat degradation	Install erosion and stormwater-control infrastructure	Site Management	Stormwater-control condition	Weekly and after rainfall	Stormwater inspection reports
Residue and waste-rock areas	Long-term ecological degradation	Conduct progressive rehabilitation of inactive disturbed areas	Environmental Officer	Rehabilitation progress	Monthly	Rehabilitation monitoring reports
Fire incidents	Vegetation loss and ecological disturbance	Maintain fire-prevention and emergency-response systems	Site Management	Fire-prevention compliance	Weekly	Safety inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Rehabilitation areas	Poor vegetation recovery	Utilize locally occurring vegetation species where feasible	Environmental Officer	Vegetation establishment success	Quarterly	Rehabilitation monitoring reports
Drought conditions	Reduced rehabilitation success	Implement adaptive rehabilitation management during prolonged drought periods	Environmental Officer	Rehabilitation condition during drought	Quarterly	Monitoring reports
Illegal hunting or wildlife disturbance	Biodiversity loss	Prohibit hunting and disturbance of wildlife by personnel	Site Management	Evidence of wildlife disturbance	Daily	Site inspection records
Uncontrolled access	Ecological degradation	Restrict unauthorized access to operational areas	Site Security / Management	Access-control condition	Weekly	Security inspection records
Closure phase	Long-term ecological degradation	Conduct final rehabilitation and ecological stabilization	Site Management	Closure rehabilitation progress	During Closure	Closure monitoring records
Failure of ecological controls	Environmental non-compliance	Conduct routine ecological inspections and monitoring	Environmental Officer	Ecological compliance status	Monthly	Environmental audit records
Poor environmental awareness	Increased ecological disturbance	Conduct environmental-awareness training for personnel	Site Management	Training participation	Quarterly	Training attendance records

6.3.5 Vegetation Clearing and Disturbance Control

Vegetation clearing shall:

- Be restricted strictly to approved operational areas;
- Be minimized wherever feasible;
- Avoid unnecessary disturbance of surrounding undisturbed areas.

No indiscriminate vegetation clearing shall be permitted.

Operational personnel shall:

- Utilize designated access routes;
- Avoid unnecessary off-road driving;
- Avoid unnecessary disturbance of surrounding vegetation.

Topsoil removed during operational activities shall:

- Be stockpiled separately;
- Be protected from erosion;
- Be utilized for rehabilitation purposes where feasible.

6.3.5 Rehabilitation and Ecological Recovery

Progressive rehabilitation shall remain a priority environmental-management requirement throughout operational phases.

Rehabilitation activities shall include:

- Surface stabilization;
- Recontouring where feasible;
- Redistribution of preserved topsoil;
- Erosion-control measures;
- Vegetation re-establishment where feasible.

Rehabilitation monitoring shall evaluate:

- Vegetation establishment success;
- Surface stability;
- Erosion control effectiveness;
- Long-term ecological recovery.

Adaptive rehabilitation management measures may be implemented where:

- Vegetation recovery remains inadequate;
- Surface instability develops;
- Drought conditions reduce rehabilitation performance.

6.3.5 Monitoring and Compliance Requirements

Biodiversity and ecological-management compliance shall be verified through:

- Routine ecological inspections;
- Rehabilitation monitoring;
- Disturbance-footprint inspections;
- Vegetation monitoring;
- Stormwater inspections;
- Environmental audits.

Monitoring programmes shall evaluate:

- Vegetation clearing extent;
- Disturbance control effectiveness;
- Surface stability;
- Rehabilitation performance;
- Presence of erosion;
- Dust impacts on vegetation;
- Wildlife disturbance indicators.

Any ecological-management non-compliance identified during inspections shall require:

- Immediate corrective action;
- Additional rehabilitation measures where necessary;
- Strengthening of environmental controls.

6.3.5 Corrective Actions

Where ecological disturbance or rehabilitation failures are identified, corrective actions may include:

- Additional stabilization measures;
- Surface recontouring;

- Additional rehabilitation;
- Restriction of operational access;
- Strengthening erosion controls;
- Additional environmental training.

Corrective actions shall be documented within environmental inspection and rehabilitation records.

6.3.5 Overall Biodiversity and Ecological Management Statement

Provided that all biodiversity, vegetation and ecological-management measures outlined within this mitigation matrix are fully implemented, ecological impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Environmentally controllable.

The proposed operational philosophy incorporating:

- Reduced operational footprint;
- Progressive rehabilitation;
- Controlled disturbance;
- Reduced infrastructure intensity;
- Controlled access management

substantially reduces ecological disturbance compared to conventional large-scale mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring environmentally responsible biodiversity protection and long-term ecological stability throughout the life of mine within the receiving environment of the Kunene Region.

6.3.6 Occupational Health and Safety Management Mitigation Matrix

6.3.6 Introduction

Occupational health and safety management represents a critical operational requirement associated with the proposed small-scale precious-metals mining operation due to:

- Mining and excavation activities;
- Ore processing;

- Crushing and screening;
- Hazardous-material handling;
- Vehicle and equipment operation;
- Remote operational conditions.

Potential occupational health and safety risks associated with the proposed operation may include:

- Physical injury;
- Equipment-related accidents;
- Dust inhalation;
- Chemical exposure;
- Noise exposure;
- Heat stress;
- Fire hazards;
- Emergency-response limitations.

The proposed operation nevertheless incorporates several important operational approaches intended to reduce occupational health and safety risk, including:

- Controlled operational scale;
- Reduced workforce intensity;
- Mercury-free processing philosophy;
- Controlled reagent systems;
- Structured environmental and safety management;
- Reduced infrastructure complexity.

This mitigation matrix establishes the occupational health and safety management requirements applicable throughout all phases of the proposed operation.

6.3.6 Occupational Health and Safety Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Mining and excavation activities	Physical injury and accidents	Conduct mining activities under supervised controlled operational procedures	Site Supervisor	Compliance with operational procedures	Daily	Safety inspection records
Mobile equipment operation	Collision and equipment accidents	Restrict equipment operation to trained personnel only	Site Management	Operator competency compliance	Daily	Training and competency records
Vehicle movement onsite	Worker injury and traffic incidents	Enforce operational speed limits and traffic-control measures	Site Supervisor / Drivers	Speed-limit compliance	Daily	Site inspection reports
Crushing and screening activities	Dust inhalation and respiratory exposure	Provide respiratory PPE to operational personnel	Site Management	PPE usage compliance	Daily	PPE inspection records
High-noise operational areas	Hearing impairment	Provide hearing-protection PPE	Site Supervisor	PPE availability and usage	Daily	Safety inspection records
Hazardous-material handling	Chemical exposure and burns	Provide chemical-resistant PPE during reagent handling	Plant Supervisor	PPE compliance	Daily during handling	PPE inspection reports

