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Proposed Dalyshope Coal Mining Project, Situated in the Magisterial District of Lephalale, Limpopo Province

Rehabilitation and Closure Plan

Prepared for:
Universal Coal PLC

Project Number:
UCD6170

September 2020

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This document has been prepared by Digby Wells Environmental.

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Project Title:	Proposed Dalyshope Coal Mining Project, Situated in the Magisterial District of Lephalale, Limpopo Province
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DETAILS AND DECLARATION OF THE SPECIALIST

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I, Brett Coutts, declare that: –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
    - I declare that there are no circumstances that may compromise my objectivity in performing such work;
    - I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

December 2020

Signature of the Specialist *Date*

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EXECUTIVE SUMMARY

Universal has appointed Digby Wells Environmental (Digby Wells) as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations required for the development of the proposed Dalyshope Coal Mining Project. As part of this process, the compilation of a Rehabilitation, Decommissioning and Closure Plan is required.

Anglo is the holder of two Prospecting Rights approved by the Department of Mineral Resources and Energy (DMRE), reference numbers LP 30/5/1/1/2/10648 PR (as renewed) and LP 30/5/1/2/2/10649 PR (as renewed), and authorised in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) to prospect for coal on an area of 4 957.7 hectares (ha). The Prospecting Rights cover numerous farm portions, the boundaries of which have since been realigned and renamed. The proposed Mining Right boundary will include various farms, as captured in the Prospecting Rights**. Anglo proposes to develop a coal mine and the proposed mining activities will take place on two of the farms; Dalyshope 232 LQ and Klaarwater 231 LQ. The Environmental Authorisation application will therefore only focus on these two properties for this phase of the Project.**

The RCP includes the following suite of documents as part of this report aligned with the Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015) (as amended) published under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA):

- Environmental Risk Assessment Report (ERR) in accordance with the minimum requirements for an ERR (Appendix 5 of GNR 1147);
- Annual Rehabilitation Plan (ARP) adhering to the minimum requirements for and ARP defined in Appendix 3 of GNR 1147; and
- RCP (this report) aligned with the minimum requirements for a Final Rehabilitation, Decommissioning and Closure Plan (Appendix 4 of GN R.1147).

Apart from the requirements of the GN R. 1147 regulations, mine closure planning is also required to be compliant with additional legislation, which is summarised in Section 5.

In addition to this a costing was also undertaken in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2008) (MPRDA) and determined using the Department of Mineral Resources (DMR) guidelines set out by the 2005 *"Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine"* be included in this RCP (Section 16).

Historically, mine closure plans mainly focused on the environment and physical aspects, such as land rehabilitation and asset removal while overlooking the cultural, social and economic aspects. However, it is now accepted that considering closure at an early stage allows mining companies to reduce the level of dependency from communities with regards to economic benefits and community services.

Successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the company and the community should realise benefits that will continue to exist without further input from the company.

The vision of mine closure should be to ensure that a process is established to guide all decisions and actions during a mine's life such that:

- Future public health and safety are not compromised;
- Environmental resources are not subject to physical and chemical deterioration;
- The post-mining use of the site is beneficial and sustainable in the long-term;
- Any adverse socio-economic impacts are minimised; and
- The opportunity is taken to maximize socio-economic benefits.

Mine closure is an ongoing programme designed to restore the physical, chemical and biological quality or potential of air, land and water regimes disturbed by mining to a state acceptable to the regulators and to post mining land users. The activities associated with mine closure are designed to prevent or minimise adverse long-term environmental impacts, and to create a self-sustaining natural ecosystem or alternate land use based on an agreed set of objectives. The objective of mine closure is to obtain legal (government) and community agreement that the condition of the closed operation meets the requirements of those entities, whereupon the companies' legal liability is terminated.

Rehabilitation can be divided into two different streams, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation must continue to be carried out along with mining. Concurrent rehabilitation activities should decrease the final closure costs that the mine will carry at the time of closure. This concurrent rehabilitation must be undertaken within the context of the approved Environmental Management Programme (EMPr) as well as the RCP. Final rehabilitation will be carried out once the mine goes into its decommissioning and closure phase.

The primary concerns for decommissioning and rehabilitation are to ensure public safety and health, ensure environmentally stable conditions compatible with the surrounding environment and consequently minimise the environmental impacts caused by mining. The overall objective is to have socially, economically and environmentally sustainable development. The general objectives of mine closure are:

- Safety and health of animals and humans must be safeguarded;
- Environmental damage and residual impacts must be minimised to a level acceptable to all parties, i.e. avoidance of future pollution;
- Land must be rehabilitated to as close to natural state as possible, i.e. creation of a stable land surface;
- Physical and chemical stability of remaining structures must be such that they are not affected by natural elements;

- Mines are closed effectively and cost efficiently; and
- Mines are not abandoned but closed in terms of applicable legislation.

Two costings have been provided for within this RCP, the one costing is aligned to the requirements outline in GNR 1147

Although the DMR costs are included, the GNR 1147 methodology is outlined below, as this will supersede the DMR costing in subsequent annual updates. The closure cost methodology is also determined in accordance with the broader legislative requirements

The closure cost calculation is aligned with the Financial Provision Regulations, 2015 (GN R. 1147) as amended. The estimated financial provision for the first year, 10 year forecast and LoM for Dalyshope is **R77,788,977, R654,911,299** and **R539,699,486** respectively (excl. VAT). The closure cost estimate breakdown is included Table 16-7 below.

Table 16-1: 1st Year, 10 Year and LoM Closure Cost Summary

Area and Description	1 Year Disturbance	10 Year Forecast	Life of Mine
Infrastructure and Rehabilitation			
Area 1: Plant & Related Infrastructure	R54,028	R6,307,727	R6,307,727
Area 2: Water Management Facilities	R3,339,752	R3,339,752	R3,339,752
Area 3: Other Infrastructure	R16,576,314	R21,883,713	R21,883,713
Area 4: Stockpiles, Dumps and Pit	R32,332,853	R472,053,325	R376,323,718
Area 5: Offices	R311,024	R311,024	R311,024
Area 6: Linear Infrastructure	R4,040,913	R7,327,864	R7,327,864
Sub-total	**R56,654,884**	**R511,223,405**	**R415,493,798**
Monitoring and Maintenance			
Monitoring Costs 10 years (Groundwater and Surface water)	R3,960,050	R3,960,050	R3,960,050
Monitoring Costs 3 years (Vegetation)	R45,904	R157,632	R213,425
Maintenance Costs 3 years (Vegetation)	R2,964,417	R11,764,361	R16,158,763
Sub-total	**R6,970,371**	**R15,882,042**	**R20,332,238**
Preliminary and General	R8,498,233	R76,683,511	R62,324,070
Contingency	R5,665,488	R51,122,341	R41,549,380
TOTAL	**R77,788,977**	**R654,911,299**	**R539,699,486**

The closure cost calculation using the DMRE rule-based model has been undertaken for the first year of mining and the Life of Mine. The estimated financial provision for the DMRE rule-based model is **R 31,634,761** and **R 337,542,083** respectively (Incl. VAT). The closure cost estimate breakdown is included Table 16-8 below.

Table 16-2: 1st Year and LoM Closure Cost Summary

Component	Description	Total Cost (1st Year)	Total Cost (LoM)

1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	R 0	R 102,466
2 (A)	Demolition of steel buildings & Structures	R 5,600,085	R 6,322,457
2 (B)	Demolition of reinforced concrete buildings & structures	R 2,906,154	R 35,515,406
3	Rehabilitation of access roads	R 2,366,126	R 3,273,835
4(A)	Demolition & rehabilitation of electrified railway lines	R 0	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	R 0	R 0
5	Demolition of housing &/or administration facilities	R 1,387,725	R 1,387,725
6	Open pit rehabilitation including final voids & ramps	R 1,108,758	R 89,512,919
7	Sealing of shafts, adits & inclines	R 0	R 0
8(A)	Rehabilitation of overburden & spoils	R 1,522,679	R 21,089,102
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	R 0	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	R 1,031,808	R 38,653,121
9	Rehabilitation of subsided areas	R 0	R 0
10	General surface rehabilitation	R 1,189,804	R 2,736,656
11	River diversions	R 0	R 0
12	Fencing	R 2,726,478	R 2,726,478
13	Water management	R 229,319	R 18,513,530
14	2 to 3 years of maintenance & aftercare	R 429,193	R 10,193,622
15(A)	Specialist studies	R 0	R 0
	Total cost + Weighting Factor 2	**R 22,547,941**	**R 253,030,047**
	Preliminary and General	R 2,705,753	R 15,181,803
	Contingency	R 2,254,794	R 25,303,005
	VAT (15%)	R 4,126,273	R 44,027,228
	Grand Total (Incl. VAT)	**R 31,634,761**	**R 337,542,083**

Closure and rehabilitation are a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. Rehabilitation and closure objectives have been tailored to the project at hand with the objective of assisting Universal Coal in carrying out successful rehabilitation.

The following is recommended to assist UCD in successfully carrying out the rehabilitation and closure at Dalyshope, as well as benefitting the Universal Coal Group in its entirety:

- Develop a post mining landform design and develop and maintain a LoM materials balance to ensure a free draining landform can be constructed with the available material and topsoil resources are allocated suitably to achieve the end land use objectives;

- Ensure that future topsoil stripping is done according to the pre-mining topsoil survey, mixing topsoil and high clay content subsoils will lead to compaction that is difficult to reverse;
- Care should be taken to keep topsoil separate from subsoils and hards. Mixing increases compaction and reduces effective rooting depth for vegetation and can increase the surface water recharge into the backfilled pit and compound residual risks;
- Concurrent rehabilitation must take place where possible;
- Closure is an ongoing and iterative process, and continuous refinement of the RCP is necessary to facilitate the successful transition between the operational to decommissioning and closure phase at Dalyshope;
- Closure must be considered early in the mining cycle, at the pre-mining stage if possible, so Digby Wells therefore advises UCD to start planning closure options and operational mining designs that facilitates a seamless closure process even prior to gaining approval for the nearby mining right applications. In this regard, green technologies and building design, and modernisation of mining technology in the operational phase, will likely significantly reduce the closure environmental liability and minimise residual and latent impacts;
- A Closure Environmental Management Programme (CEMPr) which fulfils all regulatory needs to be five (5) detailed years prior to the application of a closure certificate;
- In line with the above, a detailed gap analysis should be completed to indicate specialist studies required to assist UCD with achieving closure at Dalyshope, as well as additional monitoring and maintenance requirements;
- Long-term inspection, monitoring, and maintenance of the discard facility is recommended;
- Should the LoM be significantly extended, investigations into alternative final land-uses and/or blue waste management systems should be considered as technological advances occur, that will result in community development and economic growth in line with Africa Mining Vision (2009);
- Digby Wells recommends ongoing stakeholder engagement, so the needs of key stakeholders and the community can be taken into consideration when considering closure alternatives;
- It is advised that closure planning is managed by a few single key personnel/consultants so there is a single database that holds all necessary information, specialist studies, etc and this knowledge can be easily transferred between relevant key personnel;
- The report and costs must be updated on an annual basis as per NEMA requirements. This will ensure that the liabilities are reflected as accurate as possible.

- When stripping and stockpiling topsoil as new mining areas are opened up and expanded, care must be taken and topsoil must be placed separately from overburden dumps or directly placed during concurrent rehabilitation activities;
- Ensure rehabilitation is conducted using a clear plan for the mined area's end land use. Consider post-mining landscape designs. Ensure rehabilitation contractor is aware of rehabilitation requirements;
- UCD must take cognisance that the compliance date for aligning the site wide rehabilitation and closure planning and costing with GNR 1147 has recently been extended to 19 June 2021;
- Regular groundwater monitoring must take place to determine possible changes in groundwater flow and groundwater quality; and
- AIPs must be removed on an on-going basis.

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LIST OF ABBREVIATION & ACRONYMS

°C	Degrees Celsius
AATC	Anglo American Thermal Coal
AIP	Alien Invasive Plants
ALARP	As Low As Reasonably Practicable
AMD	Acid Mine Drainage
ARP	Annual Rehabilitation Plan
BPG	Best Practice Guidelines
CARA	Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)
CEMPr	Closure Environmental Management Programme
CSI	Cement Sustainability Initiative
dBA	Decibels
DEA	Department of Environmental Affairs
Digby Wells	Digby Wells Environmental
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EMS	Environmental Management System
EP	Environmental Practitioner
ERR	Environmental Risk Assessment Report
FRAI	Fish Response Assessment Index
GG	Government Gazette
GIS	Geographic Information System
GNR	Government Notice Regulation
GNR 1147	Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015)
ha	Hectare
HDSA	Historically Disadvantaged South Africans

HIA	Heritage Impact Assessment
HIRA	Hazard Identification and Risk Assessment
HRM	Heritage Resources Management
I&APs	Interested and Affected Parties
IHAS	Habitat Assessment System
IHI	Index for Habitat Integrity
IUCN	International Union for Conservation of Nature
IWUL	Integrated Water Use License
km	Kilometre
LDV	Light Duty Vehicle
LEMA	Limpopo Environmental Management Act
LLM	Lephalale Local Municipality
LoM	Life of Mine
LUP	Land Use Plan
m	Metre
m.a.m.s.l.	Metres Above Mean Sea Level
MAP	Mean Annual Precipitation
mbgl	Metres below ground level
MIRAI	Macroinvertebrate Response Assessment Index (MIRAI)
mm	Millimetre
MMA	Mines and Minerals Act (1999)
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MR	Mining Right
MRA	Mining Right Application
MSA	Middle Stone Age
Mtpa	Million tonnes per annum
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NFA	National Forests Act
NWA	National Water Act, 1998 (Act No. 36 of 1998)

OC1	Opencast Pit
PCD	Pollution Control Dam
PES	Present Ecological State
PVC	Polyvinyl chloride
QDS	Quarter Degree Square
RCP	Rehabilitation and Closure Plan
REC	Recommended Ecological Category
ROM	Run of Mine
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SANAS	South African National Accreditation System
SANS	South African National Standards
SASS5	South African Scoring System version 5
SEP	Stakeholder Engagement Process
SLP	Social and Labour Plan
SSC	Species of Special Concern
TDS	Total Dissolved Solids
UCD	Universal Coal PLC
VAT	Value Added Tax
WDM	Waterberg District Municipality
WMA	Water Management Area
WULA	Water Use License Application

1 Introduction

Universal has appointed Digby Wells Environmental (Digby Wells) as the Environmental Assessment Practitioner (EAP) to undertake environmental authorisations required for the development of the proposed Dalyshope Coal Mining Project. As part of this process, the compilation of a Rehabilitation, Decommissioning and Closure Plan is required.

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1.1 Project Background

The Dalyshope Project considers the establishment of a contractor operated truck and shovel opencast mine, producing approximately 2.4 million tonnes per annum (Mtpa) of thermal coal product for approximately five years. After five years, the mine will ramp up production to approximately 12 Mtpa of product for approximately 25 years from a single open pit, giving a total Life of Mine (LoM) of approximately 30 years.

Opencast strip mining using selective mining techniques is proposed for extracting the resource. The mine will be accessed via a boxcut and ramp arrangement located in the north-eastern corner of the farm Dalyshope. Overburden material will be hauled to spoil until such time as sufficient void has been created within the pit to allow for in-pit tipping. Selective mining of the coal seams is not required due to the specification of the product required but selective mining of the partings will be conducted.

Run of Mine (ROM) coal from the pit will be crushed in a primary crusher at the pit head. The crushed coal will be transported by conveyor belt from the pit head to stockpiles before the washing plant. Coal will be removed from the stockpile and fed into the plant. The coal will be screened to remove -50 millimetres (mm) coal. The oversize coal will be crushed in a secondary crusher before re-joining the -50 mm coal. The -50 mm coal is fed into the cyclone plant whereby it will be washed at a density of 1.80 to produce product and discard. The washing plant will be in modular format, with two modules each capable of a throughput of 1 000 tons per hour.

The discard will be taken by conveyor belt back to the pit head where it will be loaded into trucks to be deposited back into the bottom of the pit.

The product will be placed on stockpiles before being transported to market. The product will either be transported by road haulers on the district/provincial road or by means of a rail line, should the latter prove economically viable.

1.2 Life of Mine Plan

Based on current planning, the estimated LoM is 30 years. The mine will have an average production rate of 2.4 Mtpa Run of Mine (ROM) for the first five years. It will then increase to an average production rate of 12 Mtpa ROM from a single Opencast Pit (OC1) for the remaining LoM, giving a total life of mine of 30 years.

Table 1-1: Proposed Project Activities

Project Phase	Project Activity
Construction Phase	Site/vegetation clearance
	Temporary Pollution Control Dam (PCD)
	Contractors laydown yard
	Access and haul road construction
	Infrastructure construction
	Diesel storage and explosives magazine
	Topsoil stockpiling
Operational Phase	Open pit establishment
	Removal of rock (blasting)
	Stockpiling (rock dumps, soft dumps, soils, ROM, product, discard dump) establishment and operation
	Diesel storage and explosives magazine
	Operation of the open pit workings
	Operating crush and screen and coal washing plant
	Operating sewage treatment plant and water treatment plant
	Water use and storage on-site – during the operation water will be required for various domestic and industrial uses. Water Management infrastructure including Two PCDs will be constructed that capture water from the mining area, which will be stored and used accordingly. • Workshop and storage of chemicals; • Laundry and Laboratory services; • Backfilling and concurrent rehabilitation; • Weighing of coal trucks; • Coal transportation through trucking, rail and conveyer belts;

Project Phase	Project Activity
	• Washing of mine vehicles; and • Fuelling of diesel on site.
	Storage, handling and treatment of hazardous products (including fuel, explosives and oil) and waste.
	Maintenance activities – through the operations maintenance will need to be undertaken to ensure that all infrastructure is operating optimally and does not pose a threat to human or environmental health. Maintenance will include haul roads, crushing and washing plant, machinery, water and stormwater management infrastructure, stockpile areas, dumps, etc.
Decommissioning Phase	Demolition and removal of infrastructure – once mining activities have been concluded infrastructure will be demolished in preparation of the disturbed land rehabilitated.
	Rehabilitation – rehabilitation mainly consists of spreading of the preserved subsoil and topsoil, profiling of the land and re-vegetation.
	Post-closure monitoring and rehabilitation.

1.3 Study Area

The Dalyshope Project proposes the development of a coal mine on the farms Klaarwater 231LQ and Dalyshope 232LQ in the Limpopo Province, approximately 60 kilometres (km) west of Lephalale, covering an extent of 1 630.5 ha. The proposed Project is situated in the Waterberg Coalfield, an area which is currently largely undeveloped and characterised by undisturbed Bushveld, game farming, hunting, tourism and agriculture. Human activity in proximity to the Project includes farmhouses, game lodges, farmworker accommodation and cattle kraals.

Table 1-2: Summary of Project Location Details

Province	Limpopo
Magisterial District/Local Authority	Lephalale Local Municipality (LLM)
District Municipality	Waterberg District Municipality (WDM)
Nearest Town	Lephalale
Property Name and Number	Klaarwater 231LQ and Dalyshope 232LQ
GPS Co-ordinates (relative centre point of study area)	23°34'11.17"S
	27°14'06.27"E

1.3.1 Proposed Infrastructure

The main infrastructure associated with the mine includes, but is not limited to:

- Contractors laydown yard;
- Temporary stockpiles for construction;
- Temporary PCD for construction;
- Opencast 1 (“OC1”) pit
- ROM stockpiles;
- Slew product stockpiles;
- Discard facility;
- Topsoil and subsoil stockpiles;
- Overburden (Hards/Softs) stockpiles
- Weighbridges;
- Conveyers belts;
- Workshop;
- Two PCDs;
- Washing plant;
- Crush and Screen plant;
- Offices;
- Change-house;
- Stores;
- Laboratory;
- Laundry facility
- Water tanks;
- Potable water Pipeline and distribution;
- Dirty water pipeline;
- Sewage Treatment Plant
- Water Treatment Plant;
- Brine Pond
- Diesel/wash bay and oil separator;
- Explosives magazine;
- Stormwater management infrastructure
- Powerline/s
- Substation
- Rail link and Rail loadout facility
- Brake-test ramp;
- LDV and light vehicle access road;
- Truck access road; and
- Road upgrade (Steenbokpan to site).

