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AGRO-ECOSYSTEM ASSESSMENT REPORT

HARMONY WEST WITS RECLAMATION PROJECT: (GP) 30/5/1/1/2 (07) MR



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Acronyms and Abbreviations

AIA	Agro-Ecosystem Impact Assessment
AMD	Acid Mine Drainage
ARC-ISCW	Agricultural Research Council – Institute for Soil, Climate and Water
BA	Basic Assessment
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CV	Curriculum Vitae
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEAT	Department of Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services (Pty) Ltd
EMPr	Environmental Management Programme
GN	Government Notice
HAS	Hazardous Substances Act (Act No. 15 of 1973)
HHPs	Highly Hazardous Pesticides
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
PDALA	Preservation and Development of Agricultural Land Act (Act No. 39 of 2024)
PWV	Pretoria-Witwatersrand-Vereeniging
RWD	Return Water Dam
SACNASP	South African Council for Natural Scientific Professions
SALA	Subdivision of Agricultural Land Act (Act No. 70 of 1970)

S&EIR	Scoping and Environmental Impact Reporting
SSV	Soil Screening Value
SSVR	Site Sensitivity Verification Report
tpm	Tonnes per month
TSF	Tailings Storage Facility
TSP	Tailings Storage Pipeline
WWR	West Wits Reclamation

EXECUTIVE SUMMARY

This Agro-Ecosystem Impact Assessment (AIA) was commissioned by Randfontein Estates Limited, a subsidiary of Harmony Gold Mining Company, in support of the Environmental Impact Assessment for the proposed Deelkraal II Tailings Storage Facility (TSF) and associated infrastructure, located within the Merafong City Local Municipality, Gauteng Province, approximately 13 km south-west of Carletonville. The proposed development comprises the Deelkraal II TSF (approximately 430 ha across three compartments), a new Return Water Dam, a reclamation pump station, topsoil stockpiles, construction laydown areas, and slurry, process-water and powerline servitudes linking the Deelkraal, Kusasalethu and Savuka facilities, together constituting an assessed development footprint of 645.79 ha.

While the DFFE National Web-Based Environmental Screening Tool pre-allocated a High agricultural sensitivity rating to the site, field verification, comprising a site inspection, twenty-four soil auger observation points and comparison against the 1:50 000 ARC PWV soil survey, confirmed a substantially lower on-the-ground sensitivity and disputes the High rating in terms of the Specialist Protocol. The development footprint falls entirely within land type Fb15, in which shallow, rocky Glenrosa and Mispah lithosols and rock outcrop together constitute approximately 57.3% of the land type as a whole. No soil observation point returned a profile of High agricultural potential. The single largest soil unit mapped within the footprint is the Avalon series (mAv26, 244.50 ha), which is recorded at eleven of the twenty-four observation points on the basis of a topsoil consistent with that unit, its diagnostic plinthic horizon remaining to be confirmed by test pit (Section 6.1.2); together with the Hutton (Hu26) and Shortlands (Sd11) soils it forms 268.44 ha of Moderate agricultural potential, the best agricultural land within the footprint. A further 120.52 ha is of Low agricultural potential, and 256.83 ha, some 39.8% of the footprint, is already transformed by existing tailings storage facilities and mine dumps and retains no agricultural potential.

The principal identified impact is the permanent loss of agricultural land use, primarily informal grazing, over the Moderate- and Low-potential soils within the footprint. It is rated High in significance, pre- and post-mitigation, because the loss is certain, permanent and irreversible; its magnitude is moderate, since the land is not of High agricultural potential, carries no formal production and is partly disturbed (Section 8). Secondary construction-phase impacts, comprising topsoil loss, reduced land capability, compaction, erosion and contamination risk, reduce to Low to Medium-low significance with soil-specific topsoil management, stormwater control and rehabilitation measures. Progressive rehabilitation of the TSF and other disturbed areas has the potential to deliver a Medium to High positive impact by restoring soil stability and grazing potential to land, more than a third of the footprint, that currently has none; that benefit is conditional upon successful implementation of the rehabilitation measures and their verification against the success criteria set out in Section 10.1.2, and it is not guaranteed. Of the alternatives considered, the No-Go alternative is not, from a soils perspective, the environmentally preferable option, on the same condition, as it forgoes this rehabilitation benefit while allowing ongoing, unmanaged dust and seepage impacts from the existing unrehabilitated facilities to continue; and of the two siting options for the Kusasalethu reclamation laydown area, Option 2 is preferred, as it would displace a negligible rather than a Moderate-potential soil resource.

Based on the available agricultural and soil information, and subject to implementation of the specified mitigation, rehabilitation and monitoring measures, the proposed Deelkraal II TSF and associated infrastructure is considered acceptable from an agricultural-resource perspective. It is recommended that the development be authorised subject to the soil-specific topsoil management, erosion control, containment and rehabilitation measures set out in this report, secured through the Environmental Management Programme and verified against the rehabilitation success criteria.

1 INTRODUCTION

This Agro-Ecosystem Impact Assessment has been compiled to evaluate the impacts of the proposed development on the agricultural resources, soil dynamics, and land capability of the receiving environment. Prepared in accordance with the statutory requirements and minimum reporting criteria set forth under Government Notice (GN) 320 of 2020, promulgated under the National Environmental Management Act (NEMA) (Act No. 107 of 1998), this report establishes a baseline through analysing desktop data and undertaking an in-situ field verification survey. Due to the project footprint intersecting areas that are pre-allocated as high sensitivity by the national regulatory framework (DFFE Screening Tool), this assessment analyses the interactions between the proposed infrastructure and the surrounding agro-ecosystem. The primary objective of this study is to quantify the direct, indirect, and cumulative risks posed to long-term soil functionality and regional food security, thereby providing a robust, legally compliant framework of mitigation and management metrics for integration into the primary Environmental Impact Assessment (EIA) Report and the Environmental Management Programme (EMPr).

1.1 REPORT STRUCTURE

This assessment report has been compiled in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (GN 320, 2020, Specialist Protocols). Where a specialized protocol is applicable to a specific environmental theme, its provisions legally supersede and replace the generic specialist reporting requirements stipulated in Appendix 6 of the Environmental Impact Assessment (EIA) Regulations (GN R. 982 of 2014, as amended). This regulatory framework ensures that the depth of the specialist assessment, ranging from a comprehensive specialist report for highly sensitive receiving environments to a concise compliance statement for low-sensitivity areas, is directly proportionate to the verified environmental vulnerability of the proposed development site.

As per the Specialist Protocols (GN 320, 2020), the requirement to undertake a comprehensive Agricultural Agro-Ecosystem Specialist Assessment for the West Wits Reclamation project is triggered by both the site's environmental sensitivity and the nature of the proposed development. The DFFE National Web-Based Environmental Screening Tool identified the agricultural theme for the project site as having a “High” sensitivity rating. That rating is disputed by the site sensitivity verification undertaken for this assessment, which returns a differentiated pattern of Moderate, Low and Transformed sensitivity across the footprint, with no part of it supporting soil of High agricultural potential (Sections 5.2 and 9). Notwithstanding that dispute, a full Agro-Ecosystem Impact Assessment has been undertaken, and this report complies with the minimum content requirements stipulated in GN 320 (2020). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Minimum Report Content Requirements for Environmental Impacts on Agricultural Resources.

Protocol Section Number	Description – NEMA Regulations, Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (GN 320, 2020)	Relevant Section in Assessment Report
3.2	Agricultural Agro- Ecosystem Specialist Assessment	Section
3.2.1	The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professionals (SACNASP).	Section 1.2
3.2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1.3.2
3.2.3	The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within the past 5 years, and must identify:	Sections 4.2, 5 and 6.5
3.2.3.1	the extent of the impact of the proposed development on the agricultural resources; and	Sections 8 and 9
3.2.3.2	whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.	Section 8
3.2.4	The status quo of the site must be described, including the following aspects which must be considered as a minimum in the baseline description of the agroecosystem:	Section 6
3.2.4.1	the soil form /s, soil depth (effective and total soil depth), top and sub -soil clay percentage, terrain unit and slope;	Section 6.1
3.2.4.2	where applicable, the vegetation composition, available water sources as well as Agro-climatic information;	Sections 6.2, 6.3 and 6.4
3.2.4.3	the current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units;	Section 6.5
3.2.4.4	the current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure; and	Section 6.5

Protocol Section Number	Description – NEMA Regulations, Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (GN 320, 2020)	Relevant Section in Assessment Report
3.2.4.5	existing impacts on the site, located on a map (e.g. erosion, alien vegetation, non -agricultural infrastructure, waste, etc.).	Section 6.5
3.2.5	Assessment of impacts, including the following aspects which must be considered as a minimum in the predicted impact of the proposed development on the agroecosystem:	Section 7 and 8
3.2.5.1	change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down into production units;	Section 7 and 8
3.2.5.2	change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure; and	Section 7 and 8
3.2.5.3	any alternative development footprints within the preferred site which would be of "medium" or "low" sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.	Section 7 and 8
3.2.6	The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be written up in an Agricultural Agro-Ecosystem Specialist Report.	Section 10
3.2.7	This report must contain the findings of the Agro-ecosystem specialist assessment and the following information, as a minimum:	Section 10
3.2.7.1	details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;	Section 1.2 and Appendix 1
3.2.7.2	a signed statement of independence by the specialist;	Section 1.2 and Appendix 2
3.2.7.3	the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 4.2

Protocol Section Number	Description – NEMA Regulations, Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (GN 320, 2020)	Relevant Section in Assessment Report
3.2.7.4	a description of the methodology used to undertake the on -site assessment inclusive of the equipment and models used, as relevant;	Section 4.2
3.2.7.5	a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	Section 1.3.2 and 9 Figure 6
3.2.7.6	an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development;	Section 8
3.2.7.7	an indication of possible long-term benefits that will be generated by the project in relation to the benefits of the agricultural activities on the affected land;	Section 8
3.2.7.8	additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc.;	Section 8
3.2.7.9	information on the current agricultural activities being undertaken on adjacent land parcels;	Section 6.5
3.2.7.10	an identification of any areas to be avoided, including any buffers;	Section 9
3.2.7.11	a motivation must be provided if there were development footprints identified as per paragraph 2.5.3 that were identified as having a "medium" or "low" agriculture sensitivity and that were not considered appropriate;	Section 5 *Not Applicable*
3.2.7.12	confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro- siting of the proposed development to minimise fragmentation and disturbance of agricultural activities;	Section 10.2

Protocol Section Number	Description – NEMA Regulations, Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation (GN 320, 2020)	Relevant Section in Assessment Report
3.2.7.13	a substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the acceptability or not of the proposed development and a recommendation on the approval or not of the proposed development;	Section 10.1
3.2.7.14	any conditions to which this statement is subjected;	Section 10.1.2
3.2.7.15	where identified, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and	Section 8
3.2.7.16	a description of the assumptions made and any uncertainties or gaps in knowledge or data.	Section 10.2
3.2.8	The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be incorporated into the Basic Assessment Report or Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which are to be contained in the EMPr.	Section 10.1
3.2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Section 10.1

1.2 DETAILS OF SPECIALISTS

EIMS has been appointed Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) as the independent Soil and Agricultural Specialist to compile the Agro-Ecosystem Assessment Report. This specialist assessment is undertaken in support of the Environmental Impact Assessment process required for the proposed project's Environmental Authorisation application. The contact details of the EIMS specialist who compiled this Report are as follows:

- Name: Jessica Jordaan
- Tel No: + 27 11 789 7170
- Fax No: +27 86 571 9047
- E-mail address: jessica@eims.co.za

In terms of Regulation 12(2) of the EIA Regulations, 2014, as amended, a specialist may be appointed, at the cost of the proponent or applicant, if the level of assessment is of a nature requiring the appointment of a specialist. EIMS is compliant with the definition of a Specialist as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, inter alia, the requirement that the specialist is:

1. An EAP and a **specialist**, appointed in terms of regulation 12(1) or 12(2), must-
    (a) be independent;
    (b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity;
    (c) ensure compliance with these Regulations;
    (d) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
    (e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; and
    (f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-
        (i). any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or
        (ii). the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority;

    unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent authority.

EIMS is a private and independent environmental management-consulting firm that was founded in 1993. EIMS has in excess of 30 years' experience in conducting EIAs. Please refer to the EIMS website (www.eims.co.za) for further details of expertise and experience.

Ms. Jordaan is a Candidate Soil and Agriculture Specialist at EIMS, holding a BSc Honours degree in Environmental Soil and Soil Science, as well as a BSc in Geology. She is a registered Candidate Soil Scientist (#124758) with the South African Council for Natural Scientific Professions (SACNASP). In her capacity at EIMS, she undertakes Soil and Agriculture Assessments, evaluates land capabilities, and assists with rehabilitation strategies for prospecting and exploration projects. Her technical focus on soil is supported by her broader regulatory experience as an Environmental Consultant and Candidate EAP (EAPASA 2023/7087), where she manages Environmental Impact Assessments (EIAs), Basic Assessments (BAs), and Financial Provisioning.

Ms. Jordaan's technical assessments are conducted under the guidance of, and reviewed by, Prof. G.P. Nortjé (Pr.Sci.Nat., PhD, MPhil, MSA and BSc (Hons)), Associate Professor at the University of South Africa, of Solo Vivo Soil & Wildlife Consultancy. Prof. Nortjé undertook the senior specialist review of this report (review report dated 12 September 2026).

The professional roles in respect of this assessment are as follows:

- Report compiler: Ms J. Jordaan (Cand.Sci.Nat., SACNASP registration no. 124758), EIMS, who undertook the desktop assessment, the field verification survey of 27 and 28 May 2026, the soil classification and the compilation of this report;
- Senior specialist reviewer: Prof. G.P. Nortjé (Pr.Sci.Nat.), Solo Vivo Soil & Wildlife Consultancy, who undertook the technical senior-specialist review of this report;
- Professionally responsible specialist: Prof. G.P., being the soil scientist registered with SACNASP in terms of paragraph 3.2.1 of GN 320 who accepts professional responsibility for the findings and specialist opinion in this report; and
- Signatories to the specialist declaration of independence (Appendix 2): Ms J. Jordaan (Cand.Sci.Nat., SACNASP registration no. 124758), EIMS as the report compiler and Prof. G.P. Nortjé (Pr.Sci.Nat.), Solo Vivo Soil & Wildlife Consultancy as the professionally responsible specialist and technical reviewer of this assessment.

The curricula vitae of the report compiler and of the senior specialist reviewer are included in Appendix 1.

1.2.1 SPECIALIST DECLARATION

The declarations of independence signed by the professionally responsible specialist and by the report compiler identified in Section 1.2 are included in Appendix 2. The General Declaration and the Disclosure of Vested Interests conditions are detailed below.

General Declaration

As the appointed specialist, I hereby declare that:

- *I act as the independent specialist in this application.*
- *I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes as per the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), as amended, and specifically the "Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the Act, when applying for environmental authorisation," promulgated as Government Notice No. 320 of 20 March 2020 (i.e., "the Protocols").*
- *I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.*
- *I declare that there are no circumstances that may compromise my objectivity in performing such work.*
- *I have the necessary expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations, and any guidelines that have relevance to the proposed activity.*
- *I will comply with the Act, Regulations, and all other applicable legislation.*
- *I have no, and will not engage in, conflicting interests in the undertaking of this activity.*
- *I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing:*
- *any decision to be taken with respect to the application by the competent authority; and*

- *the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority.*
- *All the particulars furnished by me in this form are true and correct.*
- *I realise that a false declaration is an offence in terms of Regulation 48 of the NEMA EIA regulations (GN R 982 of 2014) and is punishable in terms of section 49B of the NEMA Act.*

Disclosure of Vested Interest

- *I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remunerative for work performed in terms of the Regulations.*

1.3 PROJECT BACKGROUND

This section provides an overview of the proposed Deelkraal II Tailings Storage Facility (TSF) and its supporting infrastructure, to be implemented by the applicant. Driven by the need for additional tailings deposition capacity in the West Wits region, the project aims to facilitate the ongoing reclamation and processing of existing dormant TSFs. To support the required environmental authorisation for this development, Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed to conduct the necessary Environmental Impact Assessment (EIA) processes, including an Agro-Ecosystem Impact Assessment (AIA). The following sub-sections detail the technical specifications, scope, and geographic locality of the proposed development.

1.3.1 PROJECT DESCRIPTION

Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as "the Applicant") has appointed Environmental Impact Management Services (Pty) Ltd ("EIMS") to undertake an Agro-Ecosystem Impact Assessment (AIA) as part of the Environmental Impact Assessment (EIA) process, in support of the associated environmental authorisation application. The Applicant requires additional tailings deposition capacity for its West Wits region operations and proposes to construct the Deelkraal II Tailings Storage Facility (TSF). The facility will facilitate the return of process water for reclamation of the existing Deelkraal 1 and Kusasalethu TSFs. Proposed upgrades to the existing Kusasalethu plant form part of the project.

The Savuka Plant currently treats tailings from the Savuka Dormant TSFs at 330,000 tonnes per month (tpm), depositing the resultant tailings on the Savuka 5 & 7 TSFs. Harmony also plans to remine the Deelkraal 1 Dormant TSF and Kusasalethu TSF, among other potential future sources, for processing through the Kusasalethu Plant at 500,000 tpm. The planned Life of Mine for the West Wits region exceeds the deposition capacity of the existing TSFs, necessitating additional capacity, which the Deelkraal II TSF is intended to provide.

The proposed Deelkraal II TSF will be developed on Harmony-owned land adjacent to the Deelkraal 1 Dormant TSF, combining with it to accommodate the deposition rate and capacity required for future reclamation operations. The facility will cover an area of approximately 430 ha across three compartments. Siting was informed by the West Wits Reclamation (WWR) Concept Study (SGS Bateman, 2024), which found the Deelkraal 1 TSF to contain higher grades of accessible gold; it will therefore be reclaimed first, followed by the Kusasalethu TSF.

In addition to the TSF itself, the following supporting infrastructure is proposed:

- A new Return Water Dam in the vicinity of the Deelkraal II TSF;
- Upgrades to the existing Kusasalethu plant, including new/upgraded gold and uranium sections;
- Slurry, process water, and potable water pipelines linking the Deelkraal, Kusasalethu, and Savuka facilities;
- Powerlines (22kV or lower) connecting the plants, TSFs, and shafts;
- Reclamation pump stations at the Deelkraal 1 and Kusasalethu TSFs;

- New access roads adjacent to pipeline/powerline routes and around the Deelkraal II TSF, where none currently exist;
- Topsoil and overburden stockpiles; and
- Ancillary construction infrastructure, including workshops and laydown areas.

All pipelines will be flanged steel, installed above-ground on precast concrete plinths (Figure 1), with two 3.5 m-wide access roads cleared/graded alongside for construction, maintenance, and inspection where none currently exist.



Figure 1: Representative image of above-ground pipelines.

A TSF is an engineered structure, comprising embankments and associated infrastructure, designed to permanently contain mine tailings while enabling reclaimed water to be recycled back into the mining process Figure 2). The Deelkraal II TSF will be constructed in three compartments (Figure 3), with the following key design parameters:

- Maximum final height: 65 m (to be confirmed in detailed design);
- Footprint: up to 430 ha, combined across all three compartments;
- Total capacity: Compartment 1 – 80.85 Mt; Compartment 2 – 53.9 Mt; Compartment 3 – 57.6 Mt;
- Deposition period: 2028–2048 for Compartments 1 and 2; a phased 2036–2048 period for Compartment 3;
- Maximum rate of rise: 4.98 m/year; and
- Deposition method: cyclone.

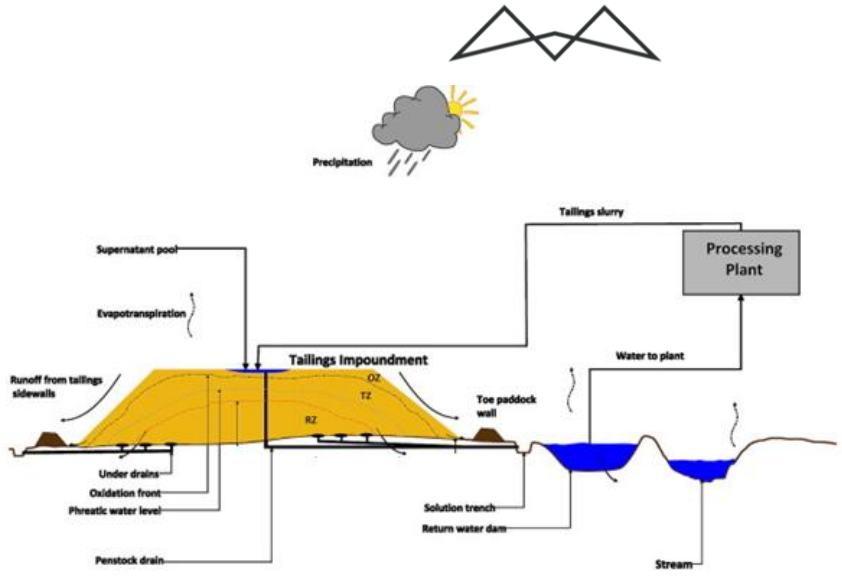


Figure 2: Cross-section through a typical TSF.

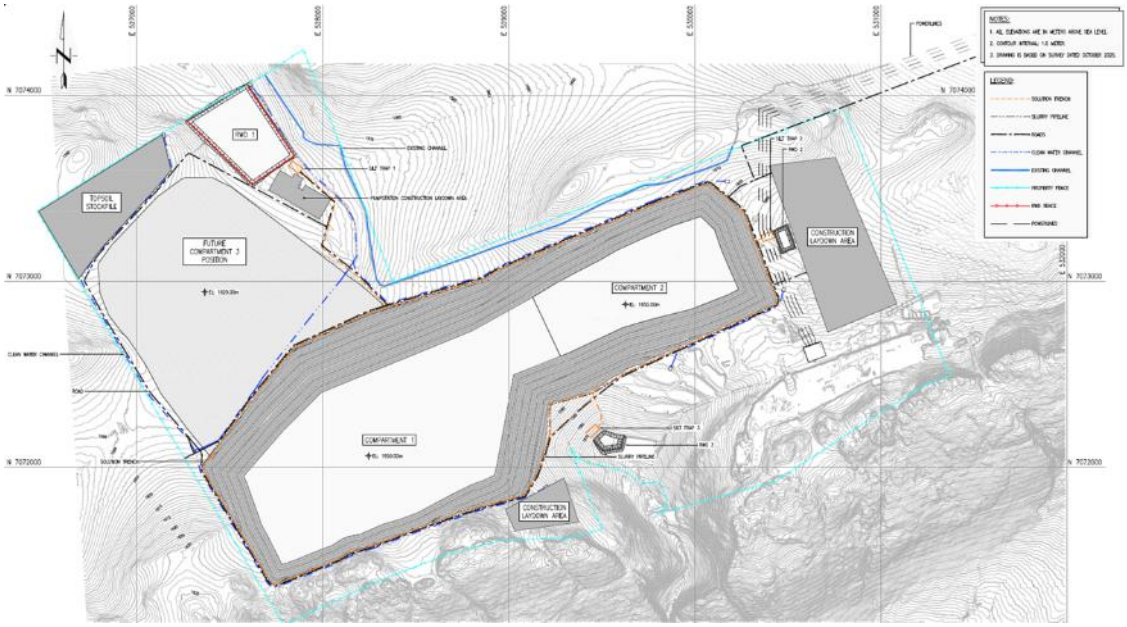


Figure 3: Deelkraal II TSF compartment.