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Sulphuric acid handling	Severe chemical injury	Maintain controlled acid-handling procedures	Environmental Officer / Plant Supervisor	Handling compliance	Daily during use	Hazardous-material records
Limited cyanide use where necessary	Acute exposure risk	Restrict cyanide handling to trained authorized personnel only	Plant Management	Authorized handling compliance	Daily during use	Operational records
Dust exposure	Long-term respiratory health impacts	Apply dust-suppression measures where necessary	Environmental Officer	Visible dust levels	Daily	Dust-monitoring records
Heat exposure	Heat stress and dehydration	Provide potable water and shaded rest areas onsite	Site Management	Availability of water and shade	Daily	Safety inspection records
Long working hours	Fatigue-related incidents	Implement controlled work-rest schedules	Site Supervisor	Worker fatigue observations	Daily	Shift records
Fuel-storage areas	Fire and explosion hazards	Maintain fire-fighting equipment near hazardous areas	Site Management	Availability of fire equipment	Weekly	Safety inspection records
Operational activities	Poor emergency preparedness	Conduct routine emergency-response drills	Site Management	Emergency drill performance	Quarterly	Emergency drill records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Remote operational location	Delayed emergency medical response	Maintain emergency communication systems onsite	Site Management	Communication-system functionality	Weekly	Inspection reports
Excavations and pits	Fall and injury hazards	Restrict unauthorized access to excavation areas	Site Supervisor	Access-control condition	Daily	Safety inspection records
Equipment maintenance activities	Injury and contamination risks	Conduct maintenance within designated controlled areas	Site Supervisor	Maintenance-area condition	Weekly	Maintenance inspection records
Poor housekeeping	Slip, trip and fire hazards	Maintain proper housekeeping throughout operational areas	All Personnel	Operational cleanliness	Daily	Housekeeping inspection records
Unsafe work practices	Increased accident risk	Conduct routine occupational health and safety training	Site Management	Training participation	Quarterly	Training attendance records
Occupational incidents	Failure to investigate safety risks	Maintain incident-reporting and investigation procedures	Site Management	Incident-reporting compliance	As Required	Incident investigation reports
Closure activities	Injury during dismantling and rehabilitation	Implement controlled closure and	Site Management	Closure safety compliance	During Closure	Closure inspection reports

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
		decommissioning procedures				

6.3.6 PPE and Worker Safety Requirements

All personnel associated with operational activities shall utilize appropriate PPE including:

- Safety boots;
- Hard hats;
- Gloves;
- Respiratory protection where necessary;
- Hearing protection;
- Reflective safety clothing;
- Eye protection.

Personnel involved in:

- Chemical handling;
- Acid handling;
- Fuel handling;
- Crushing activities

shall receive additional specialized PPE where necessary.

No operational personnel shall:

- Operate equipment without authorization;
- Enter hazardous operational areas without PPE;
- Conduct unsafe operational activities.

6.3.6 Emergency Preparedness and Incident Response

Emergency-response systems shall be maintained throughout all phases of the operation.

Emergency preparedness shall include:

- Emergency communication systems;
- First-aid equipment;
- Fire-fighting equipment;
- Spill-response kits;
- Emergency assembly points;
- Emergency transport arrangements where necessary.

Emergency drills shall be conducted periodically for:

- Fire incidents;
- Chemical spills;
- Worker injury;
- Fuel incidents;
- Operational emergencies.

All incidents and near-miss events shall be:

- Reported immediately;
- Investigated;
- Documented;
- Reviewed for corrective-action implementation.

6.3.6 Monitoring and Compliance Requirements

Occupational health and safety compliance shall be verified through:

- Routine safety inspections;
- PPE inspections;
- Incident investigations;
- Occupational monitoring;
- Emergency-response inspections;
- Environmental and safety audits.

Monitoring programmes shall evaluate:

- PPE compliance;
- Worker safety behavior;
- Equipment safety;
- Hazardous-material handling compliance;
- Emergency preparedness;
- Operational housekeeping;
- Incident trends.

Any occupational health and safety non-compliance identified during inspections shall require:

- Immediate corrective action;
- Additional training where necessary;
- Strengthening of operational controls.

6.3.6 Corrective Actions

Where occupational health and safety failures or unsafe operational conditions are identified, corrective actions may include:

- Immediate suspension of unsafe activities;
- Additional PPE requirements;
- Additional worker training;
- Strengthening operational supervision;
- Equipment maintenance or replacement;
- Strengthening emergency-response systems.

Corrective actions shall be documented within:

- Safety inspection records;
- Incident reports;
- Environmental and safety audit records.

6.3.6 Overall Occupational Health and Safety Management Statement

Provided that all occupational health and safety management measures outlined within this mitigation matrix are fully implemented, occupational risks associated with the proposed operation are expected to remain:

- Operationally manageable;
- Environmentally controllable;
- Within acceptable occupational safety limits.

The proposed operational philosophy incorporating:

- Controlled operational scale;
- Mercury-free processing;
- Controlled reagent systems;
- Structured safety management;

- Reduced infrastructure intensity

substantially reduces occupational risk compared to conventional large-scale mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring safe, responsible and legally compliant occupational health and safety management throughout the life of mine within the receiving environment of the Kunene Region.

6.3.7 Community Health, Safety and Social Management Mitigation Matrix

6.3.7 Introduction

Community health, safety and social management represent important environmental and socio-economic components associated with the proposed small-scale precious-metals mining operation due to:

- Rural communal land use;
- Groundwater dependency;
- Livestock-based livelihoods;
- Vehicle movement;
- Hazardous-material handling;
- Mining and processing activities.

Potential community-related risks associated with the proposed operation may include:

- Traffic and road-safety incidents;
- Dust impacts;
- Public access to hazardous operational areas;
- Groundwater contamination risks;
- Noise and blasting disturbance;
- Fire and emergency incidents;
- Social conflict associated with operational activities.

The proposed operation nevertheless incorporates several operational approaches intended to reduce community exposure risks, including:

- Reduced operational footprint;
- Controlled hazardous-material systems;
- Reduced infrastructure intensity;
- Controlled operational access;
- Progressive rehabilitation;
- Reduced traffic volumes.

The relatively remote project setting and low surrounding settlement density substantially reduce broader community exposure risks compared to conventional large-scale mining developments.

This mitigation matrix establishes the community health, safety and social-management requirements applicable throughout all phases of the proposed operation.

6.3.7 Community Health, Safety and Social Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Vehicle movement on public and gravel roads	Traffic accidents and livestock collisions	Enforce operational speed limits and safe-driving procedures	Site Management / Drivers	Driver compliance and traffic behavior	Daily	Vehicle inspection and transport records
Ore and supply transport	Dust generation affecting surrounding communities	Apply dust-suppression measures where necessary	Environmental Officer	Visible dust levels	Daily during dry periods	Dust-monitoring records
Hazardous-material transport	Spill incidents affecting public areas	Utilize secure hazardous-material transport procedures	Site Supervisor	Transport compliance condition	Daily during transport	Transport inspection records
Operational activities	Unauthorized public access to hazardous areas	Restrict unauthorized access to operational areas	Site Security / Management	Access-control effectiveness	Daily	Security inspection records
Open excavations and pits	Injury risks to communities and livestock	Fence or secure hazardous excavated areas where necessary	Site Supervisor	Excavation safety condition	Weekly	Safety inspection reports
Hazardous-material storage	Community exposure to hazardous substances	Maintain secure bunded chemical-storage infrastructure	Environmental Officer	Storage security condition	Weekly	Hazardous-material inspection records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Groundwater usage and operational activities	Groundwater contamination affecting surrounding users	Implement groundwater-protection and monitoring measures	Environmental Officer	Groundwater monitoring results	Quarterly	Groundwater monitoring reports
Operational noise and blasting	Disturbance to surrounding communities	Restrict blasting and high-noise activities to daytime periods	Site Management	Compliance with operational schedules	Daily	Operational records
Fire and emergency incidents	Community safety risks	Maintain emergency-response and fire-management systems	Site Management	Emergency preparedness status	Weekly	Emergency inspection records
Spill incidents	Environmental and community contamination risk	Maintain spill-response kits and emergency-response procedures	Environmental Officer	Spill-response readiness	Weekly	Spill-response inspection records
Workforce-community interaction	Social conflict and community dissatisfaction	Maintain respectful workforce conduct policies	Site Management	Community complaints and incidents	Monthly	Community liaison records
Local employment opportunities	Community dissatisfaction regarding recruitment	Promote fair and transparent local recruitment procedures	Project Proponent	Local recruitment participation	Quarterly	Employment records