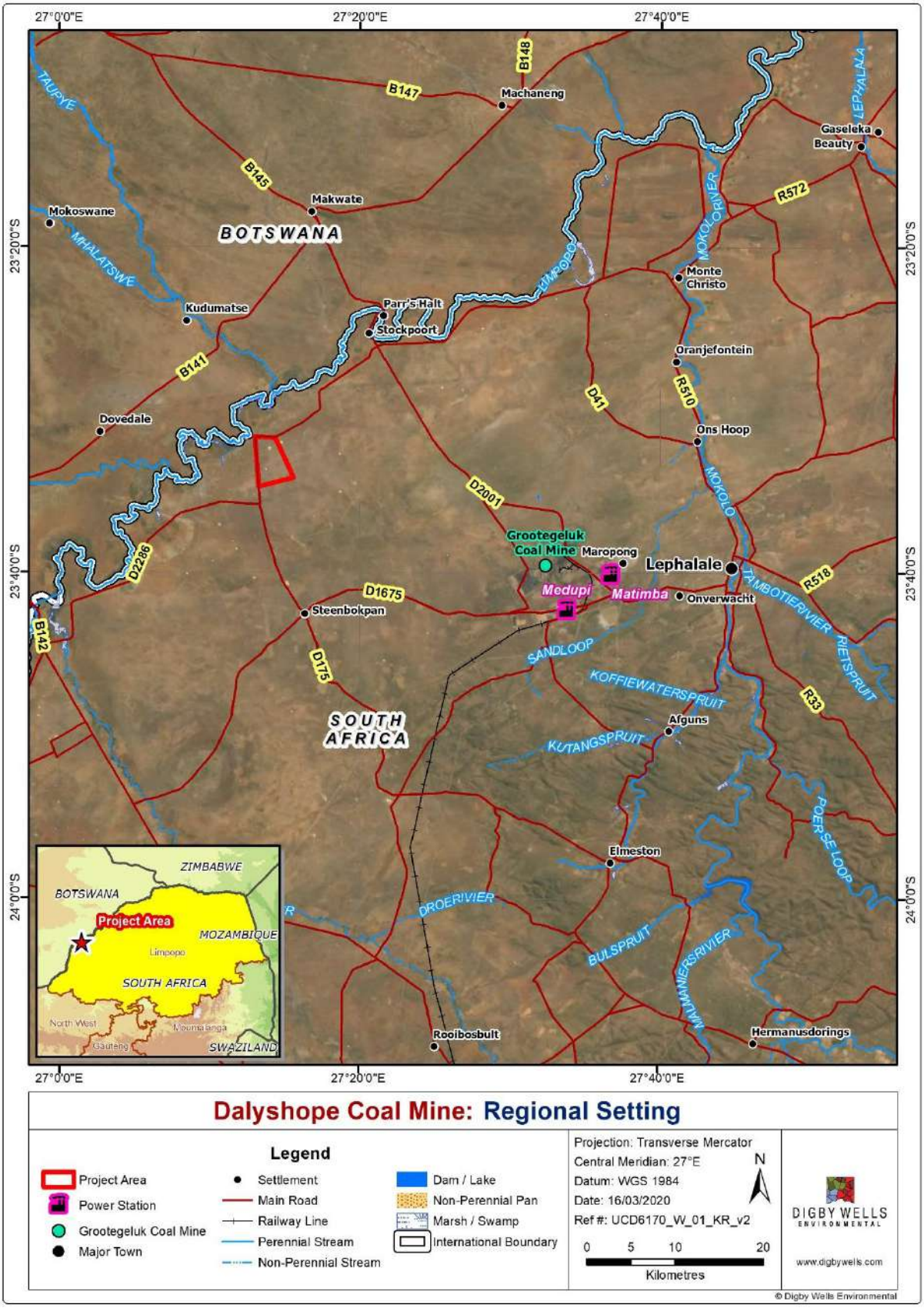


Figure 1-1: Regional Setting

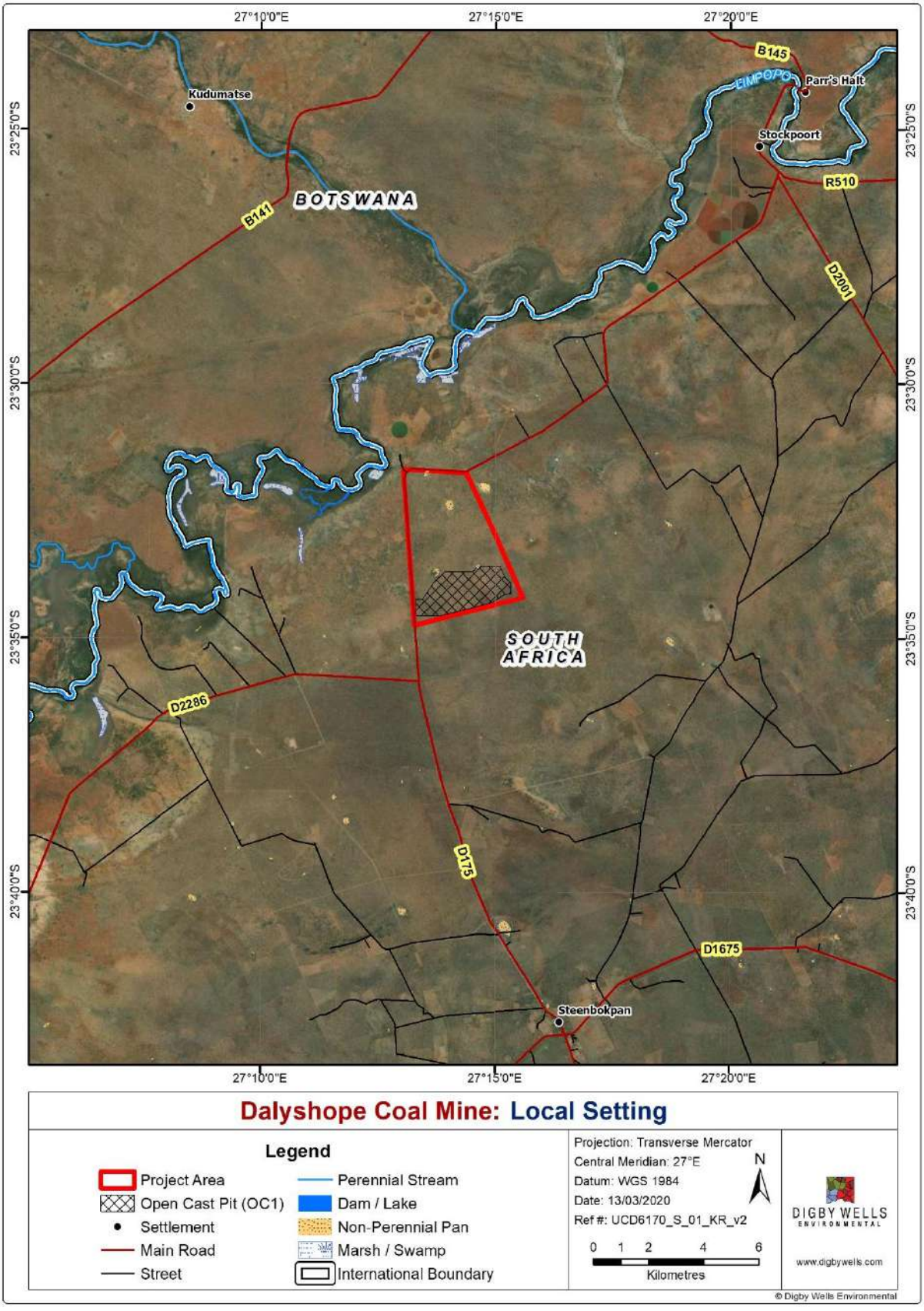


Figure 1-2: Local Setting

1.4 Details of the Specialist

The following is a list of Digby Wells' staff who were involved in this RCP:

- **Brett Coutts** is an Ecologist with a BSc Honours in Ecology, Environment and Conservation. Brett gained practical hands on experience as a project manager on environmental rehabilitation projects at Hydromulch and his roles and responsibilities include the compilation of Basic Assessment (BA) reports, Scoping & Environmental Impact Reports, compilation of Environmental Management Plans (EMP), GIS mapping and Biodiversity Action Plans linking to rehabilitation. Brett is a Principal Consultant within the Closure and Rehabilitation Division and was previously the Divisional Manager of Ecology. Brett is in the process of acquiring is SACNASP Registration as a Professional Natural Scientist.

  Prior to his appointment, he gained experience as a junior project manager on environmental rehabilitation projects at Hydromulch and then was appointed by Terra Pacis as an Environmental Consultant where his roles and responsibilities included the compilation of Basic Assessment (BA) reports, Scoping &Environmental Impact Reports, compilation of Environmental Management Plans (EMP), GIS mapping and Biophysical Studies.

- **Kathryn Terblanche** is the Rehabilitation and Soils Manager at Digby Wells. She received a Bachelor of Science in Ecology and Environmental Science and an Honours degree in Environmental Management from the University of Cape Town. She also has received her MSc in Restoration Ecology through the University of KwaZulu-Natal.

  Kathryn is an ecologist with fields of interest in wetlands, flora, restoration and rehabilitation. In her 7 year career she has undertaken various wetland delineations and assessments, flora assessments, rehabilitation assessments and audits, as well as project management of various implementation projects. Kathryn is also involved with both wetland and rehabilitation monitoring programmes. She has also worked extensively with alien invasive species removal programmes, ecological restoration projects and sustainable development programmes within the Government Sector.

  She has published a variety of environmental documents/articles and presented at various South African and international conferences.

- **Aamirah Dramat** is an Assistant Rehabilitation Consultant in the Rehabilitation, Closure and Soils Department at Digby Wells. She received her Bachelor of Science Degree in Applied Biology and Environmental and Geographical Science (EGS) as well as her Honours Degree in Biological Sciences from the University of Cape Town. She joined Digby Wells in 2020 as a Rehabilitation Intern and has since gained experience in the environmental services sector with specialised focus in Soils, Wetlands and Rehabilitation, both locally and internationally. She has been involved in the report compilation and undertaking of Baseline Assessments, Environmental Impact Assessments (EIAs), Rehabilitation and Closure Plans (RCPs), Rehabilitation Strategy

and Implementation Plans (RSIPs), Alien Invasive Plant (AIP) Assessments, Re-vegetation Trial Studies and Monitoring Assessments.

1.5 Report Structure and GNR 1147 Checklist

The RCP is structured to align with the minimum requirements set out in Section 3 of Appendix 4 of GNR 1147. The requirements are provided in Table 1-3 along with the reference to the relevant section in this report.

Table 1-3: Minimum Requirements of the RCP

Reference	Requirement	Report Section
3a	Details of- (i) the person or persons that prepared the plan; the professional registrations and experience of the preparers	Section1.4
3b	The context of the project, including— (i) material information and issues that have guided the development of the plan; (ii) an overview of— (aa) the environmental context, including but not limited to air quality, quantity and quality of surface and groundwater, land, soils and biodiversity; and (bb) the social context that may influence closure activities and post-mining land use or be influenced by closure activities and post-mining land use; (iii) stakeholder issues and comments that have informed the plan; (iv) the mine plan and schedule for the full approved operations, and must include— (aa) appropriate description of the mine plan; (bb) drawings and figures to indicate how the mine develops; (cc) what areas are disturbed; and (dd) how infrastructure and structures (including ponds, residue stockpiles etc.) develops during operations.	Sections 1.1, 1.2 and1.3
3c	Findings of an environmental risk assessment leading to the most appropriate closure strategy, including— (i) a description of the risk assessment methodology including risk identification and quantification, to be undertaken for all areas of infrastructure or activity or aspects for which a holder of a right or permit has a responsibility to mitigate an impact or risk at closure; (ii) an identification of indicators that are most sensitive to potential risks and the monitoring of such risks with a view to informing rehabilitation and remediation activities; (iii) an identification of conceptual closure strategies to avoid, manage and mitigate the impacts and risks;	Section 8

	(iv) a reassessment of the risks to determine whether, after the implementation of the closure strategy, the residual risk has been avoided and / or how it has resulted in avoidance, rehabilitation and management of impacts and whether this is acceptable to the mining operation and stakeholders; and an explanation of changes to the risk assessment results, as applicable in annual updates to the plan;	
3d	Design principles, including— (i) the legal and governance framework and interpretation of these requirements for the closure design principles; (ii) closure vision, objectives and targets, which objectives and targets must reflect the local environmental and socio-economic context and reflect regulatory and corporate requirements and stakeholder expectations; (iii) a description and evaluation of alternative closure and post closure options where these exist that are practicable within the socioeconomic and environmental opportunities and constraints in which the operation is located; (iv) a motivation for the preferred closure action within the context of the risks and impacts that are being mitigated; (v) a definition and motivation of the closure and post closure period, taking cognisance of the probable need to implement post closure monitoring and maintenance for a period sufficient to demonstrate that relinquishment criteria have been achieved; (vi) details associated with any on-going research on closure options; and (vii) a detailed description of the assumptions made to develop closure actions in the absence of detailed knowledge on site conditions, potential impacts, material availability, stakeholder requirements and other factors for which information is lacking.	Section 4
3e	A proposed final post-mining land use which is appropriate, feasible and possible of implementation, including— (i) descriptions of appropriate and feasible final post-mining land use for the overall project and per infrastructure or activity and a description of the methodology used to identify final post-mining land use, including the requirements of the operations stakeholders; and (ii) a map of the proposed final post-mining land use.	Section 7
3f	Closure actions, including—	Section 9

	(i) the development and documenting of a description of specific technical solutions related to infrastructure and facilities for the preferred closure option or options, which must include all areas, infrastructure, activities and aspects both within the mine lease area and off of the mine lease area associated with mining for which the mine has the responsibility to implement closure actions; and (ii) the development and maintenance of a list and assessment of threats and opportunities and any uncertainties associated with the preferred closure option, which list will be used to identify and define any additional work that is needed to reduce the level of uncertainty.	
3g	A schedule of actions for final rehabilitation, decommissioning and closure which will ensure avoidance, rehabilitation, management of impacts including pumping and treatment of extraneous water— (i) linked to the mine works programme, if greenfields, or to the current mine plan, if brownfields; (ii) including assumptions and schedule drivers; and (iii) including a spatial map or schedule, showing planned spatial progression throughout operations;	Section 12
3h	An indication of the organisational capacity that will be put in place to implement the plan, including— (i) organisational structure as it pertains to the plan; (ii) responsibilities; and (iii) training and capacity building that may be required to build closure competence.	Section 15
3i	An indication of gaps in the plan, including an auditable action plan and schedule to address the gaps.	Section 3
3j	Relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators.	Section 14
3k	Closure cost estimation procedure, which ensures that identified rehabilitation, decommissioning, closure and post-closure costs, whether on-going or once-off, are realistically estimated and incorporated into the estimate, on condition that— (i) cost estimates for operations, or components of operations that are more than 30 years from closure will be prepared as conceptual estimates with an accuracy of ± 50 per cent. Cost estimates will have an accuracy of ± 70 per cent for operations, or components of operations, 30 or less years (but more than ten years) from closure and ± 80 per cent for operations, or components of operations ten or less years (but more than five years) from closure. Operations with 5 or less years will have an accuracy of	Section 16

	± 90 per cent. Motivation must be provided to indicate the accuracy in the reported number and as accuracy improves, what actions resulted in an improvement in accuracy; (ii) the closure cost estimation must include— (aa) an explanation of the closure cost methodology; (bb) auditable calculations of costs per activity or infrastructure; (cc) cost assumptions; and (dd) the closure cost estimate must be updated annually during the operation's life to reflect known developments, including changes from the annual review of the closure strategy assumptions and inputs, scope changes, the effect of a further year's inflation, new regulatory requirements and any other material developments.	
3l	Monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps as a minimum and must include— (i) a schedule outlining internal, external and legislated audits of the plan for the year, including— (aa) the person responsible for undertaking the audit(s); (bb) the planned date of audit and frequency of audit; and (cc) an explanation of the approach that will be taken to address and close out audit results and schedule. (ii) a schedule of reporting requirements providing an outline of internal and external reporting, including disclosure of updates of the plan to stakeholders; (iii) a monitoring plan which outlines— (aa) parameters to be monitored, frequency of monitoring and period of monitoring; and (bb) an explanation of the approach that will be taken to analyse monitoring results and how these results will be used to inform adaptive or corrective management and/or risk reduction activities.	Section 13 and 14
3m	Motivations for any amendments made to the final rehabilitation, decommissioning and mine closure plan, given the monitoring results in the previous auditing period and the identification of gaps as per 2(i).	N/A

1.6 Supporting Information

The following sources of information were reviewed and utilised for the compilation of this report:

- Dalyshope Environmental and Social Impact Assessment: Preliminary Closure and Rehabilitation Plan (Digby Wells Environmnetal, 2014);
- Dalyshope CHPP, Process Description. Rev A (Universal Coal, 2020);
- Proposed Dalyshope Mine, Lephalale Limpopo Province: Wetland/Riparian Delineation and Functional Assessment (Limosella Consulting Pty Ltd, 2020);
- Proposed Dalyshope Coal Mining Project, Situated in the Magisterial District of Lephalale, Limpopo Province: Fauna and Flora Impact Assessment (Digby Wells Environmental, 2020a);
- Dalyshope Mining Right Application, and Environmental Authorisation, Limpopo: Soils, Land Use and Land Capability Report (Digby Wells Environmental, 2020b);
- Surface Water Assessment for the Dalyshope Mining Right Application and Environmental Authorisation, Limpopo Province (Digby Wells Environmental, 2020);
- Groundwater Assessment for the Dalyshope Mining Right Application and Environmental Authorisation, Limpopo Province (Digby Wells Environmental, 2020);
- Proposed Dalyshope Coal Mining Project, Situated in the Magisterial District of Lephalale, Limpopo Province: Heritage Impact Assessment (Digby Wells Environmental, 2020d);
- Aquatic Biodiversity and Impact Assessment for the proposed Dalyshope Coal Mine near Lephalale, Limpopo Province (Digby Wells Environmental, 2020e);
- Dalyshope Coal Environmental Impact Assessment: Hydrogeological Report (Digby Wells Environmental, 2020f); and
- Mine Works Programme for Dalyshope Mining Right Application. Anglo American and Universal Coal, 2020.

2 Terms of Reference

The RCP includes the following suite of documents as part of this report aligned with the Financial Provisioning Regulations, 2015 (GNR 1147 of 20 November 2015) (as amended) published under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA):

- Environmental Risk Assessment Report (ERR) in accordance with the minimum requirements for an ERR (Appendix 5 of GNR 1147);
- Annual Rehabilitation Plan (ARP) adhering to the minimum requirements for and ARP defined in Appendix 3 of GNR 1147; and

- RCP (this report) aligned with the minimum requirements for a Final Rehabilitation, Decommissioning and Closure Plan (Appendix 4 of GN R.1147).

Apart from the requirements of the GN R. 1147 regulations, mine closure planning is also required to be compliant with additional legislation, which is summarised in Section 5.

In addition to this a costing was also undertaken in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2008) (MPRDA) and determined using the Department of Mineral Resources (DMR) guidelines set out by the 2005 *"Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine"* be included in this RCP (Section 16).

2.1 Environmental Risk Report

The ERR must contain information that is necessary to determine the potential financial provision associated with the management of latent or residual environmental risks post closure. The ERR should address the following key aspects:

- A description of the risk including possible triggers and expected timeframes;
- An assessment of alternatives;
- Costing indicating the quantum of the liability; and
- Monitoring, auditing and reporting requirements.

2.2 Annual Rehabilitation Plan[1]

In terms of the new financial provision regulations, an ARP will need to be developed for the operation and should be linked to the action plan and schedule contained within the RCP. This report needs to document the plan for rehabilitation for the upcoming 12 months. The content of such a report is summarised below:

- Review of concurrent rehabilitation activities;
- Assessment and review of objectives set and outcomes for the upcoming 12 months;
- Scheduling, planning and budgeting for rehabilitation for the upcoming 12 months, including areas to be rehabilitated, areas to be disturbed or planned to be disturbed, details of rehabilitation measures to be implemented and description of objectives and design criteria that should be adopted for the upcoming 12 months;
- Evaluate and update the cost of rehabilitation for the 12 month period and for closure;
- Results of monitoring and risks identified; and
- Identification of shortcomings and how these will be addressed.

[1] At this project is currently a Greenfields site an ARP plan has not been compiled at this stage and will need to be compiled once the mine becomes operational.

2.3 Rehabilitation and Closure Plan

The intent of the RCP is to ensure that it is aligned to the ERR and ARP and meets the minimum requirements stipulated by the relevant regulations. In general, the RCP should contain information relating to the following:

- Providing vision, objectives, targets and criteria for final rehabilitation;
- Legal and governance framework;
- Baseline environment, including social context, which will influence the closure objectives and post-mining land use;
- Assessment of post closure options that are practical and within the socio-economic and environmental opportunities;
- Motivation for the preferred closure option;
- Proposed final land use and mapping;
- Ongoing research on closure and rehabilitation options;
- Detailed description of assumptions made;
- Stakeholder issues and comments;
- Outline of design principles for closure, including designs and drawings of how the mine will develop, including a schedule of actions for final rehabilitation, which is linked to the mine works programme;
- Risk assessment approach and outcomes and linking this to closure activities;
- Detail on closure actions to mitigate/manage identified risks and describe the nature of residual risks that will need to be managed and monitored post closure;
- Scheduling, budget, roles and responsibilities to be assigned for final rehabilitation;
- Identification of knowledge gaps and how these will be addressed;
- Detail of full financial provision for the life of the Project;
- Information on the organisational capacity to implement the rehabilitation plan;
- Auditable action plan for audits and update of the annual rehabilitation plan;
- Relinquishment criteria for infrastructure; and
- Outline of monitoring, auditing and reporting requirements.

3 Assumptions and Limitations

The compilation of this RCP is based on the following assumptions and limitations in Table 3-1.

Table 3-1: Limitations and Assumptions with Resultant Consequences of this RCP

Assumptions and Limitations	Consequences
The information contained within this RCP is based on the current plans and information provided by UCD and t is assumed that these are accurate.	If there is a significant change or addition of other infrastructure areas the RCP will need to be updated to cater for this change.
Digby Wells compiled the report considering information from work previously completed by other specialists, and information supplied by UCD and it is assumed that these are accurate.	The costing is based on information provided and assumptions made. If there are any changes to the information or layout plan, the report and closure costs assessment must be updated, if not this could result in the costing provided not being an accurate estimate.
Project consists of a natural, untouched area (i.e. greenfield land).	The ARP only looks at the upcoming 12 months as construction begins.
The recommendations contained within this report currently exclude any comments or issues raised by stakeholders and/or Interested and Affected Parties (I&APs).	This report will be updated should any comments from stakeholders or I&APs be received.
This report must be considered as a dynamic document.	The RCP should be updated and submitted annually (aligned with GNR 1147) as additional information becomes available, and as monitoring and rehabilitation progresses.

For the limitations and assumptions for the annual rehabilitation and the ERR, refer to the ARP and ERR, respectively.

4 Mine Closure Overview

Historically, mine closure plans mainly focused on the environment and physical aspects, such as land rehabilitation and asset removal while overlooking the cultural, social and economic aspects. However, it is now accepted that considering closure at an early stage allows mining companies to reduce the level of dependency from communities with regards to economic benefits and community services.

Successful closure depends on setting, continually reviewing and validating and finally meeting closure goals that align with company and stakeholder requirements. There should be minimal residual risk to the company and the community should realise benefits that will continue to exist without further input from the company.

The vision of mine closure should be to ensure that a process is established to guide all decisions and actions during a mine's life such that:

- Future public health and safety are not compromised;
- Environmental resources are not subject to physical and chemical deterioration;
- The post-mining use of the site is beneficial and sustainable in the long-term;

- Any adverse socio-economic impacts are minimised; and
- The opportunity is taken to maximize socio-economic benefits.

It is recommended that the RCP be revised as the mine production progresses; this will ensure the operation take advances in technology and rehabilitation methods into consideration.

Figure 4-1 below depicts a general approach to mine closure planning.