The construction phase will comprise site establishment, clearance, excavation, and topsoil stockpiling, layering, and compaction, prior to tailings deposition. Details of construction camps, temporary laydown areas, and other associated infrastructure will be presented in the EIA report. The tailings material is classified as a Type 3 waste under the National Norms and Standards for the Disposal of Waste to Landfill (NEMWA GN R 636, 2013), requiring a Class C liner system and an inverted barrier system (Figure 4) is recommended as a cost-effective alternative offering improved performance.

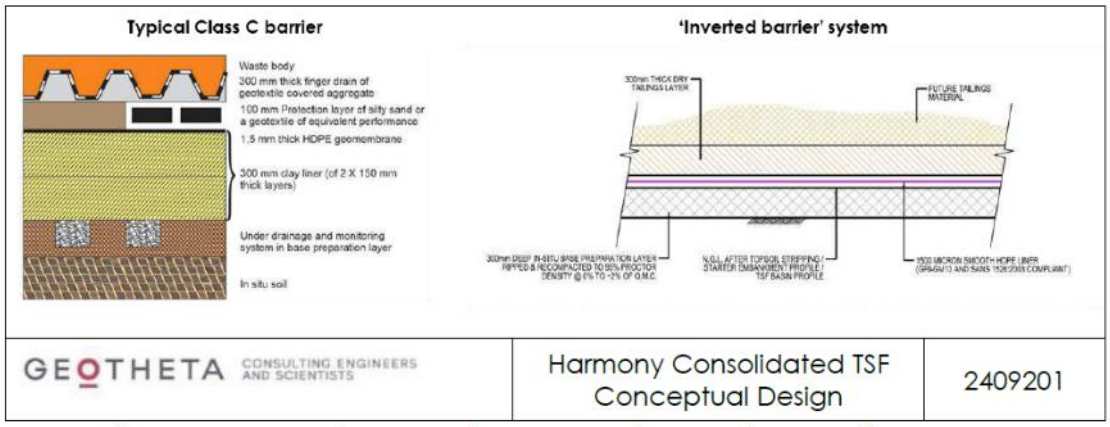


Figure 4: Comparison of Typical Class C liner and inverted liner system.

1.3.2 PROJECT LOCALITY

The proposed development footprint is administratively located within the Merafong City Local Municipality, which falls under the jurisdiction of the West Rand District Municipality in the Gauteng Province. Geographically, the project site is situated approximately 13km southwest of the town of Carletonville. The central centroid of the primary infrastructure component, the proposed Deelkraal II Tailings Storage Facility (TSF), is at the geographic coordinates: 26°28'10.51"S, 27°16'56.07"E.

Table 2: Summary of infrastructures and aerial footprint.

Infrastructure Component	Aerial Footprint (Hectares / km²)	Linear Length / Servitude Width
Deelkraal II TSF Footprint	Approximately 430 ha (4.3 km²)	N/A
New Return Water Dam (RWD)	Approximately 11 ha (0.11 km²)	N/A
New Reclamation Pump Station	Approximately 3 ha (0.03 km²)	N/A
Dedicated Topsoil Stockpiles	Approximately 37 ha	N/A
Construction Laydown Areas (Combined)	Approximately 70 ha	N/A
Slurry Pipeline Network	N/A	~10km length / 4m wide servitude
Process and Potable Water Pipelines	N/A	~25km length / 4m wide servitude

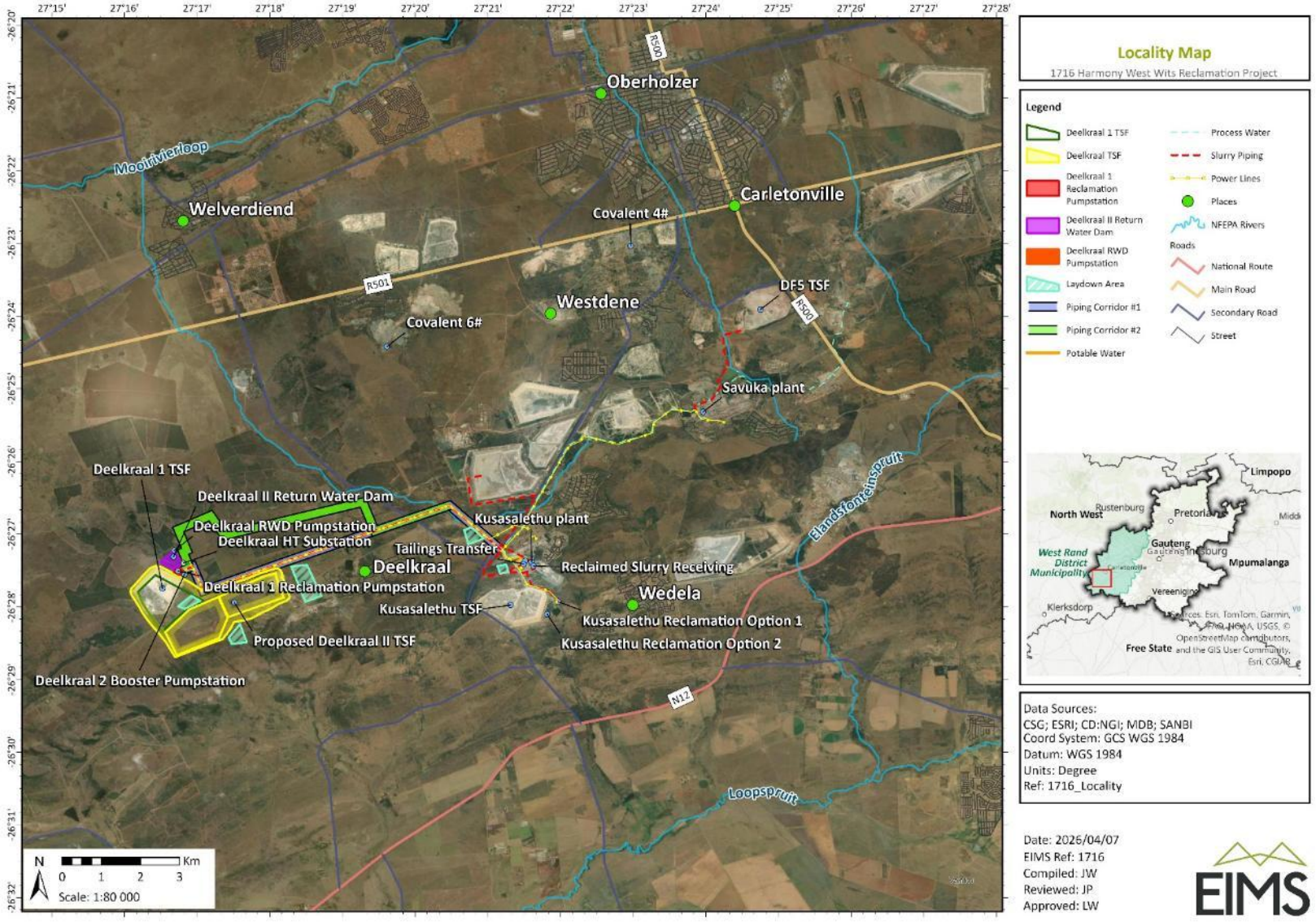


Figure 5: Locality map of the proposed project area.

2 LEGISLATIVE CONTEXT AND POLICY FRAMEWORK

The legal framework governing this application is set out in full in the Environmental Impact Assessment Report. The instruments that bear directly on this specialist assessment are the following. The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2014 (GN R. 982, as amended) require that the potential impacts of the listed activities applied for be assessed by an appropriately qualified specialist, and Sections 24(5)(a) and (h) of the Act are the enabling provisions for the protocol under which this report is compiled. The Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GN 320 of 20 March 2020) prescribe the minimum content of an Agricultural Agro-Ecosystem Specialist Assessment; paragraph 3.2 of that notice is the standard against which this report is to be read, and Table 1 maps each of its requirements to the section in which it is addressed. The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) places a duty on the land user to conserve the soil resource and to prevent erosion, and is the statutory basis for the topsoil, stockpiling and erosion-control conditions recommended in Section 10.1.2; the long-term grazing capacity norms published under it are the benchmark used in Section 6.5. The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) governs the tailings as a residue deposit, and two instruments made under it bear on the soil resource: the Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits (GN R. 632 of 24 July 2015), which govern the design, containment and closure of the TSF and therefore the contamination pathway to adjacent soils, and the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN R. 331 of 2 May 2014), whose soil screening values are the reference for the soil chemical rehabilitation criterion in Section 10.1.2. The Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970) governs the subdivision and change of use of agricultural land and is relevant to the permanent removal from agricultural use of the land assessed in Section 8. At provincial level, the Gauteng Environmental Management Framework places the footprint within Zone 4, the Normal Control Zone, which it describes as dominated by agricultural uses (Section 6.5.1).

3 SCOPE OF ASSESSMENT AND TERMS OF REFERENCE

The primary terms of reference for this specialist study are structured to comply with the minimum criteria set forth under GN 320 of 2020. The scope encompasses:

- Assessment and spatial verification of the pre-allocated agricultural sensitivity as defined by the DFFE National Environmental Screening Tool.
- Execution of a field verification survey at twenty-four observation points targeted at each of the proposed infrastructure components, together with a walkdown survey of the pipeline routes, to characterise the soils, current land use and agricultural activity within the development footprint.
- Classification of the soils observed at each point according to Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018), reconciled with the ARC land type and 1:50 000 PWV soil data.
- Verification of the regional land capability and soil datasets against the field observations, and derivation of site-specific agricultural potential and agricultural sensitivity classes for the development footprint using the classification method set out in Section 4.3.
- Incorporation of the approaches and principles outlined in the *Department of Environmental Affairs and Tourism's (DEAT) Specialist Studies, Information Series 4*. This alignment ensures that the definition of the scope of work, the establishment of baseline environmental conditions, and the subsequent impact forecasting methodologies adhere to scientifically credible standards.
- Undertaking the study in alignment with the *EIMS Specialist Studies for Impact Assessment Guide*, which governs all specialist assessments in support of applications for Environmental Authorisation (EA) and associated Environmental Impact Assessment (EIA) documentation.
- Quantification of direct, indirect, and cumulative impacts on soil and agricultural potential. This valuation will be conducted in accordance with the *EIMS Environmental Impact Assessment Rating Procedure* to ensure a legally compliant, consistent, and rigorous evaluation of all identified environmental impacts and risks.
- Formulation of practical, enforceable management actions for integration into the Environmental Management Programme (EMPr).
- The compilation of all site-specific sensitivity delineations will comply with the *EIMS Sensitivity Mapping for Environmental Impact Assessment Guide*, ensuring that the scope, intent, and mapping approach conform to standard corporate GIS protocols.

4 METHODOLOGY

4.1 DESKTOP RESEARCH AND SPATIAL DATA SOURCES

Prior to the site assessment, baseline environmental characteristics were evaluated using the following:

- DFFE National Environmental Screening Tool (Agricultural Theme Layer).
- Agricultural Research Council (ARC) land type inventory for land type Fb15 (Land Type Survey Staff, 1972 – 2006) and the 1:50 000 Pretoria-Witwatersrand-Vereeniging (PWV) soil survey (Yager et al., 1990), supplied for this study, with the PWV soil polygons as spatial data, under ARC report GW/A/2025/03 (Le Roux, 2025).
- Department of Agriculture, Land Reform and Rural Development (DALRRD) 2017 National Land Capability raster dataset (15-class scale) (DAFF, 2017).
- Satellite imagery (Google Earth) for historical land-use delineation, used to establish whether any part of the footprint had been cultivated in the five years preceding the assessment .
- Long-term grazing capacity map for South Africa (DAFF, 2018), used as the benchmark for the grazing value of the footprint (Section 6.5).
- Wetland Baseline and Impact Assessment and Rehabilitation Plan prepared for this project (The Biodiversity Company, 2026a; 2026b).

4.2 FIELD VERIFICATION CAMPAIGN AND SOIL PROFILING

A site assessment was conducted on 27 and 28 May 2026, during early winter. Twenty-four observation points were located across the development footprint, and a visual walkdown survey was undertaken along the proposed pipeline routes. Agricultural activity within the study area was predominantly informal livestock grazing, with crop cultivation limited to a small area within the informal settlements situated on the land.

Observation points were selected purposively rather than on a grid. At least one point was placed within each proposed infrastructure component (the TSF, the return water dam and pump stations, the stockpile areas, the construction and reclamation laydown areas and the piping corridor), on undisturbed ground considered representative of that component, with additional points where the terrain or surface condition changed within a component. The linear pipeline and powerline corridors were assessed by walkdown. Each point was located with a handheld GPS, and the coordinates are held with the project spatial data.

At each point the soil was investigated by hand auger to refusal or to the maximum reach of the auger. The recovered topsoil was described for moist Munsell colour (Munsell Soil Color Charts), field texture class and clay window by tactile assessment against the USDA texture triangle, consistence and coarse-fragment content, and was photographed in the hand with a date stamp (Section 6.1.2). A handheld soil probe meter appears in frame in several of the profile photographs. The diagnostic subsoil horizons were not exposed by pit at the observation points; the basis on which soil forms were assigned, and the confidence attached to each, is set out in Section 6.1.2. Effective depth was taken as the depth to auger refusal where refusal occurred; elsewhere it is taken from the depth class that the PWV survey assigns to the mapped unit (d, deeper than 1 200 mm; m, 600 to 1 200 mm; s, 300 to 600 mm; x, variable between 300 and 1 200 mm), and it is treated as unresolved at points within x-class units.

Soil forms were classified according to Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018). The ARC land type and PWV datasets use the earlier binomial system (MacVicar et al., 1977), and their series codes, for example Av26 and Hu26, are cited as they appear in those sources. The soil forms relevant to this footprint (Avalon, Bainsvlei, Clovelly, Dundee, Glenrosa, Hutton, Mispah and Shortlands) are defined on the same diagnostic horizons in both systems. Field tactile techniques were applied to define texture classifications (clay windows), morphological features and structure, and to note

indicators of prolonged or periodic internal saturation (mottling and gleying) where they were present in the material recovered.

Surface rockiness was estimated visually at each point as the percentage of the ground surface occupied by rock outcrop and surface stone, and cross-checked against the PWV soil-rock complexes, which the survey defines as carrying more than 40% rock outcrop. Drainage was inferred from matrix hue and chroma, from mottling or gleying where observed, from terrain position and from the mapped unit, a soft plinthic horizon indicating periodic saturation at depth. Slope was taken from the terrain unit in which each point lies, using the slope ranges recorded for the terrain units of land type Fb15 (crest 0 to 8%, scarp steeper than 100%, midslope 6 to 15%, footslope 3 to 6%, valley bottom 0 to 2%), and checked in the field. Erosion was assessed visually as the presence and severity of sheet, rill and gully erosion at each point and along the walkdown routes.

Spatial analysis was undertaken in a geographic information system, with areas computed in a projected coordinate system (WGS 84 / UTM zone 35S). The development footprint layers supplied by the applicant were overlaid on the land type coverage (1:250 000), the PWV soil polygons (1:50 000) and the Screening Tool agriculture layer; linear corridors were buffered by 50 m. Each PWV polygon within the footprint was assigned an agricultural potential class and a sensitivity class using the method in Section 4.3, and the observation points were used to check those assignments. The effective scale of the resulting sensitivity map is that of its finest source, 1:50 000, and boundaries should not be interpreted at a larger scale.



4.3 AGRICULTURAL POTENTIAL, LAND CAPABILITY AND AGRICULTURAL SENSITIVITY

Three related but distinct terms are used in this report, and they are applied consistently as follows. Land capability is the inherent capacity of land to sustain agricultural use without degradation, as determined by soil, terrain and climate together. Two land capability schemes are referred to: the national DALRRD land capability dataset (DAFF, 2017), a fifteen-class raster from which the Screening Tool derives its agriculture theme (Section 5.1); and the eight-class land capability system (Klingebiel & Montgomery, 1961; as adapted for South Africa by Scotney et al., 1987), in which the provisional land capability class given for each observation point in Table 6 is expressed (Classes I to VIII).

Agricultural potential is the suitability of the soil at a given location for dryland crop production and grazing. It is the property assessed in this report at each observation point and for each mapped soil unit, and it is rated in five classes, High, Moderate, Low, Very Low and Negligible, using the classification matrix in Table 3. The class is set by the most limiting factor. Where effective depth has not been measured, the class is assigned from the depth class of the mapped unit and is marked provisional; a provisional class falls by one class if the depth confirmed by test pit lies in the next-lower depth class.

Agricultural sensitivity is the sensitivity of the land to the loss of agricultural resources, which is the property that the Screening Tool pre-allocates and that GN 320 requires the specialist to verify. It is derived from agricultural potential and current agricultural use: land cultivated within the preceding five years would carry a higher sensitivity than its potential alone indicates, as it does in the Screening Tool, but no part of this footprint has been cultivated in that period (Section 5.2). The Screening Tool uses the classes Very High, High, Medium and Low. The verified sensitivity classes in Section 9 are Moderate, Low and Transformed/Negligible, where Moderate corresponds to the Screening Tool Medium class. The conversion from potential to sensitivity is given in the last row of Table 3.

Table 3: Agricultural potential classification matrix. The class at each observation point or mapped unit is set by the most limiting factor.

Factor	High	Moderate	Low	Very Low	Negligible
Effective depth (ARC depth classes)	Deeper than 900 mm (D4–D5)	600–900 mm (D3), or 600–1 200 mm (PWV class m); 300–1 200 mm (PWV class x) provisional	300–600 mm (D2)	300 mm or less (D1)	No soil
Surface rock and outcrop	Less than 2%	2–10%	10–40%	More than 40% (soil-rock complex)	Rock outcrop
Drainage	Well drained	Well drained, or periodic saturation below 600 mm (e.g. soft plinthite)	Imperfectly drained; saturation within 600 mm	Poorly drained	—
Topsoil clay (ARC clay classes)	15–35% (C3–C4)	6–15% or 35–55% (C2 or C5)	6% or less, or more than 55% (C1 or C6)	—	—
Slope	Less than 3%	3–12%	12–20%	More than 20%	—
Water-holding capacity (from depth and texture)	High	Moderate	Low	Very low	None
Fertility (base status)	Eutrophic to mesotrophic, not leached	Mesotrophic, moderately leached	Dystrophic or strongly leached	Very low nutrient reserve	—
Erosion susceptibility	Low	Moderate	High	Very high, or active erosion	—

Factor	High	Moderate	Low	Very Low	Negligible
Equivalent land capability class (eight-class system)	I–II	III–IV	V–VI	VII	VIII
Verified agricultural sensitivity (Section 9)	High	Moderate (Screening Tool Medium)	Low	Low	Transformed/ Negligible

5 SITE SENSITIVITY VERIFICATION

In accordance with national environmental protocols, a formal site sensitivity verification must be undertaken prior to the commencement of any specialist assessment to validate or challenge the baseline environmental sensitivity and current land use pre-allocated by the national web-based screening tool. This verification process falls under the direct responsibility of a qualified Environmental Assessment Practitioner (EAP) or a registered specialist. The evaluation includes a desktop analysis of satellite imagery, an initial on-site physical inspection, and an evaluation of any other available and relevant environmental data layers.

The findings of this verification assessment must be documented within a site sensitivity verification report (SSVR). This report serves to confirm or dispute the screening tool's initial findings by identifying recent landscape alterations, such as new infrastructure developments, changes in vegetation status, or shifts in land cover. This verification report must be submitted with the primary specialist assessment report compiled in alignment with the Environmental Impact Assessment (EIA) Regulations, however, for the purpose of this report the subsequent section will focus on the site sensitivity verification for the agriculture theme identified by the Screening tool.

5.1 DFFE SCREENING TOOL AGRICULTURE THEME SENSITIVITY

The DFFE Screening tool has identified the study area to have agriculture sensitivity features ranging from low (very low land capability of 2) to high (moderate-high land capability of 10, with agricultural features such as rainfed annual crop cultivation / planted pastures), as seen in Figure 6 below. A site visit has been undertaken by the EAP as part of the Site Sensitivity Verification process.