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Public grievances and complaints	Escalation of community conflict	Maintain formal grievance and complaint procedures	Environmental Officer	Complaint-resolution performance	As Required	Complaint register
Livestock movement near operational areas	Livestock injury risks	Restrict unnecessary operational movement outside designated areas	Site Supervisor	Livestock disturbance observations	Weekly	Environmental inspection reports
Public health and sanitation	Sanitation and hygiene concerns	Maintain adequate sanitation facilities onsite	Site Management	Sanitation condition	Weekly	Site inspection records
Emergency incidents	Poor communication during emergencies	Maintain emergency communication systems	Site Management	Communication-system functionality	Weekly	Emergency inspection records
Operational expansion	Increased community disturbance	Restrict unnecessary operational expansion	Site Management	Operational footprint condition	Monthly	Environmental monitoring records
Community environmental concerns	Reduced stakeholder confidence	Conduct ongoing stakeholder engagement where necessary	Environmental Officer	Stakeholder engagement activities	Quarterly	Stakeholder consultation records
Closure phase	Long-term public safety risks	Conduct closure rehabilitation and site stabilization	Site Management	Closure rehabilitation condition	During Closure	Closure monitoring reports

Environmental Aspect	**Potential Impact**	**Mitigation / Management Measure**	**Responsibility**	**Monitoring Indicator**	**Monitoring Frequency**	**Compliance Evidence**
Community awareness	Lack of public understanding of operational risks	Conduct community-awareness engagement where necessary	Site Management	Awareness engagement activities	As Required	Community engagement records

6.3.7 Community Engagement and Communication

Community engagement shall remain an important component of operational environmental management throughout the life of mine.

Stakeholder engagement activities may include:

- Community consultation;
- Complaint-response procedures;
- Environmental awareness engagement;
- Operational updates where necessary.

Community complaints and grievances shall:

- Be recorded formally;
- Be investigated promptly;
- Receive appropriate corrective response where necessary.

Community liaison systems shall aim to:

- Promote transparent communication;
- Reduce conflict potential;
- Improve operational accountability;
- Support responsible community relations.

6.3.7 Traffic and Public Safety Management

Operational traffic-management procedures shall include:

- Speed-limit enforcement;
- Driver safety awareness;
- Vehicle roadworthiness inspections;
- Controlled transport scheduling where necessary.

Drivers shall:

- Avoid reckless driving;
- Avoid unnecessary night-time transport where feasible;
- Remain alert for livestock movement along gravel roads.

Hazardous-material transport activities shall:

- Utilize controlled transport procedures;

- Maintain spill-response capability;
- Follow designated transport routes where feasible.

6.3.7 Emergency Preparedness and Community Protection

Emergency-response systems shall be maintained to protect:

- Operational personnel;
- Surrounding communities;
- Groundwater resources;
- Livestock and environmental receptors.

Emergency preparedness shall include:

- Spill-response procedures;
- Fire-response capability;
- Emergency communication systems;
- First-aid capability;
- Incident-reporting procedures.

Major incidents with potential public or environmental consequences shall:

- Be reported immediately;
- Trigger emergency-response procedures;
- Be investigated thoroughly.

6.3.7 Monitoring and Compliance Requirements

Community health and safety compliance shall be verified through:

- Routine inspections;
- Traffic monitoring;
- Groundwater monitoring;
- Community liaison activities;
- Complaint investigations;
- Environmental audits.

Monitoring programmes shall evaluate:

- Traffic behavior;
- Community complaints;
- Groundwater protection performance;
- Access-control effectiveness;
- Emergency preparedness;
- Stakeholder engagement effectiveness.

Any community-related non-compliance identified during inspections shall require:

- Immediate corrective action;
- Additional stakeholder engagement where necessary;
- Strengthening of operational controls.

6.3.7 Corrective Actions

Where community health, safety or social-management failures are identified, corrective actions may include:

- Additional traffic controls;
- Increased environmental monitoring;
- Strengthening emergency-response systems;
- Additional stakeholder engagement;
- Operational access restrictions;
- Additional workforce awareness training.

Corrective actions shall be documented within:

- Community liaison records;
- Environmental inspection records;
- Incident reports;
- Complaint registers.

6.3.7 Overall Community Health and Safety Management Statement

Provided that all community health, safety and social-management measures outlined within this mitigation matrix are fully implemented, community-related impacts associated with the proposed operation are expected to remain:

- Localized;
- Operationally manageable;
- Socially and environmentally controllable.

The proposed operational philosophy incorporating:

- Reduced operational footprint;
- Controlled hazardous-material systems;
- Reduced traffic intensity;
- Controlled operational access;
- Progressive rehabilitation;
- Structured stakeholder engagement

substantially reduces community exposure risks compared to conventional large-scale mining developments.

Implementation of the above mitigation measures will therefore assist in ensuring responsible community protection, social stability and environmentally sustainable operational performance throughout the life of mine within the receiving environment of the Kunene Region.

6.3.8 Rehabilitation, Closure and Decommissioning Management Mitigation Matrix

6.3.8 Introduction

Rehabilitation, closure and decommissioning management represent critical long-term environmental-management requirements associated with the proposed small-scale precious-metals mining operation due to:

- Surface disturbance associated with mining activities;
- Sulphide-bearing material;
- Long-term groundwater sensitivity;
- Semi-arid ecological conditions;
- Public safety considerations.

Potential closure-related environmental risks associated with the proposed operation may include:

- Residual land degradation;
- Long-term erosion;
- Groundwater contamination;

- Surface instability;
- Unrehabilitated excavations;
- Long-term visual impacts;
- Slow ecological recovery.

The proposed operation nevertheless incorporates several important operational approaches intended to reduce long-term environmental liability, including:

- Progressive rehabilitation;
- Reduced infrastructure intensity;
- Dry-stack residue management;
- Reduced chemical dependency;
- Controlled hazardous-material systems;
- Water recycling and reuse;
- Reduced operational footprint.

The relatively compact operational scale substantially improves rehabilitation feasibility and long-term environmental manageability compared to conventional large-scale mining developments.

This mitigation matrix establishes the rehabilitation, closure and decommissioning management requirements applicable throughout all phases of the proposed operation.

6.3.8 Rehabilitation, Closure and Decommissioning Management Mitigation Matrix

Environmental Aspect	Potential Impact	Mitigation / Management Measure	Responsibility	Monitoring Indicator	Monitoring Frequency	Compliance Evidence
Surface disturbance	Long-term land degradation	Conduct progressive rehabilitation throughout operational phases	Environmental Officer	Rehabilitation progress	Monthly	Rehabilitation monitoring records
Vegetation clearing	Slow ecological recovery	Minimize unnecessary disturbance outside approved operational areas	Site Supervisor	Disturbance footprint condition	Weekly	Environmental inspection reports
Topsoil removal	Reduced rehabilitation success	Preserve and stockpile topsoil separately for rehabilitation use	Site Supervisor	Topsoil stockpile condition	Weekly	Topsoil management records
Waste-rock placement	Surface instability and erosion	Stabilize inactive waste-rock areas progressively	Environmental Officer	Waste-rock stability condition	Weekly	Waste-rock inspection reports
Sulphide-bearing waste material	Long-term acid-generation risk	Manage reactive material under controlled operational procedures	Environmental Officer	Sulphide material management	Weekly	Waste-management records
Dry-stack residue areas	Long-term residue instability	Maintain stabilized dry-stack residue configurations	Plant Supervisor	Residue stability condition	Weekly	Residue monitoring reports
Disturbed slopes and excavations	Erosion and instability	Recontour disturbed areas where feasible	Site Management	Surface stability	Monthly	Rehabilitation inspection records