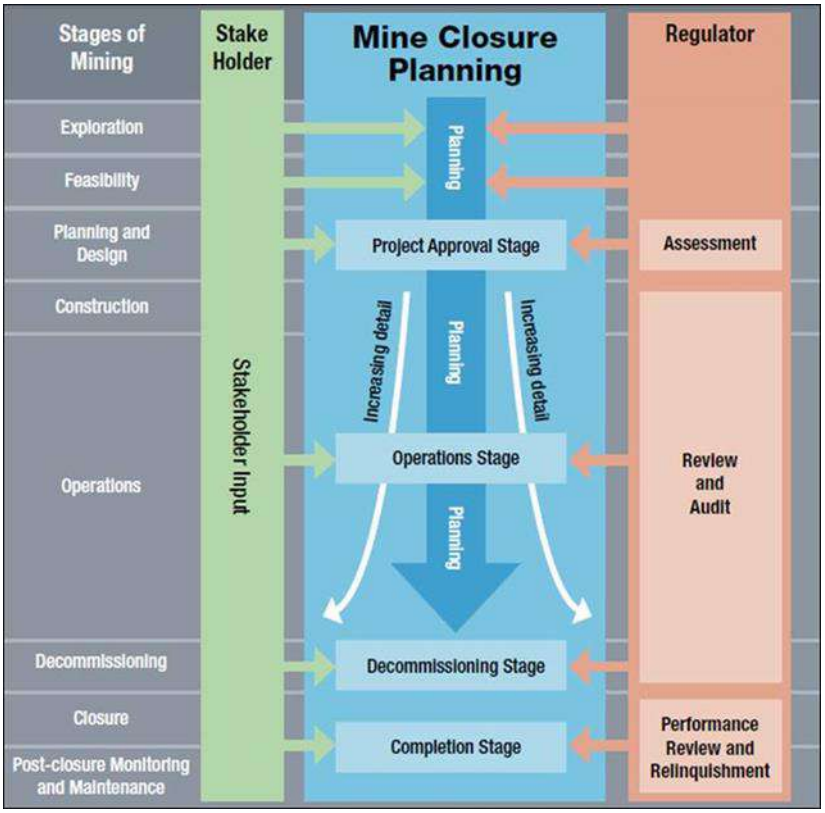


Figure 4-1: Integrating Stages of Mining and Mine Closure Planning

[Source: (DMP & EPA, 2015)]

4.1 Closure Design Principles

Mine closure is an ongoing programme designed to restore the physical, chemical and biological quality or potential of air, land and water regimes disturbed by mining to a state acceptable to the regulators and to post mining land users. The activities associated with mine closure are designed to prevent or minimise adverse long-term environmental impacts, and to create a self-sustaining natural ecosystem or alternate land use based on an agreed set of objectives. The objective of mine closure is to obtain legal (government) and community agreement that the condition of the closed operation meets the requirements of those entities, whereupon the companies' legal liability is terminated.

Rehabilitation can be divided into two different streams, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation must continue to be carried out along with mining. Concurrent rehabilitation activities should decrease the final closure costs that the mine will

carry at the time of closure. This concurrent rehabilitation must be undertaken within the context of the approved Environmental Management Programme (EMPr) as well as the RCP. Final rehabilitation will be carried out once the mine goes into its decommissioning and closure phase.

The primary concerns for decommissioning and rehabilitation are to ensure public safety and health, ensure environmentally stable conditions compatible with the surrounding environment and consequently minimise the environmental impacts caused by mining. The overall objective is to have socially, economically and environmentally sustainable development. The general objectives of mine closure are:

- Safety and health of animals and humans must be safeguarded;
- Environmental damage and residual impacts must be minimised to a level acceptable to all parties, i.e. avoidance of future pollution;
- Land must be rehabilitated to as close to natural state as possible, i.e. creation of a stable land surface;
- Physical and chemical stability of remaining structures must be such that they are not affected by natural elements;
- Mines are closed effectively and cost efficiently; and
- Mines are not abandoned but closed in terms of applicable legislation.

4.2 Closure Vision

'*To leave a rehabilitated mine site behind that is safe, stable, non-contaminating* ***and integrated into the surrounding ecosystems and land use and which is located*** *within local communities that, during the period* ***of mining, have been enabled to establish and sustain alternative livelihoods.'***

4.3 Closure Objectives

Rehabilitation and Closure is a continuous series of activities that begin with planning prior to the Project's design and construction and end with achievement of long-term site stability and establishment of a self-sustaining ecosystem. It is crucial that UCD takes cognisance that the implementation of this concept will not only result in a sustainable environment post mine closure, but it will also reduce the financial liability of closure and rehabilitation overtime.

The closure objectives for UCD are detailed in a Preliminary Closure and Rehabilitation Plan completed by Digby Wells (Digby Wells Environmnetal, 2014) and are listed below for ease of reference.

Land Capability/Land Use

To return land impacted by relevant infrastructure as far as possible to a land capability to that which existed prior to mining or as close as possible thereto. To also ensure that the management level required to utilise the rehabilitated land is within the means of the surrounding land uses.

Water Quality and Management

To ensure that as little water as possible seeps out of the waste dump during operation phase and where this is unavoidable, to ensure that the water is contained or treated if it does not meet statutory water quality requirements. Prevent any soil and surface/groundwater contamination by managing all water on site.

Physical Stability

To remove infrastructure that cannot be used by a subsequent land owner or a third party. Where buildings can be used by a third party, arrangements will be made to ensure their long term sustainable use.

Environmental Quality

To clean up all coal stockpiles and loading areas and rehabilitate these as far as possible to a land capability to that which existed prior to mining.

Progressive Rehabilitation

To follow a process of closure that is progressive and integrated into the short and long-term plans and that will assess the closure impacts proactively at regular intervals throughout the Project life. Implement progressive rehabilitation measures, beginning during the construction phase wherever possible.

Health and Safety

To leave a safe and stable environment for both humans and animals and make their condition sustainable.

Legal

To comply with local and national regulatory requirements.

Social

To form active partnerships with local communities to take care of management of the land after mining, where possible.

Monitoring and Maintenance

To maintain and monitor all rehabilitated areas following re-vegetation or capping (placement of a layer of material, e.g. clay or sandstone, which prevents/limits

capillary movement of water between soil and pollution source) and, if monitoring shows that the objectives have been met, making an application for closure.

5 Legal Requirements

Section 41(1) of the MPRDA has been repealed and in terms of Section 24P of the National Environmental Management Act (NEMA), as amended, which provides that the holder of a Mining Right (MR) must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds to undertake the following:

- Rehabilitation of the adverse environmental impacts of the listed or specified activities;
- Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water;
- Decommissioning and closure of the operations;
- Remediation of latent or residual environmental impacts which become known in the future;
- Removal of building structures and other objects; and
- Remediation of any other negative environmental impacts.

In addition to Section 24(P), the Financial Provision Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on 20 November 2015 (GNR 1147). For the purposes of this report, the financial provision estimate and respective reports are in line with the requirements of the Financial Provision Regulations, 2015, besides the current costing that has been undertaken. Refer to Section 16 for further details..

Regulation 10 of the Financial Provision Regulations, 2015 requires a Mining Right Applicant to determine the financial provision through detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:

- Annual rehabilitation[2] as reflected in the ARP as per the minimum content prescribed by Appendix 3 of the Regulations;
- Final rehabilitation, decommissioning and closure as reflected in the RCP as per the minimum content prescribed by Appendix 4 of the Regulations; and
- The remediation of latent or residual environmental impacts including but not limited to the pumping and treatment of polluted or extraneous water, as reflected in an ERR, as per the requirements of Appendix 5 of the Regulations.

[2] The costing and report for Annual Rehabilitation has not been undertaken at this stage at the site is a Greenfields site, however will be required once the mine becomes operational.

Applicable legislation is outlined in

Table 5-1.

Table 5-1: Applicable Legislation

Applicable Legislation and Guidelines	Details
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that: • Prevent pollution and ecological degradation; • Promote conservation; and • Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.
The Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983) (CARA)	The Conservation of Agricultural Resources Act 43 of 1983 states that the degradation of the agricultural potential of soil is illegal. The Conservation of Agricultural Resources Act 43 of 1983 requires that protection of land against soil erosion and the prevention of water logging and salinization of soils means of suitable soil conservation works to be constructed and maintained.
Mineral and Petroleum Resource Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. Section 41(1) of Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) has been repealed and in terms of Section 24P in the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as amended which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds to undertake the: • Rehabilitation of the adverse environmental impacts of the listed or specified activities; • Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water; • Decommissioning and closure of the operations; • Remediation of latent or residual environmental impacts which become known in the future; • Removal of building structures and other objects; and/or • Remediation of any other negative environmental impacts.
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	The NEMA, as amended was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24(1) (a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* In addition to Section 24(P), the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on the 20 November 2015 GNR 1147 published in Government Gazette (GG) 39425). Regulation 10 of the Financial Provision Regulations requires a holder of a Mining Right to determine the quantum of the financial provision through detailed itemisation of all activities and costs.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)	NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: • Alien and Invasive Species Lists, 2016 published (GNR 598 in GG 40166 of 29 July 2016); • National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and • National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GNR 1002, GG 34809, 9 December 2011).

Applicable Legislation and Guidelines	Details
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)	According to the NEM:AQA the Department of Environmental Affairs (DEA), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GNR 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.

There are several guideline documents which provide recommendations on how rehabilitation and closure should be undertaken. For the purpose of the plan, the following guideline documents were considered:

- Guidelines for the Rehabilitation of Mined Land. Chamber of Mine of South Africa/ Coaltech, November 2007 (Tanner & Mohr-Swart, 2007);
- Best Practice Guidelines (BPGs) series developed by the Department of Water Affairs (DWA) (2007);
- Land Rehabilitation Guidelines for Surface Coal Mines (CoalTech Rsearch Association, Minerals Council of Southern Africa, Land Rehabilitation Society of Southern Africa,, 2019);
- Integrated Mine Closure, Good Practice Guide 2nd edition (International Council of Mining and Metals, 2019); and
- Best Practice Guidelines (BPGs) series developed by the Department of Water Affairs (DWA).

6 Baseline Environmental and Socio-Economic Setting

The following information which forms the baseline for the environmental setting has been sourced from work previously completed by other Digby Wells specialists and has been referenced accordingly.

6.1 Climate

The Project Area falls within the Limpopo Climatic Zone characterized by warm, wet summers and dry winters (South African Weather Bureau, 1986) with rainfall predominantly occurring in the summer months (November to February). Lephalale, which is approximately 60 km away from the proposed Project Area, is generally dry due to low rainfall per annum and warm to hot summers with an average daily temperature of 21.1 Degrees Celsius (°C). The mean annual precipitation (MAP) is approximately 437 mm with the bulk of precipitation being experienced during the summer months (October to April). Annual average maximum, minimum and mean temperatures for the Project Area are given in Figure 6-1 below.

Lephalale lies 829 meters above mean sea level (m.a.m.s.l.) and is influenced by local steppe climate. The climate is considered BSh (hot semi-arid) according to the Köppen-Geiger climate classification (Köppen & Geiger, 1936). The driest month is July with 2 mm of rainfall, whereas in January the peak is reached with an average of 91 mm of rainfall.

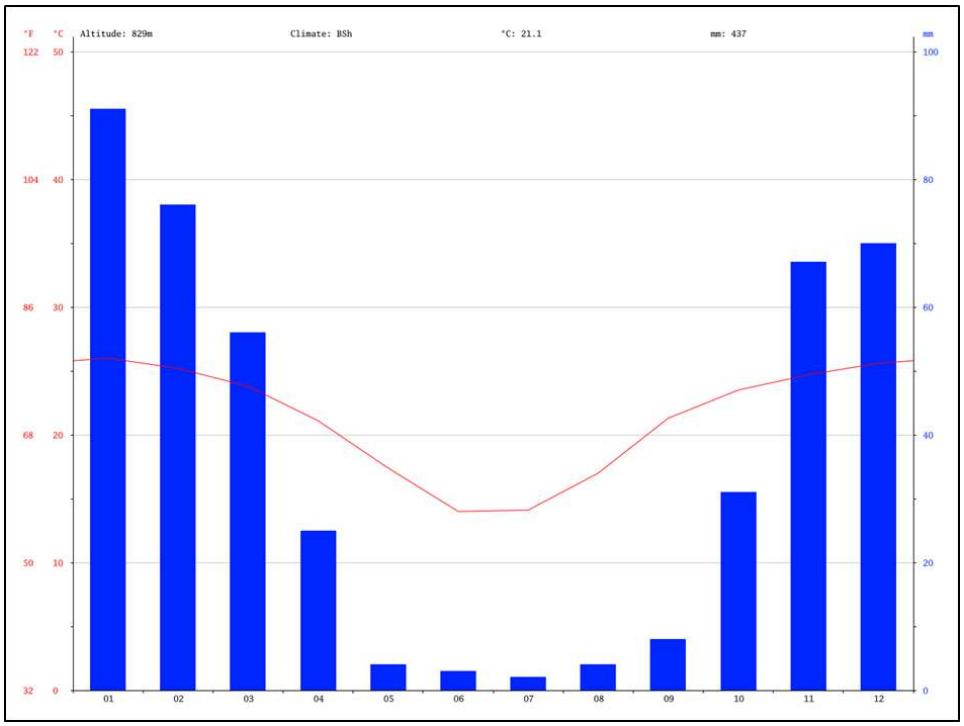


Figure 6-1: Annual Climate Trends in Lephalale (Source: Climate-data.org, 2019)

Implications for Rehabilitation:

- The warm, wet summers are conductive to vegetation growth therefore promoting rehabilitation;
- Seeding should take place at the beginning of the summer season so that germination can take place when there is rainfall;
- The generally warm and dry conditions means that hydroseeding options or irrigation may be required; and
- Extreme climate events (e.g. increased rainfall intensity, drought, severe frost) could affect long term landform viability and increase the risk of erosion.

6.2 Geology

The coal resources of South Africa are hosted within the Karoo Supergroup, which has been divided into 19 coal fields. The OC1 Area falls within the Ellisras Basin coal fields (Digby Wells Environmental, 2020b). Coal extracted from the Karoo Supergroup varies significantly in grade, type, thickness, and lateral extent due to climate, biomes, environments, and structural disturbances (Johnson, et al., 2006).

The main structural disturbances to the Karoo Supergroup are associated with the intrusion of dolerite dykes, and sills, which displace the coal resource (Johnson, et al., 2006), however, there are no dolerite exposures in the Ellisras Basin. The Ellisras Basin is bounded by the

Eenzaamheid, and Zoetfontein faults, as well as the Daarby fault on the eastern boundary with extensive minor faulting, and magnetic lineaments present within the Ellisras Basin itself.

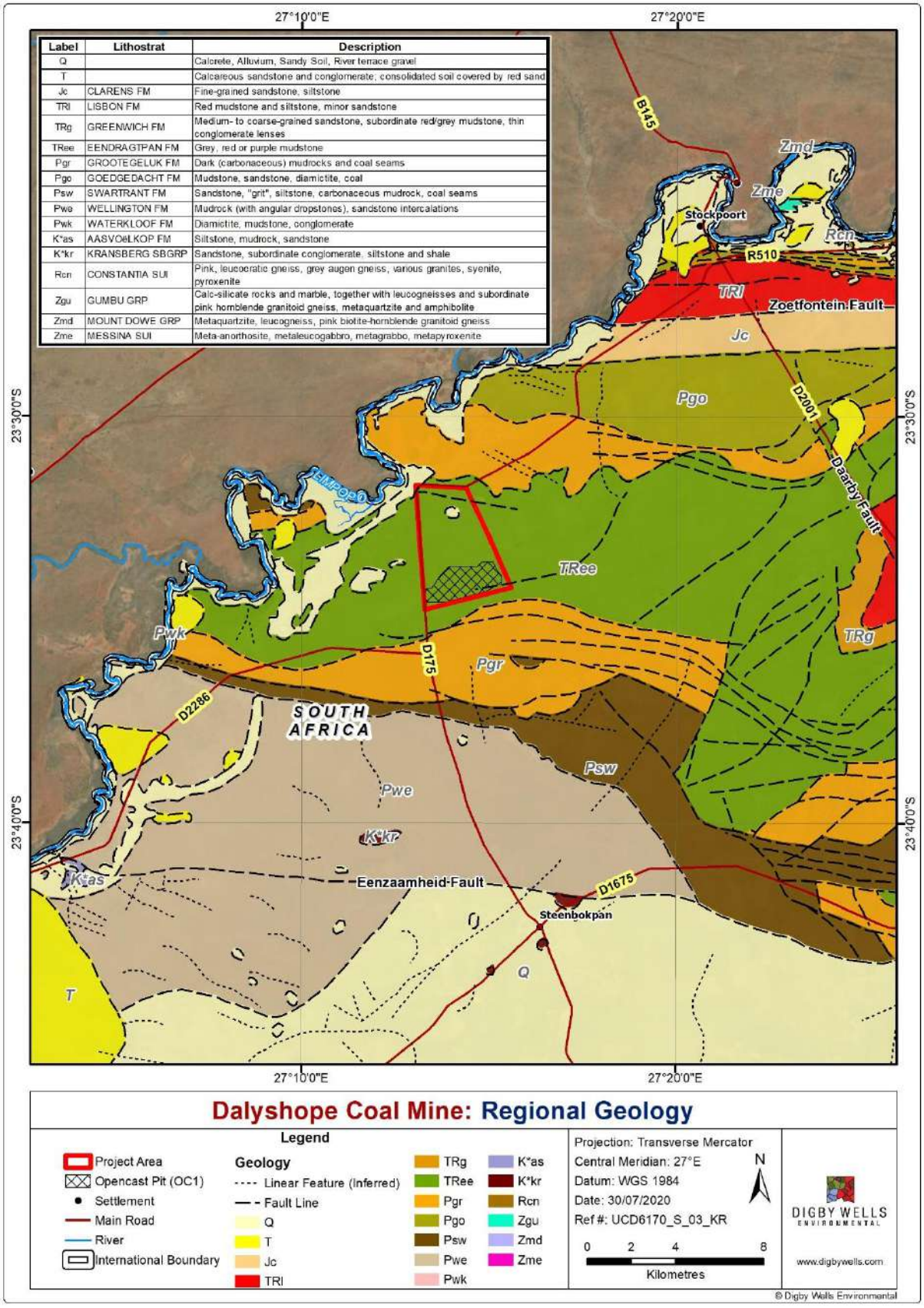
Swartrant and Grootegeluk Formations form part of the Ellisras Basin consisting of depositional features accepted by the meandering river, and floodplain environment. The lithology of the OC1 Area is Siliciclastic Rock (Digby Wells Environmental, 2020b) (Figure 6-2). Siliciclastic rock can be described as non-carbonaceous sedimentary rock with a high silica content, either as forms of quartz or other silicate minerals. These sedimentary rocks form from precipitation from fluids or through a biochemical process of living organisms by processes such as erosion, transportation, lithification, or deposition.

The Ellisras Basin consists of deposits representing formations of the Karoo Supergroup, and different depositional environments. The Grootegeluk Formation is an economically important formation within the Ellisras Basin containing an approximate 80 m thick coal deposit. The coal seams of the Swartrant Formation, adjacent to the Project Area, comprised three distinct seams varying in thickness from 0.5 m to 8 m, which are separated by sandstone, siltstone, and mudstone inter-burden (Universal Coal, 2020; Digby Wells Environmental, 2020b).

The Grootegeluk Formation is covered by the Eendragtpan Formation comprising of variegated mudstones (Johnson, et al., 2006). The weathered profile consists of calcareous material forming drainage channels and small pans.

Implications for Rehabilitation:

- The high silica content could aid in the prevention of Acid Mine Drainage (AMD) from occurring.



Label	Lithostrat	Description
Q		Calcrete, Alluvium, Sandy Soil, River terrace gravel
T		Calcareous sandstone and conglomerate; consolidated soil covered by red sand
Jc	CLARENS FM	Fine-grained sandstone, siltstone
TRl	LISBON FM	Red mudstone and siltstone, minor sandstone
TRg	GREENWICH FM	Medium- to coarse-grained sandstone, subordinate red/grey mudstone, thin conglomerate lenses
TRee	EENDRAGTPAN FM	Grey, red or purple mudstone
Pgr	GROOTEGELUK FM	Dark (carbonaceous) mudrocks and coal seams
Pgo	GOEDGEDACHT FM	Mudstone, sandstone, diamictite, coal
Psw	SWARTRANT FM	Sandstone, "grit", siltstone, carbonaceous mudrock, coal seams
Pwe	WELLINGTON FM	Mudrock (with angular dropstones), sandstone intercalations
Pwk	WATERKLOOF FM	Diamictite, mudstone, conglomerate
K*as	AASVOëLKOP FM	Siltstone, mudrock, sandstone
K*kr	KRANSBERG SBGRP	Sandstone, subordinate conglomerate, siltstone and shale
Rcn	CONSTANTIA SUI	Pink, leucocratic gneiss, grey augen gneiss, various granites, syenite, pyroxenite
Zgu	GUMBU GRP	Calc-silicate rocks and marble, together with leucogneisses and subordinate pink hornblende granitoid gneiss, metaquartzite and amphibolite
Zmd	MOUNT DOWE GRP	Metaquartzite, leucogneiss, pink biotite-hornblende granitoid gneiss
Zme	MESSINA SUI	Meta-anorthosite, metaleucogabbro, metagrabbo, metapyroxenite

Figure 6-2: Regional Geology of the Dalyshope Project Area

6.3 Topography

The topography of the Project Area, as depicted in Figure 6-3, can be described as flat with slight to moderate undulating plains with some small depressions scattered throughout the landscape, containing alluvial deposits. The Project Area is located on gentle slopes, averaging from 0 to 0.7°, with elevations ranging between approximately 789 to 850 m.a.m.s.l. (Figure 6-4) (Digby Wells Environmental, 2020b). Drainage predominantly flows in a northern direction towards the Limpopo River. Current activities related to change to the natural topography include:

- Agro-pastoral activities;
- Roads, powerlines and fence lines; and
- Infrastructure, including buildings and dams.

Terrain-morphological units in the landscape were not easily distinguished, however, two small pans were identified within the OC1 Area. Clear signs of water accumulation take place in the identified depression areas during the rainy season (September to April), however, dries up during the rest of the year. As such these pans can be described as seasonal pans (Digby Wells Environmental, 2020b).

Implications for Rehabilitation:

- Align any levelling, shaping or backfilling of rehabilitated areas with the surrounding drainage network;
- Limit the disturbed footprint and rehabilitate areas as soon as possible;
- Generally flat areas should reduce the risk of erosion and minimise the need for constructed storm water management measures; and
- The gentle topography is expected to have high arable potential.