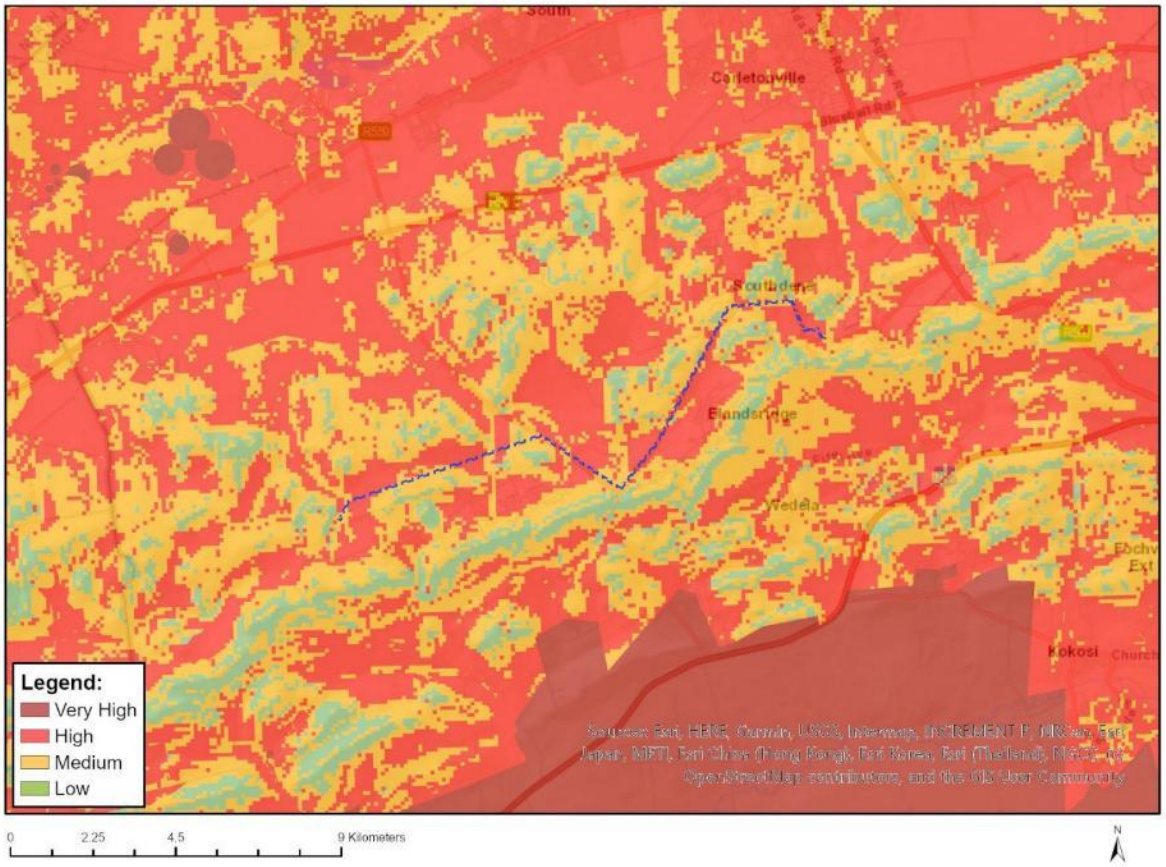


Figure 6: DFFE Screening Tool Agriculture Theme Sensitivity map.

The High rating is generated by two features of the Screening Tool agriculture theme, and it is these, rather than the soil pattern in general, that the verification in Section 5.2 addresses. The first is the national land capability dataset (DAFF, 2017), which assigns values in the moderate-high range, up to 10, to parts of the footprint. The second is the national Field Crop Boundary dataset, which includes parts of the footprint as rainfed annual crop cultivation or planted pasture.

5.2 SPECIALIST SENSITIVITY VERIFICATION

The development footprint is not under cultivation, has not been cultivated within the past five years, and supports little to no agricultural production. The site inspection of 27 and 28 May 2026 recorded natural veld and rocky bushveld vegetation across the undisturbed portions of the footprint, comprising sparse bunchgrass with bare, crusted inter-tuft areas, woody encroachment by *Searsia* and *Vachellia* species, aloes, and active termite mounds. Photographic evidence of these conditions are in Appendix 3. Accordingly, the production figures required under paragraph 3.2.4.3 of the protocol (GN 320) and the employment figures required under paragraph 3.2.4.4 are nil (Section 6.5). The inclusion of parts of the footprint in the national Field Crop Boundary dataset is not supported by the land cover recorded on site, which is natural veld and rocky bushveld with no evidence of cultivation, nor by historical imagery, which shows no cultivation of these areas in the preceding five years; that designation is accordingly disputed.

The 1:50 000 scale Pretoria-Witwatersrand-Vereeniging soil survey (Yager et al., 1990), obtained from the Agricultural Research Council for this study under report GW/A/2025/03 (Le Roux, 2025), provides site-specific mapping at a resolution an order of magnitude finer than the national land capability grid, and it addresses the first of the two Screening Tool features directly. It maps five soil series and three soil-rock complexes within the footprint, of which the Avalon (Av26), Hutton (Hu26), Shortlands (Sd11) and Dundee (Du10) series are rated Moderate and the remainder Low; none is rated High. For the Hutton series, which is recorded at seven observation points, it records rock as the depth-limiting material and assigns depth class 'x', denoting a variable

effective depth of between 300 mm and 1 200 mm which cannot be separated at that scale, and it describes the series as moderately leached, indicating a reduced base status and nutrient reserve. Where the national grid and the finer site-specific survey differ, the latter is considered the more reliable indicator of agricultural potential at the scale of this development footprint.

The development footprint falls within land type Fb15, as confirmed by spatial overlay of all fourteen project components and all twenty-four soil sample points against the ARC Land Type Survey coverage. The Fb15 inventory records the following:

- An average effective soil depth of 503 mm, corresponding to depth class D2.
- 38.18% of the land type has an effective depth of 300 mm or less.
- Lithosols of the Mispah and Glenrosa forms account for 38.18% of the land type, and rock outcrop for a further 19.13%, giving a combined shallow or non-soil component of 57.3%.
- The average topsoil clay content is 21.6%, and the broad soil pattern is described as commonly shallow soils on hard rock, fractured rock or weathering rock materials.

These figures describe land type Fb15 as a whole, which extends well beyond the development footprint, and they are not a measure of the footprint itself. For the footprint, the 1:50 000 PWV survey provides the equivalent figures: of the 645.79 ha, 120.52 ha (18.7%) is mapped as shallow soils and soil-rock complexes of Low potential, 256.83 ha (39.8%) is already transformed, and 268.44 ha (41.6%) is mapped as soils of Moderate potential. No part of the footprint is mapped as of High potential. The dispute of the High rating rests on this footprint-specific pattern and on the field observations described below, rather than on the land type percentages.

Twenty-four soil observation points were located across the development footprint. Of these, four points, S8, S15, S23 and S24, returned no sample on auger investigation. In each case the non-recovery reflected auger refusal on rock rather than an absence of data, and at S24 this was confirmed photographically where the surface comprises a thin, discontinuous veneer of reddish-brown fine earth over a dense lag of angular to sub-angular rock fragments, with an estimated 40 to 60% surface rock cover and effective soil depth below that required for augering. Comparable conditions were recorded at S23. Of the remaining twenty observation points, none returned a soil of High agricultural potential under the classification matrix in Table 3 (Section 4.3). The highest rating assigned to any observation point in this assessment is Moderate.

Of the total development footprint of 645.79 ha, some 256.83 ha, being 39.8%, is already transformed and comprises existing tailings storage facilities and mine dumps. The ARC PWV survey independently maps this ground as 'Mine dumps and excavations' and 'Urban areas'. No soil resource, and therefore no agricultural potential, remains on this land. It is therefore, classified as of Low sensitivity (or negligible).

The single largest soil unit mapped within the footprint is the Avalon series (mAv26), covering 244.50 ha or approximately 38% of the development area. The Avalon form comprises an orthic A horizon over a yellow-brown apedal B horizon over soft plinthite. The presence of a plinthic horizon indicates a periodically fluctuating water table and imposes a genuine restriction on effective rooting depth and internal drainage. Eleven of the twenty-four observation points are classified as the Avalon form on the basis of a yellow-brown topsoil consistent with this mapped unit (Section 6.1.2). The soft plinthic horizon itself was not exposed at any point, and its presence and depth remain to be confirmed by test pit during the pre-construction topsoil survey.

6 BASELINE AGRICULTURE / SOILS ENVIRONMENT

This section establishes the baseline agricultural and soil conditions of the receiving environment, as required by paragraph 3.2.4 of the protocol. It describes the terrain, land types and soil forms of the development footprint, the effective depth, clay content and agricultural potential of each soil recorded, and the climate, vegetation, hydrological regime, current land use and productivity within which those soils occur. Soil conditions across the site range from shallow, rocky lithosols to deeper, arable ground, and it is this range that defines the agricultural potential and the sensitivity identified by the DFFE Screening Tool.

6.1 TERRAIN, LAND TYPES AND SOIL FORMATIONS

The development footprint lies approximately 13 km south-west of Carletonville in the Merafong City Local Municipality, on and below a series of parallel hills forming the Gatsrand. These rise to approximately 1 770 metres above mean sea level (mamsl) and fall to approximately 1 690 mamsl at the Savuka Tailings Storage Facility (TSF) and 1 620 mamsl at the DF5 TSF, giving some 150 m of relief across the assessed area. This relief organises the soil resource into a crest-to-footslope catena of the kind illustrated in Figure 7, and terrain unit and slope position are accordingly the principal control on effective soil depth within the footprint. The crests and steep upper slopes of the Gatsrand are zones of net erosion and rapid external drainage, on which weathered material is removed approximately as fast as it forms; profiles there are thin, immature and skeletal, and it is on these terrain positions that the shallow Mispah and Glenrosa soil-rock complexes and rock outcrop occur, which together account for some 57.3% of land type Fb15 and which the 1:50 000 PWV survey maps within the footprint as the sMs10 unit and the Ms/R complex. The midslopes and footslopes below them are zones of net deposition which accumulate colluvium and moisture, and carry the deeper, better-developed profiles. On the freely drained midslopes this is the red apedal Hutton form, mapped as xHu26, with the red structured Shortlands form (mSd11) where the parent material is more basic. On the lower slopes, where a seasonally fluctuating water table segregates iron into soft plinthite beneath a yellow-brown apedal B horizon, it is the Avalon form, which the survey maps as mAv26 across 244.50 ha and which is the single most extensive soil unit in the footprint. The alluvial terraces at the base of the sequence carry the deep, stratified Dundee form (dDu10). The land type inventory records the vertic Arcadia and Rensburg forms in the valley bottoms of Fb15, at 2.6% of the land type, but no such profile was mapped within the footprint by the finer survey and none was verified in the field. The distribution of soil forms recorded at the twenty-four observation points described in Section 6.1.2 follows this sequence.

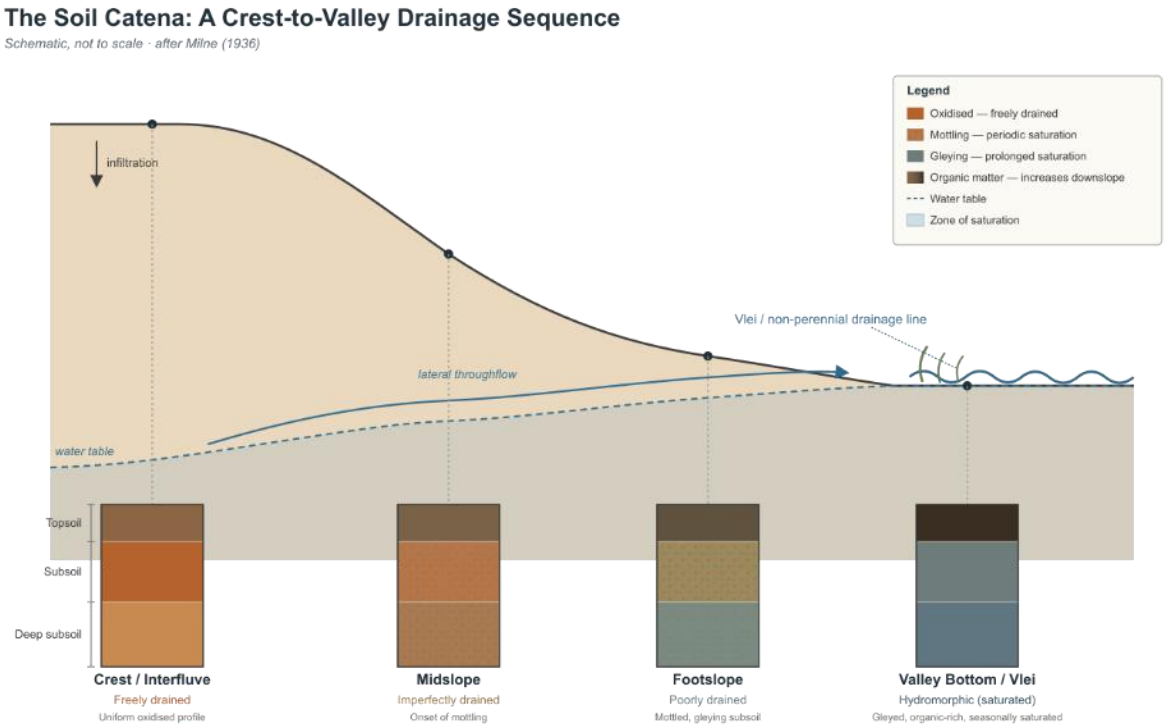


Figure 7: Soil catena.

6.1.1 LANDTYPES

The study area straddles land types Fb5 and Fb15 (Figure 8). The development footprint itself falls wholly within Fb15, as confirmed in Section 5.2 by spatial overlay of all fourteen project components and all twenty-four soil observation points against the ARC Land Type Survey coverage, and Fb15 alone is therefore described below.

Both units are described as shallow, rocky and often steep environments that are moderately leached, with calcareous deposits (lime) generally restricted to valley features. In terms of pedological distribution, the Glenrosa and Mispah soil-rock complexes are the dominant formations, collectively encompassing approximately 38% of the total area. Secondary to these complexes, a cumulative 35% of the study site is comprised of the Hutton, Oakleaf, Dundee, Arcadia and Rensburg soil series (Land Type Survey Staff, 1972 – 2006).

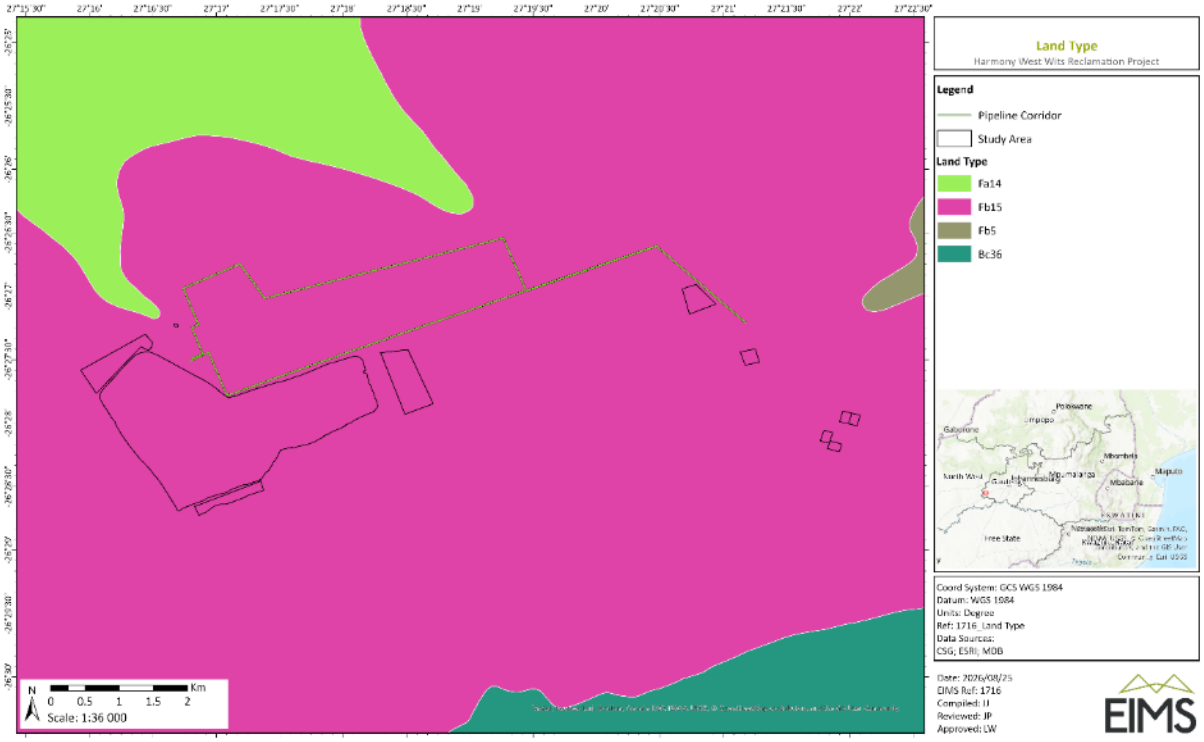


Figure 8: Land types in study area (Land Type Survey Staff, 1972 – 2006).

6.1.1.1 FB15 LAND TYPE

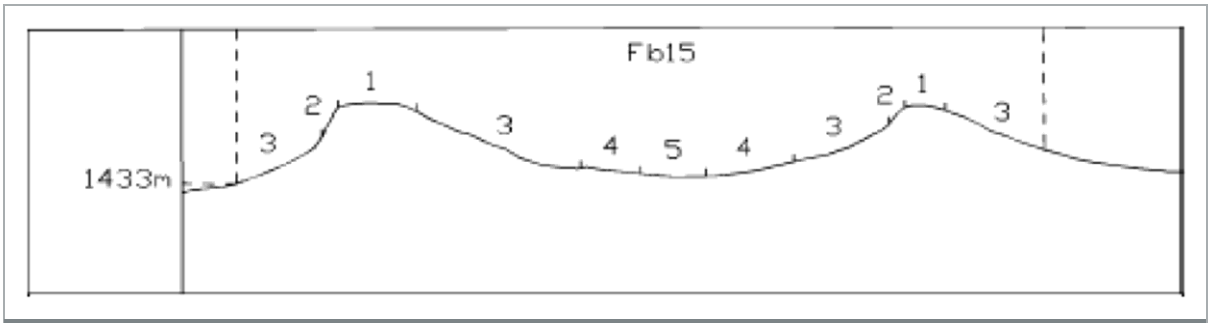
The area is characterised primarily by shallow soils overlying hard, fractured, or weathering rock. While calcareous deposits (lime) are generally rare or absent in upland soils, they are frequently observed in lower landscape positions. The pedological profile is dominated by soil-rock complexes, with the Mispah and Glenrosa forms being the most prevalent. Secondary to these complexes, the Hutton, Oakleaf, Dundee, Arcadia, and Rensburg series are common, while the Clovelly, Shortlands, and Avalon forms, along with streambeds, constitute less than 10% of the total surface area (Land Type Survey Staff, 1972 – 2006). Table 4 provides a summary of the soil formations and their descriptions, as well as the predominant soil-rock complexes. Table 5 outlines the terrain morphological units of Land Type Fb15 and correlates the specific soil series with their respective positions within the catena.

Table 4: Fb15 Land Type soil information.

Soil Name	Depth	Soil Form Description	Soil Series Description	%
Soil Description				
Hutton (Hu26, Hu36, Hu16)	Deep	Red-brown to brown topsoil overlying freely drained, red apedal soil material	Medium base status, sandy loam to sandy clay loam subsoil; High base status (lacking free lime), sandy loam to sandy clay loam subsoil; Low base status, sandy loam to sandy clay loam	28.4%

Soil Name	Depth	Soil Form Description	Soil Series Description	%
Oakleaf (Oa16, Oa36, Oa17, Du10) **Dundee (Du10)**	Deep	Reddish brown topsoil over a reddish (not uniform coloured), moderately to well drained subsoil. Soils may have variations in texture and in colour within a reddish matrix, and be located in lowland positions	Sandy loam to sandy clay loam subsoil; Sandy loam to sandy clay loam subsoil; Clay loam to clay subsoil; Wide texture range possible. Refer to detailed information sources	4.3%
Arcadia (Ar20) **Rensburg (Rg20)**	Moderately deep	Dark brown to black, strongly structured, swelling and plastic clay. Large cracks (dry state) or a loose surface layer (mulch) is common. Polished surfaces, the result of soil swelling are commonly encountered between the topsoil and lower soil layers	Strongly crusting surface with lime present in or immediately below the topsoil; Lime present in grey (gleyed wet) subsoil	2.6
Other soils	Clovelly (Cv26, Cv16, Cv36 - 2.52%), Hutton (Hu27, Hu37, Sd21 - 1.92%), Clovelly (Cv23, Cv13, Cv33 - 1.68%), Avalon (Av26, Av36 - 0.84%), Streambeds (0.5%)			
Soil-rock Complex				
Mispah (Ms10)	Very shallow	Grey to dark brown topsoil over hard rock	Topsoil lacks free lime	19.6
Rock				19.1
Glenrosa (Gs16, Gs17)	Shallow	Grey to dark brown topsoil over soil materials mixed with partly weathered rock-derived materials to hard rock fragments and stones	Fine sandy loam to sandy clay loam topsoil; Medium sandy loam to sandy clay loam topsoil	18.6

Table 5: Fb15 Terrain type and soils distribution.



Terrain Type 1	Terrain Type 2	Terrain Type 3	Terrain Type 4	Terrain Type 5
40% Rock	70% Rock	21% Rock	5% Rock	12% Rock
33% Mispah	20% Mispah	25% Mispah	11% Mispah	16% Mispah



23% Glenrosa	10% Glenrosa	29% Glenrosa	12% Glenrosa	10% Oakleaf, Dundee
4% Hutton		23% Hutton	48% Hutton	52% Arcadia, Rensburg
		2% Hutton, Shortlands	9% Oak leaf, Dundee	10% Streambeds
			6% Arcadia, Rensburg, Clovelly	
			3% Hutton, Shortlands	
			4% Clovelly	
			2% Avalon	

6.1.2 SOIL DESCRIPTION

To establish a baseline of the receiving environment's soil characteristics a high-level desktop assessment followed by an in-situ field verification survey was undertaken for this assessment.

6.1.2.1 **DESKTOP ASSESSMENT**

The soil distribution map (Figure 9) delineates the pedological characteristics of the West Wits project area near Carletonville. The mapping illustrates a landscape where soil units are classified by effective depth, structure, and underlying lithology. The area is significantly fragmented by anthropogenic disturbances, specifically mine dumps, excavations, and slime dams, which are demarcated by cross-hatched patterns. The natural soilscape varies from deep (>1200mm) structureless loamy sands in the eastern and central sectors, to shallow (<600mm) lithosols associated with rocky outcrops. Moderately deep, yellow-brown apedal soils on soft plinthite and red structured soils on saprolite serve as transitional zones between the arable lands and the rocky ridges (Land Type Survey Staff, 1972 – 2006).