Environmental Aspect	**Potential Impact**	**Mitigation / Management Measure**	**Responsibility**	**Monitoring Indicator**	**Monitoring Frequency**	**Compliance Evidence**
Stormwater runoff	Erosion and sediment transport	Install and maintain erosion-control infrastructure	Site Supervisor	Stormwater-control condition	Weekly and after rainfall	Stormwater inspection records
Open excavations and pits	Long-term public safety risks	Backfill or secure hazardous excavations where feasible	Site Management	Excavation safety condition	Monthly	Closure inspection records
Hazardous-material storage areas	Residual contamination risk	Remove hazardous materials during closure activities	Environmental Officer	Hazardous-material removal status	During Closure	Closure monitoring reports
Hydrocarbon-contaminated areas	Long-term soil and groundwater contamination	Conduct contamination cleanup and remediation where necessary	Environmental Officer	Contamination cleanup condition	During Closure	Environmental remediation records
Temporary infrastructure	Persistent visual and environmental impacts	Remove temporary infrastructure during decommissioning	Site Management	Infrastructure removal progress	During Closure	Closure inspection reports
Operational waste areas	Long-term waste accumulation	Remove or stabilize waste areas appropriately	Site Supervisor	Waste-area condition	Monthly	Waste-management records
Rehabilitation areas	Failure of vegetation establishment	Utilize locally occurring vegetation where feasible	Environmental Officer	Vegetation establishment success	Quarterly	Rehabilitation monitoring reports

Environmental Aspect	**Potential Impact**	**Mitigation / Management Measure**	**Responsibility**	**Monitoring Indicator**	**Monitoring Frequency**	**Compliance Evidence**
Drought conditions	Reduced rehabilitation performance	Implement adaptive rehabilitation management during drought periods	Environmental Officer	Rehabilitation condition	Quarterly	Environmental monitoring records
Groundwater systems	Long-term contamination pathways	Conduct post-closure groundwater monitoring	Environmental Officer	Groundwater analytical results	Quarterly post-closure	Groundwater monitoring reports
Closure activities	Worker and public safety risks	Implement controlled decommissioning procedures	Site Management	Closure safety compliance	During Closure	Safety inspection records
Long-term environmental stability	Post-closure environmental degradation	Conduct periodic post-closure environmental inspections	Environmental Officer	Environmental stability condition	Quarterly post-closure	Post-closure monitoring reports
Poor rehabilitation awareness	Reduced rehabilitation effectiveness	Conduct rehabilitation-awareness training for personnel	Site Management	Training participation	Quarterly	Training attendance records
Closure-management failure	Increased long-term environmental liability	Maintain formal closure-management planning throughout operations	Project Proponent	Closure-planning compliance	Annually	Closure-planning records

6.3.8 Progressive Rehabilitation Requirements

Progressive rehabilitation shall remain a mandatory environmental-management requirement throughout operational phases.

Rehabilitation activities shall commence:

- As early as operationally feasible;
- Concurrently with mining activities where possible;
- On inactive disturbed areas.

Progressive rehabilitation shall include:

- Surface stabilization;
- Topsoil redistribution;
- Erosion-control measures;
- Recontouring where feasible;
- Vegetation re-establishment where feasible.

Rehabilitation shall aim to:

- Reduce erosion;
- Improve long-term environmental stability;
- Reduce visual impacts;
- Promote ecological recovery;
- Reduce closure liability.

6.3.8 Closure and Decommissioning Procedures

Closure and decommissioning activities shall include:

- Removal of temporary infrastructure;
- Removal of hazardous materials;
- Cleanup of contaminated operational areas;
- Stabilization of disturbed surfaces;
- Final rehabilitation activities;
- Closure inspections.

No hazardous materials shall remain onsite following closure unless specifically approved under controlled conditions.

Closure planning shall remain:

- Ongoing throughout operational phases;
- Adaptive to operational changes;
- Integrated into environmental management systems.

6.3.8 Post-Closure Monitoring Requirements

Post-closure monitoring shall be undertaken to evaluate:

- Groundwater quality;
- Surface stability;
- Rehabilitation success;
- Erosion development;
- Residual contamination;
- Public safety risks.

Post-closure monitoring frequency may be adjusted based on:

- Environmental performance;
- Rehabilitation success;
- Groundwater-monitoring results;
- Long-term environmental stability.

Additional corrective rehabilitation measures shall be implemented where:

- Surface instability develops;
- Rehabilitation failure occurs;
- Contamination pathways are identified.

6.3.8 Monitoring and Compliance Requirements

Rehabilitation and closure compliance shall be verified through:

- Routine environmental inspections;
- Rehabilitation monitoring;
- Groundwater monitoring;
- Closure inspections;

- Environmental audits.

Monitoring programmes shall evaluate:

- Rehabilitation progress;
- Surface stability;
- Vegetation establishment;
- Erosion-control effectiveness;
- Groundwater protection performance;
- Closure compliance.

Any rehabilitation or closure-management non-compliance identified during inspections shall require:

- Immediate corrective action;
- Additional rehabilitation measures where necessary;
- Strengthening of environmental controls.

6.3.8 Corrective Actions

Where rehabilitation failures or closure-management deficiencies are identified, corrective actions may include:

- Additional surface stabilization;
- Recontouring of disturbed areas;
- Additional rehabilitation measures;
- Additional groundwater monitoring;
- Removal of unstable material;
- Strengthening erosion-control systems.

Corrective actions shall be documented within:

- Rehabilitation records;
- Closure inspection reports;
- Environmental monitoring reports.

6.3.8 Overall Rehabilitation and Closure Management Statement

Provided that all rehabilitation, closure and decommissioning management measures outlined within this mitigation matrix are fully implemented, long-term environmental impacts associated with the proposed operation are expected to remain:

- Localized;
- Environmentally manageable;
- Operationally controllable.

The proposed operational philosophy incorporating:

- Progressive rehabilitation;
- Dry-stack residue management;
- Reduced infrastructure intensity;
- Reduced chemical dependency;
- Controlled hazardous-material management;
- Reduced operational footprint

substantially reduces long-term environmental liability compared to conventional precious-metals mining operations.

Implementation of the above mitigation measures will therefore assist in ensuring environmentally responsible closure, long-term environmental stability and sustainable post-mining land management throughout the receiving environment of the Kunene Region.

6.4 Environmental Monitoring Programme

6.4.1 Introduction

Environmental monitoring forms a critical component of the Environmental Management Plan (EMP) for the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The purpose of the Environmental Monitoring Programme is to:

- Evaluate environmental performance;
- Verify compliance with mitigation measures;
- Detect environmental contamination or degradation;
- Assess effectiveness of environmental controls;
- Support adaptive environmental management;
- Ensure long-term environmental protection and sustainability.

Environmental monitoring will be undertaken throughout all phases of the project, including:

- Site establishment;
- Construction activities;
- Mining operations;
- Ore processing;
- Waste management;
- Rehabilitation;
- Closure and post-closure monitoring.

Monitoring activities shall focus particularly on:

- Groundwater protection;
- Hazardous-material management;
- Waste and residue stability;
- Dust and air quality;
- Rehabilitation success;
- Occupational and community safety.

6.4.2 Objectives of the Environmental Monitoring Programme

The primary objectives of the Environmental Monitoring Programme are to:

- Detect environmental contamination at an early stage;
- Ensure compliance with EMP requirements;
- Evaluate operational environmental performance;
- Assess groundwater quality and protection;
- Monitor rehabilitation effectiveness;
- Evaluate stability of disturbed operational areas;
- Verify effectiveness of mitigation measures;
- Support environmental auditing and reporting;
- Promote continuous environmental improvement.

The monitoring programme further aims to ensure that:

- Environmental risks remain controlled;
- Corrective actions can be implemented promptly;
- Long-term environmental sustainability is maintained.