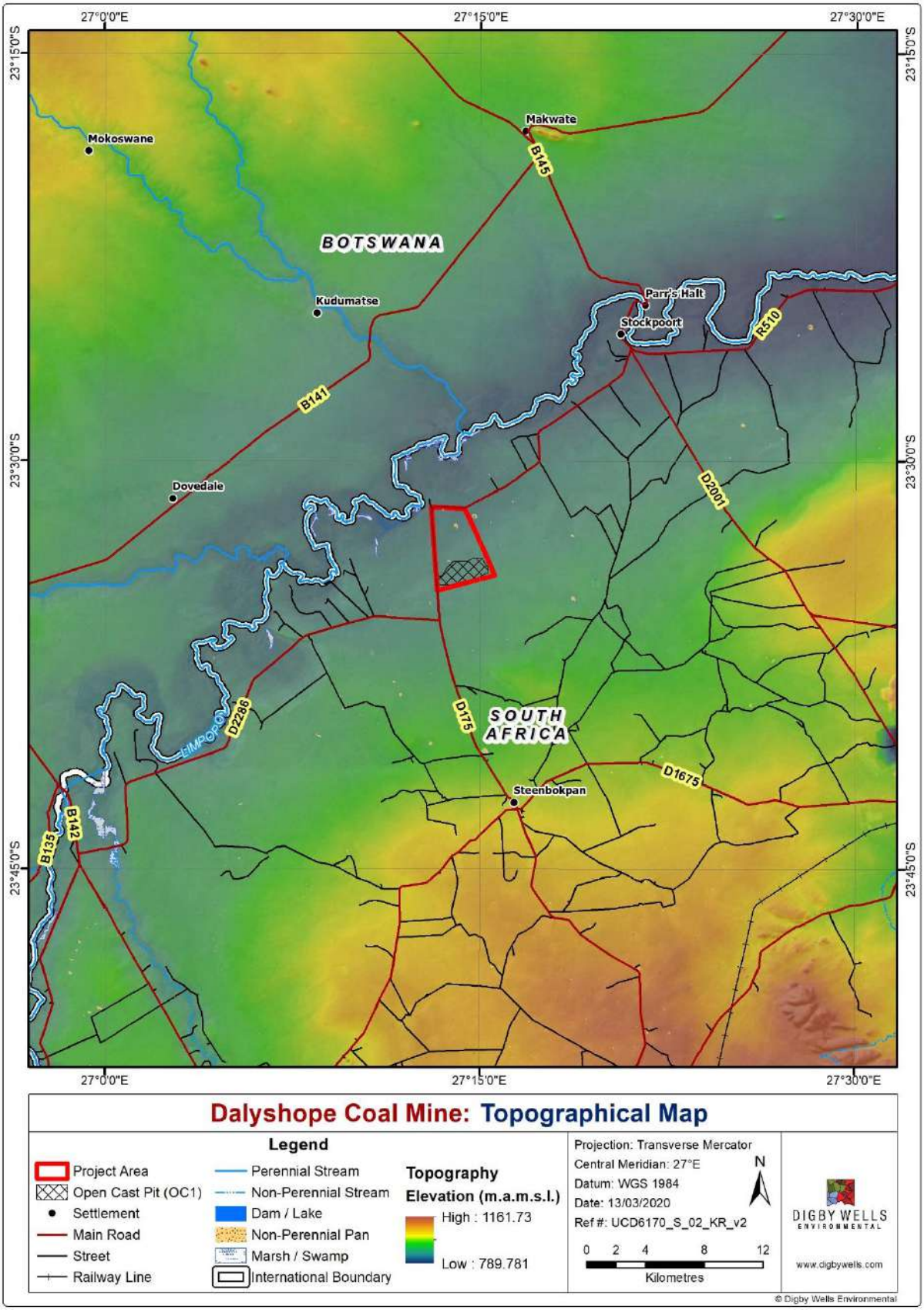


Figure 6-3: Topography of the Dalyshope Project Area

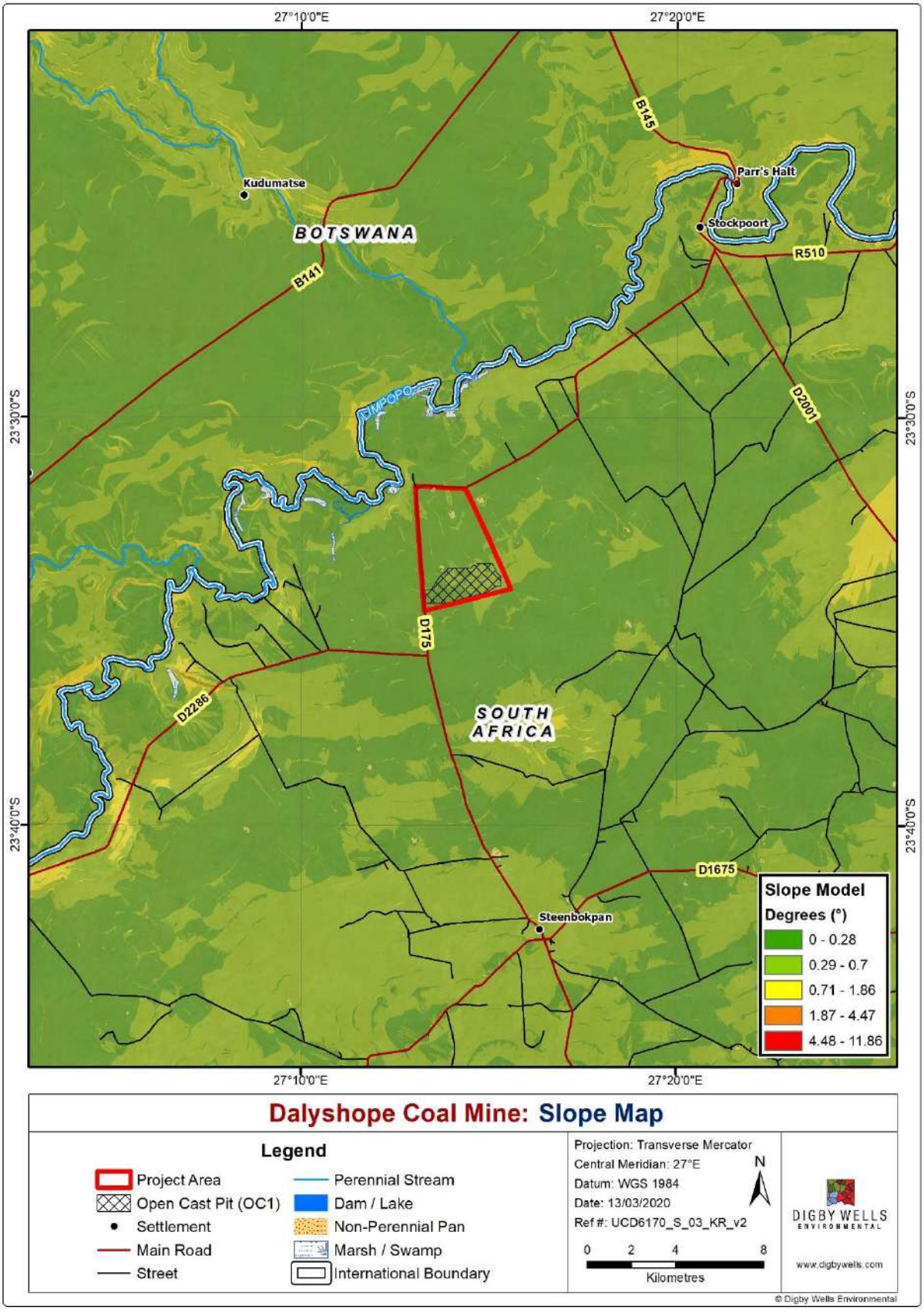


Figure 6-4: Slope of the Dalyshope Project Area

6.4 Soils

Baseline data suggested that the land types for the Project Area are predominantly of the Ah86 type with a small portion of the Ae257 type. These land types and dominant soil forms are briefly described below in Table 6-1 as per the Land Type Survey Staff (1972 - 2006) and illustrated in Figure 6-5.

Table 6-1: Land Type and Dominant Soil Forms

Land Type	Soil Forms	Geology	Characteristics
Ae257	• Hutton; • Shortlands; • Valsrivier; • Oakleaf; • Clovelly; • Arcadia; • Mispah; and • Glenrosa.	• Sandstone and siltstone of the Clarens Formation; and • Undifferentiated shale, sandstone, mudstone, alluvium and coal of the Karoo Sequence.	• 500 ha estimated area unavailable for agriculture; • Slopes are between 0 and 4%; • Depths mainly deeper than 1 200 mm, with some areas with shallow soils of 50 mm; • 93% of the soils occurring in the foot slope terrain; • Dominant soil types are well drained, sandy, red apedal soils; and • Clay content varying between 8 and 25% in the B-horizon.
Ah86	• Hutton; • Clovelly; • Fernwood; • Longlands; • Avalon; • Glencoe; • Valsrivier; • Oakleaf; and • Katspruit.	• Sandstone, alluvium and mudstone of the Waterberg Group (Matlabas subgroup); and • Undifferentiated shale, sandstone and coal of the Karoo Sequence.	• 1000 ha estimated area unavailable for agriculture; • Slopes are between 1 and 3%; • Depths mainly deeper than 1 200 mm; • 83% of the Ah86 occurs in the foot slope terrain; and • Dominant soil types are well drained, sandy, red apedal soils.

Hutton, Clovelly, Oakleaf, Glencoe, and Kroonstad soil forms dominate the Project Area (Digby Wells Environmental, 2020b) (Figure 6-6). Soil forms are conceptual generalizations based on specific soil properties. Each soil form is made up of soil horizons, uniquely combined, and integrated. The typical augured soil horizons were identified as:

- Orthic A-horizons, overlying Yellow-brown to Red Apedal B-horizons with a Hard-Plinthic B-horizon; and
- Soft Plinthic G, and Neo-cutanic B-horizons were dominant. in the pan regions, These soils are high clay, young soils with clear evidence of emerging soil development in the form of colour variations and clay lamellae.

The Orthic A-horizons are generally low in organic carbon while the Apedal B-horizons consist of uniform yellow-brown to red, iron-rich pigmented chroma soils. The Apedal soils identified

on-site are deep, sandy, well-drained soils that are generally low in organic carbon but are rather easily manageable soils for cultivation. Carbonaceous soils were evident in some parts of the Project Area with lime concretions on the surface and within the soil matrix. Some areas within the Project Area also showed limited soil depths with high volumes of peds (an individual, natural soil aggregate), gravel, and stones.

Hutton and Clovelly soils are typically deep soils, dominated by a red to yellow-brown apedal (non-structure), sandy B-horizons with a clayey underlying material such as Soft-Plinthic. Oakleaf soils consist of a neo-cutanic B-horizon, indicating unconsolidated material from alluvial or colluvial origin typically found within the pans or low-lying areas in the topography. Kroonstad and Glencoe soils consist of sandy, from yellow-brown B-horizons to bleached B-horizons indicating interflow soils, high drainage, and high leaching potential.

Implications for Rehabilitation:

- Soils with high pH levels that may lead to brackish soils when mismanaged, this in return can lead to vegetation, and basal cover restrictions, and land capability deterioration;
- Limited soil depths with high volumes of peds, gravel, and stones will restrict rooting depth and root development. This may limit the cultivation potential (decrease Land Capability) of the area and can lead to underestimated volumes of calculated soil volumes;
- The clayey horizon increases the water holding capacity, organic material, and CEC of the soil, and therefore increasing the agricultural potential;
- Kroonstad and Glencoe soil forms have a high leachability, and often low in soil organic material;
- Conserving soil resources and limiting the damage to the chemical and physical quality is a crucial component in achieving successful rehabilitation and the defined end land use and capability post closure;
- Soil types should be stripped according to the pre-mining soil plan and to the correct depth to prevent mixing with subsoils;
- Soil compaction can limit the effectiveness of revegetation efforts. Disturbed areas should be limited to as small as possible and compacted/hardstand areas should be ripped to alleviate compaction; and
- Measures to ensure soils are not contaminated by hydrocarbon spillages or leaks from vehicles should be implemented.

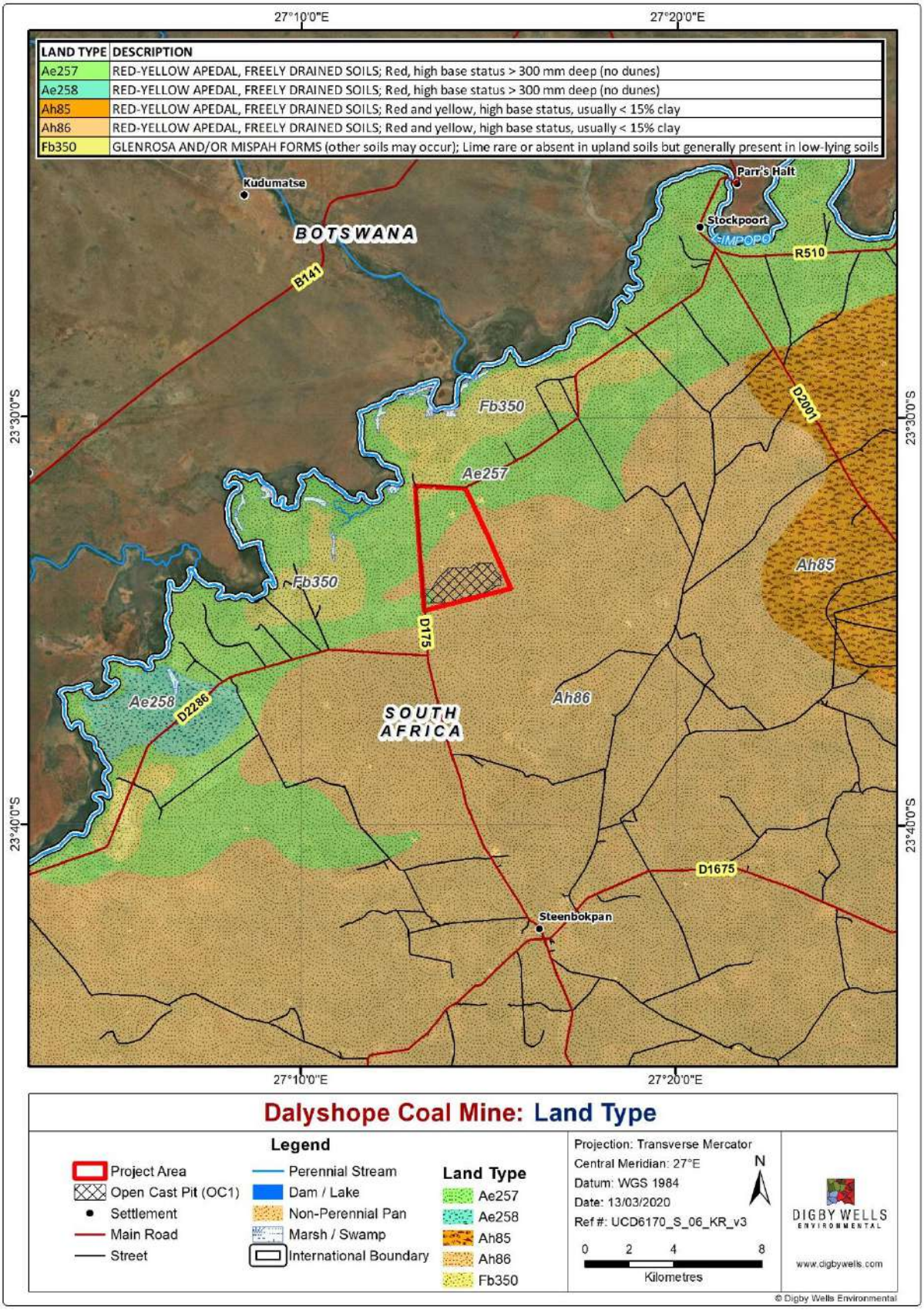


Figure 6-5: Land Type of the Dalyshope Project Area

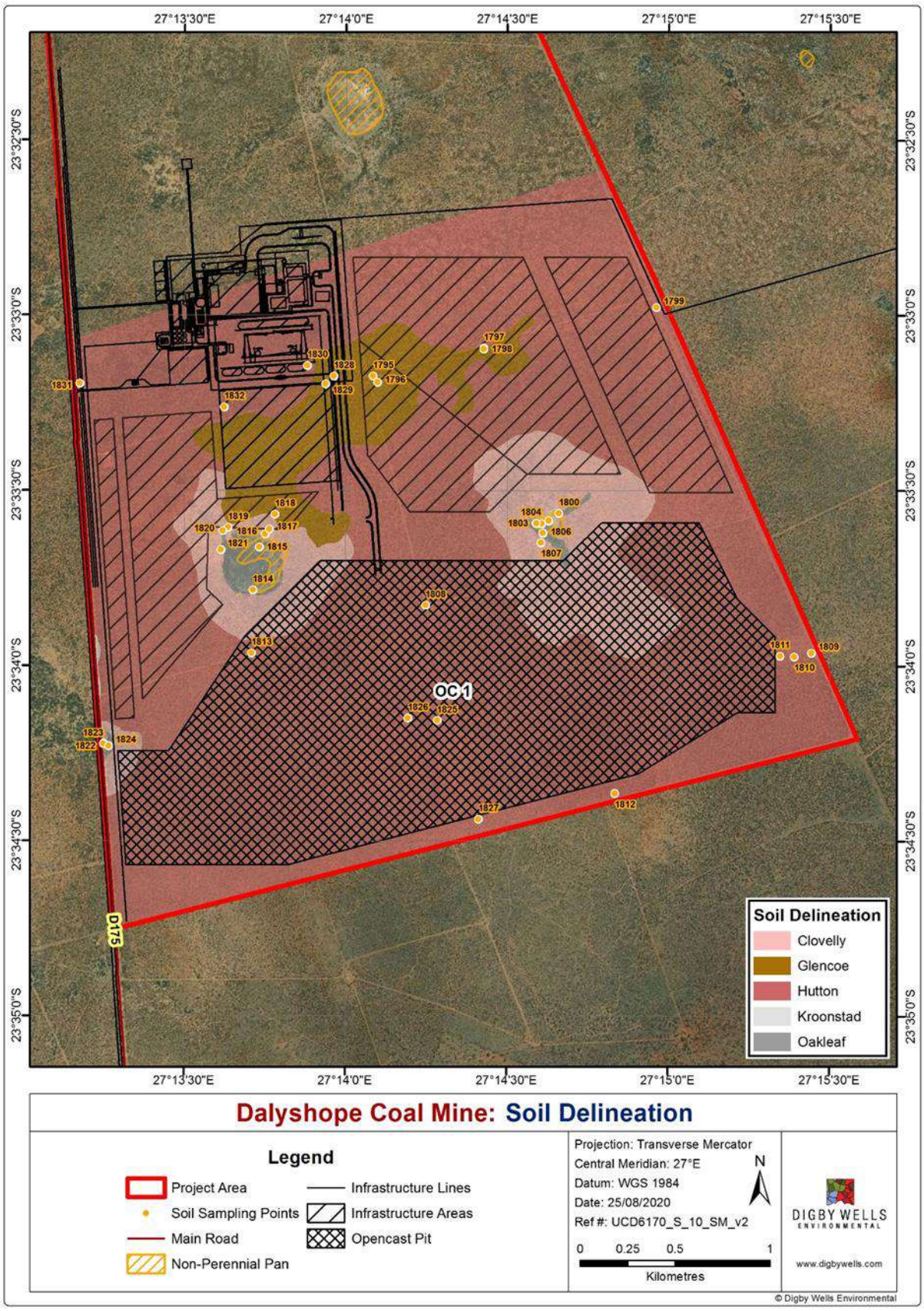


Figure 6-6: Soil Delineation

6.5 Land Capability

Land capability is defined as the most intensive long-term sustainable use of land under rain-fed conditions (Schoeman, et al., 2000). The land capability of the entire Project Area is Class V (Grazing – Moderate Grazing) (Figure 6-7). The Project Area is not yet disturbed by mining activities but is currently used for wildlife and cattle grazing. The dominant land capability is grazing due to the dry climate and high evaporative demand (Digby Wells Environmental, 2020b). A detailed breakdown is provided in Table 6-2.

Table 6-2: Land Capability Classification

Land Capability Class	Description	Dominant Limitation Influencing the Physical Suitability for Agricultural Use
V	Grazing – Moderate Grazing	These lands are generally not suitable for cultivation. The soils have little or no erosion hazard but have other limitations. They are impractical to remove thus limiting their use. These areas are generally used for pasture, range, forestland or wildlife for food and cover. The soils in this class have restrictions regarding cultivation which can limit plant growth and prevent normal tillage of cultivated crops lands. Some limitations include that the soils are frequently wet and overflowed by streams, are stony and have climate limitations. These soils are nearly level and created ponding and prevent drainage of cultivated crops. The soils are not feasible to cultivate and mainly suitable for grasses or trees.

Implications for Rehabilitation:

- Application of fertilizers and other measures will need to be implemented to achieve long-term improvement in the soil fertility for revegetation success and agricultural use.

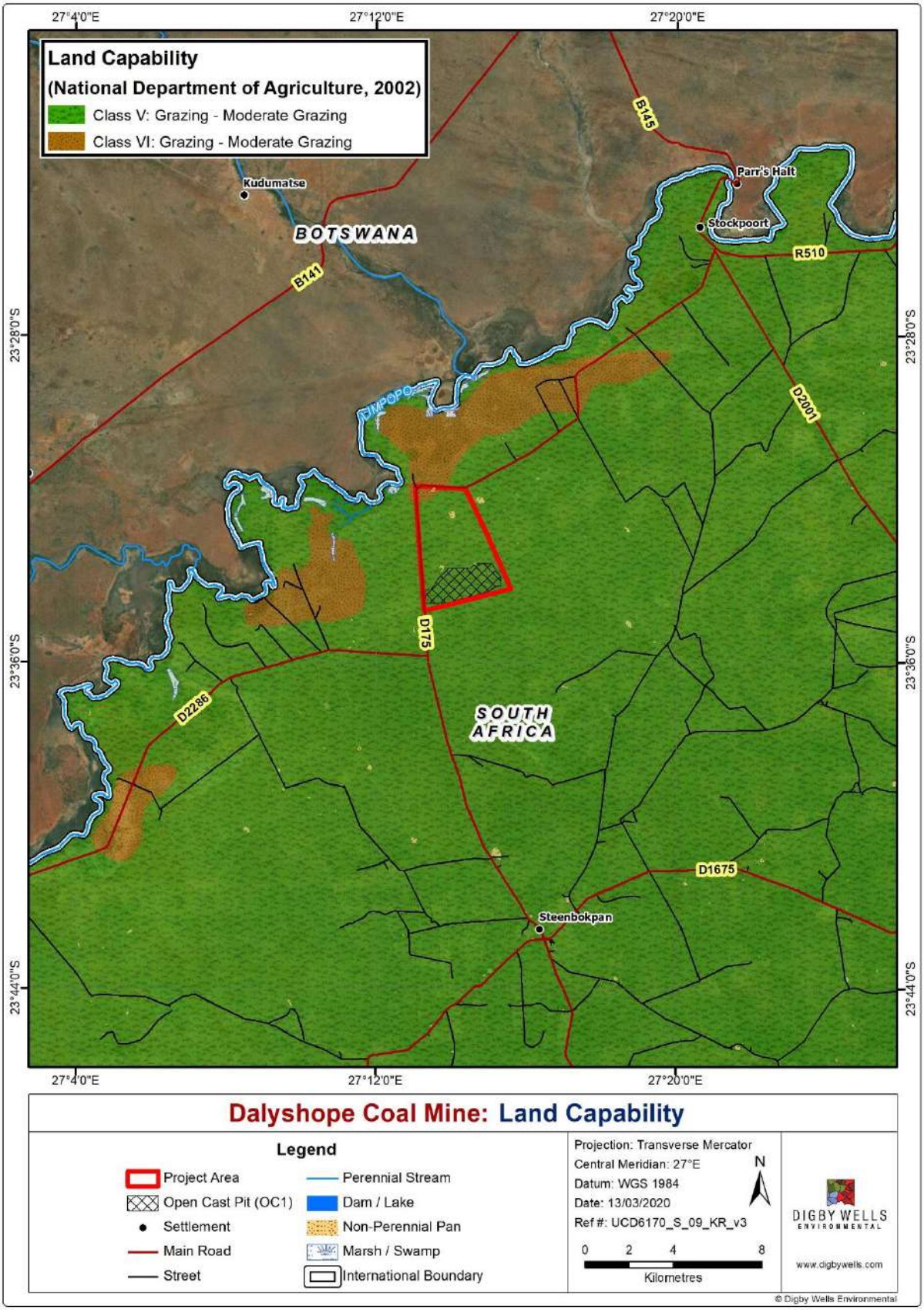


Figure 6-7: Land Capability of the Dalyshope Project Area

6.6 Land Use

The land use for the Project Area is dominated by agriculture, dominated by cattle grazing, and game farming (Figure 6-8). This can be attributed to the low agricultural potential of the soils, low rainfall, and high evapotranspiration demand. The site consists of natural open woodland, and grassland, with small seasonal pans, herbaceous wetlands, eroded lands, and sparsely wooded grassland (Figure 6-8). The dominant land use in the Steenbokpan region is:

- Game farming;
- Cattle grazing; and
- Cultivation.