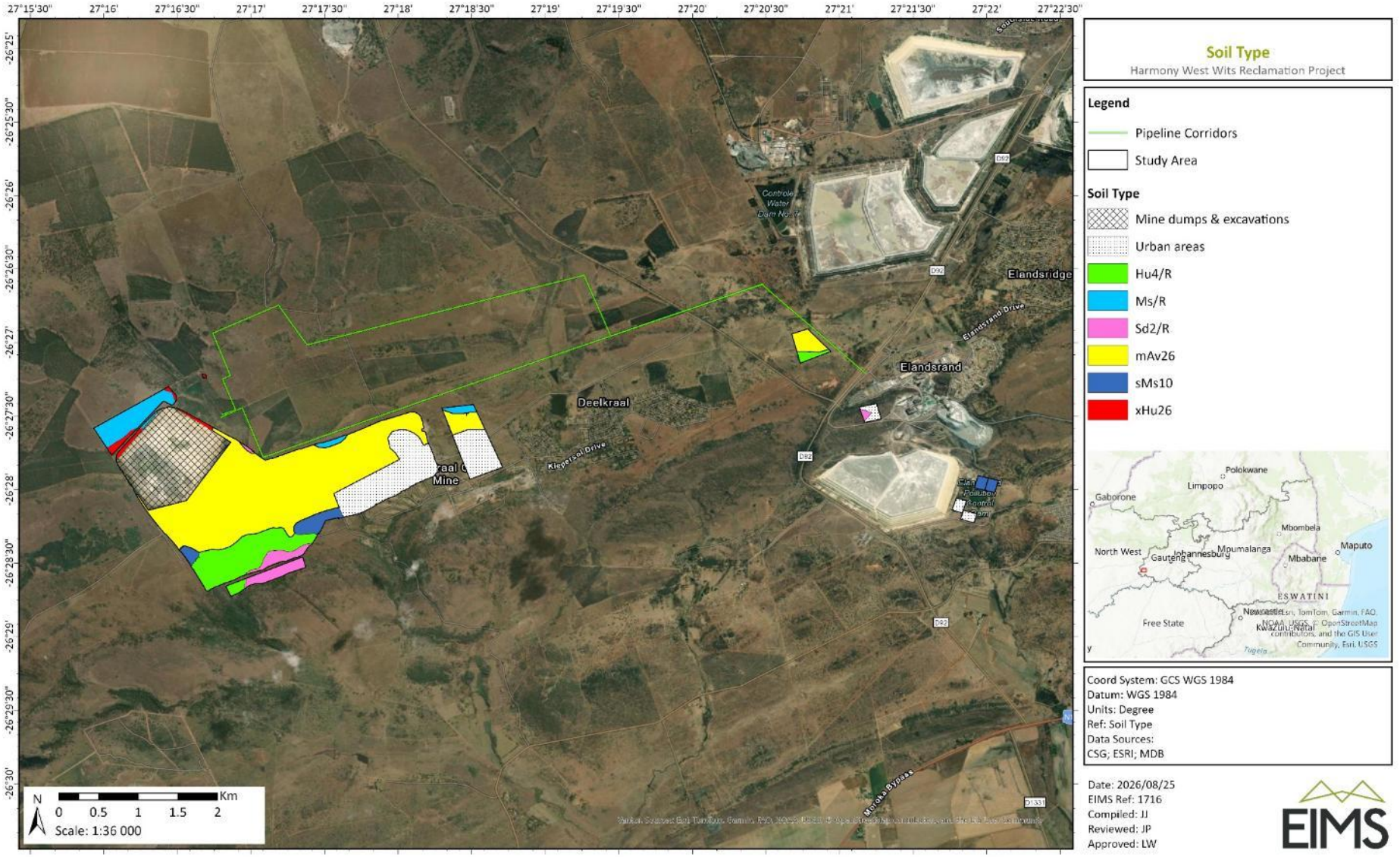


Figure 9: Soil descriptions of study area (Land Type Survey Staff, 1972 – 2006).



The soil forms given in Table 6 have been assigned by reconciling the field observations with the 1:50 000 ARC PWV soil survey (Yager et al., 1990), obtained for this study under ARC report GW/A/2025/03, which is the finest-resolution soil mapping available for the footprint and which Section 5.2 identifies as the more reliable source at this scale. The field survey recorded, at each observation point, the topsoil colour, texture class and clay window, together with the surface condition and, where it occurred, auger refusal. Soil form in the South African system is determined by the diagnostic horizon sequence, and the subsoil horizons were not exposed at the observation points. The form given at each point is therefore the mapped unit whose diagnostic properties are consistent with the topsoil observed, and it is identified as such in the Basis of classification column.

Where the observed topsoil is yellow-brown in hue (7.5YR to 10YR), structureless, and not limited by rock at or near the surface, it is consistent with the mAv26 unit, which the survey maps across 244.50 ha of the development footprint and which is defined as an orthic A horizon over a yellow-brown apedal B horizon over soft plinthite, at an effective depth of 600 to 1 200 mm. Those points are classified as the Avalon form, and the soft plinthic B horizon is taken from the survey rather than from direct observation. Where the observed topsoil is red (5YR and redder) it is consistent with the xHu26 unit, the Hutton form on a red apedal B horizon with rock as the depth-limiting material at a variable depth of 300 to 1 200 mm, or, where the clay content is high and the material breaks to blocky peds, with the mSd11 unit and the Shortlands form. Where auger refusal, surface rock or a shallow gritty profile was recorded, the point is classified as the Mispah or Glenrosa form, consistent with the sMs10 and Ms/R units.

Two verification steps follow from this and are recommended in Section 10.1.2. The first is a desktop step that can be completed immediately: the twenty-four observation points should be overlaid on the PWV soil polygons supplied with ARC report GW/A/2025/03, in the same way that they were overlaid on the land type coverage in Section 5.2, so that the mapped unit at each point is established by position rather than inferred from the topsoil. The second is a field step: the presence and depth of the plinthic horizon at the Avalon points, and the depth to rock at the Hutton points, should be confirmed by test pit during the pre-construction topsoil survey, because both determine the effective rooting depth and the depth to which topsoil can usefully be salvaged.

The confidence attached to each classification is recorded in the Soil form column of Table 6 in three categories. A confirmed classification is one in which the diagnostic horizons were observed and described in an exposed profile; no observation point meets this standard, and the only entry marked confirmed is the transformed surface at S8, which is a land class rather than a soil form. A provisional classification is one in which field evidence bearing directly on the diagnostic subsoil or on the depth-limiting layer was recorded, but the diagnostic criteria were not fully confirmed: this applies at S11 (red, clay-rich material breaking to coherent blocky clods), at S20 (ferruginous concretions consistent with plinthite) and at S21 and S24 (shallow, rock-limited profiles with auger refusal and surface rock). An inferred classification is one assigned from the mapped PWV unit that is consistent with the observed topsoil, the diagnostic subsoil not having been observed: this applies to the remaining Avalon and Hutton points. Provisional and inferred classifications are to be confirmed by test pit during the pre-construction topsoil survey, and the agricultural potential attached to them is correspondingly provisional in the sense defined in Section 4.3.

6.1.2.2 IN-SITU SURVEY

Note on the plates below. Images 1 to 6 are representative profile exposures and are not tied to a numbered observation point. Images 7 to 22 are the hand samples recovered at the numbered points; they record topsoil colour, texture and consistence, and the soil form given in each caption is the mapped PWV unit consistent with that topsoil, not a form observed in a described profile. Section 6.1.2 sets out the basis of classification in full.



Image 1: Representative soil profile, Gatsrand midslope: reddish-brown, structureless apedal material with abundant coarse fragments passing down into weathering rock. Representative plate; not tied to a numbered observation point. A handheld soil probe meter is in frame for scale.



Image 2: Representative soil profile: reddish-brown apedal material showing faint horizontal banding, with a handheld soil probe meter in frame for scale. Representative plate; not tied to a numbered observation point.



Image 3: Representative exposure of yellow-brown material carrying abundant irregular, vesicular ferruginous nodules and concretions. Material of this appearance is consistent with a plinthic horizon, which is the diagnostic subsoil of the Avalon form mapped across the footprint, and it should be described and depth-referenced during the pre-construction topsoil survey to settle whether it is plinthite or weathered ferruginous sandstone of the Klapperkop Member.



Image 4: Rock outcrop with a thin, discontinuous soil veneer resting abruptly on unweathered, horizontally bedded hard rock. Conditions of this kind correspond to the Mispah form and to rock outcrop, and to the sMs10 and Ms/R units of the PWV survey.



Image 5: Shallow profile over highly fractured, angular weathering bedrock, with a surveyor's staff for scale. Conditions of this kind correspond to the Glenrosa form.



Image 6: Deeper red apedal profile with a prominent, naturally occurring stone line bisecting the structureless red subsoil. Conditions of this kind correspond to the Hutton form and to the xHu26 unit.



Image 7: Sample S1 – Northern Stockpile area: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark brown (7.5YR 2.5/3) silty clay loam topsoil, 27–40% clay. Agricultural potential – Moderate.



Image 8: Sample S2, S3 – Northern Stockpile area: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); brown (10YR 4/3) sandy loam topsoil, 0–20% clay. Agricultural potential – Moderate.



Image 9: Sample S4 – Deelkraal RWD Pumpstation: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); brown (7.5YR 4/4) sandy loam topsoil, 0–20% clay. Agricultural potential – Moderate.



Image 10: Sample S5, S6 – Deelkraal II RWD: Hutton form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark reddish brown (5YR 3/4) silt loam topsoil, 0–27% clay. Agricultural potential – Moderate.



Image 11: Sample S7 – Deelkraal II Booster Pumpstation: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); very dark brown (7.5YR 2.5/2) silty clay loam topsoil, 27–40% clay. Agricultural potential – Moderate.



Image 12: Sample S9 – Deelkraal II Reclamation Construction Laydown Area: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); very dark brown (10YR 2/2) silty clay loam topsoil, 27–40% clay. Agricultural potential – Moderate.



Image 13: Sample S10 – Deelkraal II TSF: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); brown (10YR 3/3) silty clay topsoil, 40–60% clay. Agricultural potential – Moderate.



Image 14: Sample S11 – Deelkraal II TSF: Shortlands form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark reddish brown (5YR 3/4) silty clay topsoil, 40–60% clay. Agricultural potential – Moderate.



Image 15: Sample S12 – Deelkraal II TSF: Hutton form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark reddish brown (5YR 3/4) loam topsoil, 7–27% clay. Agricultural potential – Moderate.



Image 16: Sample S13, S14 – Southern Stockpile area: Hutton form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark reddish brown (5YR 3/4) silt loam topsoil, 0–27% clay. Agricultural potential – Moderate.



Image 17: Sample S16, S17 – Deelkraal II TSF: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark yellowish brown (10YR 3/4) sandy loam topsoil, 0–20% clay. Agricultural potential – Moderate.



Image 18: Sample S18 – TSF Construction Laydown Area: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark brown (7.5YR 3/2) silty clay topsoil, 40–60% clay. Agricultural potential – Moderate.



Image 19: Sample S19 – TSF Construction Laydown Area: Hutton form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); yellowish red (5YR 4/6) sandy clay loam topsoil, 20–35% clay. Agricultural potential – Moderate.



Image 20: Sample S20 – Piping Construction laydown area: Avalon form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); dark yellowish brown (10YR 4/4) silty clay topsoil, 40–60% clay, with scattered ferruginous concretions. Agricultural potential – Moderate.



Image 21: Sample S21 – Kusasalethu Plant Construction laydown area: Mispah to Glenrosa form, assigned from the PWV mapped unit (see Section 6.1.2 for the basis of classification); very dark greyish brown (7.5YR 3/2) sandy loam topsoil, 0–20% clay, visibly gritty. Agricultural potential – Very Low to Low.



Image 22: Sample S24 – Kusasalethu Reclamation Option 2 laydown: site surface condition showing the dense lag of angular to sub-angular tabular rock fragments and the sparse dwarf-shrub and bunchgrass cover, with an estimated 40–60% surface rock cover. No auger sample could be recovered. Mispah form with rock outcrop and Glenrosa inclusions (sMs10 / Ms/R). Agricultural potential – Very Low to Negligible.



Table 6: Soil sample description and agricultural potential.

Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
S1	Northern Stockpile area	27-40	7.5YR 2.5/3	Silty clay loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Dark brown (7.5YR 2.5/3) silty clay loam topsoil, 27 to 40% clay, breaking to loose granular crumbs in the hand sample, with no rock fragments present and no auger refusal recorded. The 7.5YR hue places the material in the yellow-brown family. The recorded clay window sits above the sandy clay loam texture given for Av26 and should be checked against a laboratory particle-size determination. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set.
S2	Northern Stockpile area	0-20	10YR 4/3	Sandy loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Brown (10YR 4/3) sandy loam topsoil, 0 to 20% clay, loose and weakly granular in the hand sample, with no rock fragments visible and no auger refusal recorded. The 10YR hue is squarely within the yellow-	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately

[1] Clay percentages are based on the USDA soil texture triangle (https://www.researchgate.net/figure/USDA-Soil-Texture-Triangle_fig2_279631053).



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						brown family. The clay content sits at the light end of the range recorded for Av26; should a test pit find no plinthic horizon beneath the yellow-brown apedal B, the form would be Clovelly, the two being separated on the plinthite alone. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. The sandy topsoil texture at this point further limits water-holding capacity and raises erodibility once cover is removed, so the material should be stripped and re-spread under cover rather than stockpiled in exposed mounds.
S3	Northern Stockpile area	0-20	10YR 4/3	Sandy loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Brown (10YR 4/3) sandy loam topsoil, 0 to 20% clay, loose and weakly granular in the hand sample, with no rock fragments visible and no auger refusal recorded. The 10YR hue is squarely within the yellow-brown family. The clay content sits at the light end of the range recorded for Av26; should a test pit find no plinthic horizon beneath the yellow-brown apedal B, the form would be Clovelly, the two being separated on the plinthite alone. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. The sandy topsoil texture at this point further limits water-holding capacity and raises erodibility once cover is removed, so the material should be



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
							stripped and re-spread under cover rather than stockpiled in exposed mounds.
S4	Deelkraal RWD Pumpstation	0-20	7.5YR 4/4	Sandy loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Brown (7.5YR 4/4) sandy loam topsoil, 0 to 20% clay, friable and weakly granular in the hand sample, with no rock fragments present in the material recovered. The 7.5YR hue places the material in the yellow-brown family. As at S2 and S3, the Clovelly form applies instead should no plinthic horizon be present beneath the yellow-brown apedal B. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set.
S5	Deelkraal II RWD	0-27	5YR3/4	Silt loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Dark reddish brown (5YR 3/4) silt loam topsoil, 0 to 27% clay, fine and structureless in the hand sample. The 5YR hue places the material in the red apedal family and excludes the Avalon and Clovelly forms, both of which require a yellow-brown B horizon. The Dundee form (dDu10, deep stratified alluvium) remains	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						the alternative on the alluvial terrace immediately adjacent to the return water dam, and the boundary between the two units should be taken from the PWV polygons. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock.
S6	Deelkraal II RWD	0-27	5YR3/4	Silt loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Dark reddish brown (5YR 3/4) silt loam topsoil, 0 to 27% clay, fine and structureless in the hand sample. The 5YR hue places the material in the red apedal family and excludes the Avalon and Clovelly forms, both of which require a yellow-brown B horizon. The Dundee form (dDu10, deep stratified alluvium) remains the alternative on the alluvial terrace immediately adjacent to the return water dam, and the boundary between the two units should be taken from the PWV polygons. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock.



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	
S7	Deelkraal II Booster Pumpstation	27-40	7.5YR2.5/2	Silty clay loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Very dark brown (7.5YR 2.5/2) silty clay loam topsoil, 27 to 40% clay, crumbly and root-permeated in the hand sample. The dark value reflects organic-matter accumulation under grassland cover in the orthic A horizon and does not of itself indicate a melanic horizon, which would additionally require strong blocky structure and a high base status; neither was determined. The 7.5YR hue places the material in the yellow-brown family. Note the wetland and drainage-line association at this point: watercourse buffers must be confirmed before any disturbance, and a fluctuating water table in this position is consistent with the formation of the plinthic horizon. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set.
S8	Deelkraal II TSF	-	-	-	Transformed — existing TSF	No sample recovered.	**Agricultural Potential – Very Low to Negligible**



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
					surface, no natural profile (confirmed)		Location is on an existing TSF (Deelkraal I TSF), which exhibits very low to negligible agricultural potential due to the absence of natural soil horizons, plant nutrients, and viable soil structure. The mine residue substrate presents chemical constraints, including potential heavy metal toxicity, elevated salinity, and Acid Mine Drainage (AMD), alongside physical conditions such as compaction and poor water retention. Additionally, ongoing geotechnical management, dust suppression requirements, and safety hazards render both crop cultivation and livestock grazing non-viable.
S9	Deelkraal II Reclamation Construction Laydown Area	27-40	10YR2/2	Silty clay loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Very dark brown (10YR 2/2) silty clay loam topsoil, 27 to 40% clay, with a dense grass root mat through the sample. As at S7, the dark value is the normal organic-matter darkening of an orthic A horizon under grassland and is not a melanic horizon. The 10YR hue is squarely within the yellow-brown family. The recorded clay window sits above the sandy clay loam texture given for Av26 and should be checked against a laboratory determination. The soft plinthic B horizon is taken from the survey and was not exposed at this point;	**<u>Agricultural Potential – Moderate</u>** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. The material is a reasonable rehabilitation medium if



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	stripped at optimum moisture; avoid compaction by construction traffic across the laydown area.
S10	Deelkraal II TSF	40-60	10YR3/3	Silty clay	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Brown (10YR 3/3) silty clay topsoil, 40 to 60% clay, friable and root-permeated in the hand sample. A vertic A horizon is defined on a dark, low-chroma colour together with strong angular blocky or wedge-shaped peds, slickensides and deep cracking on drying; a chroma of 3 is a brown, and none of the structural features were recorded, so the Arcadia form is not supported at this point. The 10YR hue places the material in the yellow-brown family. The recorded clay window is substantially heavier than the sandy clay loam given for Av26 and is the least well reconciled of the Avalon points; a laboratory particle-size determination is recommended here in particular. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. Given the recorded clay content, the trafficability and foundation behaviour of this material should be evaluated by the geotechnical specialist irrespective of the soil form ultimately confirmed.



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
S11	Deelkraal II TSF	40-60	5YR3/4	Silty clay	Shortlands — provisional (mSd11 · red hue, high clay)	Shortlands form (orthic A horizon over a red structured B horizon carrying clay cutans), assigned from the mSd11 unit and the Sd2/R soil-rock complex, both of which the PWV survey maps within the development footprint and both of which it describes as red and structured. Dark reddish brown (5YR 3/4) silty clay topsoil, 40 to 60% clay, breaking to coherent reddish clods in the hand sample. The 5YR hue places the material in the red family and excludes the Avalon form, which requires a yellow-brown B horizon. The distinction between Shortlands and a clayey phase of Hutton is readily made in the field and should be confirmed by test pit: a Hutton B horizon is apedal and crumbles to structureless material, whereas a Shortlands B horizon breaks into blocky peds with shiny clay cutans. Rock is the depth-limiting material for Sd11 at 600 to 1 200 mm.	**Agricultural Potential – Moderate** Sd11 is rated Moderate by the PWV survey on account of moderate leaching, with a moderately deep (600 to 1 200 mm) profile limited by rock. The high clay content and the red, well-drained character are favourable relative to the shallow Glenrosa and Mispah soils elsewhere on site, but do not support a High rating (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource; confirm depth to rock before stripping volumes are set.
S12	Deelkraal II TSF	7-27	5YR3/4	Loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Dark reddish brown (5YR 3/4) loam topsoil, 7 to 27% clay, fine and structureless in the hand sample. The 5YR hue places the	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						material in the red apedal family and excludes the Avalon and Clovelly forms. This point lies within the TSF footprint and close to S8 and S15, both of which returned auger refusal on rock, so the effective depth here should not be assumed to be at the upper end of the Hu26 range. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock.
S13	Southern Stockpile area	0-27	5YR3/4	Silt loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Dark reddish brown (5YR 3/4) silt loam topsoil, 0 to 27% clay, friable and crumbly in the hand sample. The 5YR hue places the material in the red apedal family. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock. Worth salvaging in full given the arable land removed by the southern stockpile footprint.



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
S14	Southern Stockpile area	0-27	5YR3/4	Silt loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Dark reddish brown (5YR 3/4) silt loam topsoil, 0 to 27% clay, friable and crumbly in the hand sample. The 5YR hue places the material in the red apedal family. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock. Worth salvaging in full given the arable land removed by the southern stockpile footprint.
S15	Deelkraal II TSF	-	-	-	No sample recovered (auger refusal on rock)	No sample was recovered at this point. The non-recovery reflects auger refusal on rock rather than an absence of data, and the conditions are those of a shallow soil-rock complex consistent with the sMs10 and Ms/R units. The sample area for this point is to be confirmed against the field sheets.	**Agricultural Potential – Very Low to Negligible** No effective rooting medium and no meaningful topsoil resource at this point (Land Capability Class VII–VIII). Non-arable; natural veld grazing only, at low carrying capacity. The shallow rock contact is also a foundation consideration for infrastructure siting.
S16	Deelkraal II TSF	0-20	10YR3/4	Sandy loam	Avalon — inferred (mAv26	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint.	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
					· yellow-brown hue)	Dark yellowish brown (10YR 3/4) sandy loam topsoil, 0 to 20% clay, granular and friable in the hand sample. The 10YR hue is squarely within the yellow-brown family and the material is visibly yellow-brown in the field photograph. This point and S17 fall within the part of the footprint that the PWV survey maps as mAv26, and the Avalon form is accordingly assigned here rather than the Glenrosa form, which would require a lithocutanic B horizon over weathering rock that was neither observed nor mapped at this position. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. The favourable, easily handled texture makes this a useful topsoil dressing for rehabilitation.
S17	Deelkraal II TSF	0-20	10YR3/4	Sandy loam	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Dark yellowish brown (10YR 3/4) sandy loam topsoil, 0 to 20% clay, granular and friable in the hand sample. The 10YR hue is squarely within the yellow-brown family and the material is visibly yellow-brown in the field photograph. This point and S17 fall within the part of the footprint that the PWV survey maps as mAv26, and the Avalon form is accordingly assigned here rather than the Glenrosa form, which	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						would require a lithocutanic B horizon over weathering rock that was neither observed nor mapped at this position. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	to plinthite by test pit before stripping volumes are set. The favourable, easily handled texture makes this a useful topsoil dressing for rehabilitation.
S18	TSF Construction Laydown Area	40-60	7.5YR3/2	Silty clay	Avalon — inferred (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Dark brown (7.5YR 3/2) silty clay topsoil, 40 to 60% clay, friable and root-permeated in the hand sample. As at S10, the recorded colour does not meet the dark, low-chroma requirement of a vertic A horizon and none of the diagnostic structural features of that horizon were recorded, so the Arcadia form is not supported. The 7.5YR hue places the material in the yellow-brown family. The recorded clay window is heavier than the sandy clay loam given for Av26 and warrants a laboratory particle-size determination. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	**<u>Agricultural Potential – Moderate</u>** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth to plinthite by test pit before stripping volumes are set. Given the recorded clay content and the position of this point within a construction laydown area, bearing capacity and compaction risk should be evaluated by the geotechnical specialist; compaction damage to a clayey topsoil is difficult to reverse.