6.4.3 Monitoring Philosophy

The environmental-monitoring philosophy adopted for the proposed operation is based upon:

- Prevention rather than remediation;
- Early detection of environmental risks;
- Continuous environmental oversight;
- Adaptive environmental management;
- Long-term environmental accountability.

Monitoring programmes shall therefore be:

- Structured;
- Measurable;
- Auditable;
- Operationally practical;
- Scientifically defensible.

Monitoring results shall be reviewed periodically to:

- Identify environmental trends;

- Evaluate environmental performance;
- Strengthen mitigation measures where necessary;
- Guide corrective-action implementation.

6.4.4 Groundwater Monitoring Programme

Groundwater monitoring represents the most important environmental-monitoring component associated with the proposed operation due to:

- Regional groundwater dependency;
- Semi-arid climatic conditions;
- Controlled reagent usage;
- Sulphide-bearing geological material.

Groundwater monitoring shall evaluate:

- Groundwater quality;
- Groundwater abstraction trends;
- Potential contamination pathways;
- Long-term groundwater stability.

Groundwater monitoring parameters may include:

- pH;
- Electrical conductivity;
- Sulphates;
- Total dissolved solids;
- Hydrocarbon indicators;
- Heavy metals where necessary;
- Cyanide indicators where applicable.

Groundwater monitoring shall be undertaken:

- Quarterly during operational phases;
- During closure activities;
- During post-closure monitoring where necessary.

Groundwater-monitoring results shall be:

- Recorded systematically;

- Compared against baseline conditions where available;
- Reviewed for contamination trends.

6.4.5 Air Quality and Dust Monitoring Programme

Air-quality and dust monitoring shall be undertaken to evaluate:

- Dust generation levels;
- Effectiveness of dust-control measures;
- Worker exposure conditions;
- Dust impacts on surrounding areas.

Monitoring activities may include:

- Visual dust inspections;
- Dust-suppression inspections;
- Vehicle speed monitoring;
- Inspection of disturbed operational areas.

Dust monitoring shall be undertaken:

- Daily during operational activities;
- More frequently during prolonged dry conditions where necessary.

Additional dust-control measures shall be implemented where:

- Excessive visible dust occurs;
- Dust complaints are received;
- Dust suppression becomes ineffective.

6.4.6 Hazardous Materials and Spill Monitoring Programme

Hazardous-material monitoring shall evaluate:

- Storage integrity;
- Spill-prevention effectiveness;
- Chemical handling compliance;
- Hazardous-waste management;
- Spill-response preparedness.

Monitoring inspections shall include:

- Fuel-storage inspections;
- Chemical-storage inspections;
- Spill-kit inspections;
- Hazardous-waste inspections.

Hazardous-material inspections shall be conducted:

- Weekly during operational phases;
- Immediately following any spill incident.

Any spill incident shall trigger:

- Immediate environmental inspection;
- Incident investigation;
- Corrective-action implementation.

6.4.7 Waste and Residue Monitoring Programme

Waste-management and residue-monitoring activities shall evaluate:

- Waste segregation effectiveness;
- Residue stability;
- Waste-rock stability;
- Wind and water erosion;
- Surface runoff interaction;
- Waste-storage conditions.

Monitoring activities shall include:

- Residue inspections;
- Waste-rock inspections;
- Housekeeping inspections;
- Waste-storage inspections.

Monitoring frequency shall include:

- Weekly inspections during operations;
- Additional inspections following heavy rainfall events.

Corrective stabilization measures shall be implemented where:

- Surface instability develops;
- Erosion occurs;
- Waste accumulation becomes excessive.

6.4.8 Rehabilitation Monitoring Programme

Rehabilitation monitoring shall evaluate:

- Vegetation establishment;
- Surface stability;
- Erosion-control effectiveness;
- Ecological recovery;
- Long-term rehabilitation performance.

Monitoring activities shall include:

- Rehabilitation inspections;
- Surface-stability inspections;
- Vegetation monitoring;
- Erosion assessments.

Rehabilitation monitoring shall be conducted:

- Monthly during operational phases;
- Quarterly during closure and post-closure phases where necessary.

Additional rehabilitation measures shall be implemented where:

- Vegetation establishment fails;
- Surface erosion develops;
- Rehabilitation performance becomes inadequate.

6.4.9 Occupational Health and Safety Monitoring

Occupational health and safety monitoring shall evaluate:

- PPE compliance;
- Worker safety behavior;

- Hazardous-material handling compliance;
- Emergency preparedness;
- Operational housekeeping;
- Incident trends.

Monitoring activities shall include:

- Routine safety inspections;
- PPE inspections;
- Incident investigations;
- Emergency-response inspections.

Safety monitoring shall be undertaken:

- Daily during operational activities;
- Immediately following incidents or near-miss events.

6.4.10 Community Health and Safety Monitoring

Community-related monitoring shall evaluate:

- Traffic behavior;
- Community complaints;
- Dust impacts;
- Access-control effectiveness;
- Groundwater-protection performance;
- Stakeholder engagement effectiveness.

Monitoring activities may include:

- Community liaison;
- Complaint investigations;
- Traffic inspections;
- Environmental inspections.

Community monitoring shall be undertaken:

- Continuously throughout operational phases;
- As required following complaints or incidents.

6.4.11 Monitoring Records and Reporting

All environmental-monitoring activities shall be:

- Documented systematically;
- Recorded within environmental registers;
- Retained for auditing and regulatory review.

Monitoring records may include:

- Groundwater analytical reports;
- Inspection records;
- Incident reports;
- Rehabilitation monitoring records;
- Waste-management records;
- Training records.

Environmental monitoring reports shall:

- Summarize environmental performance;
- Identify environmental trends;
- Record non-compliance incidents;
- Recommend corrective actions where necessary.

6.4.12 Corrective Actions and Adaptive Management

Where environmental monitoring identifies:

- Environmental contamination;
- Environmental degradation;
- Ineffective mitigation measures;
- Regulatory non-compliance;
- Rehabilitation failure,

corrective actions shall be implemented immediately.

Corrective actions may include:

- Strengthening mitigation measures;

- Increasing monitoring frequency;
- Additional rehabilitation measures;
- Operational adjustments;
- Additional environmental training.

Monitoring results shall therefore guide:

- Adaptive environmental management;
- Continuous environmental improvement;
- Long-term environmental protection.

6.4.13 Environmental Auditing

Environmental auditing shall be undertaken periodically to:

- Verify compliance with EMP requirements;
- Evaluate environmental-management effectiveness;
- Assess monitoring compliance;
- Identify operational weaknesses;
- Improve environmental-management systems.

Environmental audits may include:

- Internal inspections;
- Compliance audits;
- Regulatory inspections;
- Closure audits where necessary.

Audit findings shall:

- Be documented formally;
- Trigger corrective actions where necessary;
- Be incorporated into environmental-management improvements.

6.4.14 Overall Environmental Monitoring Statement

The Environmental Monitoring Programme establishes the environmental-performance evaluation framework through which the proposed small-scale precious-metals mining operation will be monitored throughout all phases of the project.

The monitoring programme provides:

- Environmental oversight;
- Early contamination detection;
- Compliance verification;
- Environmental accountability;
- Adaptive environmental-management capability.

Provided that all monitoring programmes, inspection procedures, corrective-action systems, and environmental-management commitments outlined within this programme are fully implemented, the proposed operation is considered capable of maintaining environmentally responsible and legally compliant operational performance within the receiving environment of the Kunene Region.

6.5 Emergency Preparedness and Response Plan

6.5.1 Introduction

Emergency preparedness and response represent critical operational and environmental-management requirements associated with the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The purpose of this Emergency Preparedness and Response Plan is to:

- Protect human health and safety;
- Protect groundwater resources;
- Minimize environmental contamination;
- Reduce operational risk;
- Ensure rapid incident response;
- Improve emergency-response coordination;
- Support regulatory compliance.