Implications for Rehabilitation:

- Application of fertilizers and other measures may need to be implemented to achieve long-term improvement in the soil fertility after closure to increase the agricultural potential of the soils, if required;
- Develop a land use plan to ensure rehabilitation outcomes align with the surrounding land uses;

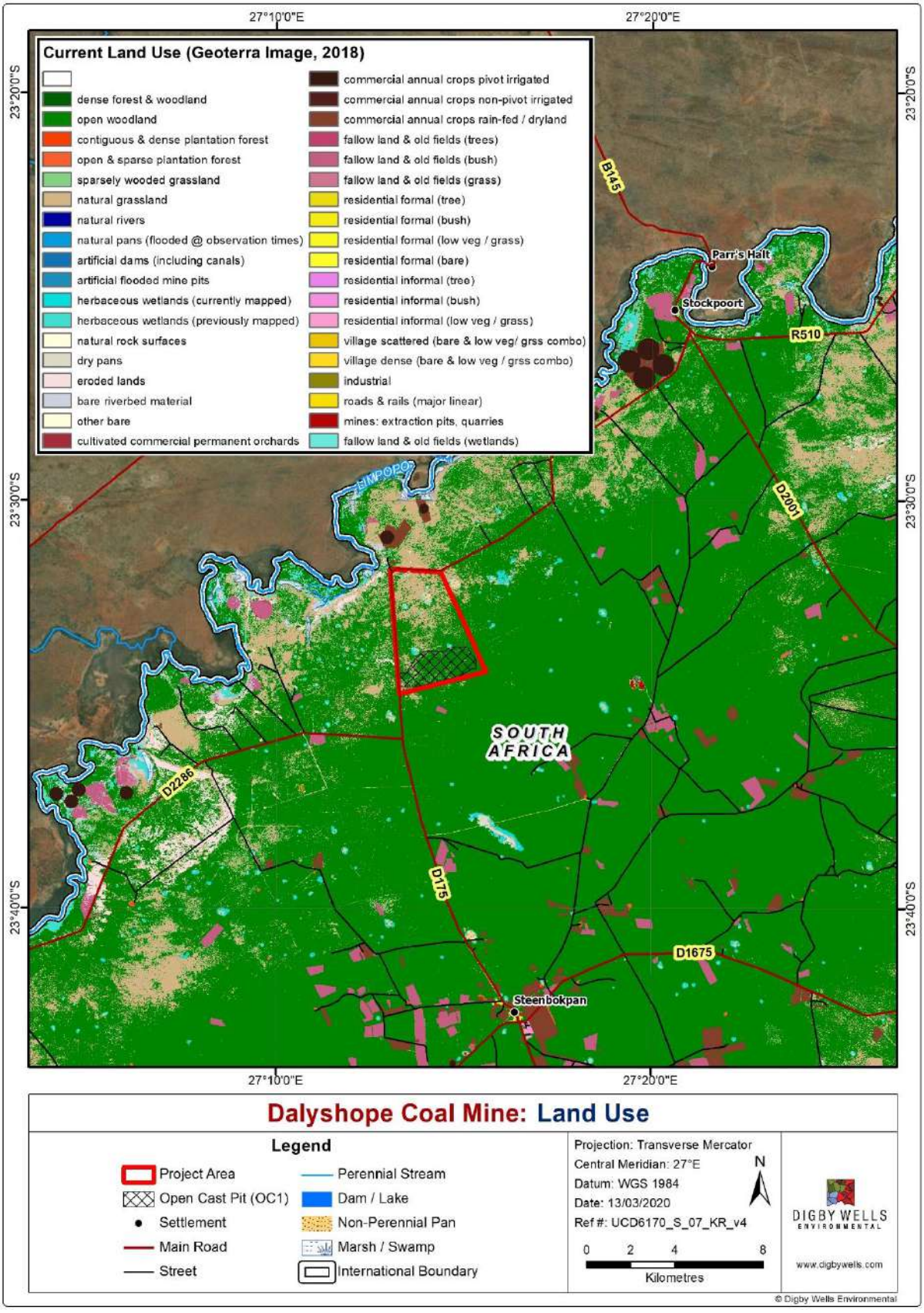


Figure 6-8: Land Use at the Dalyshope Project Area

6.7 Fauna and Flora

6.7.1 Fauna

Fauna occurring in the Project area include assemblages within terrestrial and wetland ecosystems: mammals, birds, reptiles, amphibians and invertebrates (Digby Wells Environmental, 2020a).

As the area is used primarily for game hunting, there are large number of mammals, both naturally occurring and introduced. Most of the mammals make use of the Bushveld unit for grazing, foraging and hunting. The Riparian areas support large mammals such as Hippopotamus and provide refuge for many avifauna. The Pans support the likes of ungulates such as Impala and Oryx with smaller mammals such as Water Mongoose (*Atilax paludinosus*), Black Backed Jackal (*Canis mesomelas*) and Red Veld Rat (*Aethomys chrysophilus*) (Digby Wells Environmental, 2020a).

Reptiles occur throughout the property and are not restricted by fences, as some larger mammals. As the survey was conducted during the summer the likes of many juvenile snakes were observed. During the survey in February 2020, encounters with juvenile Black Mamba (*Dendroaspis polylepis*), Snouted Cobra (*Naja annulifera*), Puff Adder (*Bitis arietans*) and Flap-neck Chameleon (*Chamaeleo* sp.), demonstrated the active ectothermic species (Digby Wells Environmental, 2020a). Due to the close proximity of the Limpopo River, although not sighted during the survey, Nile Crocodiles have been seen by the local landowners. Observations of amphibians were not far behind in terms of numbers with opportunistic recordings of African Bullfrog (*Pyxicephalus edulis*), Foam Nest Frog (*Chiromantis* sp) and Giant Bullfrog (*Pyxicephalus adspersus*).

According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the area; the majority of these birds are comprised of bushveld species. Avifauna was abundant during the survey and present amongst all habitat units within the Project Area. Many species of migratory birds from central and eastern Africa reach their southern limit near the Limpopo River system. The presence of the river and pan systems in and adjacent to the Project area offer an array of rare and interesting birds. Most notably Fish Eagle (*Haliaeetus vocifer*), Spur-winged Goose (*Plectropterus gambensis*), Saddle-billed Stork (*Ephippiorhynchus senegalensis*) (International Union for Conservation of Nature (IUCN IUCN), Decreasing Population), Marabou Stork (*Leptoptilos crumenifer*), Black Winged Stilt (*Himantopus himantopus*), Red Billed Teal (*Anas erythrorhyncha*) and African Crake (*Crex egregia*), to name a few that were observed in the pan vegetation in the central region of the Project Area (Digby Wells Environmental, 2020a).

Invertebrates were common given it was after the rainy season, particularly the Corn Crickets (*Acanthoplus discoidalis*). Many Butterflies, Lacewings, Scorpion Burrows, Velvet Mites, Spiders as well as Baboon Spider burrows were observed during the survey (Digby Wells Environmental, 2020a).

Implications for Rehabilitation:

- Special care needs to be taken due to the presence of IUCN Red Data species; and
- The extent of surface disturbances should be limited as far as possible and rehabilitated as soon as possible.

6.7.2 Flora

The Dalyshope Project area falls within the Limpopo Sweet Bushveld vegetation type which is located within the Bushveld biome (Mucina & Rutherford, 2012) (Figure 6-9). This vegetation type occurs within Limpopo Province at an altitude of 700-1 000 metres (m). This vegetation type extends across the border, into Botswana and consists of plains, which are traversed by several tributaries of the Limpopo River. Table 6-3 lists the plant species characteristic of the Limpopo Sweet Bushveld. The Limpopo Sweet Bushveld is listed as Least Threatened on the National List of Threatened Terrestrial Ecosystems with a conservation target of 19% (Mucina & Rutherford, 2012). However, a Critical Biodiversity Area and Protected Area are located within a close proximity to the study area.

Table 6-3: Plant Species Characteristic of the Limpopo Sweet Bushveld (Mucina & Rutherford, 2012)

Plant Form	Species
Graminoids	*Digitaria eriantha subsp. eriantha, Enneapogon cenchroides, Eragrostis lehmanniana, Panicum coloratum, Schmidtia pappophoroides, Aristida congesta, Cymbopogon nardus, Eragrostis pallens, E. rigidior, E. trichophora, Ischaemum afrum, Panicum maximum, Setaria verticillata, Stipagrostis uniplumis, Urochloa mosambicensis.*
Herbs	*Acanthosicyos naudinianus, Commelina benghalensis, Harpagophytum procumbens subsp. transvaalense, Hemizygia elliottii, Hermbstaedtia odorata, Indigofera daleoides, Kleinia fulgens, Plectranthus neochilus.*
Shrubs	*Catophractes alexandri, Dichrostachys cinerea, Phaeoptilum spinosum, Rhigozum obovatum, Cadaba aphylla, Combretum hereroense, Commiphora pyracanthoides, Ehretia rigida subsp. rigida, Euclea undulata, Grewia flava, Gymnosporia senegalensis, Acacia tenuispina, Commiphora africana, Felicia muricata, Gossypium herbaceum subsp. africanum, Leucosphaera bainesii.*
Trees	*Acacia robusta, A. burkei, Acacia erubescens, A. fleckii, A. nilotica, A. senegal var. rostrata, Albizia anthelmintica, Boscia albitrunca, Combretum apiculatum, Terminalia sericea.*

Dominance of species varied marginally throughout the Project Area with an abundance of cosmopolitan species such as *Boscia* spp. and *Grewia* spp. Various portions of the Project area were dominated by smaller trees of *Senegalia erubescens*, *Terminalia cinerea*, *Dichrostachys cinerea*, *Combretum apiculatum* and interspersed with *Commiphora pyracanthoides* and numerous forbs such as *Crotalaria* sp., *Tephrosia multijuga* and *Tribulus terrestris*.

Five major vegetation types were noted within and adjacent to the Project Area (Digby Wells Environmental, 2020a). Three of these are types of bushveld with different dominant species, and the fourth a very distinctive watercourse (pan vegetation). The five identified vegetation communities are:

1. *Acacia* (*Senegalia and Vachellia*) woodland;
2. *Combretum* woodland;
3. *Terminalia* woodland;
4. Pan vegetation; and
5. Riparian vegetation (adjacent to study area).

Most of the Project site is comprised of bushveld vegetation with a small tree and herbaceous layers indicating a Savanna Woodland (Digby Wells Environmental, 2020a). The proposed Project area lies within two Quarter Degree Square (QDS) namely 2327CA and 2327CB. According to the PRECIS, no Red Data species are expected to be present for the 2327CA and 2327CB.

Three Nationally Protected Tree species (according to Schedule A of the National Forests Act (NFA) (Act. 89 of 1998) (*Boscia albitrunca* (Shepherds Bush Tree), *Combretum imberbe* (Leadwood) and *Vachellia erioloba* (Camel Thorn)) and one Declining yet Least Concern (IUCN status) species (according to the South African Red Data list) (*Grewia rogersii* (Waterberg Raisin)) were identified during the field investigations (Digby Wells Environmental, 2020a). In addition, one provincially protected species according to Schedule 12 of the Limpopo Environmental Management Act (LEMA) 2003 (Act No. 7 of 2003) plant species, *Grewia rogersii*, was also recorded. It is important to note that this does not necessarily imply that additional species of special concern do not occur on site.

Implications for Rehabilitation:

- Special care needs to be taken due to the presence of IUCN Red Data, NFA and LEMA protected species;
- Rehabilitation and end land use planning should consider the site specific vegetation and soil conditions;
- Locally sourced endemic species should be utilised during rehabilitation as far as possible;
- Specific measures should be considered to ensure that alien invasive species, should they establish, are eradicated; and
- The extent of surface disturbances should be limited as far as possible and rehabilitated as soon as possible.

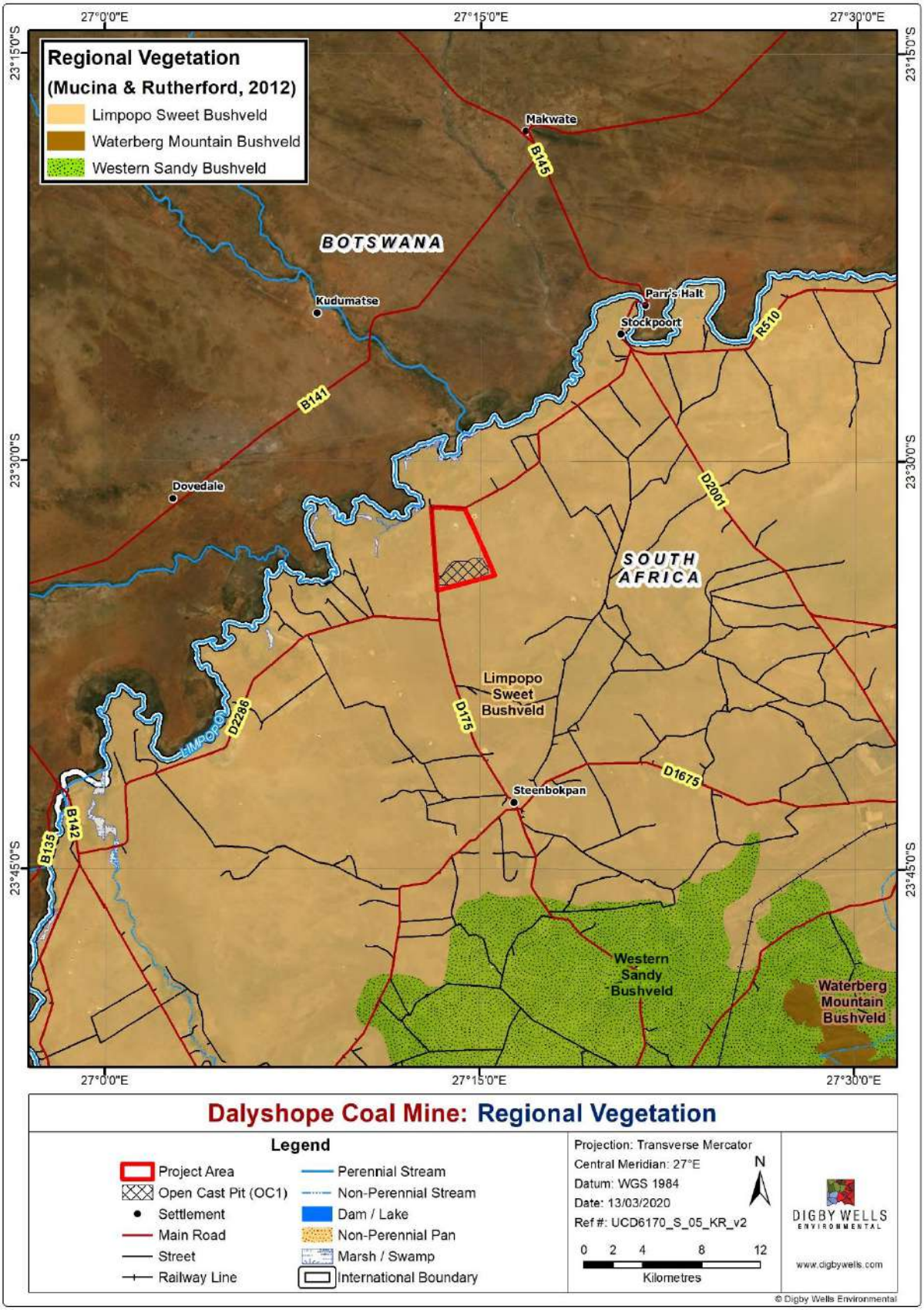


Figure 6-9: Regional Vegetation of the Dalyshope Project Area

6.8 Aquatics

Water quality results within the sampled Limpopo River reach were variable (Digby Wells Environmental, 2020e). The pH values recorded exhibited largely close to neutral, slightly alkaline conditions. Conductivity values and oxygen levels were predominantly low at all assessed sites. These were suspected to be attributed to the flooding event at the time of the survey, i.e. a dilution effect causing lower levels of the parameters. None of the parameters recorded extreme levels, therefore were not expected to deter indigenous aquatic biota from colonisation and/or inhabiting the associated extent of the watercourse to a notable degree. In comparison to the 2014 wet season survey, only conductivity and dissolved oxygen levels differ at a single upstream site, most notably the conductivity levels. The relatively higher conductivity and dissolved oxygen levels were probably a result of increased turbidity and aeration caused by the high flows (Digby Wells Environmental, 2020e).

Along the assessed Limpopo River reach, the ecological condition of the habitat was found to be in a moderately modified state (Ecological Category C) both for the instream and riparian components (Digby Wells Environmental, 2020e). The main modifications were those associated with game reserves and agricultural land uses such as water abstraction for irrigation, installation of weirs, small dams, alien invasive vegetation encroachment and sedimentation. The same Ecological Category (C) was obtained for the instream component during the 2013 surveys, whilst the Ecological Category for the riparian component declined from A to B (i.e. from natural state to largely natural state). This decline is attributed to the increase in alien vegetation encroachment along the sampled Limpopo River reach (Digby Wells Environmental, 2020e).

The availability and integrity of aquatic macroinvertebrate biotopes were poor across the sampled river reach, as sampling was largely limited to the marginal banks due to both flood conditions and, thus not the ideal natural habitat of the macroinvertebrates. Similarly, the results of the South African Scoring System version 5 (SASS5) and Macroinvertebrate Response Assessment Index (MIRAI) indicate that conditions at the sampled reach largely modified (Ecological Category D). The aquatic macroinvertebrate specimens collected are believed to have been flushed towards the floodplain margins or seeking refuge there. In the 2014 survey, the integrity of aquatic inverts' habitat was scored as poor due to lack of the stones and vegetation biotopes along the sampled Limpopo River reach, subsequently the invert community assemblage exhibited largely modified conditions (Ecological Category D) (Digby Wells Environmental, 2020e).

Results of the fish community assessment showed that the sampled Limpopo River Reach was in a seriously modified condition (Ecological Category E) (Digby Wells Environmental, 2020e). This was likely due to the fact that sampling was limited to the river banks and not across a variety of other fish habitats. The presence of species with moderate sensitivity to water quality modifications gives an indication that the aquatic ecosystems do have the capacity to support sensitive life and should be conserved irrespective of the modified ecological outcomes expressed in the baseline Aquatic Study. The conservation important fish species *Oreochromis mossambicus* (i.e. listed as Vulnerable according to the International Union for Conservation of Nature) was also present in the sampled Limpopo River reach. In

terms of the fish community assemblage sampled in the 2013/14 surveys (both 2013 and 2014 surveys were considered in the determination of the Present Ecological State (PES)), the PES was determined to be largely natural as a result of collecting 15 out of the expected 16 species.

Following integration of the defined ecological conditions obtained for the instream biological integrity (i.e. combination of MIRAI from aquatic invertebrates and Fish Response Assessment Index (FRAI) from fish) and the riparian component (i.e. surrogate Index of Habitat Integrity (IHI) from riparian vegetation assessment), it was determined that the habitat segments represented an integrated EcoStatus of largely modified (Ecological Category D) at the upstream sites and close to largely modified at the downstream site (Digby Wells Environmental, 2020e). This was driven largely by the observed aquatic macroinvertebrate and fish assemblages, as a low confidence was associated with these biological response indicators. Furthermore, the Ecological Importance was likely to be regarded as High and the Ecological Sensitivity determined to be High during periods of '*normal*' flow and improved water quality conditions i.e., lower turbidity.

Similarly, an integrated EcoStatus of largely modified conditions (Ecological Category D) was attained during the 2013/14 surveys. The water quality was largely natural across the sampled sites whilst the habitat integrity and aquatic macroinvertebrates were seriously modified and largely modified respectively. The fish community assemblage was in a natural condition (Digby Wells Environmental, 2020e).

Implications for Rehabilitation:

- Refer to Section 6.9 below.

6.9 Surface Water

The Project area occurs within the A41E quaternary catchment, of the Limpopo Water Management Area (WMA). The A41E catchment has an aerial extent of 1 938 km^2 which contains an endorheic region (an area that does not contribute surface water flow to river systems) (Digby Wells Environmental, 2020f). The Limpopo River forms the northern boundary of the catchment.

The main drainage system in the vicinity of the Project area is the Limpopo River, which also forms the border with Botswana. Topographic maps and aerial imagery available for the Project area indicate no other perennial or non-perennial streams are located near to the Project area, however there are numerous non-perennial pans which will receive surface water runoff. Although small streams may drain towards the Limpopo River during rain events, there are no major tributaries in the area contributing to the flow of the Limpopo River (Digby Wells Environmental, 2020f).

6.9.1 Water Quality

Water quality was benchmarked against the South African Target Water Quality Guidelines for domestic use, aquatic ecosystems, livestock watering and irrigation. Based on the water

quality results from the Surface Water Assessment (Digby Wells Environmental, 2020), the baseline water quality is generally acceptable and have slight exceedances in relation to the guideline values. An alkaline pH of 8.9 was measured at SW4. Copper was also slightly elevated (0.019 mg/L) at this point. Suspended solids were also above the irrigation guideline, with a measured concentration of 86 mg/L (Digby Wells Environmental, 2020).

Total Dissolved Solids (TDS) and Aluminium were elevated at SW2 (i.e. 490 and 0.119 mg/L, respectively). Calcium was elevated at SW1 and SW2 (i.e. 37 mg/L at both sites), while the concentration of suspended solids was 217 mg/L at both SW1 and SW2. Both sites 1 and 2 show some human influence on water quality from upstream activities. However, apart from suspended solids, the observed exceedances are not significantly elevated above the target water quality guidelines (Digby Wells Environmental, 2020).