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
S19	TSF Construction Laydown Area	20-35	5YR4/6	Sand clay loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint. Yellowish red (5YR 4/6) sandy clay loam topsoil, 20 to 35% clay, crumbly and root-permeated in the hand sample. The 5YR hue places the material in the red apedal family. The texture and clay window correspond closely to the sandy clay loam recorded for Hu26. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	**Agricultural Potential – Moderate** Hu26 is rated Moderate by the PWV survey on account of moderate leaching, with rock as the depth-limiting material at a variable depth (class x, 300 to 1 200 mm, recorded by the survey as not separable at that scale). Good structure and infiltration in the freely drained red apedal material are favourable, but the effective depth has not been confirmed at this point and should not be assumed deep (Land Capability Class III–IV, provisional). Retain as a topsoil salvage resource pending field confirmation of depth to rock. Retain as a priority topsoil resource pending field confirmation of depth.
S20	Piping Construction laydown area	40-60	10YR4/4	Silty clay	Avalon — provisional (mAv26 · yellow-brown hue)	Avalon form (orthic A horizon over a yellow-brown apedal B horizon over soft plinthite), assigned from the mAv26 unit mapped over this part of the footprint. Dark yellowish brown (10YR 4/4) silty clay topsoil, 40 to 60% clay, massive in the hand sample and carrying scattered dark, hard, rounded concretions through the material. The 10YR hue places the material in the yellow-brown family. The concretions visible in the field photograph are consistent with the ferruginous nodules associated with a plinthic horizon and, if confirmed, would be the only direct field evidence of plinthite recorded during the	**Agricultural Potential – Moderate** Av26 is rated Moderate by the PWV survey on account of moderate leaching, with soft plinthite as the depth-limiting material at 600 to 1 200 mm. The plinthic horizon perches a seasonal water table and restricts effective rooting depth and internal drainage below it, which precludes a High rating, but the profile is moderately deep and the topsoil is a genuine salvage resource (Land Capability Class III–IV, provisional). Strip topsoil to the top of the plinthic horizon and keep plinthic material out of topsoil stockpiles; confirm the depth



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						survey; they should be examined and described at this point as a priority. A pedocutanic B horizon over saprolite, which the Swartland form requires, was neither observed nor mapped at this position. The recorded clay window is heavier than the sandy clay loam given for Av26 and warrants a laboratory determination. The soft plinthic B horizon is taken from the survey and was not exposed at this point; the effective depth is expected to fall within the 600 to 1 200 mm range recorded for Av26 and requires confirmation by test pit.	to plinthite by test pit before stripping volumes are set. Should gleying or a G horizon be confirmed at this point, which its position on the piping corridor makes possible, the rating should be reduced to Low and the point treated as a wetland indicator.
S21	Kusasalethu Plant Construction laydown area	0-20	7.5YR3/2	Sandy loam	Mispah to Glenrosa — provisional (sMs10 / Ms/R · shallow, gritty)	Mispah form grading to Glenrosa (orthic A horizon directly on hard rock, or over a lithocutanic B horizon), assigned from the sMs10 unit and the Ms/R soil-rock complex. Very dark greyish brown (7.5YR 3/2) sandy loam topsoil, 0 to 20% clay, loose and visibly gritty in the hand sample with abundant coarse fragments. Although the hue falls within the yellow-brown family, the material is shallow and rock-limited, which is inconsistent with the moderately deep Av26 unit and consistent with the shallow, rocky units the survey maps in this position.	**<u>Agricultural Potential – Very Low to Low</u>** Severely restricted effective rooting depth, droughtiness, low nutrient status and high post-disturbance erodibility (Land Capability Class VII). Non-arable; natural veld grazing only. Topsoil volume is minimal; strip to refusal and blend with better material if used in rehabilitation.
S22	Kusasalethu Reclamat	0-20	5YR3/3	Sandy loam	Hutton — inferred (xHu26 · red hue)	Hutton form (orthic A horizon over a red apedal B horizon), assigned from the xHu26 unit mapped over this part of the footprint.	**<u>Agricultural Potential – Moderate</u>** Hu26 is rated Moderate by the PWV survey. Easily worked and well drained, but



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
	ion Option 1 laydown					Dark reddish brown (5YR 3/3) sandy loam topsoil, 0 to 20% clay, loose and easily worked. The 5YR hue places the material in the red apedal family. The sandy phase grades to the Glenrosa form where the profile becomes shallow over weathering rock, and the position of the boundary should be taken from the PWV polygons. Rock is the depth-limiting material for Hu26 at a variable depth of 300 to 1 200 mm; the depth to rock was not established at this point and requires confirmation by test pit. Should a soft plinthic horizon be found beneath the red apedal B, the form would be Bainsvlei rather than Hutton.	limited by low water-holding capacity, low cation exchange capacity, susceptibility to acidification and high leaching losses (Land Capability Class III–IV). Useful, easily handled topsoil for rehabilitation; confirm depth to rock before stripping volumes are set.
S23	Kusasalethu Reclamation Option 2 laydown	-	-	-	No sample recovered (auger refusal on rock)	NO SAMPLE RECOVERED - no clay, colour or texture data returned for this point in the Kusasalethu Reclamation Option 2 laydown area. Non-recovery most probably reflects a Mispah form (orthic A on hard rock), rock outcrop, or ground already transformed by historical mining activity.	**Agricultural Potential – Very Low to Negligible** No viable rooting medium and no meaningful topsoil resource (Land Capability Class VII-VIII) and non-arable..
S24	Kusasalethu Reclamation Option 2 laydown	-	-	-	Mispah — provisional (sMs10 / Ms/R · surface rock outcrop)	MISPAH FORM (orthic A directly on hard rock), with rock outcrop and Glenrosa inclusions - confirmed by field photograph (28 May 2026) rather than by auger sample. No sample could be recovered because the site consists of a thin, discontinuous veneer of reddish-brown fine earth over a dense lag of angular to	**Agricultural Potential – Very Low to Negligible** No effective rooting medium, negligible water-holding capacity and no meaningful topsoil resource (Land Capability Class VII-VIII). Non-arable; natural veld grazing only, at low carrying capacity. Not suitable as a topsoil borrow area, rehabilitation of this



Sample nr	Sample Area	Clay %[1]	Colour (Munsell)	Texture	Soil form, status (basis)	Description	Agricultural Potential
						sub-angular tabular rock fragments and pebbles, with an estimated 40-60% surface rock cover (locally higher) and effective soil depth below that required for augering. Clast lithology (tabular, reddish to orange-brown) is consistent with ferruginised quartzite and shale float, with weathered diabase/andesite clasts, derived from the Pretoria Group quartzite, shale and slate with diabase sills and Hekpoort lava that underlie the dominant Fb15 land type. The red hue of the fine-earth fraction indicates free drainage and iron oxide accumulation within the limited pockets of residual material - i.e. Hutton-like material occurs only as shallow pockets too thin to classify as such. Vegetation is a sparse, open dwarf-shrub and bunchgrass community with bare, crusted inter-tuft areas, woody encroachment (Searsia-type shrubs) and an active termite mound, all consistent with shallow, droughty, nutrient-poor lithosols; the pedestalled gravel lag indicates active sheet wash and surface erosion. This is a classic Fb15 land type soil-rock complex, matching the desktop expectation that Glenrosa/Mispah complexes dominate ~38% of the study area.	footprint should target re-establishment of the rocky grassland cover rather than soil replacement. The shallow rock contact is also a foundation consideration for infrastructure siting.



6.1.2.3 OBSERVED SOIL FORMS AND INDICATIVE PARENT MATERIAL

The bedrock of the study area is mapped on the 1:250 000 West Rand 2626 (1986) geological sheet as the Rooihoogte, Timeball Hill and Hekpoort Formations of the Pretoria Group, cut by later diabase sills and dykes, and the ARC land type inventory describes the parent material of Fb15 in the same terms. For the purposes of a soil assessment the material point is that this succession contains two chemically contrasting classes of parent material. The Rooihoogte and Timeball Hill Formations are siliciclastic sedimentary rocks dominated by quartz, kaolinitic clay minerals and iron oxides, which are acidic, quartz-rich and inherently poor in exchangeable bases. The Hekpoort Formation and the diabase intrusions are basic, or mafic, igneous rocks rich in calcium- and magnesium-bearing plagioclase feldspar and pyroxene, which weather to base-rich clays dominated by smectite. The interleaving of the two suites across the footprint is the principal reason for the heterogeneity of soil form, texture and colour recorded during the field verification survey, and it is also the reason no observation point returned a profile of High agricultural potential. The soils formed on the siliciclastic rocks may be deep and freely drained, but they are acidic, leached and of low base status; the soils formed on the Hekpoort lava and the diabase are chemically fertile, but they are shallow, clayey, physically difficult to manage and frequently interrupted by rock outcrop. Neither combination of properties satisfies the requirements of a high-potential arable soil, and the shallow Glenrosa and Mispah complexes and rock outcrop that occupy 57.3% of land type Fb15 occur on both.

The soil forms recorded at the twenty-four observation points described above are set out in Table 7 below, together with the parent material that each indicates. Soil morphology is a reliable indicator of parent material at this scale. Melanic and vertic A horizons, red structured B horizons carrying clay cutans and pedocutanic B horizons develop only on base-rich, smectitic weathering products, and therefore indicate the Hekpoort lava or the diabase intrusions. Orthic A horizons over lithocutanic, apedal or plinthic B horizons, with lower clay contents and a leached, low base status, indicate the shale, claystone and quartzitic sandstone of the Timeball Hill and Rooihoogte Formations. Where the profile is shallow and rock-limited the two suites converge on the Glenrosa and Mispah forms, and the parent material is then inferred from clast lithology and from the colour and clay content of the fine-earth fraction.

Table 7: Observed soil forms and indicative parent material at each soil observation point.

Sample nr	Classified soil form	Indicative parent material
S1	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S2	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S3	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S4	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes



S5	Hutton (orthic A over red apedal B); Dundee on the adjacent alluvial terrace	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S6	Hutton (orthic A over red apedal B); Dundee on the adjacent alluvial terrace	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S7	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S8	No sample recovered (auger refusal on rock)	Rock at or near the surface; parent material indeterminate
S9	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S10	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S11	Shortlands (orthic A over red structured B with clay cutans)	Hekpoort lava / diabase (basic igneous)
S12	Hutton (orthic A over red apedal B)	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S13	Hutton (orthic A over red apedal B)	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S14	Hutton (orthic A over red apedal B)	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S15	No sample recovered (auger refusal on rock)	Rock at or near the surface; parent material indeterminate
S16	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S17	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S18	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes

S19	Hutton (orthic A over red apedal B)	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S20	Avalon (orthic A over yellow-brown apedal B over soft plinthite)	Ferruginous Timeball Hill / Rooihoogte siliciclastics; iron segregated into soft plinthite by a seasonally fluctuating water table on the lower slopes
S21	Mispah to Glenrosa (orthic A on hard rock / over lithocutanic B)	Timeball Hill / Rooihoogte siliciclastics (shale, siltstone, quartzitic sandstone)
S22	Hutton (orthic A over red apedal B), sandy phase	Colluvium derived from the ferruginous Timeball Hill / Rooihoogte siliciclastics
S23	No sample recovered (auger refusal / transformed ground)	Rock outcrop, or ground transformed by historical mining activity
S24	Mispah with rock outcrop and Glenrosa inclusions	Ferruginised quartzite and shale float with weathered diabase and andesite clasts

The soil forms recorded at the observation points follow the terrain sequence described in Section 6.1. The Avalon profiles at S1, S2, S3, S4, S7, S9, S10, S16, S17, S18 and S20 occupy the midslope and lower-slope positions on which the 1:50 000 survey maps the mAv26 unit, and their yellow-brown topsoil is consistent with the yellow-brown apedal B horizon of that form; the soft plinthic horizon beneath it is the product of iron released by weathering of the ferruginous mudstones of the Rooihoogte Formation and the banded iron formation and iron-rich sandstone horizons of the Timeball Hill Formation, segregated by a seasonally fluctuating water table in these positions. The Hutton profiles at S5, S6, S12, S13, S14, S19 and S22 are consistent with freely drained colluvium derived from the same ferruginous siliciclastic rocks, on the midslope positions the survey maps as xHu26, and the red structured profile at S11 with the more basic parent material of the mSd11 unit. The shallow, rock-limited profiles at S21 and S24, and the auger refusals at S8, S15 and S23, are the normal expression of the shallow soil-rock complexes on and immediately below the resistant quartzite, ferruginous sandstone and diabase outcrops that form the Gatsrand ridges.

The profile at S11 carries a clay content of 40 to 60% beneath a dark reddish brown (5YR 3/4) surface. A Hutton B horizon is by definition apedal, and an apedal B horizon is not readily maintained at that clay content; a red B horizon of that clay content developed on basic parent material is characteristic of a red structured B horizon with clay cutans, and the coherent, blocky clods recovered at this point are consistent with one. The profile is accordingly classified, provisionally, as a Shortlands form, with a clayey phase of the Hutton form as the less probable alternative. This is supported by the ARC PWV soil survey, which maps the Shortlands series Sd11 and the Sd2/R soil-rock complex within the development footprint. The distinction is readily confirmed in the field: a Hutton B horizon crumbles to structureless material, whereas a Shortlands B horizon breaks into blocky peds with shiny clay cutans.

The profile at S20 occupies a footslope on the piping corridor and returned a dark yellowish brown (10YR 4/4) silty clay topsoil at 40 to 60% clay, carrying scattered dark, hard, rounded concretions through the material. The Swartland form requires a pedocutanic B horizon over saprolite and the Valsrivier form a pedocutanic B over unconsolidated material; neither horizon was exposed at this point, and the 1:50 000 survey maps no pedocutanic unit within the footprint. The point is therefore classified as the Avalon form on the mAv26 mapping, consistent with its yellow-brown hue and its footslope position. The concretions recorded in the hand sample and visible in Image 20 are consistent with the ferruginous nodules associated with a plinthic horizon and are the only material of that description noted anywhere in the survey; they should be examined, described and depth-referenced as a priority during the pre-construction topsoil survey, since confirmation at this point would place the Avalon attribution across the footprint on direct field evidence. Should gleying or a G horizon be found instead, the point is a wetland indicator and the rating falls to Low.



The profiles at S10 and S18 returned clay contents of 40 to 60% beneath brown (10YR 3/3) and dark brown (7.5YR 3/2) surfaces respectively. A vertic A horizon, which the Arcadia form requires, is defined on a dark, low-chroma colour together with strong angular blocky or wedge-shaped peds, slickensides and deep cracking on drying; neither recorded colour meets that requirement, none of the structural features was recorded at either point, and both hand samples were friable and root-permeated rather than strongly swelling. Both hues fall within the yellow-brown family and both points lie within the area the 1:50 000 survey maps as mAv26, and they are classified as Avalon forms on that basis. The recorded clay windows are nonetheless substantially heavier than the sandy clay loam given for Av26, and these two points, together with S20, should carry a laboratory particle-size determination in the pre-construction survey to establish whether the field texture assessment over-estimated the clay fraction or whether a different unit is present.

No sample was recovered at S8, S15, S23 and S24. In each case the non-recovery reflects auger refusal on rock rather than an absence of data, and the conditions are those of a shallow soil-rock complex. At S24 the surface was recorded photographically and comprises a thin, discontinuous veneer of reddish-brown fine earth over a dense lag of angular to sub-angular tabular rock fragments, with an estimated 40 to 60% surface rock cover. The clast lithology at that point, ferruginised quartzite and shale float together with weathered diabase and andesite clasts, records the presence of both parent-material suites within a single locality.

The reconciliation of the mapped soil pattern with the field record requires particular comment. The 1:50 000 ARC PWV soil survey maps the Avalon series mAv26 as the single largest soil unit within the development footprint, at 244.50 ha or approximately 38% of its area, and Section 9 accordingly attributes the greater part of the Moderate sensitivity class to it. Eleven observation points returned a yellow-brown topsoil consistent with that unit and are classified as the Avalon form. The Avalon form is distinguished from the Clovelly form, and both from the Hutton form, only by the horizons beneath the orthic A: a soft plinthic horizon beneath the yellow-brown apedal B in the case of Avalon, none in the case of Clovelly, and a red rather than a yellow-brown apedal B in the case of Hutton. The soft plinthic horizon was not exposed at any observation point, and the Avalon classification is therefore inferred from the mapping rather than confirmed. Where no plinthic horizon is present beneath the yellow-brown apedal B the Clovelly form applies, and where a plinthic horizon lies beneath a red apedal B the Bainsvlei form applies.

There is a geological basis for expecting plinthite in these positions. The ferruginous mudstones of the Rooihoogte Formation and the banded iron formation and iron-rich sandstone horizons of the Timeball Hill Formation provide an abundant source of iron, and soft plinthite forms where that iron is segregated by a seasonally fluctuating water table, conditions that are met on the lower slopes within the footprint. The Avalon classification is therefore consistent with the geology, with the terrain sequence described in Section 6.1 and with the concretions recorded at S20, but it remains to be confirmed. It is recommended that the presence and depth of the plinthic horizon be verified by test pit at the Avalon points during the pre-construction topsoil survey, since both materially affect the effective rooting depth and the depth to which topsoil can usefully be salvaged.

A difference in scale between the two desktop sources should also be noted. The ARC land type inventory records the Avalon series at 0.84% of land type Fb15, whereas the PWV survey maps it at approximately 38% of the development footprint. The two figures are not directly comparable: the land type inventory is a 1:250 000 generalisation across the whole of Fb15, which extends well beyond the footprint and includes extensive areas of crest and upper slope on which plinthite would not be expected, whereas the PWV survey maps at 1:50 000 within the footprint itself, which is weighted towards the lower slopes on which it would. Where the two differ, the finer survey is the more reliable indicator at the scale of this assessment, as recorded in Section 5.2.

6.1.3 AGRICULTURAL POTENTIAL

A significant portion of the project area comprises mine dumps, excavations and slimes dams; consequently, these anthropogenic features are excluded from the agricultural potential assessment. Across land type Fb15 as a whole, lithosols of the Glenrosa and Mispah forms are dominant (Section 6.1.1); within the development footprint the PWV survey maps shallow soils and soil-rock complexes of this kind over 120.52 ha, against 268.44 ha of Moderate-potential soils. The Glenrosa form is characterised by an orthic A horizon overlying a lithocutanic B horizon on hard rock, while the Mispah form consists of an orthic A horizon directly underlain by rock; because



of their effective depth, the agricultural potential of these soils is Low to Very Low. The soil series mapped as being of moderate agricultural potential are the Dundee (Du10), Avalon (Av26), Shortlands (Sd11) and Hutton (Hu26) forms (Land Type Survey Staff, 1972 – 2006). Of these, the Avalon, Hutton and Shortlands forms are recorded at the observation points (Table 6), and the Dundee form only as a possible alternative on the alluvial terrace adjacent to S5 and S6. Table 8 summarises the desktop description of these four series and their rated agricultural potential. Agricultural potential at each observation point and for each mapped unit has been assigned using the classification matrix in Table 3 (Section 4.3); refer to Table 6 for the class assigned at each of the twenty-four observation points.

The baseline agricultural potential across the site spans from Moderate to Very Low and Negligible, driven primarily by variable effective soil depth, physical clay constraints, and historical mining infrastructure. Soil units of Moderate agricultural potential are the Avalon, Hutton and Shortlands forms, with the Dundee form on the alluvial terraces. They are precluded from a High rating by moderate leaching and by effective depth: 600 to 1 200 mm to soft plinthite in the Avalon series, 600 to 1 200 mm to rock in the Shortlands series, and a variable 300 to 1 200 mm to rock in the Hutton series (PWV depth class x). Because effective depth was not measured at these observation points, the Moderate class assigned to them is provisional in the sense defined in Section 4.3: a point falls to Low if the depth confirmed by test pit lies in the 300 to 600 mm class. Despite these depth restrictions, these Moderate potential profiles represent the primary topsoil salvage resource on site, requiring site-level confirmation of depth prior to stripping and careful management during construction to avoid compaction from heavy machinery.

Areas of Low agricultural potential are those in which effective rooting depth is limited to 300 to 600 mm or rock outcrop occupies 10 to 40% of the surface; within the footprint this is principally the shallow sMs10 unit. Such soils are marginal for dryland cropping and are best retained as natural pasture, though their upper horizons remain useful as topsoil dressing during site closure. The soil-rock complexes (Hu4/R, Ms/R and Sd2/R), in which rock outcrop exceeds 40%, and the shallow Glenrosa and Mispah forms on and immediately below the ridges fall in the Very Low class of Table 3, although the PWV survey rates the complexes Low; both classes convert to Low sensitivity (Section 9). These soils are severely limited by droughtiness, nutrient poverty and high post-disturbance erodibility. Being non-arable and restricted to low-carrying-capacity veld grazing, any topsoil salvage in these areas requires stripping the complete profile down to bedrock to maximise recovery of the thin organic fraction and seed bank.

The lowest agricultural potential class, Very Low to Negligible, applies to exposed bedrock outcrops and the engineered Deelkraal I Tailings Storage Facility (TSF). The TSF substrate completely lacks natural soil horizons and presents severe chemical risks, including Acid Mine Drainage, elevated salinity, and heavy metal toxicity, alongside extreme compaction and active geotechnical management requirements. Consequently, the TSF footprint is entirely non-viable for agricultural production or grazing and offers no salvageable topsoil. Across the broader development footprint, environmental management must account for geotechnical foundation risks associated with high-clay soils, ensure strict adherence to watercourse buffers near drainage lines, and prioritise the stripping and stockpiling of all viable topsoil to offset the permanent loss of agricultural land.

Table 8: Summary of the moderate-potential soil series mapped by the ARC PWV soil survey and their rated agricultural potential.