Potential emergency scenarios associated with the proposed operation may include:

- Chemical spills;
- Fuel and hydrocarbon spills;
- Fire incidents;
- Worker injury;
- Equipment accidents;
- Hazardous-material exposure;
- Groundwater contamination incidents;
- Extreme weather events;
- Excavation-related incidents.

The remote nature of the proposed operation increases the importance of:

- Rapid onsite response capability;
- Effective communication systems;
- Trained operational personnel;
- Structured emergency procedures.

This Emergency Preparedness and Response Plan establishes the operational emergency-response framework applicable throughout all phases of the proposed operation.

6.5.2 Objectives of the Emergency Preparedness and Response Plan

The primary objectives of this Emergency Preparedness and Response Plan are to:

- Prevent emergency incidents where feasible;
- Ensure rapid emergency-response capability;
- Minimize injury and environmental damage;
- Protect surrounding communities and groundwater resources;
- Establish clear emergency-response responsibilities;
- Ensure availability of emergency-response equipment;
- Promote emergency preparedness awareness among personnel;
- Support operational continuity and environmental protection.

The plan further aims to ensure that:

- Emergency incidents are managed systematically;
- Environmental contamination is contained rapidly;
- Corrective actions are implemented effectively;
- Emergency-response systems remain operationally effective.

6.5.3 Emergency Management Philosophy

The emergency-management philosophy adopted for the proposed operation is based upon:

- Prevention rather than reaction;
- Early incident detection;
- Rapid containment;
- Protection of life and the environment;
- Structured emergency coordination;
- Continuous emergency preparedness.

Emergency-response systems shall therefore remain:

- Operationally accessible;
- Properly maintained;
- Routinely inspected;

- Supported by trained personnel.

6.5.4 Potential Emergency Scenarios

Potential emergency situations associated with the proposed operation may include:

- Fuel spills;
- Chemical spills;
- Sulphuric acid exposure incidents;
- Limited cyanide exposure incidents where applicable;
- Fire outbreaks;
- Vehicle accidents;
- Worker injury;
- Equipment failure;
- Excavation collapse or instability;
- Groundwater contamination incidents;
- Extreme weather and flooding events.

All emergency scenarios shall be managed according to:

- Incident severity;
- Risk to human health;
- Environmental contamination potential;
- Threat to groundwater resources;
- Threat to surrounding communities.

6.5.5 Emergency Roles and Responsibilities

Emergency-response responsibilities shall remain clearly defined throughout all operational phases.

Project Proponent

The Project Proponent shall retain overall responsibility for:

- Emergency preparedness;
- Provision of emergency resources;
- Regulatory communication where necessary;

- Implementation of corrective actions.

Site Management

Site management shall be responsible for:

- Coordinating emergency-response activities;
- Ensuring personnel safety;
- Activating emergency procedures;
- Coordinating evacuation where necessary;
- Ensuring emergency equipment availability.

Environmental Officer

The Environmental Officer shall be responsible for:

- Environmental spill response;
- Groundwater-protection response measures;
- Environmental incident investigations;
- Environmental reporting.

Employees and Contractors

All operational personnel shall:

- Report emergencies immediately;
- Follow emergency procedures;
- Participate in emergency drills;
- Cooperate with emergency coordinators.

6.5.6 Spill Response Procedures

Spill prevention and rapid spill response represent critical environmental-management priorities due to the groundwater sensitivity of the receiving environment.

Spill-response procedures shall include:

- Immediate spill containment;
- Isolation of affected operational areas;
- Utilization of spill-response kits;
- Removal of contaminated material where necessary;
- Environmental inspection and assessment;

- Incident reporting.

Spill-response equipment shall include:

- Spill kits;
- Absorbent materials;
- Neutralization materials where applicable;
- Emergency PPE;
- Containment barriers.

Major spill incidents with potential environmental contamination risk shall:

- Be reported immediately to management;
- Trigger environmental assessment;
- Be reported to relevant authorities where required.

6.5.7 Fire Prevention and Fire Response

Fire risks associated with the proposed operation may arise from:

- Fuel-storage areas;
- Hydrocarbon handling;
- Equipment operation;
- Electrical systems;
- Welding and maintenance activities.

Fire-management measures shall include:

- Fire extinguishers in operational areas;
- Fire-fighting equipment near fuel-storage areas;
- Restricted smoking areas;
- Routine inspection of electrical systems;
- Housekeeping and waste-control measures.

In the event of fire:

- Emergency personnel shall be notified immediately;
- Fire-response procedures shall be activated;
- Personnel evacuation shall occur where necessary;

- Hazardous-material areas shall be isolated.

6.5.8 Chemical Exposure Response

Potential chemical exposure risks may involve:

- Sulphuric acid;
- Thiosulfate;
- Thiourea;
- Limited cyanide usage where necessary;
- Hydrocarbons and fuels.

Chemical-response procedures shall include:

- Immediate isolation of affected areas;
- Use of emergency PPE;
- Medical response where necessary;
- Spill containment;
- Incident investigation.

Safety Data Sheets (SDS) for all hazardous materials shall:

- Remain available onsite;
- Be accessible to personnel;
- Be incorporated into training programmes.

6.5.9 Medical Emergencies and Worker Injury

Medical emergencies may include:

- Physical injury;
- Chemical exposure;
- Heat stress;
- Vehicle accidents;
- Equipment-related incidents.

Emergency medical preparedness shall include:

- First-aid equipment onsite;

- Trained first-aid personnel;
- Emergency communication systems;
- Emergency transport arrangements where necessary.

All injuries and medical incidents shall:

- Be reported immediately;
- Be documented formally;
- Be investigated where necessary.

6.5.10 Emergency Communication Systems

Effective emergency communication systems shall be maintained throughout operational phases.

Emergency communication systems may include:

- Mobile communication systems;
- Radios where necessary;
- Emergency contact lists;
- Incident-reporting procedures.

Emergency contact information shall include:

- Medical services;
- Emergency-response services;
- Regulatory authorities where necessary;
- Operational management personnel.

Communication systems shall be tested periodically to ensure operational functionality.

6.5.11 Emergency Training and Drills

Emergency-response training shall be conducted to ensure that personnel:

- Understand emergency procedures;
- Understand spill-response procedures;
- Understand evacuation procedures;
- Understand fire-response procedures;
- Understand hazardous-material response requirements.

Emergency drills shall be conducted periodically for:

- Fire incidents;
- Spill-response scenarios;
- Chemical exposure incidents;
- Worker injury response;
- Evacuation procedures.

Emergency drills shall be:

- Documented formally;
- Reviewed for effectiveness;
- Utilized to improve emergency-response systems.

6.5.12 Incident Reporting and Investigation

All emergency incidents and near-miss events shall:

- Be reported immediately;
- Be documented formally;
- Be investigated systematically.

Incident investigations shall evaluate:

- Root causes;
- Environmental impacts;
- Operational failures;
- Corrective-action requirements.

Corrective actions may include:

- Additional training;
- Strengthening operational controls;
- Additional emergency equipment;
- Operational procedure revisions.

6.5.13 Monitoring and Review of Emergency Preparedness

Emergency-response systems shall be reviewed periodically to evaluate:

- Emergency preparedness effectiveness;
- Equipment availability;
- Personnel readiness;
- Spill-response effectiveness;
- Fire-response capability.

Routine inspections shall include:

- Spill-kit inspections;
- Fire-equipment inspections;
- Communication-system inspections;
- Emergency PPE inspections.

Deficiencies identified during inspections shall require:

- Immediate corrective action;
- Additional emergency preparedness measures where necessary.