Zinc was elevated for the aquatic ecosystems guideline which stipulates a concentration below 0.002 while concentrations of 0.015, 0.013 and 0.029 mg/L were at SW2, SW3 and SW4, respectively. The exceedances are not significant, and it is therefore not envisaged that this would have significant impacts on aquatic ecosystems within the Limpopo River (Digby Wells Environmental, 2020).

Implications for Rehabilitation:

- The Limpopo River and numerous non-perennial pans are major and minor areas of concern, respectively. Regular monitoring of the mine activities need to be done to prevent or stop any possible contamination from taking place.
- The extent of surface disturbances should be limited as far as possible and rehabilitated as soon as possible;
- A post mining landform design should be developed to align surface water runoff with the surrounding surface water drainage framework;
- A LoM materials balance should be maintained and regularly updated to ensure enough material is available to construct a free draining landform;
- Concurrent backfilling and rehabilitation should be implemented to design elevations to maximise clean surface water runoff back into the natural catchment; and
- Clean and dirty water separation should be managed throughout the LoM.

6.10 Ground Water

The main source of drinking water supply in and around the Project Area is groundwater through a number of solar energy, windmill pumps and submersible pumps which are mainly used for domestic and livestock watering (Digby Wells Environmental, 2020f).

However, no major groundwater abstraction takes place within the study area. A total of 88 private boreholes were surveyed, of which 10 were within the mining right area while 42 were within a 3 km radius of the mining right area (Digby Wells Environmental, 2020f). Of the 42 boreholes:

- 8 (9%) boreholes are used for game watering only;
- 20 (23%) are used for livestock watering;
- 11 (13%) are used for human drinking, gardening and livestock watering;
- 13 (15%) are used for groundwater monitoring;
- 12 (14%) are exploration holes (not boreholes) used for monitoring;
- 3 (3%) are not used; and
- The remaining 21 (24%) boreholes are unused.

None of the boreholes are of good water quality as they are all above the Class I category. At least one of the tested parameters exceed the recommended limit. The water is generally not recommended for human drinking without treatment (Digby Wells Environmental, 2020f). The elevated element concentrations are mainly due to the natural dissolution of the host rocks. The only external impacts are associated with the elevated nitrate concentrations identified in two boreholes (CAN1 and KW4) which is associated with fertiliser application and/or animal waste as cattle often live nearby (Digby Wells Environmental, 2020f).

Noteworthy is the sulphate levels in these boreholes. The recommended maximum sulphate limit for drinking is 400 mg/L, but the concentration is currently less than 200 mg/L (Digby Wells Environmental, 2020f). The low levels of sulphate in all the boreholes suggests that no mine-related contamination has taken place at the project site. Sulphate should be used as an indicator to assess the Dalyshope Coal Mine impact and the values obtained currently should be used as a baseline for future comparisons.

The groundwater levels within the study area vary between 8 m and 20 m below surface, with an average of 15.1 m (Digby Wells Environmental, 2020f). Under natural condition groundwater flow mimics the topography and regional surface water flow direction is towards the Limpopo River. However, local depression of water table could occur due to abstractions by the local farmers.

Water strikes have been intercepted at depths between 20 and 100 m below ground level (Digby Wells Environmental, 2020f). Although some boreholes were drilled up to 160 m, no water strike was recorded below 100 m, defining the bottom of the aquifer. The water strikes are distributed almost uniformly between this interval. There is no zone in this interval without distinct absence of water strike. Unless disturbed by local abstraction, and possibly a localised perched aquifer, there is no abrupt change in hydraulic head even between shallow (<30 m) and deep boreholes (>30 m). The aquifer was therefore simplified into one layer, with the aquifer permeability ranging from very low (0.002 m/d) to very high (6.6 m/d). The aquifer is highly heterogeneous with permeability values being variable in a relatively short distance (Digby Wells Environmental, 2020f).

Implications for Rehabilitation:

- Intense groundwater management measures will have to be implemented due ground water being the main source of drinking water;

- Regular updating of the monitoring and maintenance plans to ensure no contamination of the groundwater sources;
- Limiting evaporation of dirty water and recycling the dirty water throughout the operation can assist with reducing raw water requirements; and
- Develop and regularly update a geohydrological model, geochemical model and a salt and water balance for the operational and closure phases.

6.11 Wetlands

Three wetlands were recorded on or directly adjacent to the open pit area (Limosella Consulting Pty Ltd, 2020). Only small sections of these wetlands and their associated buffer zones are located within the open pit area. All three of these wetlands are classified as Non-Perennial Episodic Endorheic Depression Pans. This indicates that the depression wetlands only fill (naturally) with water during high rainfall events where it then remains saturated for only small periods during the year, remaining dry the rest of the year. The summary of the PES, Ecological Importance and Sensitivity (EIS), WET-EcoServices, Scientific Buffer and Recommended Ecological Category (REC) results for the wetland potentially affected by the proposed development.

Table 6-4: Wetland Results Summary

Classification	PES	EIS	WET-EcoServices (Main 3)	Scientific Buffer		REC
				Construction	Operational	
Episodic Depression Pan Wetlands	1.0 B	1.8 - Moderate	• Phosphate trapping - 2.4 • Erosion control - 2.4 • Flood attenuation- 2.9	82 m	82 m	B

Implications for Rehabilitation:

- Rehabilitation methods will need to be implemented to those wetland, that could be impacted upon as a result of mining activities; and
- Regular monitoring and maintenance of wetland areas to prevent degradation of the wetland ecosystem.

6.12 Air Quality

Findings from the baseline assessment have confirmed that the meteorology is influenced by dominant winds from the northeast and east-northeast respectively. The average wind speed

was observed to be ~3.1 m/s, with winds greater than 5.4 m/s occurring for 7.3% of the time (with data showing records of wind speeds that ranged between 7.0 m/s to 11.0 m/s). Therefore, an unplanned event of a sudden wind gust sweeping through the proposed MRA is possible.

Based on this rating system, impacts on the surrounding receptors from the operational phase are deemed “major negative” without mitigation. However, with mitigation, the impacts were reduced to “negligible negative”. Since anticipated emissions from the operational phase activities are likely to influence receptors outside the MRA boundary, mitigation and management interventions are crucial.

Implications for Rehabilitation:

- Rehabilitation activities could lead to dust generation; and
- Regular monitoring and maintenance to ensure air quality remains within regulatory limits.

6.13 Noise

The average daytime ambient noise level is 41 decibels (dBA). The daytime noise levels at the different measurement locations were all below the South African National Standards (SANS) guidelines rating limit of 45 dBA allowable outdoor in rural districts. The noise sources impacting daytime background levels are birdsongs, tractors, and other farm vehicles and vehicles along the D175 road.

The average night time ambient noise level is 39 dBA. The night-time noise levels indicate that the ambient night-time levels are above the SANS guidelines rating levels of 35 dBA allowable outdoor in rural districts. The noise sources impacting night time background levels are crickets, Cicada insects and vehicles along the D175 road.

The Project may have minimal impacts on the surrounding noise receptors mostly because of the proximity to the surrounding farmsteads. The distance to the surrounding houses is considered sufficient enough for the noise to have attenuated through atmospheric absorption to below the current ambient noise level.

Implications for Rehabilitation:

- Limit rehabilitation activities taking place at night so as to be below the SANS guideline rating limit; and
- Regular monitoring and maintenance to ensure day-time noise level remains within SANS guideline rating limits.

6.14 Sites of Archaeological and Cultural Importance

A preliminary assessment of the Genealogical Society of South Africa (2011) database did not indicate additional burial grounds are known to exist within the Project area. The cultural landscape within which the Project is located is characterised by the Middle Stone Age (MSA) and burial grounds and graves (Digby Wells Environmental, 2020d). Heritage resources

including archaeological resources from the MSA, Farming Community periods and built environment resources were identified in a pre-disturbance survey completed in 2012 and 2013 in support of a previous Heritage Resources Management (HRM) process. During this process, Digby Wells identified 30 heritage resources on the properties earmarked for this Project. Digby Wells undertook a verification survey of the affected properties in February 2020 (Digby Wells Environmental, 2020d). During this survey, one additional heritage resource was identified. Table 6-5 presents a summary of the cultural significance of the heritage resources identified in the pre-disturbance survey completed in February 2020 (Digby Wells Environmental, 2020d).

Table 6-5: Cultural Significance of Identified Heritage Resources

Resource ID	Description	Integrity	Cultural Significance
S.35-001; S.35-002; S.35-003; S.35-004; S.35-005; S.35-006; S.35-007; S.35-008; S.35-009; S.35-010; S.35-011; S.35-012; S.35-013; S.35-014; S.35-015; S.35-016; S.35-017; S.35-018; S.35-019; S.35-020; S.35-024; S.35-025; S.35-026; S.35-027; S.35-034; S.35-043; S.35-044; S.35-045; S.35-050; S.35-051; S.35-052	Isolated Stone Age or Farming Community occurrences	0	Negligible
S.35-069		1	Negligible

The South African Heritage Resources Agency (SAHRA) Minimum Standards recommend that heritage resources with negligible cultural significance require no mitigation and their inclusion into an Heritage Impact Assessment (HIA) report is considered to be sufficient in terms of recording these resources (Digby Wells Environmental, 2020d). There is no direct impact on heritage resources of significance resulting from the Project activities envisaged for the Construction, Operational or Decommissioning phases of the Project. This notwithstanding, there are residual impacts to heritage resources that have not been identified in the Project area that may be encountered during Project-related activities (Digby Wells Environmental, 2020d).

Implications for Rehabilitation:

- Special care needs to be taken in the Project areas where the archaeological resources are most likely to be present.

6.15 Socio-Economic Setting

The (IFC) defines a study area as “an area that is likely to experience impacts arising from, or exert influence on, the Project or activity being assessed”. Three interdependent study areas were identified for the purposes of this study and correspond, where relevant, to the existing

administrative boundaries. The study areas were derived through a mapping exercise considering settlements in relation with Project footprint and its associated buffer areas. Subsequently, areas of that are likely to experience Project impacts were identified and categorised as follows:

- Direct area of impact (or the primary study area) which is an area likely to experience the most Project effects (positive and negative) due to their proximity to the Project footprint. This area encompasses farms adjacent to the Project area (Farms Dalyshope and Klaarwater) and the community of Lesedi within Ward 3;
- Indirect area (or secondary study area) of impact which is an area likely to experience some Project impacts including economic pull exerted by the Project. It is comprised of Waterberg District Municipality (WDM); Lephalale Local Municipality (LLM) and broader Ward 3 as depicted in Figure 6-11; and
- Induced areas of impact which are areas likely to experience Project impacts regardless of their geographical proximity to the Project area; for example, increased spending in the economy thus decreased demand for goods and services; therefore some industries needing to employ more people in order to meet the demand for services and goods. This area encompasses the entire Limpopo Province as shown in Figure 6-12.

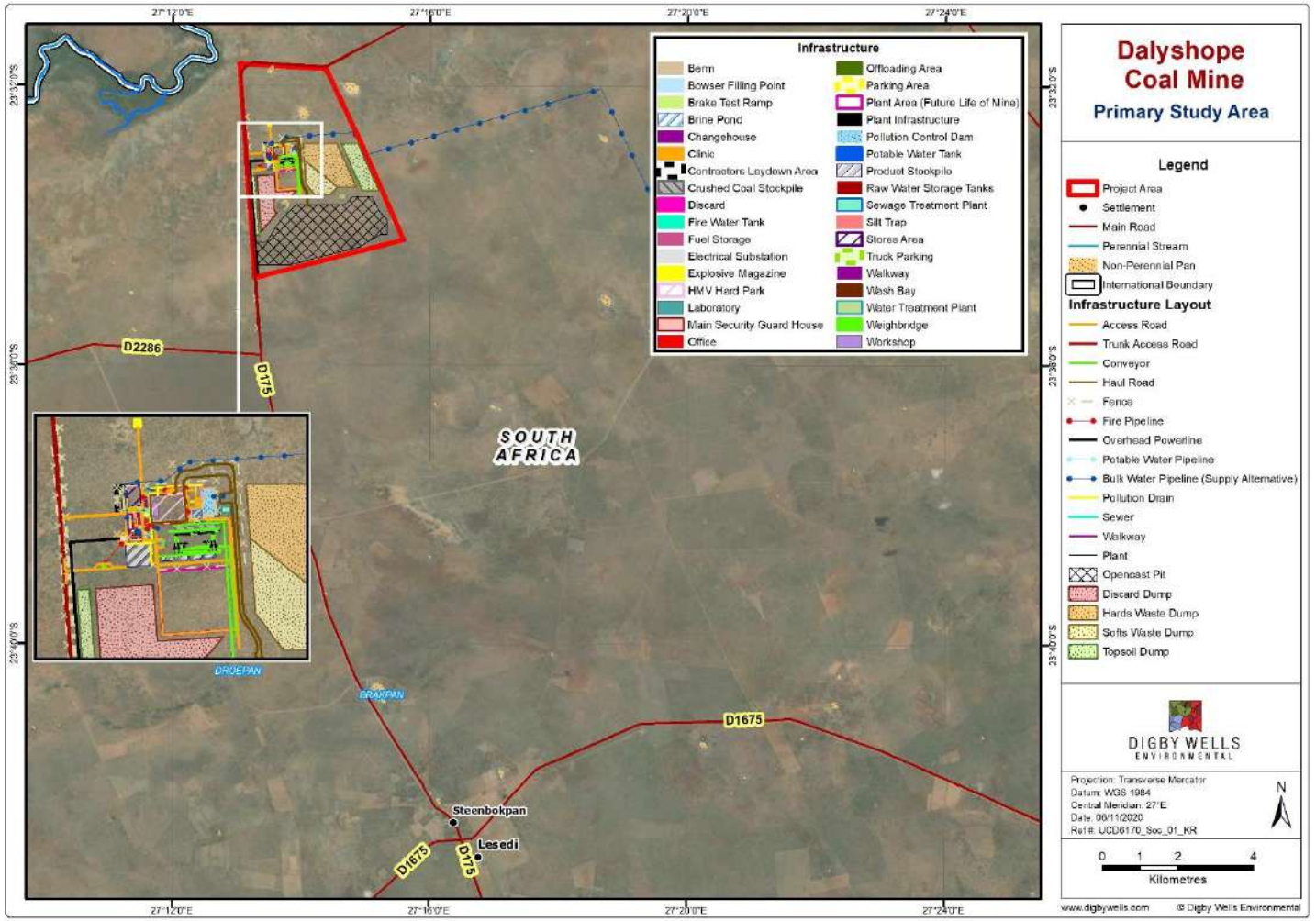


Figure 6-10: Primary Study Area

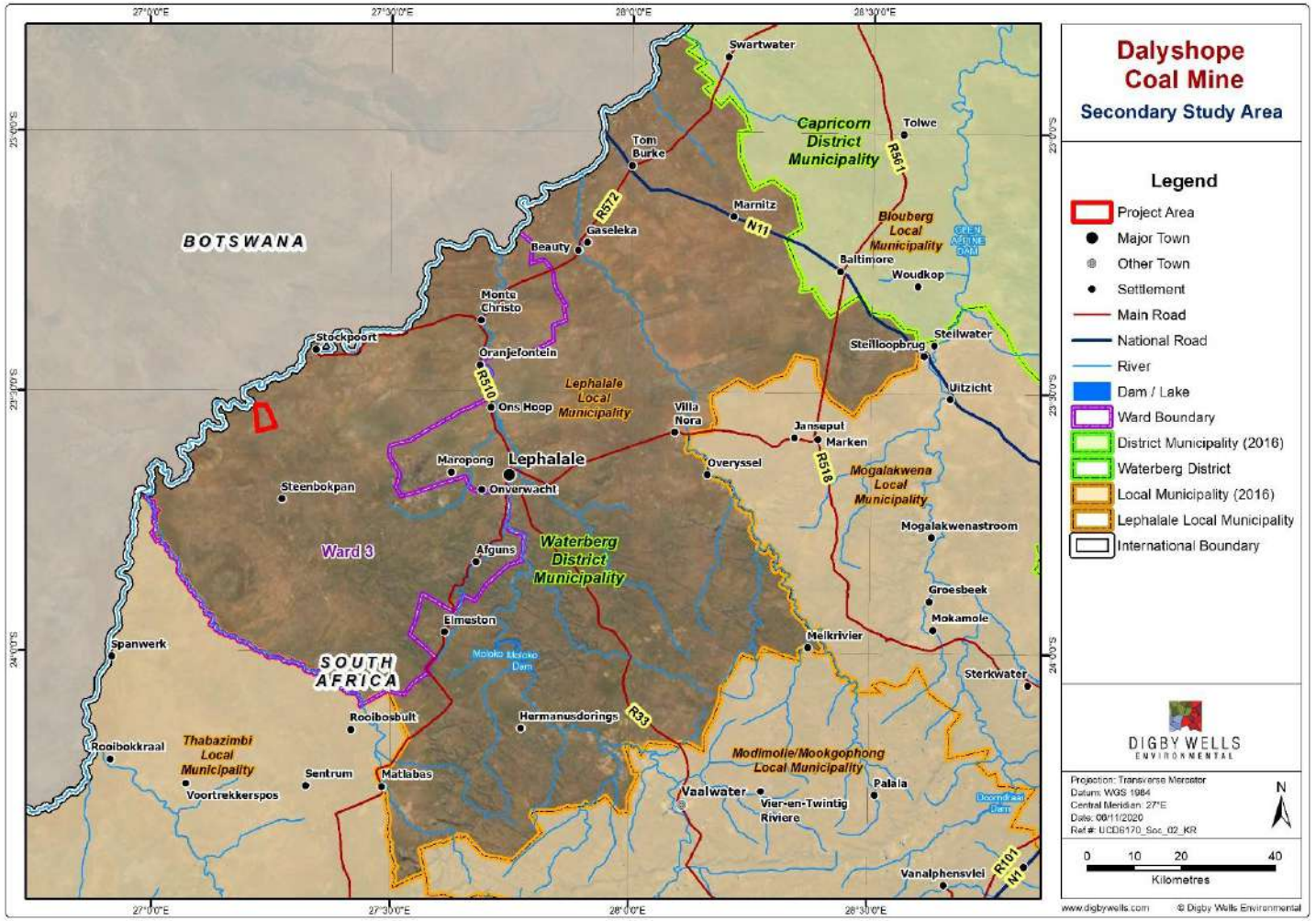


Figure 6-11: Secondary Study Area

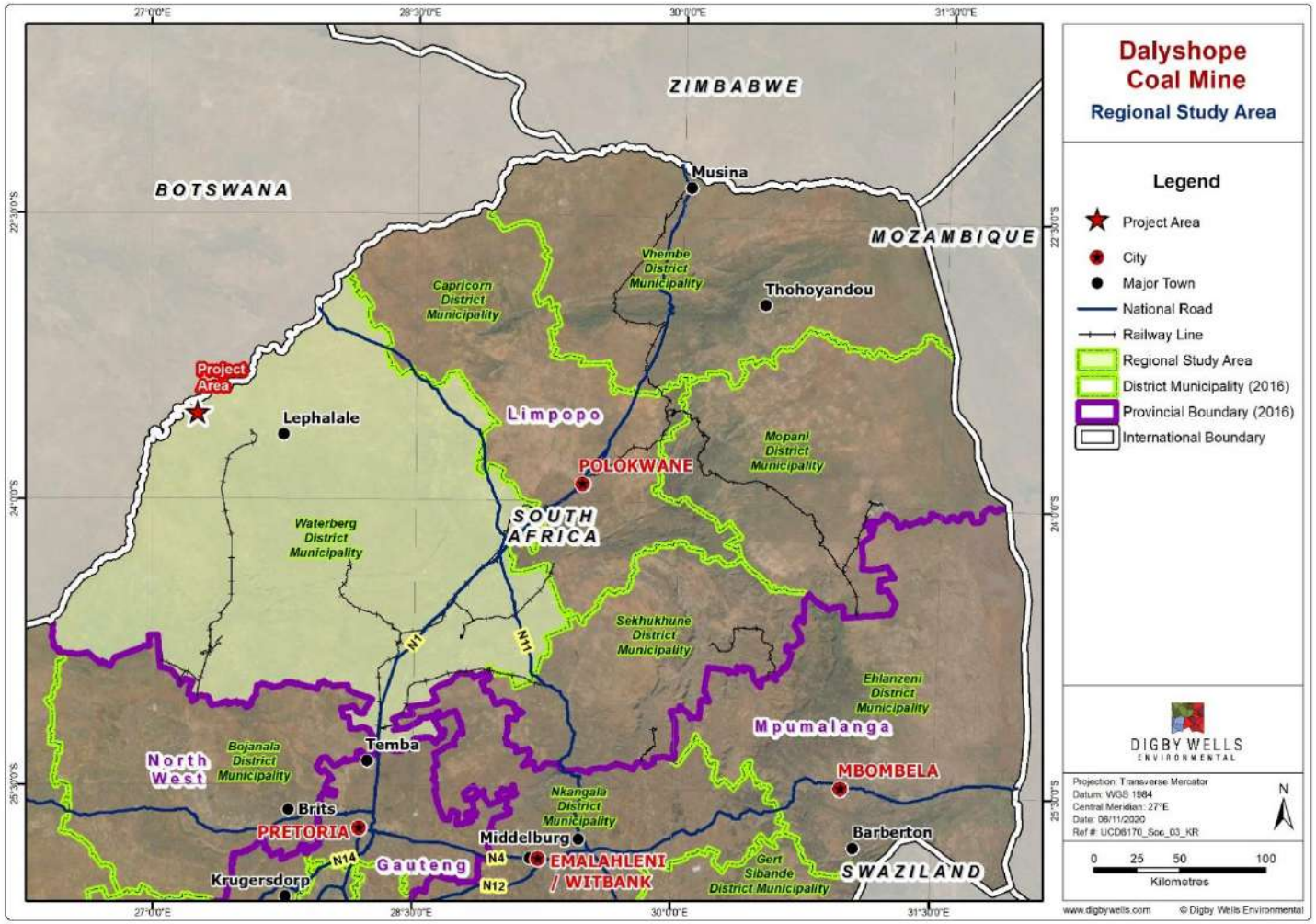


Figure 6-12: Regional Study Area

The primary study area (or Ward 3) is comprised of commercial farmers engaged in livestock, and crop farming and ecotourism and the community of Lesedi. These are described below.

6.15.1 Commercial Farmers

The farmer currently leasing the Project affected farms, co-owns one farm portion in the area. The main land uses of the farmland include cattle breeding and keeping, and hunting. The farmer has five families currently working on the farms and one of these resides full-time on the farm. Water on the farms is sourced from boreholes, and energy source is mainly grid electricity. In general, the roads are unpaved and become impassable during the rainy season. The farmers and their employees use the clinic in Lesedi for health care services or consult private doctors in town.