Series	Colour and structure	Texture	Depth limiting material	Depth	Agricultural potential	Remarks
Du10	Brown, structureless	Loamy sand/ Sandy clay loam	-	>1 200 mm	Moderate	Alluvial, usually deep

Series	Colour and structure	Texture	Depth limiting material	Depth	Agricultural potential	Remarks
Av26	Yellow-brown, structureless	Sandy clay loam	Soft plinthite	600 - 1 200 mm	Moderate	Moderately leached
Sd11	Red, structured	Sandy clay/Clay	Rock	600 - 1 200 mm	Moderate	Moderately leached
Hu26	Red, structureless	Sandy clay loam	Rock	300 - 1 200 mm	Moderate	Moderately leached

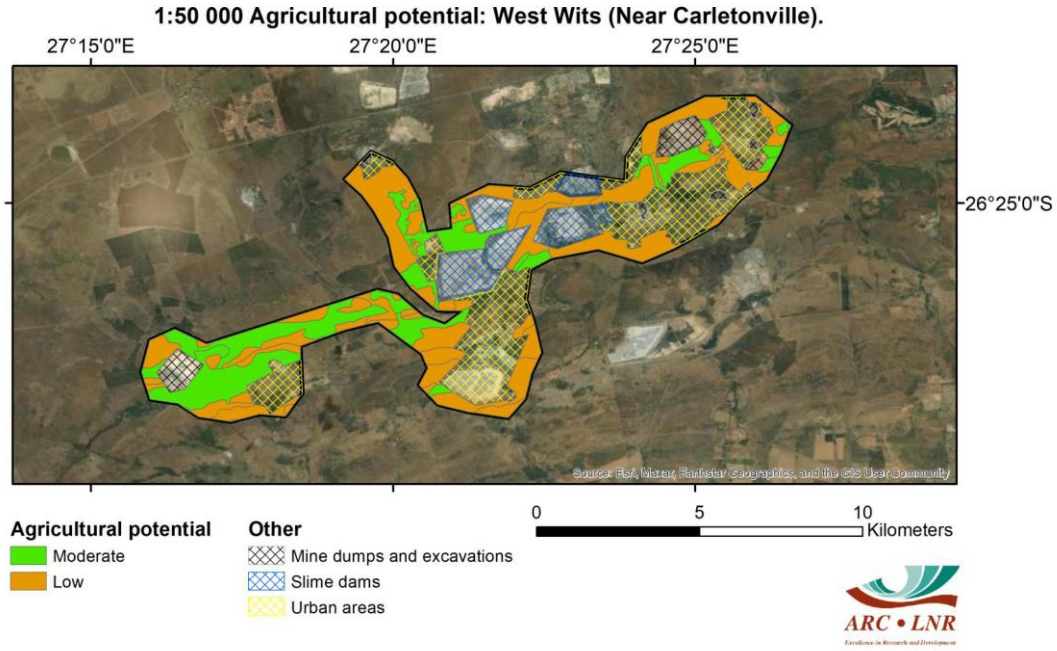


Figure 10: Agriculture Potential map of study area (Land Type Survey Staff, 1972 – 2006).

Agricultural activities observed during the site assessment consist primarily of informal farming within local settlements. On-site consultations with residents confirmed the presence of livestock, specifically cattle, pigs, and goats, with cattle and goats grazing freely across adjacent farmlands. Crop cultivation is predominantly localised within residential plots in informal settlements, serving primarily as subsistence farming to sustain the immediate community.



Image 23: Pig livestock observed on-site.





Image 24: Cattle livestock observed on-site.



Image 25: Goat livestock observed on-site.

6.2 CLIMATE

The study area near Carletonville is classified as a Cwb climate under the Köppen-Geiger classification system (Peel, Finlayson, & McMahon, 2007), indicating a temperate climate with a Dry Winter. This classification is based on specific temperature and precipitation thresholds. The thermal regime requires the average temperature of the coldest month to exceed 0˚C, with all months averaging below 22˚C, while maintaining at least four months with an average temperature above 10˚C (Peel, Finlayson, & McMahon, 2007).

The climate is a typical Southern African Highveld climate with warm to hot summers and warm sunny winter days with frosty nights. Rainfall occurs predominantly during the summer months because of thunderstorm activity. The mean annual precipitation ranges from 565 mm to 697 mm per annum depending on the location of the weather station. Rainfall data was obtained from several sources, including mine data and data from the South African Weather Service (Consulting, 2025).

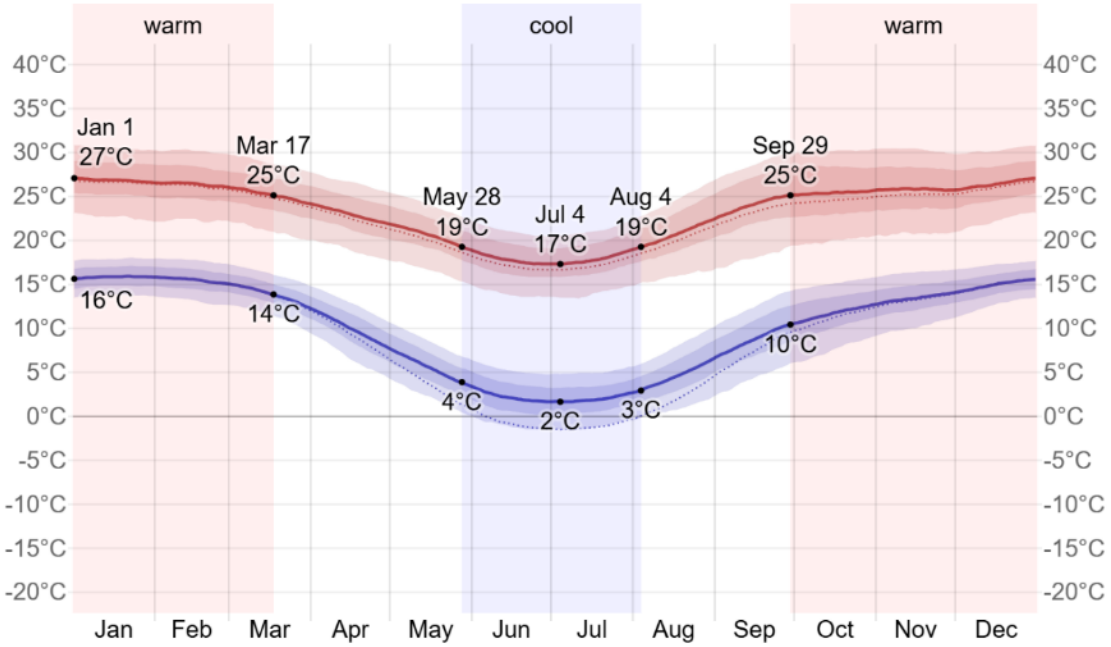


Figure 11: Average high and low temperature in Carletonville (Weather Spark, 2025).

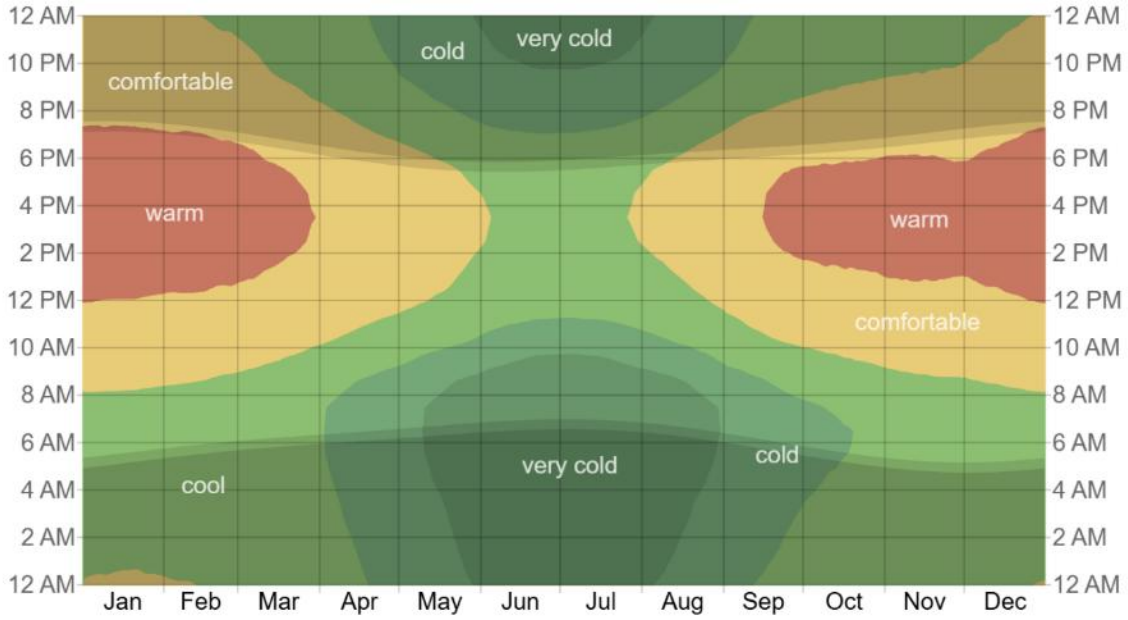


Figure 12: Average Hourly Temperature in Carletonville (Weather Spark, 2025).

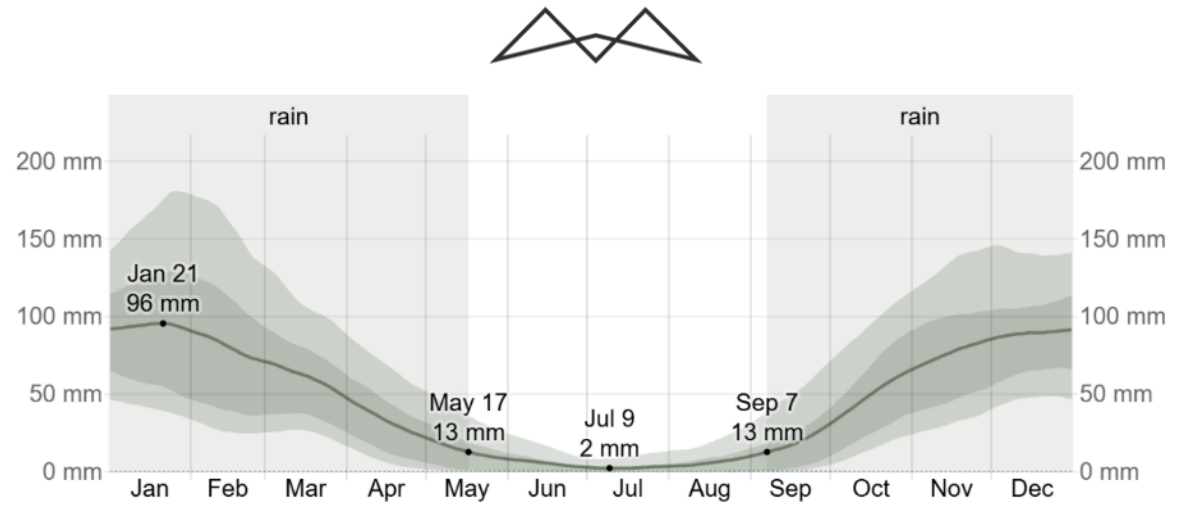


Figure 13: Average Monthly Rainfall in Carletonville (Weather Spark, 2025).

6.3 VEGETATION

The project area is situated within the Gassland biome (Rutherford, Mucina, & Powrie, 2006), on the interfaces of the Dry Highveld Grassland Bioregion, Central Bushveld Bioregion and the Mesic Highveld Grassland Bioregion. The vegetation types within the project area are, respectively with the bioregions, Carletonville Dolomite Grassland (CDG), Gauteng Shale Mountain Bushveld (GSMB) and the Rand Highveld Grassland (RHG).

Carletonville Dolomite Grassland is found on slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species, such as *Aristida congesta*, *Brachiaria serrata*, *ragrostis chloromelas* and *Alloteropsis semialata*. The soils are mostly from the Dolerite and chert of the Malmani Subgroup, which support mostly shallow Mispah and Glenrosa soil forms (SANBI, 2025).

The Gauteng Shale Mountain Bushveld (GSMB) occurs on low, broken ridges varying in steepness and with high surface rock cover. Vegetation is a short (3–6 m tall), semi-open thicket dominated by a variety of woody species including *Acacia caffra*, *Rhus leptodictya*, *R. magalismontana, Cussonia spicata, Ehretia rigida, Maytenus heterophylla, Euclea crispa, Zanthoxylum capense, Dombeya rotundifolia, Protea caffra, Celtis africana, Ziziphus mucronata, Vangueria infausta, Canthium gilfillanii, Englerophytum magalismontanum, Combretum molle, Ancylobotrys capensis, Olea europaea subsp. africana* and *Grewia occidentalis*. The understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover (SANBI, 2025).

The Rand Highveld Grassland is highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the *Asteraceae*, is also a typical feature. Rocky hills and ridges carry sparse (*savannoid*) woodlands with *Protea caffra subsp. caffra, P. welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the *genus Rhus* (especially *R. magalismonata*) is most prominent (SANBI, 2025).

A study has determined that the grassland communities differ significantly in the soil fertility components, namely soil organic carbon, total nitrogen, phosphorus, potassium, sodium, calcium and magnesium content. All the components of soil fertility were significantly higher in CDG than in RHG, except pH that was similar at both grassland communities (CDG and RHG). Soil sodium content was the same at all slope positions in CDG and significantly higher than similar slopes in RHG. A potential indicator for fertile soil would be the presence of CDG vegetation (Pule, Tjelele, & Tedder, 2018).

The CDG and RHG, which are the dominant vegetation types on the plains, will foster the development of deep A-horizons rich in organic matter. Grasses have dense, fibrous root systems that die back and regenerate annually. This process introduces organic matter (biomass) deep into the soil profile, creating a continuous

source of stable humus and driving the formation of a dark, fertile A-horizon. Grasslands generally act as efficient nutrient pumps, drawing mobile nutrients from the subsoil and depositing them on the surface.

The study indicating significantly higher soil organic carbon, total nitrogen, phosphorus, and potassium in the CDG compared to the RHG directly reflects the effectiveness of the local grass species and the underlying dolomite/chert parent material interaction. The CDG vegetation is thus a strong indicator of more fertile, nutrient-rich soils in its immediate vicinity.

The GSMB and the shrublands on the rocky outcrops of the RHG introduce woody species to the area (e.g., *Acacia caffra*, *Rhus, Protea caffra*). Deciduous woody litter (leaves and woody material) typically decomposes more slowly than grass roots and can influence soil pH. Specifically, certain woody species can promote increased localized leaching and lower pH in the topsoil compared to pure grassland. The larger, deeper, and stronger root systems of the woody species enhance physical weathering by widening cracks and fissures in the hard underlying bedrock (shale and chert), facilitating the disintegration of the parent material and creating space for deeper soil penetration. The canopy cover in the GFSMB affects the soil's microclimate, reducing direct sun exposure and limiting evaporation, which can lead to higher average soil moisture than in the open grassland.

The presence of species like *Acacia caffra* in the GSMB and RHG is particularly significant. As a legume, Acacia hosts nitrogen-fixing bacteria, which directly convert atmospheric nitrogen (N_2) into plant-available forms. This process locally enriches the soil's total nitrogen content, counteracting the natural depletion caused by the high leaching characteristic of the Cwb climate's wet summer season.

In summary, the various vegetation in Carletonville ensure that soil fertility and profile depth vary substantially over short distances. The grassland communities (especially CDG) will establish the most organically rich and nutrient-concentrated A-horizons, while the shrublands and woodlands will enhance physical weathering and provide pockets of localised nitrogen enrichment, all contributing to the overall heterogeneity of soil characteristics in the project area.

6.4 HYDROLOGICAL REGIME

The study area lies within the upper C23 catchment and straddles two quaternary catchments. The hydrological setting of the site is illustrated in Figure 14. Although the site is positioned primarily within catchments C23E and C23J, its area of hydrological relevance extends into the adjacent C23G catchment. The nearest watercourses are the Mooirivierloop to the north-east and the Loopspruit to the south. According to the National Geospatial Information (NGI) 1:50 000 topographical dataset, surface water drains from the site towards both rivers through a network of channels and non-perennial watercourses. The dataset indicates numerous non-perennial systems to the north and south of the site, both of which converge to the south-west and ultimately report to the Mooirivier.

The aquatic features of the study area have been delineated in detail by the Wetland Baseline and Impact Assessment prepared for this project (The Biodiversity Company, 2026b). That assessment identified sixteen hydrogeomorphic (HGM) units within its 500 m Project Area of Influence, comprising three channelled valley-bottom wetlands, five unchannelled valley-bottom wetlands and eight hillslope seeps, together with non-perennial drainage features, dams and artificial features. All but three of these units intersect the proposed project site, and the aquatic specialist records that the current Deelkraal II TSF footprint would result in the complete loss of HGM 1, HGM 2 and HGM 4 and the substantial loss of HGM 3, HGM 5 and HGM 6, as well as sections of non-perennial drainage. These are the same valley-bottom and seep positions that, in terms of the catena described above, carry the seasonally saturated and hydromorphic soils of the study area. The buffers recommended by that specialist, being 25 m on wetlands and 15 m on non-perennial drainage features after mitigation, against a GDARDE default of 50 m in rural settings, should be read together with the soil management and no-go requirements set out in Section 10 of this report.

The hydrological regime is material to this assessment because the proposed development will intercept, divert and impound water. The impact pathways that follow from this, namely the waterlogging of soils downslope of impoundments and diversions, salinisation where seepage carries dissolved solutes onto adjacent soil, and the redistribution of erosion where concentrated runoff is discharged onto unprotected ground, are assessed in

Section 8. The linkage between the hydrological regime and the agricultural resource is closest on the lower slopes, where the plinthic Avalon soils that dominate the footprint and the eight hillslope seeps identified by the wetland assessment are expressions of the same seasonally perched water table. The loss of HGM 1, HGM 2 and HGM 4 beneath the TSF, and the interruption of lateral throughflow on these slopes, is therefore also a loss of the seasonally moist soils that carry the better grazing on site; and the wetland and drainage-line buffers recommended by that assessment coincide with the areas in which topsoil stripping and stockpiling require most care.

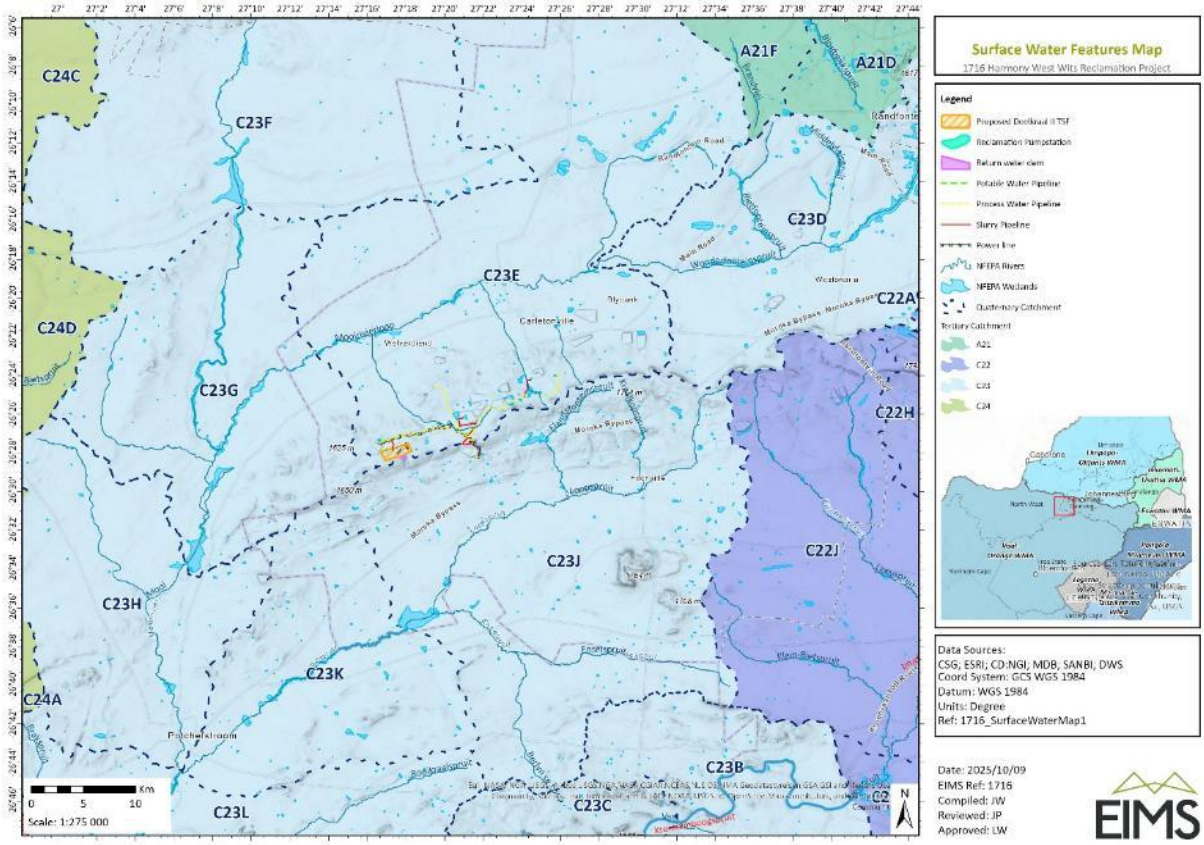


Figure 14: Hydrological regime map.

6.5 CURRENT LAND USE AND PRODUCTIVITY

The project area is situated within an area consisting mainly of mining activities, grazing and naturally occurring dams. Residential areas, waterbodies, wetlands, mines and ridges are also located within and surrounding the study area.

Under Government Notice (GN) 320 of 2020, an agricultural assessment must establish a historical baseline of actual land productivity over the preceding five-year period. This accounts for temporal and environmental variability, including climate shifts, drought cycles, rotational fallow practices, and market fluctuations, to provide a basis for evaluating potential impacts on regional food security and agricultural sustainability.

To comply with standard reporting criteria, baseline productivity is typically expressed in formal, quantitative production units. Cultivation enterprises are quantified by annual crop yields in tons per hectare (t/ha) or total volumetric output. Livestock operations are measured using localized carrying capacities in hectares per Large or Small Stock Unit (ha/LSU or ha/SSU), alongside off-take rates or weaning percentages. Protocol guidelines dictate that these metrics be sourced directly from verified landowner records or, where physical figures are unavailable or confidential, modelled using regional benchmarks from the Agricultural Research Council (ARC) Institute for Soil, Climate and Water based on Land Type, soil fertility, and macro-climate data.