6.5.14 Overall Emergency Preparedness Statement

This Emergency Preparedness and Response Plan establishes the operational emergency-management framework through which emergency incidents associated with the proposed small-scale precious-metals mining operation will be:

- Prevented where feasible;
- Detected rapidly;
- Contained effectively;
- Managed systematically.

The emergency-management framework provides:

- Emergency-response procedures;
- Environmental protection measures;
- Worker and community protection systems;
- Emergency accountability structures;
- Corrective-action mechanisms.

Provided that all emergency-response procedures, training programmes, spill-response systems, communication systems, and environmental-protection measures outlined within this plan are fully implemented, the proposed operation is considered capable of maintaining effective emergency preparedness and environmentally responsible incident management throughout the life of mine within the receiving environment of the Kunene Region.

6.6 Environmental Auditing, Reporting and Compliance Management

6.6.1 Introduction

Environmental auditing, reporting and compliance management form critical components of the Environmental Management Plan (EMP) for the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The purpose of environmental auditing and compliance management is to:

- Verify implementation of EMP requirements;
- Evaluate environmental performance;
- Ensure legal compliance;
- Detect environmental-management deficiencies;
- Support adaptive environmental management;
- Promote continuous environmental improvement.

Environmental auditing and reporting systems further ensure that:

- Environmental obligations remain measurable;
- Environmental incidents remain traceable;
- Corrective actions are implemented effectively;
- Environmental accountability is maintained throughout all phases of the project.

This section establishes the environmental auditing, reporting and compliance-management framework applicable throughout:

- Site establishment;
- Construction activities;
- Mining operations;
- Ore processing;
- Rehabilitation;
- Closure and post-closure activities.

6.6.2 Objectives of Environmental Auditing and Compliance Management

The primary objectives of environmental auditing and compliance management are to:

- Ensure compliance with EMP requirements;

- Ensure compliance with applicable environmental legislation;
- Verify effectiveness of mitigation measures;
- Detect environmental non-compliance;
- Promote proactive environmental management;
- Improve operational environmental performance;
- Support regulatory reporting requirements;
- Promote long-term environmental sustainability.

The auditing and compliance-management system further aims to:

- Reduce environmental risk;
- Improve operational accountability;
- Strengthen environmental governance;
- Support environmental transparency.

6.6.3 Environmental Auditing Philosophy

The environmental auditing philosophy adopted for the proposed operation is based upon:

- Continuous environmental oversight;
- Prevention rather than remediation;
- Adaptive environmental management;
- Accountability and traceability;
- Continuous environmental improvement.

Environmental audits shall therefore remain:

- Structured;
- Measurable;
- Systematic;
- Operationally practical;
- Legally defensible.

Audit findings shall be utilized to:

- Strengthen environmental controls;
- Improve mitigation effectiveness;

- Address operational weaknesses;
- Improve environmental performance.

6.6.4 Types of Environmental Audits

Environmental auditing associated with the proposed operation may include:

- Routine environmental inspections;
- Internal compliance audits;
- Environmental monitoring audits;
- Rehabilitation audits;
- Hazardous-material management audits;
- Waste-management audits;
- Closure and post-closure audits;
- Regulatory compliance inspections where required.

Audits may be:

- Scheduled periodically;
- Triggered by environmental incidents;
- Conducted following operational expansion;
- Conducted following major complaints or non-compliance events.

6.6.5 Routine Environmental Inspections

Routine environmental inspections shall be conducted to evaluate:

- Operational environmental compliance;
- Implementation of mitigation measures;
- Groundwater-protection systems;
- Waste-management systems;
- Hazardous-material handling;
- Rehabilitation performance;
- Housekeeping standards.

Routine inspections shall include:

- Site inspections;
- Infrastructure inspections;
- Spill-response inspections;
- Dust-control inspections;
- Waste-storage inspections;
- Safety inspections.

Inspection frequency shall include:

- Daily operational inspections where necessary;
- Weekly environmental inspections;
- Monthly environmental reviews.

Inspection findings shall be:

- Documented formally;
- Reviewed by management;
- Utilized for corrective-action implementation where necessary.

6.6.6 Environmental Compliance Monitoring

Environmental compliance monitoring shall evaluate compliance with:

- EMP requirements;
- Environmental legislation;
- Environmental Clearance Certificate conditions;
- Operational environmental procedures;
- Hazardous-material handling requirements;
- Waste-management requirements;
- Rehabilitation commitments.

Compliance monitoring shall specifically evaluate:

- Groundwater-monitoring compliance;
- Dust-control effectiveness;
- Waste segregation;
- Spill-prevention systems;

- Environmental record keeping;
- Environmental training implementation.

Non-compliance events shall:

- Be documented formally;
- Trigger corrective-action procedures;
- Be investigated where necessary.

6.6.7 Environmental Reporting Requirements

Environmental reporting shall be undertaken to:

- Record environmental performance;
- Document environmental incidents;
- Support regulatory compliance;
- Track corrective-action implementation;
- Maintain environmental accountability.

Environmental reporting may include:

- Monitoring reports;
- Groundwater analytical reports;
- Environmental inspection reports;
- Spill and incident reports;
- Rehabilitation reports;
- Waste-management records;
- Environmental training records.

Environmental reports shall:

- Be maintained systematically;
- Be available for regulatory review where required;
- Be reviewed periodically by management.

6.6.8 Environmental Incident Reporting

Environmental incidents may include:

- Chemical spills;
- Fuel spills;
- Groundwater contamination;
- Hazardous-material exposure;
- Waste-management failures;
- Significant dust incidents;
- Fire incidents;
- Environmental non-compliance events.

All environmental incidents shall:

- Be reported immediately;
- Be documented formally;
- Be investigated systematically.

Incident investigations shall evaluate:

- Root causes;
- Environmental consequences;
- Operational failures;
- Corrective-action requirements.

Major environmental incidents shall be reported to relevant authorities where required under applicable legislation.

6.6.9 Corrective Actions and Non-Compliance Management

Where environmental non-compliance or environmental-management deficiencies are identified, corrective actions shall be implemented immediately.

Corrective actions may include:

- Strengthening mitigation measures;
- Additional environmental training;
- Additional monitoring;
- Infrastructure repairs;
- Operational procedure revisions;
- Temporary suspension of unsafe activities where necessary.

Corrective-action procedures shall include:

- Identification of non-compliance;
- Root-cause investigation;
- Corrective-action implementation;
- Verification of corrective-action effectiveness.

Repeated or severe environmental non-compliance may result in:

- Disciplinary action;
- Contractor penalties;
- Regulatory enforcement action;
- Operational restrictions where necessary.

6.6.10 Environmental Record Keeping

Environmental records shall be maintained throughout all phases of the project.

Environmental records may include:

- Monitoring records;
- Inspection reports;
- Groundwater analytical results;
- Incident reports;
- Waste-disposal records;
- Hazardous-material inventories;
- Training attendance records;
- Rehabilitation monitoring records.

Environmental records shall:

- Be maintained systematically;
- Remain accessible for auditing purposes;
- Be retained for regulatory review where necessary.

6.6.11 Management Review and Continuous Improvement

Environmental-management systems shall be reviewed periodically to:

- Evaluate environmental performance;
- Assess compliance effectiveness;
- Identify operational weaknesses;
- Improve mitigation measures;
- Strengthen monitoring systems.

Environmental review processes shall incorporate:

- Audit findings;
- Monitoring results;
- Incident investigations;
- Community complaints where applicable;
- Regulatory feedback where necessary.

The EMP shall therefore operate according to a philosophy of:

- Adaptive environmental management;
- Continuous environmental improvement;
- Long-term environmental accountability.