Farmers highlighted the following challenges as they relate to the presence of the mine in the area:

- Both farming and mining are dependent on water and the presence of an additional mine in the area will significantly reduce the water supply. He noted that the water supply has already been impacted by the presence and operation of a nearby mine. He suggested that the mine should undertake a cumulative impact assessment study focused on water supply prior to its establishment.
- International hunters come to South Africa to be in the bush; and that ecotourism farmers cannot sell the bush experience if there are open cast coal mine in amongst the hunting farms. Therefore, the presence of coal mines in the area will affect the local people's livelihood activities.

6.15.2 Lesedi Community

The Lesedi Community is located approximately 17 km from the proposed Project area and 46 km from Lephalale. The community was established in 2008 and are informal occupiers of vacant land owned by the South African Government (the Department of Education). The majority of the community relocated onto this land after the tenure of farmland they were living on was uncertain. Other community members have relocated here from the Lephalale area. There is a High Court Moratorium preventing the establishment of any permanent infrastructure within the community and there are no plans to convert the present settlement to a permanent settlement. The Municipality plans to relocate the community outside this area.

The community is said to comprise of 1 500 residents; spread across an estimated 300 households[3] According to the interviewees, approximately 70% of the population are females. The majority of the households in the area are headed by women. An estimated 25% of the total population were reportedly as being youths, and the remaining population is comprised of a combination of middle-aged and elderly people. Approximately 15% of the community have completed Grade 12.

[3] Personal communication, Ward Community Members residing in Lesedi

The majority of the population is unemployed and are reliant on government social grants; and piece jobs; while formal employment is comprised of farm work in neighbouring commercial farms as general workers. Furthermore, most of the people of economic active ages have general skills which they acquired through working on the farms and being taught artisanry skills by others.

In terms of access to infrastructure and services, the community of Lesedi reported the following:

- The community has access to a day-clinic; however, it is not open every day. It is not equipped to handle emergencies but provides referrals to the facilities in Lephalale.
- The community has a single primary school. Secondary/ high schools are found in Lephalale and they are provided transportation by the Department of Education in a form of a school bus. Some of the key schooling challenges of the households include:
    - A shortage of educators which has led to the employment of untrained educators at the local school;
    - There are inadequate classrooms at the primary school and some locally based mining companies have donated temporary structures which are used as classrooms. This is due to the local government restrictions on construction of permanent structure in the community; and
    - There is a high drop-out rate amongst primary and high school scholars.
- Some households in the area have access to grid electricity – however, only those who can afford to buy electricity. Other households use wood as a source of fuel for cook and heating.
- The main water sources in the area are boreholes which pump into communal taps and taps inside some houses.
- Sanitation facilities are comprised of pit latrines within the yard. For households without sanitation facilities, they share facilities with other shared households.

Implications for Rehabilitation:

- The “green economy” goal for Waterberg District Municipality (WDM) and Lephalale Local Municipality (LLM)will help promote and increase rehabilitation efforts; and
- Rehabilitation efforts will increase tourism and therefore uplift the economy.

7 Land Use Plan

The final Land Use Plan (LUP) is essentially the end land use to which UCD would like to return the land affected by mining activities. The closure objectives set as part of the mine closure planning process aims to ensure that the final LUP is implemented and that the area is sustainable in the long term from an environmental and social perspective.

The end land use objectives as described in this report are based on the current expectations of UCD management personnel and may alter in time due to further studies, economic developments, quarry extensions, and any future developments.

7.1 Current Land Use

The farmer currently leasing the Project affected farms, co-owns one farm portion in the area. The main land uses of the farmland include cattle breeding and keeping, and hunting.

7.2 Post Mining Land Use

Based on current information about the mine (i.e. location, soils, land capability and land use information), it's highly possible that the post-mining land use will be returned to its original land use of game farming, hunting and cattle grazing. It is imperative that a detailed Final End Use Landform Design be developed for the Dalyshope Project.

8 Environmental Risk Assessment

The objective of the ERR is outlined in the Financial Provisioning Regulations, 2015. The objective is to:

- Ensure timeous risk reduction through appropriate interventions;
- Identify and quantify the potential latent environmental risks related to post closure;
- Detail the approach to managing the risks;
- Quantify the potential liabilities associated with the management of the risks; and
- Outline monitoring, auditing and reporting requirements.

8.1 Methodology

The baseline HIRA is a qualitative method to determine the risks and is aligned with Dalyshope's internal risk assessment methodology. Risks were identified based on the review of available information. Key steps in the risk assessment include:

- A general discussion on hazards and "driving forces" was used to determine things that could "go wrong" during the mine closure;
- The boundaries of the Project were defined;
- Areas within the mining area were defined;
- For each of the areas in the process:
    - Potential unwanted events were identified;
    - Current controls for each unwanted event were identified and recorded;
    - The most likely severity, should the event occur, and likelihood of the event occurring were then estimated;

- Based on this, the level of risk was estimated using the risk matrix; and
- For the Highly and Extremely Intolerable events, additional controls were recommended to reduce the level of risk.

The four levels of risks are classified as shown in Table 8-1 below:

Table 8-1: Risk Levels

Colour	Descriptor	Action	Sign-off
	Extremely Intolerable	Immediate Action	General Manager
	Highly Intolerable	Short term action required	Senior Management
	ALARP[4]	Heightened Action	Section Manager
	Maintain	Ensure levels of control	Supervisor

The six types of risk have been outlined and included in the risk matrix[5]. These are:

- Norms and Standards;
- Effect on Work Image (Reputation);
- Effect on Environment;
- Effect on Social and Ecosystem Processes;
- Public Reaction; and
- Legal Implications.

A qualitative Severity and Likelihood Matrix was used during the risk estimation as shown below in

[4] As Low As Reasonably Practicable

[5] HB 436:2004, Risk Management Guidelines, Companion to AS/NZS 4360:2004 (Standards Australia, 2004)

Table 8-2.

The severity and likelihood definitions are provided in

Table 8-2. Once the severity and likelihood of the unwanted events had been rated, the risk rank was determined using the risk matrix. This matrix is not a simple multiplication tool; risk rank is skewed so that emphasis is placed on high severity events, rather than on high likelihood events. The likelihood and consequence definitions were reviewed by the risk assessment team and accepted as being relevant for this risk assessment.

Table 8-2: Risk Estimation Matrix

	ENVIRONMENTAL RISK MATRIX							Norms and Standards (N)	Effect on Work Image (WI)	Effect on Environment (E1)	Effect on Social and Ecosystem Processes (E2)	Public Reaction (P)	Legal Implications (L)
		ALARP	HIGH RISK (INTOLERABLE)										
SEVERITY	A	Highly Intolerable	Highly Intolerable	Extremely Intolerable	Extremely Intolerable	Extremely Intolerable	Extremely Intolerable	Consistently outside of the norm or standard.	Reputation impacted with majority of key stakeholders.	Irreversible changes to abundance/ biomass in affected area. Loss of ecological functioning with little prospect of recovery.	**Majo**r, potential for irreversible change to valued flora and fauna, ecosystem processes and structure, including ecosystem services.	Severe national pressure to cease business. Serious public or media outcry (international coverage).	Referral to the National Prosecuting Authority. Potential investigation by authority with prosecution and fines.
	B	ALARP	Highly Intolerable	Highly Intolerable	Extremely Intolerable	Extremely Intolerable	Extremely Intolerable	Largely deviating from the norm or standard.	Reputation impacted with significant number of key stakeholders.	Substantial reduction of abundance/ biomass in affected area. Eventual recovery of ecological systems possible, but not necessarily to same pre-impact conditions.	**Major**, potential for unacceptable, longer term change to valued flora and fauna, ecosystem processes and structure, including ecosystem services.	Severe local and national public or press reaction.	Withdrawal of permit.
	C	ALARP	ALARP	Highly Intolerable	Highly Intolerable	Extremely Intolerable	Extremely Intolerable	Frequent and significant deviations from the norm or standard.	Reputation impacted with some stakeholders.	Reduction of abundance/biomass in affected area. Limited impact to local biodiversity without significant loss of pre-impact functioning.	**Moderate**, potential for unacceptable, short term change to valued flora and fauna, ecosystem processes and structure, including ecosystem services	Local public or press reaction.	Notification of intent to issue a directive.
	D	Maintain	Maintain	ALARP	ALARP	Highly Intolerable	Highly Intolerable	Occasional and minor deviation from the norm or standard.	Reputation impacted with small number of people.	Minimal reduction of abundance/biomass in affected area. Limited impact to local biodiversity without significant loss of pre-impact functioning.	**Moderate**, potential for acceptable, longer term change to valued flora and fauna, ecosystem processes and structure, including ecosystem services	Minor local public or media reaction.	Departmental enquiry and correspondence.
	E	Maintain	Maintain	Maintain	ALARP	ALARP	ALARP	Rare and minimal deviation from the norm or standard.	No discernible impact on reputation.	Reduction of the abundance/biomass of flora and fauna in affected area. No permanent changes to biodiversity or exposed ecological system.	**Minor**, potential for acceptable, short term change to valued flora and fauna, ecosystem processes and structure, including ecosystem services..	Little or no reaction Public concern restricted to local complaints.	Complaints from the public and/or regulator.
	F	Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	Consistently within the norm or standard.	No discernible impact on reputation.	Possible incidental impacts to flora and fauna in locally affected area. No ecological consequences.	**Minor,** potential for incidental and/or transient changes to valued flora and fauna, ecosystem processes and structure, including ecosystem services	None.	No legal implications.

	LIKELIHOOD					
	G	***H***	***I***	***J***	***K***	***L***
	Highly Unlikely	***Rare***	***Low Likelihood/ Unlikely***	***Probable/ Possible***	***Can happen/ Likely***	***Regular/ Almost Certain***
Percentage (%)	***<0.1%***	***0.1 - 0.4%***	***5 - 14%***	***15 - 49%***	***50 - 74%***	***75 - 100%***
Descriptor	Practically impossible, not foreseen to occur	Conceivable under exceptional circumstances	Only remotely possible (has happened somewhere)	Unusual but possible (can happen)	Quite possible	Is the most likely and expected to happen (has and foresee it to happen again)
	Once in more than 10 000 years.	Once in 1 000 years.	Once in 100 years.	Once every 10 years	Once every year	More than once a year

8.1.1 Risk Analysis Results

Potential unwanted events for and during mine closure were identified and discussed. All unwanted events are listed Table 8-5.

Eleven (11) unwanted events were identified. These unwanted events were ranked for risk based on the maximum reasonable severity should they occur and the likelihood of that specific severity/consequence occurring. This analysis was firstly done assuming that no controls are in place (i.e. the raw risk) and secondly considering current controls were in place and effective (i.e. residual risk).

Zero of the unwanted events were ranked as extremely intolerable, four (4) as highly intolerable, five (4) as ALARP and three (3) ranked maintain as shown in Table 8-3 below.

Table 8-3: Raw Risk Ranking

Area number	Description	Number of unwanted events	Extremely Intolerable	Highly Intolerable	ALARP	Maintain
1	Open Pit Area – OC1	**1**	0	0	1	0
2	Workshops, Offices and other Surface Infrastructure	**1**	0	0	0	1
3	ROM Pads	**1**	0	0	0	1
4	Overburden and Discard Dumps	**1**	0	1	0	0
5	Pollution Control Dams	**1**	0	0	1	0
6	General	**6**	0	3	2	1
Total		**11**	**0**	**4**	**5**	**3**

For the highest ranked events, additional “controls” should be put in place to reduce the level of risk. Deadlines for ensuring that the additional controls are put in place as well as accountabilities for doing so, should be defined.

The 17 unwanted events were again assessed taking into consideration the current control measures.

The residual risks were ranked assuming the control measures are in place and effective. Table 8-4 below summarises the residual risks after taking the current control measures into

consideration. The initial number of risks per risk priority is shown with the number of residual risks included in brackets.

Table 8-4: Residual Risk Ranking

Area number	Description	Number of unwanted events	Extremely Intolerable	Highly Intolerable	ALARP	Maintain
1	Open Pit Area – OC1	**1**	0 (0)	0 (1)	1 (1)	0 (0)
2	Workshops, Offices and other Surface Infrastructure	**1**	0 (0)	0 (0)	0 (0)	1 (1)
3	ROM Pads	**1**	0 (0)	0 (0)	0 (0)	1 (1)
4	Overburden and Discard Dumps	**1**	0 (0)	0 (0)	1 (1)	0 (1)
5	Pollution Control Dams	**1**	0 (0)	0 (0)	1 (1)	0 (0)
6	General	**6**	0 (0)	0 (3)	4 (2)	2 (1)
Total		**11**	**0 (0)**	**0 (4)**	**7 (5)**	**4 (3)**

Table 8-5 below provides a detailed description of the risks including mitigation.

Table 8-5: Summary of Potential Extremely and Highly Intolerable Risks (Raw risk)

Area	Hazard (Unwanted Event)	Consequence(s)	Primary Risk Category	Raw Risk			Current Controls	Residual Risk			Possible New Controls
				Severity	Likelihood	Risk Rank		Severity	Likelihood	Risk Rank	
General	Potential inadequate budget for the rehabilitation of the mine.	Failure to rehabilitate and close the mine sustainably.	Natural Environment	C	J	Highly Intolerable	Annual update of the financial provision. Adjusting the closure provision fund with the DMRE.	C	H	ALARP	Ensure mine rehabilitation and closure funds are available to implement the final Land Use Plan. Annually update financial provision liabilities. Conduct annual rehabilitation where possible once the mine is in operation..
Open Pit Area - OC1	Groundwater - Migration of contamination plume	Potential contamination of groundwater resources as a result of the migrating plume post closure.	Natural Environment	D	J	ALARP	Undertaking of Concurrent Rehabilitation according to approved plan.	D	J	ALARP	The pit is not completely backfilled and contains a final void. The water table in the pit area should be lowered as part of the contaminant management plan whereby evaporation from the pit lake will keep the water level below the regional groundwater depth. The water level should always be below the regional water level taking advantage of the evaporation where it is approximately 1,950 mm/a, which is more than 4 times higher than the mean annual precipitation (438 mm/a). The potentially acid generating waste materials should be deposited below the water table to avoid oxidation reactions. The waste rocks with neutralising potential should be placed on top of the potentially acid-forming materials. Water with a higher pH that will seep from the alkaline waste rocks and will neutralise low pH water released from the potentially acid forming materials placed underneath. Ongoing surface and groundwater monitoring.
General	Possibility of not implementing the final Land Use Plan for the disturbed areas.	Loss of biodiversity, increased soil erosion, increased siltation of rivers etc.	Natural Environment	C	J	Highly Intolerable	Implementation of Final Land Use Plan and ensure contractors are aware of what the final end use design is.	C	H	ALARP	Ensure rehabilitation is conducted using a clear plan for the mined area's end land use. Consider post-mining landscape designs. Ensure rehabilitation contractor is aware of rehabilitation requirements (include in contract).

Area	Hazard (Unwanted Event)	Consequence(s)	Primary Risk Category	Raw Risk			Current Controls	Residual Risk			Possible New Controls
				Severity	Likelihood	Risk Rank		Severity	Likelihood	Risk Rank	
General	Potential negative impact on biodiversity.	Failure of re-established vegetation on rehabilitated areas. Loss of biodiversity, increased soil erosion, increased siltation of rivers etc.	Natural Environment	C	J	Highly Intolerable	Maintain operational monitoring programmes to ensure that credible monitoring data is available. Monitoring and maintenance of rehabilitated areas. Conduct concurrent rehabilitation as per the mine's rehabilitation plan.	C	H	ALARP	Continuous monitoring and maintenance of rehabilitated areas. Conduct rehabilitation as per the mine's rehabilitation plan.
General	Possible human access to remnant infrastructure.	Collapse of remnant infrastructure which could lead to human injury or fatality.	Health & Safety	B	G	ALARP	Demolish and remove all remnant infrastructure from site during the decommissioning phase. Legally transfer useable infrastructure to third party, for instance the local municipality. Implementation of RCP	E	G	Maintain	Undertake rehabilitation according to Landform design criteria
Overburden and Discard Dump	Possible pollution originating from dump footprints.	Contamination of soil and groundwater resources should overburden/discard material be left on surface after mine closure.	Natural Environment	C	I	Highly Intolerable	Remove overburden material from surface and use as backfill material during rehabilitation.	C	H	ALARP	Undertake rehabilitation according to Landform design criteria and ensure that no remnant stockpiles remain.
Pollution Control Dams	Possible pollution originating from PCDs.	During the decommissioning phase, possible pollution of the natural environment might occur.	Natural Environment	D	I	ALARP	Maintain current stormwater management until all rehabilitation has been complete.	D	I	ALARP	Ensure that decommissioning and rehabilitation of PCDs are conducted in an efficient and effective manner to reduce the possibility of contamination. Remove HDPE liners and dispose of appropriately. Remove contaminated soil in vicinity of PCDs and dispose of appropriately.
General	Possibility of failing to control alien invasive species on rehabilitated land.	Loss of biodiversity.	Natural Environment	E	J	ALARP		E	J	ALARP	Establish a alien invasive control/eradication programme and monitor alien invasive species during the post closure phase.

Area	Hazard (Unwanted Event)	Consequence(s)	Primary Risk Category	Raw Risk			Current Controls	Residual Risk			Possible New Controls
				Severity	Likelihood	Risk Rank		Severity	Likelihood	Risk Rank	
General	Possible dust generation during decommissioning and closure of the mine.	Nuisance dust to community.	Health & Safety	E	I	Maintain	Implement standard dust suppression techniques. Monitoring and maintenance of rehabilitated areas to ensure areas of bare soil are attended to and remediated to minimise the impact of wind-blown dust.	E	I	Maintain	Ensure dust suppression is undertaken during the decommissioning phase and continue with monitoring.
ROM Pads	Possible pollution originating from ROM pad areas.	Contamination of soil and groundwater resources.	Natural Environment	F	J	Maintain	Ongoing groundwater and surface water monitoring	F	J	Maintain	Clean-up coal stockpile areas and remove coal veneer from ROM pads periodically to reduce impact and dispose of within the pit. Ensure that this material is disposed of below the groundwater recharge level.
Workshops, Offices & other Surface Infrastructure	Possible pollution originating from workshop areas.	Contamination of soil and groundwater resources.	Natural Environment	F	J	Maintain	Ongoing groundwater and surface water monitoring	F	J	Maintain	Adequately remove contaminated soil around workshop areas during the decommissioning phase.

9 Closure Environmental Management Plan

The main aim in developing the RCP is to minimise and mitigate the impacts caused by mining and industrial activities and to restore land back to a satisfactory standard. It is best practice to develop the RCP as early as possible so as to ensure the optimal management of rehabilitation and closure issues that may arise. It is critical that a mine's RCP is defined and understood from before mining progresses and is complimentary to the objectives and goals set.

Table 9-1 below sets out the rehabilitation and closure actions required at the various areas related to the mine.

Table 9-1: Summary of Rehabilitation and Closure Actions

Aspect	Rehabilitation measures
Main Plant and related infrastructure	• Demolish and remove all concrete structures to 1 m below ground level • Dismantle streel structures including tanks and store in designated salvage yard prior to removal/selling off • Demolish all paving walkways and parking areas • Dismantle and remove all generators and internal components of substations prior to further structure demolition • Demolish brick structures including concrete foundations
Water Management Facilities	• Demolish and remove all liners and structures • Remove HDPE liners and geomembranes, shred and place within the pit or disposal at an appropriate landfill site • Demolish brick structures including concrete foundations • Dismantle steel structures
Other Infrastructure and Offices	• Demolish and remove all concrete structures to 1 m below ground level • Dismantle carport structures, store in designated salvage yard prior to removal/selling off • Demolish brick structures including concrete foundations • Demolish all paving walkways and parking areas
Mining, stockpiles and discard dump	<u>Stockpiles around the Plant</u> • Utilise as backfill for the dam basins and large cavities remaining from plant demolition • Replace topsoil once areas are levelled and shaped to align surface water runoff with the site wide drainage framework <u>Opencast pit and mining stockpiles</u> • Utilise stockpiled material as backfill for the opencast void to achieve the post mining landform design elevations • Place topsoil as a final layer over the backfilled pit prior to vegetation establishment • Rehabilitation of dump footprints after material has been removed • Shaping of the pit perimeter and placement of berm around pit; <u>Coal veneer</u> • Remove the coal veneer from ROM stockpile areas, plant footprint and tip for disposal into the pit, prior to final shaping and rehabilitation
Linear infrastructure	<u>Haul roads, tar and gravel roads</u> • Rip all haul roads prior to removal of the carbonaceous layer; • Rip all gravel roads to break compaction • Demolish and remove concrete structures and restore pre-mining flow regime <u>Lined storm water drains</u> • Demolish and remove liners <u>Conveyor belts</u> • Demolish and remove concrete plinths and bases • Dismantle all ancillary steel structures, transfer houses and chutes • Dismantle all overland conveyors and associated infrastructure • Dismantle suspended conveyors and associated infrastructure <u>Powerlines, pipelines, cables and cable racks</u> • Dismantle all internal powerlines • Dismantle all internal pipelines to 1000 mm below ground level • Dismantle and remove cables and cable racks

Aspect	Rehabilitation measures
General rehabilitation	<u>General rehabilitation</u> • Shape and level disturbed area to align storm water runoff with the surrounding surface water drainage framework • Replace topsoil across the backfilled opencast pit area, reshaped areas where infrastructure was demolished, cleared stockpile footprints and backfilled and shaped dams • Rip all areas to alleviate compaction • Establish vegetation including soil amelioration based on dedicated sampling and analysis, seed bed preparation and the application of an appropriate seed mix
Monitoring and maintenance	• Ground water monitoring costs are included and assumed to take place quarterly at 10 points (sampling locations) for ten years after mine closure • Surface water monitoring costs are included and assumed to take place monthly at 5 points (sampling locations) for ten years after mine closure • Vegetation monitoring and maintenance on rehabilitated areas is included for three years after closure

9.1 Rehabilitation Strategy

The following section describes general rehabilitation strategies to assist with site wide rehabilitation.

9.1.1 Material Balance

UCD should undertake a topsoil material balance to ensure that there is enough material to complete all the rehabilitation actions and be able to implement a sustainable post-mining land-use. Based on current information available and modelling scenarios conducted, there will be a final void that will remain. It is critical that soil management is a key priority during the inception of the mine, to ensure that sols resources are protected and utilised for the entended purpose.