For this site assessment, formal production units could not be determined, and the correct figure is nil. No formal commercial agricultural production has taken place within the proposed project footprint over the preceding five years, and the footprint has supported no permanent or casual agricultural employment over that period. Existing land use is entirely informal, consisting of variable subsistence crop cultivation within residential areas and unconfined livestock keeping (cattle, pigs and goats) across the surrounding veld. Because these activities lack structured commercial records, uniform management practices or fixed production outputs, formal production and employment metrics cannot be applied to them, and no modelled production figure has been substituted for them. The agricultural value of the land is instead indicated against a regional benchmark in the paragraph that follows. The production figures required under paragraph 3.2.4.3 of the protocol and the employment figures required under paragraph 3.2.4.4 are accordingly recorded as nil, and the loss arising from the proposed development is expressed in Section 10 as the extent and quality of land removed from informal use rather than as a quantified production or employment figure.

6.5.1 GAUTENG ENVIRONMENTAL MANAGEMENT FRAMEWORK

The Gauteng Environmental Management Framework (GEMF), administered by the Gauteng Department of Agriculture and Rural Development (GDARD), divides the province into five environmental management zones, each carrying a different level of environmental control depending on its sensitivity and its position relative to the urban edge defined in the Gauteng Spatial Development Framework (GSDF). At the two ends of this system, Zone 1 (Urban Development Zone) and Zone 5 (Industrial and Large Commercial Focus Zone) accommodate consolidated urban, industrial and commercial growth, while Zones 2 and 3 (High Control Zones, inside and outside the urban boundary respectively) apply heightened control to areas of particular environmental sensitivity. Zone 4, the Normal Control Zone, applies to the remaining rural landscape that falls outside the urban edge.

As shown on the GEMF map in Figure 15, the Proposed Deelkraal II TSF and its associated infrastructure are located predominantly within Zone 4, Normal Control Zone. The nearest Zone 1 areas lie several kilometres to the north, around Welverdiend, Oberholzer and Carletonville, and a single Zone 5 node occurs at Westdene, north-east of the site; scattered Zone 2 and Zone 3 High Control pockets elsewhere in the wider study area are generally associated with existing mining infrastructure and sensitive natural features such as rivers and dams. None of these more tightly controlled zones coincide with the project footprint, which sits within the surrounding Zone 4 landscape.

The GEMF's own stated intention for Zone 4 is that "*this zone is dominated by agricultural uses outside the urban development zone as defined in the Gauteng Spatial Development Framework*," and that, in recognition of this, "*no listed activities may be excluded from environmental assessment requirements*" within it. This carries two implications for the project:

- Provincial spatial planning data confirms that the receiving environment remains predominantly agricultural, actively supporting informal livestock grazing, despite localized disturbances from historical waste-rock dumps and tailings infrastructure.
- It confirms that the applicable environmental assessment requirements apply to the project without exemption, consistent with the scope of the current agriculture impact assessment.

This regional planning context reinforces the approach taken in this assessment. Because the project is situated within a zone explicitly recognised as agriculturally dominated rather than urban or industrial, the assessment's focus on agricultural potential, soil resources and grazing land, and its emphasis on rehabilitating disturbed areas to a land use compatible with the surrounding agricultural setting, is consistent with, and directly supported by, the intent of the Gauteng Environmental Management Framework for this part of the province.

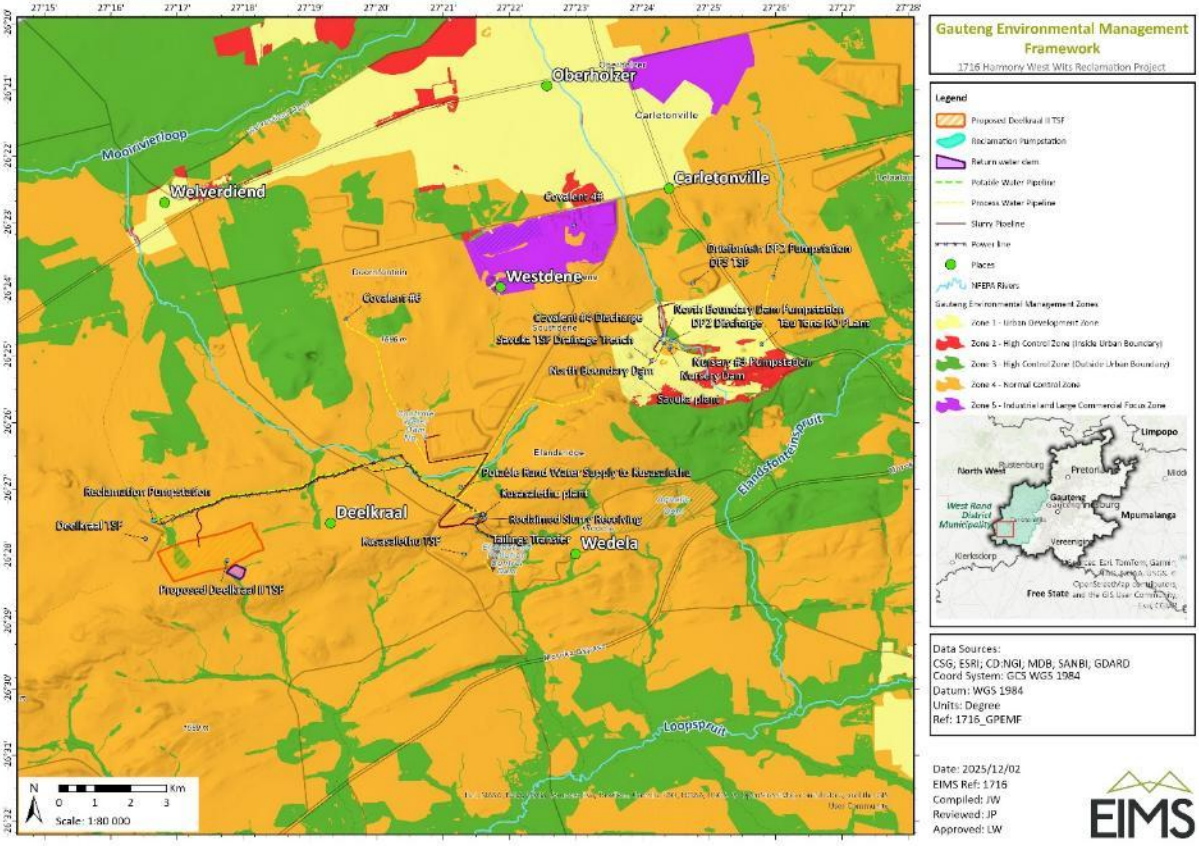


Figure 15: Gauteng Environmental Management Framework.



Figure 16:Unauthorized waste disposal and refuse accumulation within the assessed application area.

7 ALTERNATIVES

The consideration of alternatives is a requirement of Regulation 21 and Appendices 2 and 3 of the EIA Regulations (GNR982), promulgated under the NEMA, 1998 (Act 107 of 1998). Alternatives must be assessed to a level of detail sufficient to allow the competent authority to compare them, and the assessment must include the option of not proceeding with the activity. This section evaluates the identified alternatives from the perspective of soils, land capability and agricultural potential only. Alternatives are assessed against the baseline established in this study, namely that the project areas fall entirely within land type Fb15, in which shallow, rocky Glenrosa and Mispah soil-rock complexes and rock outcrop together account for approximately 57.3% of the land type as a whole, and within whose development footprint 268.44 ha is of Moderate, 120.52 ha of Low and 256.83 ha of Negligible agricultural potential, with no soil of High agricultural potential identified.

7.1 THE NO-GO ALTERNATIVE

The No-Go alternative represents the option of not proceeding with the proposed reclamation project. Under this scenario the proposed Deelkraal II Tailings Storage Facility, the associated construction laydown areas, stockpile areas, pump stations, piping corridors and the Kusasalethu reclamation areas would not be established, and no reclamation of the existing tailings deposits would take place. The No-Go alternative provides the environmental baseline against which the impacts of the proposed development are measured; it does not represent a preferred outcome in itself, but rather the reference condition of the receiving environment should the project not be authorised.

7.1.1 IMPLICATIONS FOR SOILS AND AGRICULTURAL POTENTIAL

From a purely soils and agricultural perspective, the No-Go alternative would avoid all direct project-related impacts on the soil resource. Specifically, the following would be avoided:

The permanent loss of approximately 268.44 ha of land assessed as being of Moderate agricultural potential, comprising Avalon, Hutton and Shortlands soils of the plinthic, red apedal and red structured groups. This constitutes the best agricultural land within the project footprint.

- The loss of a further 120.52 ha of land of Low agricultural potential, associated with the shallow Glenrosa and Mispah soil-rock complexes.
- Physical disturbance of soil structure through stripping, stockpiling and vehicle compaction, together with the associated loss of soil organic matter, microbial activity and seed bank that accompanies prolonged topsoil stockpiling.
- Accelerated erosion arising from the removal of vegetative cover, to which the shallow, structurally weak soils of the Fb15 land type are particularly susceptible once disturbed.
- Contamination risk to soils from hydrocarbon spillage, cement washings and general construction-phase pollution within the laydown and construction areas.

The significance of these avoided impacts must, however, be qualified. The agricultural resource at risk is modest in both extent and quality. The site falls entirely within land type Fb15, which is characterised by an average effective soil depth of 503 mm, with 38.18% of the land type shallower than 300 mm. No soil within the project footprint was assessed as being of High agricultural potential. Furthermore, 256.83 ha of the total 645.79 ha project footprint, some 39.8%, is already transformed and comprises existing tailings storage facilities and mine dumps on which no soil resource remains. The No-Go alternative therefore protects a limited and largely marginal agricultural resource.

The No-Go alternative is not without adverse consequence, and it would be inaccurate to present it as an unambiguously positive outcome for the receiving environment. The proposed project is a reclamation project, the purpose of which is the reprocessing of existing tailings deposits. Should the project not proceed, the following would apply:



- The existing tailings storage facilities and mine dumps would remain in their current unrehabilitated state. The 256.83 ha of transformed land carries no agricultural potential at present and, in the absence of the project, there is no committed mechanism or funding stream by which that land would be rehabilitated or returned to any productive land capability.
- Ongoing wind erosion and dust deposition from the exposed surfaces of the existing facilities would continue to affect soils on adjacent land. Tailings-derived dust deposition can alter the chemical status of receiving soils, and the continuation of this process represents a persistent, if diffuse, impact on surrounding agricultural land.
- Seepage from the existing facilities, and the associated potential for acidification and salinisation of downgradient soils, would continue unabated and unmanaged.
- The opportunity to consolidate historical tailings into a single, engineered and properly closed facility, with a defined rehabilitation and closure liability, would be forgone.

The comparison between the proposed project and the No-Go alternative cannot be decided on area alone, because the land that would be lost and the land that would be rehabilitated differ in quality, in timing and in certainty. Table 9 compares the two on those terms.

Table 9: Comparison of the proposed project and the No-Go alternative from an agricultural-resource perspective.

Criterion	Proposed project	No-Go alternative
Agricultural land lost	388.96 ha permanently removed from agricultural use: 268.44 ha of Moderate and 120.52 ha of Low agricultural potential.	None.
Land capability of the land lost	Moderate potential (land capability Class III–IV, provisional) over 268.44 ha; Low to Very Low (Class V–VII) over 120.52 ha. No High-potential land.	Retained at its present capability.
Existing agricultural use	Informal, unconfined grazing by livestock from adjacent communities, lost over the footprint. No formal cultivation, production or employment.	Informal grazing continues.
Area rehabilitated	256.83 ha of existing tailings and mine-dump footprint reclaimed and rehabilitated. The new TSF landform is not returned to agricultural use.	None. There is no committed mechanism or funding for rehabilitation of the existing facilities.
Expected rehabilitation outcome	A stable, vegetated surface suited to extensive grazing, at a capability expected to be lower than that of the undisturbed Moderate-potential soils lost, since it depends on replaced growth medium over former tailings footprints.	Existing facilities remain unrehabilitated, with no grazing value.
Time to rehabilitation	Progressive, as each dormant facility is reclaimed over the life of the project. Grazing value is not restored on any area until vegetation cover meets the criteria in Table 12, typically several growing seasons after soil replacement.	Not applicable.
Uncertainty and residual risk	The loss is certain and immediate. The rehabilitation benefit is deferred and uncertain: it depends on the availability of suitable growth medium, on implementation, and on verification against the criteria in Table 12. Residual risk of contamination and erosion from the new TSF.	Ongoing, unmanaged dust deposition and seepage from the existing facilities onto adjacent soils. No uncertainty in the loss avoided.

7.1.2 SPECIALIST CONCLUSION ON THE NO-GO ALTERNATIVE

From the perspective of soils and agricultural potential, the No-Go alternative would avoid the certain, permanent loss of approximately 389 ha of soil resource, of which some 268 ha is of Moderate agricultural

potential. This is a genuine, permanent and irreversible impact that the No-Go alternative avoids. Table 9 sets it against the rehabilitation that the project would deliver: the land rehabilitated is smaller in area than the land lost, is expected to attain a lower agricultural capability than the Moderate-potential soils it replaces, and delivers its benefit only after reclamation, soil replacement and revegetation have succeeded. Against this, the No-Go alternative forgoes the rehabilitation of 256.83 ha of already-degraded land and allows the ongoing, unmanaged dust and seepage impacts of the existing facilities to continue indefinitely. On balance, and considered from a soils perspective alone, the No-Go alternative is not considered the environmentally preferable option. This conclusion is conditional: it holds only if the topsoil, stockpile and rehabilitation measures set out in Section 10.1.2 are implemented and are verified against the rehabilitation success criteria in Table 12, and if the management of dust and seepage from the existing facilities proposed by the project is achieved. Should the rehabilitation not be secured through the Environmental Management Programme and the closure financial provision, the benefit on which this conclusion rests would not be realised.

7.2 SITE ALTERNATIVE

7.2.1 KUSASALETHU RECLAMATION LAYDOWN AREA (OPTION 1 VERSUS OPTION 2)

Two siting options are already under consideration for the Kusasalethu reclamation laydown area, and these constitute a site alternative that can be assessed directly against the agricultural baseline. The two options differ in agricultural potential. Option 1 is underlain by a Hutton form soil, sandy phase, of Moderate agricultural potential (provisional; Table 6), whereas Option 2 returned no soil on auger investigation and was confirmed by site inspection to comprise a thin veneer of fine earth over a dense rock lag, consistent with a Mispah form or rock outcrop, and is rated Very Low to Negligible potential (disturbed area).

Option 2 is the preferred alternative from a soils and agricultural potential perspective, as its development would displace a negligible soil resource. Should Option 1 be selected, the mitigation measures set out in this assessment must be implemented.

8 IMPACT ASSESSMENT AND SIGNIFICANCE RATING

The potential impacts on soil and agricultural resources identified during this assessment were evaluated against environmental parameters, including nature, extent, duration, intensity, probability, consequence, and overall significance. Table 10 presents a description of each impact, outlines corresponding mitigation and management measures, and identifies the preferred project alternative. The management and mitigation measures proposed within this report are designed to minimise potential negative impacts or enhance potential benefits and are put forth for inclusion in the Environmental Impact Assessment (EIA) and the Environmental Management Programme (EMPr). The rating methodology is set out in Appendix 4: the consequence of an impact is derived from its extent, duration, magnitude and reversibility, multiplied by its probability to give the environmental risk, and adjusted by a priority factor reflecting cumulative impact and irreplaceable loss of resources to give the final significance. The scores for each impact are given in the impact assessment matrix in Appendix 5, and Table 11 sets out the basis of the rating for the permanent loss of agricultural land.



Table 10: Summary of impacts and mitigation measures.

#	Impact	Phase	Pre-mitigation Risk	Post-mitigation Risk	Final Significance	Description of Impact, Assessment of Cumulative Impact and Preliminary Mitigation
1	Permanent loss of agricultural land use	Operation	High -	High -	High -	**Activity:** Site selection and layout; land clearing, excavation and earthworks; establishment of the TSF, return water dam, roads, pipelines and ancillary infrastructure; and deposition of tailings (permanent land occupation). **Aspect:** Permanent land take and occupation by the TSF and permanent infrastructure; fragmentation of grazing areas. The affected land is of moderate agricultural potential, is not under formal cultivation, and portions are already disturbed by historical waste-rock (dumping) placement. **Impact:** Permanent loss of the affected land to agricultural use, including the informal free-range livestock grazing currently practised by local communities. Because the land is of moderate potential and partly already disturbed, the loss is locally real but of limited regional agricultural value. **Cumulative impact:** The footprint permanently removes land from the local grazing resource; given the moderate potential and pre-existing disturbance, the incremental contribution to regional agricultural-land loss is limited. **Mitigation: Optimise layout to avoid the least-disturbed, better soils and preferentially place infrastructure on already-disturbed/waste-rock areas; minimise footprint; progressive/concurrent rehabilitation; agree a realistic post-closure land use (extensive grazing).**



#	Impact	Phase	Pre-mitigation Risk	Post-mitigation Risk	Final Significance	Description of Impact, Assessment of Cumulative Impact and Preliminary Mitigation
2	Loss or degradation of topsoil resource	Construction	Medium to high -	Low -	Low -	**Activity:** Topsoil stripping, handling and stockpiling during planning and construction. **Aspect:** Inadequate topsoil management; mixing of topsoil and subsoil; stockpile degradation, nutrient loss and weed invasion. Topsoil quality is already limited by the moderate potential and prior disturbance of the site. **Impact:** Loss or degradation of the available topsoil resource required for rehabilitation, reducing the quality of the growth medium for re-establishing post-closure grazing. **Cumulative impact:** Topsoil loss is incremental and largely avoidable through salvage; cumulative significance is low where a topsoil management strategy is applied. **Mitigation: Topsoil management plan; strip and stockpile soil horizons separately; limit stockpile height; seed/vegetate stockpiles with cover crops; re-use salvaged topsoil in rehabilitation.**
3	Reduction in future land capability	Construction	Medium to high -	Medium to low -	Medium to low -	**Activity:** Excavation, earthworks, embankment construction, shaping and levelling. **Aspect:** Disturbance and mixing of soil horizons; burial of natural soils; permanent change to soil profile, permeability and rooting depth in earthworks areas. **Impact:** Localised permanent alteration of natural soil profiles reduces future land capability in earthworks areas; the effect is tempered by the moderate baseline potential and existing disturbance. **Cumulative impact:** Represents a permanent local change to soil capability, with limited regional cumulative effect given the moderate baseline potential. **Mitigation: Minimise cut and fill; stockpile and reinstate horizons separately; document soil profiles; rip and re-profile disturbed areas during rehabilitation.**



#	Impact	Phase	Pre-mitigation Risk	Post-mitigation Risk	Final Significance	Description of Impact, Assessment of Cumulative Impact and Preliminary Mitigation
4	Reduced infiltration, aeration and root penetration in compacted areas	Construction	Medium to high -	Low -	Low -	**Activity:** Movement of construction vehicles and heavy machinery; operational maintenance traffic and access-road use. **Aspect:** Soil compaction, rutting and structural degradation in disturbed, servitude and access areas. **Impact:** Reduced infiltration, aeration and root penetration in compacted areas, temporarily lowering grazing and soil productivity until ripped and rehabilitated. **Cumulative impact:** Compaction is incremental and reversible through ripping; cumulative significance is low. **Mitigation:** Designated haul routes and access roads; low-ground-pressure equipment; confine traffic to demarcated areas; rip compacted soils before rehabilitation.
5	Erosion and sediment loss	Operation	Medium to high -	Medium to low -	Medium to low -	**Activity:** Site clearance and exposure of soils; stormwater and dirty-water management; alteration of natural drainage and runoff patterns. **Aspect:** Exposure of bare soils; concentrated runoff, ponding and erosion; sediment deposition on adjacent land. **Impact:** Erosion and sediment loss from exposed areas and altered drainage can degrade surrounding soils and downslope grazing land if left uncontrolled. **Cumulative impact:** Erosion and sedimentation is an interactive catchment process; with standard controls the cumulative significance is low to moderate. **Mitigation: Phased clearing; stormwater management with clean/dirty water separation; silt traps and energy dissipaters; maintain diversion channels; prompt revegetation and erosion control.**



#	Impact	Phase	Pre-mitigation Risk	Post-mitigation Risk	Final Significance	Description of Impact, Assessment of Cumulative Impact and Preliminary Mitigation
6	Soil contamination	Operation	Medium to low -	Low -	Low -	**Activity:** Storage and handling of fuels, oils and chemicals; operation of the return water dam, slurry pipelines and process-water infrastructure. **Aspect:** Risk of spills, leaks, seepage or overtopping; dirty-water handling contaminating exposed soils. **Impact:** Localised soil contamination may alter soil chemistry and reduce fertility, constraining future agricultural or grazing use in affected areas. **Cumulative impact:** Contamination can act synergistically with existing mining-related pollution; the risk is low to moderate where containment and monitoring are applied. **Mitigation:** Bunded storage, drip trays and spill-response procedures; immediate clean-up of spills; pipeline inspection and leak detection; groundwater and soil monitoring.
7	Dust deposition	Operation	Medium to low -	Low -	Low -	**Activity:** Dust generation from exposed embankments, road surfaces and operational areas. **Aspect:** Dust fallout on adjacent land and vegetation; surface crusting; reduced soil-surface quality. **Impact:** Dust deposition may reduce vegetation performance and grazing quality on nearby land and marginally reduce the condition of the soil surface. **Cumulative impact:** Dust deposition combines with existing regional dust sources; cumulative significance is low with suppression. **Mitigation: Dust suppression (moisture/chemical); vegetate slopes; wind barriers; progressive capping of exposed surfaces.**



#	Impact	Phase	Pre-mitigation Risk	Post-mitigation Risk	Final Significance	Description of Impact, Assessment of Cumulative Impact and Preliminary Mitigation
8	Short-term soil disturbance	Rehab and Closure	Medium to low -	Low -	Low -	**Activity:** Decommissioning of infrastructure and final reshaping of disturbed areas. Aspect: Renewed earthworks, soil disturbance and potential short-term erosion during closure works. **Impact:** Short-term additional soil disturbance during closure; readily managed and outweighed by the stabilisation benefits of correct reshaping. **Cumulative impact:** Unlikely to result in long-term cumulative change if reshaping and stabilisation are correctly implemented. **Mitigation: Detailed closure plan; phased decommissioning; minimise disturbance; immediate stabilisation and revegetation of reshaped areas.**
9	Restoration of soil stability and re-establishment of grazing potential	Rehab and Closure	Medium to low -	Low to medium +	Medium to high +	**Activity:** Replacement of topsoil, rehabilitation cover placement, revegetation and erosion control of the TSF and disturbed areas. **Aspect:** Quality and depth of topsoil replacement; establishment and stability of vegetation cover; erosion resistance. **Impact:** Well-managed rehabilitation restores soil stability and re-establishes limited grazing potential on disturbed land; poor rehabilitation would leave low capability and ongoing erosion. (Positive impact where managed correctly, and conditional upon verification against the rehabilitation success criteria in Table 12.) **Cumulative impact:** A successful, sequential rehabilitation programme reduces regional erosion and restores grazing capability - a positive cumulative outcome. **Mitigation: Replace growth medium to the soil-specific depths in Section 10.1.2; rip subsoil and apply amendments; indigenous seed mixes; erosion control; invasive-species management; monitoring and adaptive management.**

The permanent loss of agricultural land is the one impact that remains of High significance after mitigation, and the basis of that rating is therefore set out parameter by parameter in Table 11.