6.6.12 Regulatory Compliance and Legal Obligations

The Project Proponent shall remain responsible for ensuring compliance with:

- The Environmental Management Act, 2007;
- Environmental Clearance Certificate conditions;
- Applicable mining legislation;
- Hazardous-material regulations;
- Occupational health and safety requirements;
- Waste-management requirements.

Environmental auditing and reporting systems shall therefore support:

- Regulatory compliance verification;
- Environmental accountability;
- Legal defensibility;
- Environmental transparency.

6.6.13 Overall Environmental Auditing and Compliance Statement

This Environmental Auditing, Reporting and Compliance Management framework establishes the environmental-governance system through which environmental performance associated with the proposed small-scale precious-metals mining operation will be:

- Monitored;
- Audited;
- Verified;
- Reported;
- Improved continuously throughout the life of mine.

The auditing and compliance-management system provides:

- Environmental accountability;
- Compliance verification;
- Corrective-action capability;
- Environmental traceability;
- Long-term environmental oversight.

Provided that all auditing procedures, monitoring programmes, reporting systems, corrective-action procedures, and compliance-management requirements outlined within this framework are fully implemented, the proposed operation is considered capable of maintaining environmentally responsible and legally compliant operational performance within the receiving environment of the Kunene Region.

7 Conclusion and Recommendations

7.1 Conclusion

This Environmental Scoping Study (ESS) was undertaken to evaluate the potential environmental and socio-economic impacts associated with the proposed small-scale precious-metals mining operation within the Kunene Region of north-western Namibia.

The assessment evaluated impacts associated with:

- Mining and excavation activities;
- Ore processing and mineral recovery;
- Controlled hazardous-material usage;
- Groundwater abstraction and protection;
- Waste and residue management;
- Biodiversity disturbance;
- Occupational and community health and safety;
- Rehabilitation and closure;
- Long-term environmental sustainability.

The receiving environment is characterized by:

- Semi-arid climatic conditions;
- Groundwater dependency;
- Slow ecological recovery rates;
- Rocky mountainous terrain;
- Rural communal land-use activities.

Groundwater protection was identified as the most environmentally sensitive component of the proposed operation due to:

- Regional dependence on borehole water;
- Low groundwater recharge potential;
- Potential contamination pathways associated with mining and processing activities.

Several impacts associated with the proposed operation initially exhibited:

- Moderate significance; or
- High significance

prior to mitigation, particularly those associated with:

- Hazardous-material management;
- Groundwater protection;
- Sulphide-bearing material;
- Long-term closure liability.

However, the assessment determined that implementation of the mitigation measures, monitoring programmes, environmental controls, and operational management systems outlined within the Environmental Management Plan (EMP) substantially reduces residual environmental risk.

The assessment further determined that:

- No fatal environmental flaws were identified;
- No irreversible regional-scale environmental impacts are anticipated;
- The majority of impacts reduce to low significance following mitigation;
- Residual moderate impacts remain environmentally manageable through long-term monitoring and adaptive environmental management.

Several important project characteristics substantially reduce environmental risk compared to conventional precious-metals mining operations, including:

- Small operational footprint;
- Gravity-assisted mineral processing;
- Mercury-free processing philosophy;
- Reduced cyanide dependency;
- Controlled reagent systems;
- Dry-stack residue management;
- Water recycling and reuse;
- Progressive rehabilitation commitments;
- Reduced infrastructure intensity.

The absence of:

- Conventional wet tailings dams;
- Large-scale cyanide processing systems;
- Major industrial infrastructure

substantially reduces long-term environmental liability and catastrophic contamination risk.

Positive socio-economic impacts associated with the proposed operation may include:

- Employment creation;
- Skills transfer;
- Increased localized economic participation;
- Support for regional economic development.

Long-term environmental sustainability nevertheless remains dependent upon:

- Strict implementation of the EMP;
- Effective groundwater monitoring;
- Responsible hazardous-material management;
- Continuous environmental auditing;
- Progressive rehabilitation;
- Responsible closure implementation.

Provided that all environmental-management commitments and mitigation measures outlined within this ESS and the accompanying EMP are fully implemented, the proposed operation is considered environmentally manageable and acceptable within the receiving environment of the Kunene Region.

7.2 Recommendations

Based on the findings of this Environmental Scoping Study, the following recommendations are made:

Groundwater Protection

Groundwater protection shall remain the highest environmental-management priority throughout all phases of the project.

The Project Proponent should:

- Maintain structured groundwater-monitoring programmes;
- Maintain strict spill-prevention procedures;
- Maintain controlled hazardous-material storage systems;
- Prevent uncontrolled discharge of contaminated water;
- Continue water recycling and reuse wherever feasible.

Hazardous-Material Management

All hazardous materials, including:

- Sulphuric acid;
- Hydrocarbons;
- Controlled processing reagents;
- Limited cyanide usage where applicable

should remain subject to:

- Controlled handling procedures;
- Bunded containment systems;
- Spill-response preparedness;
- Routine environmental inspections.

Mercury-free processing shall remain a permanent operational commitment throughout the life of mine.

Waste and Residue Management

Dry-stack residue management and controlled waste-management systems should remain operational priorities throughout the project.

The Project Proponent should:

- Stabilize inactive waste areas progressively;
- Prevent uncontrolled runoff interaction with residue-storage areas;
- Conduct routine waste-management inspections;
- Maintain proper waste segregation procedures.

Rehabilitation and Closure

Progressive rehabilitation should be implemented continuously throughout operational phases rather than delayed until closure.

Rehabilitation should prioritize:

- Surface stabilization;
- Erosion prevention;
- Topsoil preservation;
- Reduction of long-term environmental liability;
- Ecological recovery where feasible.

Closure planning should remain:

- Ongoing throughout the life of mine;
- Adaptive to operational changes;
- Integrated into environmental-management systems.

Environmental Monitoring and Auditing

The Environmental Monitoring Programme and environmental auditing systems outlined within the EMP should be implemented fully throughout all project phases.

Monitoring should focus particularly on:

- Groundwater quality;
- Waste and residue stability;
- Dust management;
- Rehabilitation success;
- Hazardous-material management.

Environmental auditing and reporting systems should remain:

- Structured;
- Measurable;
- Auditable;
- Legally compliant.

Occupational and Community Health and Safety

The Project Proponent should maintain:

- PPE compliance systems;
- Emergency-response capability;
- Traffic-management systems;
- Community-protection measures;
- Environmental awareness training programmes.

Emergency preparedness and spill-response systems should remain operationally functional throughout the life of mine.

Regulatory Compliance

The Project Proponent should ensure continued compliance with:

- The Environmental Management Act, 2007;
- Environmental Clearance Certificate conditions;
- Applicable mining legislation;
- Hazardous-material regulations;
- Occupational health and safety requirements.

All environmental records, monitoring results and incident reports should remain available for regulatory review where required.

Environmental Sustainability

The proposed operation should continue operating according to principles of:

- Reduced environmental footprint;
- Responsible resource utilization;
- Pollution prevention;
- Water conservation;
- Progressive rehabilitation;
- Long-term environmental stewardship.

Adaptive environmental management should remain a core operational principle throughout all phases of the project.

7.3 Final Recommendation

Based on the findings of this Environmental Scoping Study and provided that all mitigation measures, monitoring programmes, environmental-management commitments, rehabilitation obligations, emergency-response systems, and regulatory compliance requirements contained within the Environmental Management Plan are fully implemented, the proposed small-scale precious-metals mining operation is recommended for consideration of Environmental Clearance Certificate approval within the Kunene Region of north-western Namibia.

The proposed operation is considered:

- Environmentally manageable;
- Technically feasible;
- Operationally controllable;

- Socially acceptable;
- And capable of operating within acceptable environmental limits under the proposed environmental-management framework.