Table 11: Basis of the significance rating for the permanent loss of agricultural land (Impact 1).

Parameter	Rating	Basis
Nature	Negative	Removal of land from agricultural use.
Extent	Site (local)	Confined to the development footprint, within which 388.96 ha carries residual agricultural or grazing value; no agricultural land beyond the footprint is lost.
Duration	Permanent	The land occupied by the TSF and permanent infrastructure is not returned to agricultural use after closure.
Magnitude (intensity)	Moderate	The land lost is of Moderate (268.44 ha) and Low (120.52 ha) agricultural potential, with no High-potential land; it carries no formal commercial production or employment, is used informally for grazing, and is partly disturbed. These factors bear on the value of the resource and are reflected here.
Reversibility	Irreversible	The soil profile beneath the TSF is buried and cannot be restored to its pre-development capability.
Probability	Definite	The loss follows necessarily from the proposed layout.
Consequence	Medium–High	Duration and reversibility are at the top of their scales; magnitude is moderate and extent local.
Sensitivity of the receiving environment	Moderate to Low	Verified agricultural sensitivity is Moderate over 268.44 ha and Low over 120.52 ha (Section 9); it is not High.
Cumulative effect	Low–Medium	The footprint adds to the progressive loss of agricultural land to mining infrastructure in the West Rand mining belt, within a landscape that the Gauteng Environmental Management Framework describes as dominated by agricultural uses (Section 6.5.1). The incremental contribution is local and limited, but it is not negligible.
Irreplaceable loss of resources	Medium	Moderate-potential soil is not regionally scarce, but the soil profile lost cannot be replaced.
Final significance	High (negative), before and after mitigation	Mitigation (layout optimisation and topsoil salvage) reduces the area affected and conserves the topsoil, but cannot alter the permanence, irreversibility or certainty of the loss.

The High rating is therefore a product of the certainty, permanence and irreversibility of the loss, which together carry more weight in the methodology than its magnitude, and not of the quality of the land. The magnitude of the loss is rated Moderate, reflecting that the affected land is not of High agricultural potential, carries no formal commercial production, is used informally and is already partly disturbed. Significance in this sense is distinct from the question posed by paragraph 3.2.3.2 of the protocol, namely whether the development will have an unacceptable impact on the agricultural production capability of the site. That question is answered in Section 10 by reference to the quality and productivity of the land lost and to the conditional rehabilitation benefit, and not by the significance rating alone.

9 SENSITIVITY

Figure 17 presents the agricultural sensitivity of the development footprint, differentiated into Moderate, Low and Transformed/Disturbed classes on the basis of the site-specific soil mapping and field verification described in Sections 5 and 6. This internal differentiation was derived from the 1:50 000 ARC PWV soil survey and the twenty-four soil auger observation points, confirming that no part of the footprint supports soil of High agricultural potential with the highest rating returned at any observation point, or assigned to any mapped soil unit within the footprint, is Moderate. Agricultural sensitivity, as used here, is the verified counterpart of the Screening Tool agriculture theme: it expresses the sensitivity of the land to loss of agricultural resources, and it is derived from the agricultural potential of each mapped soil unit and from current agricultural use by the conversion in the last row of Table 3 (Section 4.3). The Moderate class corresponds to the Screening Tool Medium class.

Areas of Moderate sensitivity, totalling 268.44 ha, correspond to the Avalon (mAv26), Hutton (Hu26) and Shortlands (Sd11) soil series: apedal to structured soils, freely drained in the Hutton and Shortlands series and periodically saturated at depth in the Avalon series, with an effective depth in the order of 300 mm to over a metre. These are the best agricultural soils within the footprint and represent the primary topsoil salvage resource, but are precluded from a High rating by moderate leaching, a reduced base status and, in the case of the Avalon series, a soft plinthic horizon that periodically perches the water table and restricts effective rooting depth. The Avalon extent within this class is taken from the 1:50 000 ARC PWV survey and is supported by eleven observation points at which the topsoil is consistent with that unit; the plinthic horizon itself is not yet confirmed (Section 6.1.2), and the class boundary between Moderate and Low sensitivity on the lower slopes is accordingly subject to confirmation by test pit during the pre-construction topsoil survey. Areas of Low sensitivity, totalling 120.52 ha, correspond to the shallow soils and soil-rock complexes (sMs10, Ms/R, Hu4/R and Sd2/R) that are extensive in land type Fb15. These soils comprise a thin orthic A horizon directly over, or on, hard rock, with an effective depth frequently below 300 mm; they are droughty, nutrient-poor, non-arable and suited only to low-carrying-capacity veld grazing.

The remaining 256.83 ha, some 39.8% of the 645.79 ha footprint, is classed as Transformed or of Negligible sensitivity, comprising the existing Deelkraal I TSF and associated mine dumps, on which no soil resource and therefore no agricultural potential remains. Taken together, this Moderate/Low/Transformed pattern underlies the specialist's dispute, described in Section 5.2, of the DFFE Screening Tool's High rating for the site.

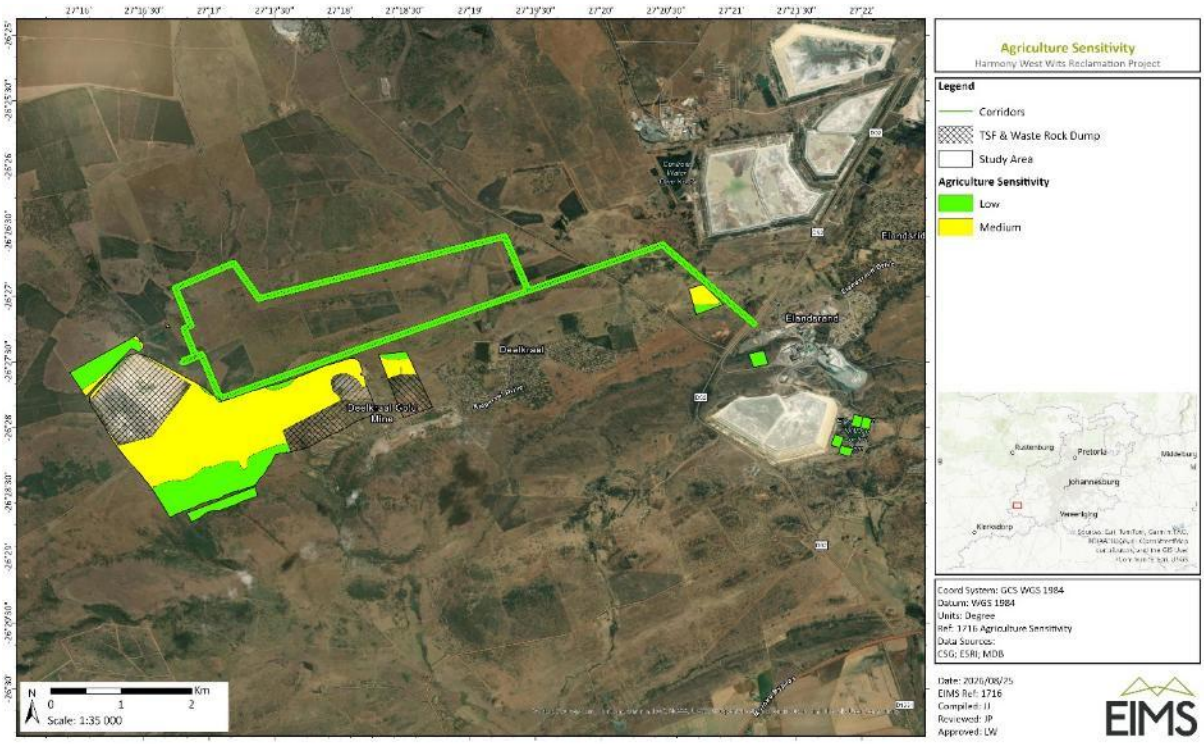


Figure 17: Agriculture sensitivity map.

10 SPECIALIST FINDINGS

No formal commercial agricultural production or employment has occurred within the development footprint over the preceding five years; existing use is limited to informal, unconfined livestock grazing and small-scale subsistence cultivation within adjacent informal settlements, for which no structured production or employment records exist. The potential loss arising from the proposed development is accordingly expressed in terms of the extent and quality of land removed from this informal use, rather than as a quantified production or employment figure: the project will result in the permanent loss of approximately 389 ha of land carrying residual agricultural or grazing value (268.44 ha of Moderate and 120.52 ha of Low agricultural potential), assessed in Section 8 as a High- significance impact, pre- and post-mitigation, given the permanent and irreversible nature of the land take.

Set against this loss, Section 8 also identifies the progressive rehabilitation of the Deelkraal I TSF, associated mine dumps and other disturbed areas as a potential Medium to High positive impact. If successfully implemented, this rehabilitation would restore soil stability and re-establish limited grazing potential across the 256.83 ha of the footprint that is currently transformed and holds no agricultural value, and would remove the ongoing, unmanaged wind erosion, dust deposition and seepage impacts that the existing, unrehabilitated facilities presently impose on surrounding agricultural land. The comparison between the two is not, however, one of area alone. The land rehabilitated is smaller in area than the land lost, is expected to attain a lower agricultural capability than the Moderate-potential soils it replaces, and delivers its benefit only after reclamation, soil replacement and revegetation have succeeded (Table 9). The rehabilitation benefit is therefore considered sufficient to offset the informal grazing value foregone only on condition that it is achieved: the topsoil, stockpile and rehabilitation measures in Section 10.1.2 must be implemented, and each rehabilitated area must be verified against the success criteria in Table 12 before the benefit is taken to have been delivered.

Current agricultural activity on land parcels adjacent to the footprint follows the same informal pattern documented on site, such as unconfined cattle, pig and goat grazing and small-scale subsistence cultivation within surrounding settlements, consistent with the Gauteng Environmental Management Framework's characterisation of this part of the Zone 4 Normal Control Zone as agriculturally dominated. The additional impacts expected from the existing status quo, erosion, dust and seepage from the unrehabilitated Deelkraal I TSF and mine dumps, are already assessed in Section 8 and are common to both the project and No-Go scenarios on this land. No further agricultural areas beyond the development footprint itself are identified as requiring avoidance; the recommended mitigation already directs infrastructure preferentially onto already-disturbed, waste-rock areas in preference to the Moderate-potential soils, and requires that watercourse and drainage-line buffers be strictly maintained.

The proposed layout adheres to the mitigation hierarchy and the requirements of paragraph 2.5.3 of the Protocol (GN 320 of 2020). A lower-sensitivity agricultural footprint was not set aside in favour of a higher-sensitivity alternative. Conversely, where a lower-sensitivity siting option is available, specifically Option 2 for the Kusasalethu reclamation laydown area, it is supported as the preferred layout because it displaces a negligible rather than a Moderate-potential soil resource. Consequently, no formal motivation for disregarding a lower-sensitivity alternative is required.

10.1 SPECIALIST STATEMENT

In terms of the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GN 320, 2020) promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998), the specialist is required to provide a definitive, reasoned opinion on the environmental acceptability of the proposed project on agricultural resources. This opinion is informed by a combination of desktop baseline analysis, in-situ field surveying, and a quantitative evaluation of potential direct, indirect, and cumulative impacts on regional land capability and food security.

The findings and conclusions of the Agricultural Agro-Ecosystem Specialist Assessment must be integrated into the Environmental Impact Assessment (EIA) Report. All identified management, mitigation, and monitoring measures must be incorporated into the EMPr to ensure their legal enforceability throughout the project lifecycle. Additionally, a signed declaration and copy of the complete specialist assessment must be appended as a technical appendix to the EIAR submission to satisfy statutory compliance requirements under the National Environmental Management Act (NEMA) protocols.

The specialist has evaluated the findings of the assessment and presents the alternative recommendations to the Competent Authority in the subsequent sections.

10.1.1 ALTERNATIVE 1: RECOMMENDATION FOR CONDITIONAL APPROVAL

Based on the available agricultural and soil information, and subject to implementation of the specified mitigation, rehabilitation and monitoring measures, the proposed development is considered acceptable from an agricultural-resource perspective. It is accordingly recommended that the proposed West Wits Reclamation Project and its associated infrastructure be authorised, subject to the implementation of the management measures outlined in this report and the Environmental Management Programme (EMPr), and to verification of rehabilitation against the success criteria in Table 12.

While the DFFE Screening Tool pre-allocated a High sensitivity rating to the agricultural theme, physical site verification confirmed that the land is not cultivated, carries no production or formal agricultural related employment history, is underlain by a shallow and rock-limited soil mantle within a land type of which ~57.3% comprises lithosols and rock outcrop, and includes 256.83 ha on which no/little soil resource remains. No observation point returned a soil of high agricultural potential. The High sensitivity rating generated by the screening tool is accordingly disputed in terms of paragraph 2.3(a) of the protocol. The permanent loss of approximately 389 ha of Moderate- and Low-potential land is rated High in significance (Section 8), because it is certain, permanent and irreversible. It is not, however, a loss of High-potential land or of land in formal production, and, provided the mitigation measures are enforced and the rehabilitation benefit is secured and verified, it is not considered to constitute an unacceptable impact on the agricultural production capability of the site in terms of paragraph 3.2.3.2 of the protocol.

10.1.2 RECOMMENDATIONS FOR EA AND/OR EMPR

To ensure the integrity of the soil resources is maintained throughout the project lifecycle, the following conditions should be integrated into the final EMPr and/or EA:

- Topsoil management: Prior to the commencement of site clearance, a formal Topsoil Salvage and Stockpiling Plan must be implemented across all active construction zones, including the Tailings Storage Facility (TSF) footprint, dams and access roads. Topsoil shall be stripped to the depth of the approved growth-medium horizon, based on pre-construction field verification and mapped soil-specific stripping depths. A uniform stripping depth is not to be applied across soil units. Indicative stripping depths by soil unit, to be confirmed by the pre-construction survey, are:
    - Avalon (mAv26): the orthic A horizon as topsoil (indicatively 200 to 300 mm), and the yellow-brown apedal B horizon as a separate subsoil lift to the top of the soft plinthic horizon (indicatively 600 to 1 200 mm). Plinthic material is not to be salvaged as growth medium.



- Hutton (xHu26) and Shortlands (mSd11): the orthic A horizon as topsoil (indicatively 200 to 300 mm), and the red apedal or red structured B horizon as a separate subsoil lift to the depth of rock or saprolite.
- Shallow soils and soil-rock complexes (Glenrosa and Mispah forms; sMs10, Ms/R, Hu4/R and Sd2/R): the full profile to refusal as a single lift, typically less than 300 mm, including the surface seed bank.
- Transformed ground (existing TSF and mine-dump surfaces): not to be stripped as growth medium; the material is to be characterised before any use in rehabilitation.

To preserve soil fertility, biological activity, and structural integrity for future rehabilitation:

- Material Separation: Topsoil and subsoil must be stripped, transported, and stockpiled in strictly separate locations to prevent cross-contamination. Topsoil from the Avalon, Hutton and Shortlands units is to be stockpiled separately from the thin, stony growth medium of the shallow units, so that the better material can be returned preferentially to the areas where grazing is to be re-established.
- Height Restrictions: All stockpiles must be configured as low-profile mounds with a maximum height limit of 2.0 metres.

- Soil decompaction: Following the completion of construction activities, all compacted areas, including linear servitudes, laydown areas and haul roads, must be ripped to below the depth of the compacted layer before growth medium is replaced, except on shallow soils over rock (Glenrosa and Mispah forms), where ripping is limited to the soil depth.
- Containment and Seepage Control: The Tailings Storage Facility (TSF) and Return Water Dam barrier system must be installed in accordance with approved engineering specifications to mitigate any operational risk of chemical seepage or toxic solute contamination to adjacent agricultural soils.
- Erosion Monitoring: A storm-water management plan featuring active energy-dissipating structures must be maintained along graded access roads and pipeline corridors to prevent subsequent erosion and downstream sedimentation.
- Sulfidic claystone: Pyrite occurs within the carbon-rich claystone facies of the Timeball Hill Formation. Where deep excavation exposes this material to atmospheric oxygen, oxidation of the sulfide can generate sulfuric acid and produce acid sulfate soil conditions, with consequent aluminium and manganese toxicity and phosphate fixation in any soil onto which the resulting drainage reports. This is a pathway distinct from the tailings seepage addressed in Section 8. Sulfidic claystone must be identified during bulk earthworks and, where encountered, encapsulated below the final rehabilitated surface rather than incorporated into topsoil or subsoil stockpiles.
- Rehabilitation success criteria: Rehabilitation is to be verified against the measurable criteria in Table 12, which are consistent with the monitoring plan of the Rehabilitation Plan prepared for the project (The Biodiversity Company, 2026a) and are to be carried into the EMPr and the closure plan. Criteria are expressed, where possible, relative to undisturbed reference sites on the same soil unit, to be established before construction. An area that fails a criterion at any monitoring event is subject to the corrective action stated, and the rehabilitation benefit on which the conclusions of Sections 7, 8 and 10 rest is contingent upon these criteria being met.

Table 12: Rehabilitation success criteria for soils and agricultural land capability.

Aspect	Criterion	Method and frequency	Corrective action
Growth-medium depth	Replaced growth medium not less than the pre-disturbance topsoil depth recorded for the corresponding soil unit in the pre-construction survey.	Depth survey on a grid after placement.	Place additional growth medium from the stockpile of the same soil unit.
Vegetation cover	Aerial cover of perennial grasses of at least 70% of that of the reference site, sustained for two consecutive growing seasons.	Fixed transects or quadrats, surveyed annually at the end of the growing season.	Reseed with the approved indigenous mix; identify and correct the cause (compaction, erosion, nutrient deficiency).
Erosion condition	No active rill or gully erosion; no bare patches that are expanding between surveys.	Annual inspection, and after any high-intensity rainfall event.	Repair and re-profile; install erosion control; revegetate.
Compaction	Penetration resistance below 2 MPa in the upper 300 mm of the rehabilitated profile, at field capacity.	Penetrometer transects after ripping and after growth-medium placement.	Re-rip before revegetation; restrict traffic to demarcated routes.
Infiltration	Steady-state infiltration rate of at least 50% of that of the reference site.	Infiltrometer tests after the first growing season, then every second year.	Rip, apply organic amendment, re-establish cover.
Soil chemical status	pH and electrical conductivity within the range measured on reference soils of the same unit; no exceedance of the applicable soil screening values of GN R. 331 of 2014.	Composite soil samples analysed before revegetation and annually thereafter.	Lime or other amendment as indicated; investigate and remediate the source of any exceedance.
Invasive species control	No listed Category 1a or 1b invasive species established; Category 2 species controlled.	Inspection each growing season.	Clearing and follow-up treatment in terms of the alien invasive species management plan.
Grazing suitability	Grass sward dominated by palatable perennial species, with species composition comparable to the reference site.	Veld condition assessment annually from the second growing season.	Reseed or oversow; defer grazing until the criterion is met.
Monitoring period	Annual monitoring for a minimum of three years after rehabilitation of each area, and until all criteria have been met for two consecutive years.	Monitoring report to the Environmental Control Officer each year.	An area is not signed off as rehabilitated until every criterion is met.

10.2 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations relating to this assessment should be noted:

- This assessment is limited to the proposed Deelkraal II TSF, pipeline corridors and various laydown areas, reclamation areas, pumping stations, etc., near Carletonville within the Merafong City Local Municipality, Gauteng Province, in support of the EIA study;
- Information supplied by the applicant has been considered together with available desktop information and field observations. Where information could not be independently verified, this is recognised as an uncertainty or limitation of the assessment;
- This report combines a desktop review of existing, publicly available information, client-supplied documentation and remote sensing data (aerial imagery and GIS data) with an in-situ field verification survey undertaken on 27 and 28 May 2026, during which twenty-four soil observation points were

recorded across the development footprint and the soil was investigated by hand auger to refusal or to the maximum reach of the auger (Section 4.2);

- It is assumed that the DFFE Screening Tool Report, the ARC land type and 1:50 000 PWV soil survey data and the other desktop datasets relied on are accurate and objective, and that, together with the field verification survey undertaken for this assessment, they are adequate to determine the agricultural baseline and the required level of assessment for the EIA phase;
- It is assumed that the spatial data (e.g., shapefiles, site plans, cadastral boundaries) provided for the facility footprint and surrounding infrastructure accurately reflect their real-world positions;
- In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report are correctly and effectively implemented and managed throughout the life of the project;
- The assessment is based on the layout and preliminary engineering information available at the time of compilation, as the final engineering design is still being completed. The areas of land lost, the agricultural sensitivity classes affected and the rating of the permanent loss of agricultural land are therefore based on the footprint as currently defined. Should the final design change the footprint materially, those figures, and the overlay on which they rest, must be recalculated;
- No formal commercial agricultural production or employment occurred within the project footprint during the five years preceding this assessment, and production and employment figures are accordingly recorded as nil rather than modelled. The grazing value of the land is indicated instead against the regional long-term grazing capacity norm (Section 6.5). On-site observations indicate that agricultural activity is limited to small-scale subsistence cultivation and unconfined livestock rearing serving the surrounding communities, for which no structured production records exist;
- Soil forms at the observation points are classified from topsoil observations reconciled with the 1:50 000 PWV mapping. The diagnostic subsoil horizons were not exposed, and effective depth was not measured where auger refusal did not occur. These classifications, and the agricultural potential attached to them, are provisional or inferred as indicated in Table 6, and are to be confirmed by test pit during the pre-construction topsoil survey;
- All reasonable measures have been considered in the micro- siting of the proposed development to minimise fragmentation and disturbance of agricultural activities;

The information presented in this report was the most accurate and relevant at the time of compilation of the report

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Appendix 1: Specialist/s CVs

Appendix 2: Specialist Declaration

Appendix 3: Site Visit Photographs

Appendix 4: Impact Assessment Methodology

Appendix 5: Impact Assessment Matrix