9.1.2 Soil Management

The soil management plan demonstrates how soil should be preserved in a condition as near as possible to its pre-mining condition in order to allow successful rehabilitation. The plan should be implemented during clearance of the soil in preparation for mining activities and includes procedures for storage of soil. Soil management measures typically include the following:

- The rehabilitated area should be profiled to replicate the natural landform;
- When there is insufficient soil material for use, select suitable sub-surface materials (i.e. those that are neither saline nor sodic) to use as a substitute for soil when covering rehabilitated areas; and
- Ensuring organic content is sufficient to sustain microbial activity, encourage infiltration, limit runoff and improve soil stability. Despite not being practical, mulch with grass clippings (cut when seed content is at its highest) as an attempt to provide a seed bank.

9.1.3 Shaping and Levelling

The disturbed area should be shaped and levelled back to original pre-mining ground level and should be free draining.

9.1.4 Soil Compaction and Alleviation

In order to alleviate or reduce soil compaction the following should take place:

- Rip all disturbed footprints by a depth of 0.5 m and heavily compacted areas (hard pans, access roads);
- Soil should be ripped when moist to allow for maximum alleviation of compaction; and
- Soils should be moved and/or replaced when they are dry to minimise compaction.

9.1.5 Soil Amelioration

Soil amelioration should be done as follows:

- Following de-compaction, an acceptable seed-bed must be produced through surface tillage;
- Soil must be sampled and analysed for contamination and amelioration requirements before being placed on rehabilitated areas; and
- Fertiliser must be applied to raise the soil nutrient content (if needed) to the desired levels, thereafter maintenance must continue.

9.1.6 Erosion Control

The following should be undertaken as part of erosion control on rehabilitated land:

- Unnecessary disturbance and vegetation removal should be avoided and prevented;
- Pre-development drainage patterns should be reinstated as far possible; and
- Rehabilitated areas should be monitored for erosion quarterly and after extreme rainfall events.

9.1.7 Vegetation Establishment

Should appropriate vegetation (species and cover) not be established naturally then seeding would be required. Plant species to be selected for rehabilitation should be hardy, tolerant of drought, acidity, fire and harsh conditions (GDARD, 2009). Grasses such as *Hyparrhenia hirta* (Common Thatching Grass) and *Cynodon dactylon* (Couch Grass) are suitable for this. The vegetation established will also need to align with the proposed end land use. Species lists must include species that are fast growing and stoloniferous to aid in erosion control and that will create a sustainable cover as soon as possible.

The establishment of natural vegetation is a necessary component of the decommissioning and rehabilitation phase. The overall objectives for the establishment of natural vegetation of reshaped areas are to:

- Prevent erosion;
- Avoid soil loss;
- Restore the land to the agreed land capability;
- Reduce sedimentation into aquatic ecosystems such as rivers and streams;
- Re-establish eco-system processes (succession) to ensure that a sustainable land use can be established without requiring excessive fertiliser additions; and
- Restore the biodiversity of the area as far as possible.

In order to ensure vegetation establishment, the following must be done:

- Rehabilitated areas must be properly prepared;

- Woody patch cavities must be in-filled with suitable growth medium; and
- Growth properties must be improved by the addition of organic matter and fertilizer, where required.

9.1.7.1 Species for Re-vegetation

Re-vegetation should focus on initially using pioneer species and either aid, assist or plant out next phase plants through seed dispersal or tree planting. Fast-growing, resilient, keystone species that will assist with the natural establishment of indigenous plants surrounding the rehabilitation site should be chosen.

Red List species, Species of Special Concern (SSC) and protected species are generally fragile species and may not be viable to promote successful re-vegetation. These species need to be transplanted into surrounding pristine or rehabilitated (not rehabilitating) areas.

The grass seed mix advised for the rehabilitation areas of the mine site are shown in Table 9-2, whilst Table 6-3 lists species characteristic of Limpopo Sweet Bushveld vegetation type ,which the Project Area falls within, (Mucina & Rutherford, 2012) that can be planted on site to boost species richness. However, some grass species indicated in Table 6-3 must also be included to increase species diversity and ensure that the grass species represent species that would have been found naturally in the area. Additionally, in South Africa, only one in six plant species are grasses, therefore it is imperative that these areas should also be vegetated with herbs, geophytic herbs, succulent herbs and low shrubs.

Table 9-2: Species for Re-Vegetation

Scientific Name	Common Name	Properties	Grazing Potential	Grazing Status	Sowing Rate (kg/ha)	% mix
Cenchrus ciliaris	Foxtail buffalo grass	Highly adaptable, drought resistant perennial	High	Decreaser	2	13%
Chloris gayana	Rhodes Grass	Grows in all fertile soil and wetter areas	High	Decreaser	1	Less than 1%
Cynodon dactylon	Couch grass	Mat-forming, stabiliser	High	Increaser 2	2	13%
Digitaria eriantha	Common finger grass	Perennial	High	Decreaser	5	25%
Eragrostis tef	Teff	Annual, pioneer	High	Exotic grass	5	25%

TOTAL	**15**	

Hand seeding/tractor seeding are options for seeding at the mine site. Planting is generally most successful when done at or immediately after the first rains and into freshly prepared fine-tilled seedbeds. To stimulate germination, water retention in the seed zone is essential and can be aided by using light vegetation mulches. The rehabilitation seed mixes generally consist of grasses as they rapidly establish and provide excellent protection against surface erosion (Tanner & Mohr-Swart, 2007).

To ensure successful rehabilitation at the Dalyshope site, it is important to note vegetation types (as discussed above) so that these can be replaced to some extent once mining has been completed.

9.2 Alien Invasive Species Management

AIPs tend to out-compete the indigenous vegetation; this is due to the fact that they are vigorous growers that are adaptable and able to invade a wide range of ecological niches (Bromilow, 2010). They are tough, can withstand unfavourable conditions and are easily spread, which is detrimental to rehabilitation of vegetation. AIPs directly compete with rehabilitating vegetation and could result in increasing costs of revegetation in the long term. In addition, various invasive species are required by law to be removed.

Methods should be used that are appropriate for the species concerned, as well as to the ecosystem in which they occur. When performing the controlling methodology for weeds and invaders, damage to the environment must be limited to a minimum. AIPs must be continually removed after rehabilitation has occurred for at least three growing seasons to ensure the seed bank is depleted. Continual monitoring will be needed for establishment of AIPs from seeds that are likely to be blown in from adjacent areas.

The following should be considered during the rehabilitation process:

- There must be no planting of alien invasive plants anywhere within the Project area;
- The transportation of soils or other substrates infested with alien plant species should be strictly controlled;
- Benefits to local communities as a result of the alien plant control programme should be maximised by not only ensuring that local labour is employed, but by also ensuring that cleared alien trees are treated as a valuable wood resource that can be utilised (e.g. charcoal manufacturing, domestic fuel burning, or hand-made articles); and
- It is considered essential that appropriate veld management (particularly appropriate grazing levels and burning frequencies) should be applied to areas of secondary indigenous vegetation (e.g. secondary grassland of historically cultivated areas) and especially the grassland and wetland vegetation of untransformed habitats. Appropriate grazing levels and burning frequencies will ensure that good vegetation condition and biodiversity levels are maintained.

There are a number of possible methods which can be used to control alien invasive species; these include mechanical, chemical and biological control. The sections below outline possible techniques used in mechanical and chemical control methods.

9.2.1 Mechanical Control Methods

Mechanical methods for alien plant removal may include felling, removing or burning invading alien plants. The following mechanical methods for felling are recommended:

- **Hand Pulling**: grip the young plant low down and pull out by hand (using gloves);
- **Ring Barking**: bark is removed to from the bottom of the stem to a height of 0.75-1.0 m to below ground level. Bush knives or hatchets can be used for debarking;
- **Frill or Ring-bark**: using an axe or bush knife, angled cuts are made downward into the cambium layer through the bark in a ring; herbicide is applied into the cuts; and
- **Cut Stump Treatment**: stems should be cut as low as practical as stipulated on the herbicide label. Chemical herbicides are applied in diesel or water as recommended. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

9.2.2 Follow-Up Control Methods

Follow up control of alien seedling and sapling re-growth is essential to achieve and sustain the progress made with initial control work. If this phase is neglected, the cleared area will soon become infested with dense alien vegetation again, arising either from re-invasion by the original species or from invasion/encroachment by another species. Follow-up control is essential to prevent alien seedlings suppressing planted or colonizing grasses. Before starting initial control operations in new infestations, all required follow-up control and rehabilitation work must be completed or in progress in areas initially prioritised for clearing and rehabilitation.

Follow-up control should combine the following methods:

- Chemical control methods including selective/non-selective, contact/systemic herbicides (always use registered herbicides applicable to the specific species); and
- Mechanical control methods.

Evaluate and select methods for follow-up control work according to species and the type and density of re-growth.

The aim is to keep the area stabilised by maintaining a good grass cover. Further soil disturbance must be prevented. Planted grass must be maintained as a healthy mat to achieve the aims of rehabilitation. If the grass is neglected, it can become rank and moribund or suppressed by alien plant seedlings.

Annual inspection of grass cover and alien plant re-growth is essential. Follow-up and maintenance control work each year will protect the planted grass cover. If this is neglected,

the rehabilitated area will revert to dense patches of alien plants, resulting in increased control costs and loss of grass cover.

10 Alternative Closure Strategies

The opencast void will need to be closed and rehabilitated. For the final closure, the entire area will need to be re-evaluated and the final void filled and prepared for rehabilitation. Two scenarios for final void closure are available at this point, including:

- Option1: To completely backfill the pit with overburden, interburden and discard material.; and
- Option 2: The pit is completely backfilled with a final void.

The void and sides will need to be levelled once the subsoil has been placed and topsoil is to be placed. The conceptual diagrams for the two final options are shown below in Figure 10-1 and Figure 10-2.

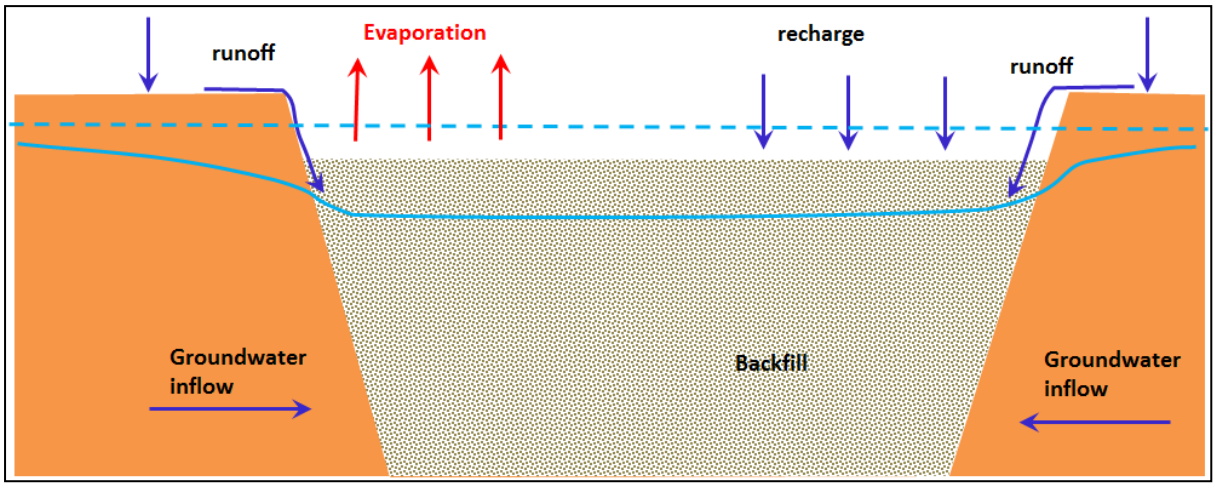


Figure 10-1: Conceptual diagram of the backfill for Option 1

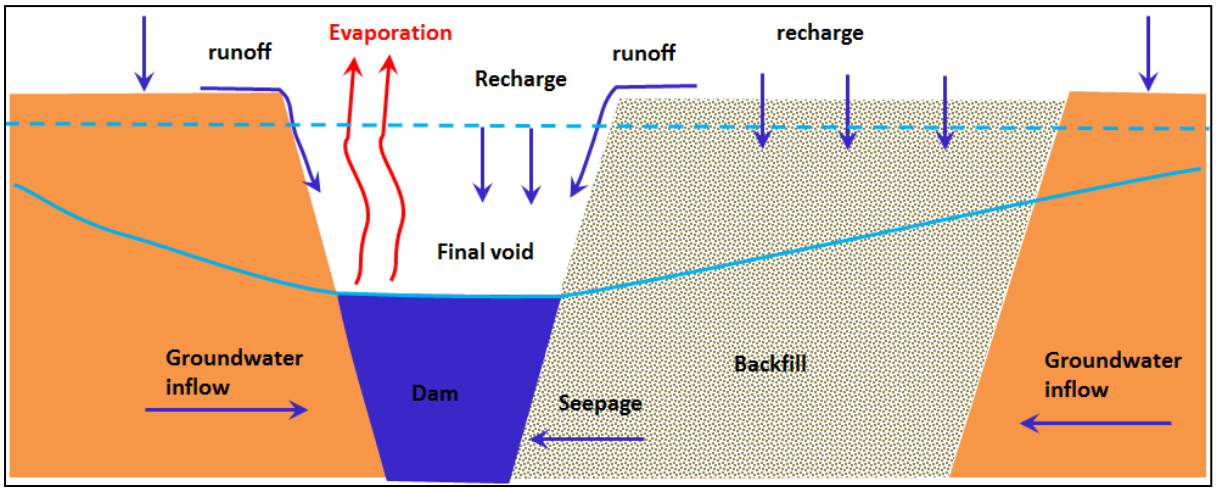


Figure 10-2: Conceptual diagram of the backfill for Option 2

11 Threats, Opportunities and Uncertainties

The following threats, opportunities and uncertainties to the compilation of this plan are identified:

11.1 Threats

- Not addressing the knowledge gaps and uncertainties relating to the environmental baseline;
- Lack of regulatory consistency due to changes in legislation, political effort and regulator personnel with site-specific involvement and knowledge;
- Failing to engage in rigorous contract development to ensure efficient and accurate implementation by contractors onsite;
- Failing to manage the post mining landform construction and topsoil resources throughout the LoM;
- Waste generation onsite, potential waste classifications and disposal that may be required at closure; and
- Inefficient communication and management of stakeholders and authorities expectations regarding post closure land capabilities and land uses.

11.2 Opportunities

- On-going surface water and groundwater quality monitoring during the operational LoM in order to determine trends overtime and to monitor changes in water quality overtime to determine if the mine is impacting on water quality and/or quantity within the vicinity of the mine;

- The water sampling results must inform the groundwater model, to refine the model and more accurately predict post closure impacts based on actual data obtained during the operational phase;
- Skill development training for employees and engagement with employees to ensure that when closure is reached and downscaling, and retrenchment of staff occurs that all are aware of the process and that people have the required skills in order to find alternative employment;
- Engagement with the stakeholders and the authorities throughout the project life cycle to ensure alignment on closure and rehabilitation methodologies and expected outcomes;
- Develop specific rehabilitation closure measures to be implemented during the project lifespan to reduce financial burden at the end of life;
- Comprehensive environmental monitoring programme providing comprehensive baseline data to inform decision making;
- Availability of appropriate closure funds;
- Depending of the accuracy of implementation, disturbed areas can be rehabilitated to align with the surrounding agricultural land use mix; and
- Adopting closure recommendations as identified in the respective specialist reports, with particular emphasis on social, water and biodiversity related aspects.

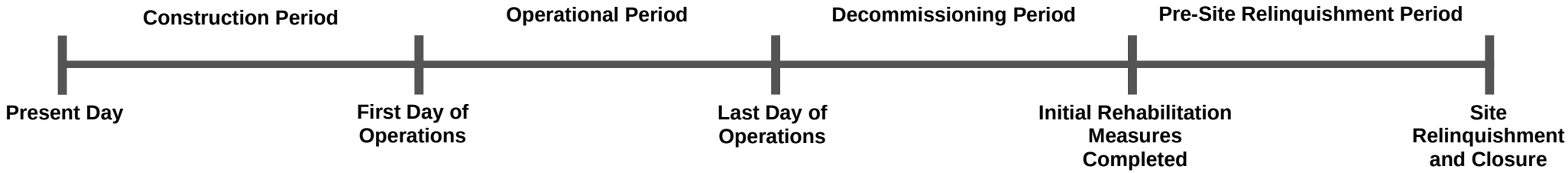
11.3 Uncertainties

- Conduct rehabilitation trials utilising different plant species and different techniques for rehabilitation to develop a plan that would allow for the most successful establishment of plant species;
- On-going surface water and groundwater quality monitoring during the operational LoM in order to determine trends overtime and to monitor changes in water quality overtime to determine if the mine is impacting on water quality and/or quantity within the vicinity of the mine;
- Conducting a soil balance and determining soil availability, which then will determine most appropriate areas for soil to be utilised for rehabilitation measures;
- Develop a numerical or analytical groundwater model and update it every 5 years for the Project site with closure in mind; and
- Adopting closure recommendations as identified in specialist reports, with particular emphasis on social, water and biodiversity related aspects.

12 Preliminary Mine Closure Schedule

The mine closure schedule addresses the timing of rehabilitation and closure activities performed during the decommissioning and post-closure phases of UCD. The schedule

presented is high level and identifies the key activities UCD will conduct during the decommissioning and post-closure phases. Closer to the time of mine closure, the schedule should be refined. The mine schedule is depicted in Figure 12-1 below.



Year 1 - 3	Year 3 - 30	Year 30 - 33	Year 33 - 35
Ensure activities that are undertaken are aligned to the EMP and closure objectives.	Update the RCP, annual rehabilitation plan, closure costing and environmental risk assessment annually.	Decontaminate and demolish the identified surface infrastructure and ensure that access to the underground mining areas is prohibited by the backfilling and sealing of shafts.	Undertake rehabilitation monitoring as per the post-closure monitoring programme to confirm success of rehabilitation measures.
Stripping of material and proper soil management must be in place and adhered to.	Reduce the identified threats and uncertainties in the plan. Close the knowledge gaps.	Rehabilitate impacted footprints as per the approved measures.	Undertake care and maintenance (corrective action) where applicable. This will be informed by the rehabilitation monitoring.
Ongoing engagement with all stakeholders	Engage with the relevant stakeholders with respect to the final land use.	Rehabilitate the disturbed footprints once infrastructure is removed.	Post-closure groundwater management will most likely affect the pre-site relinquishment phase.
Design of post closure land form design.	Assess and put in place the required agreements for the third-party transfer of usable infrastructure.	Identify and transfer usable infrastructure for third-parties.	Conduct a radiation clearance assessment and submit a report to the National Nuclear Regulator.
		Undertake rehabilitation monitoring.	

Figure 12-1: Preliminary Mine Closure Schedule

13 Audits, Reporting Requirements and Monitoring

Initial monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps are shown in Table 13-1. The audit schedule differentiates between internal and external audits, defines the frequency and the responsible person.

All audit findings should be captured in the Environmental Management System (EMS). Resources and timeframes must be assigned to all audit findings, and progress tracked on an EMS platform.

Table 13-1: Internal, External and Legislated Audits

Internal/External	Type	Frequency	Responsible person
Internal	Water Use License audit	Annual	Environmental Manager
	Environmental Legal Compliance audits	Annual	Environmental Manager
	Addressing knowledge gaps for the RCP	Annual	Environmental Manager
External	Site EMS audit	Annual	EMS specialist
	Water Use License audit	Annual	Water specialist
	GN704 audit	Annual	Water specialist
	Environmental audit (EA/EMP)	Annual	Environmental specialist
	Closure cost audit	Annual	Closure specialist

14 Monitoring Plan and Relinquishment Criteria

Monitoring provides information on whether rehabilitation methods employed are functioning correctly or not. Monitoring should provide an early indication of problems arising so that corrective management actions can be taken.

The post closure monitoring period will begin once scheduled decommissioning and rehabilitation activities for the site have been completed. The duration of post closure monitoring will be determined based on environmental performance and until it can be demonstrated that the rehabilitation work has achieved the agreed endpoints; however, at present, it has been assumed that post closure monitoring will not continue for more than 5 years. It is important that the data obtained during monitoring is used to gauge the success of rehabilitation. Negative monitoring findings should be clearly linked to specific corrective actions.

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the operational phase as well as during the progress of establishment of the desired final land use.

Relinquishment requires formal acceptance from the regulatory authority to ensure that all obligations associated with closure are achieved, prior to a closure certificate being issued. To achieve relinquishment, criteria need to be set, measured and met for all parties to understand what needs to be done to obtain a closure certificate. This provides all parties involved in the process a target that needs to be achieved and sets the standards that closure and rehabilitation are measured against. Table 14-1 provides the respective Environmental Monitoring Plan and Relinquishment Criteria.

Table 14-1: Environmental Monitoring Plan and Relinquishment Criteria

Aspect	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of the Monitoring Programmes)	Frequency	Type of Requirement (Monitoring, Auditing and/or Reporting)
Fauna and Flora	Alien Invasive Management.	During the operational phase the presence of AIPs should be detected and monitored. An active programme of weed management, to control the presence and spread of invasive weeds, will need to be instituted so that encroaching weeds (from edge effects and fragmentation) are controlled by means appropriate to the species. This should run for the life of the mine and five years after rehabilitation.	Environmental Officer.	Annually during the wet season for the first five years after rehabilitation.	Monitoring and reporting.
	Vegetation Cover Monitoring.	The natural vegetation cover established on the disturbed areas needs to be monitored annually for the first five years after rehabilitation has been carried out, to ensure that the rehabilitation work has been successful in terms of stabilising the newly formed surfaces (preventing air and water erosion from affecting those surfaces), and that the newly established vegetation cover is trending towards convergence with the original vegetation cover found on the areas prior to disturbance (and on adjacent undisturbed areas). Parameters to be followed during monitoring: • Plant species present/absent; • Weed species composition; • Species density (number of individuals); • Species frequency (number of times species is recorded); • Basal cover; and • Biomass for ground cover.	Botanist/Flora Specialist.	Annually during the wet season for the first five years after rehabilitation.	
	Red Data listed fauna and flora.	All protected and Red Data plant and animal species must be marked prior to any construction taking place.	Field Specialist.	Monitored every 6 months from rehabilitation.	
	Fauna monitoring.	This will be closely linked to the flora monitoring to enable scientific conclusions and comparisons. To successfully monitor faunal and floral biodiversity with a Savannah biome, a solid baseline (pre-construction) will be established through the first round of monitoring. This needs to be supplemented with regular repeats to compile a reasonable comparison between the pre-construction faunal communities present and faunal communities found in the same areas during various stages of construction and operation of the proposed project. It is recommended that this monitoring be carried out through the life of the mine and concurrently during rehabilitation.	Field Specialist.	Monitored every 6 months from rehabilitation.	

Aspect	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of the Monitoring Programmes)	Frequency	Type of Requirement (Monitoring, Auditing and/or Reporting)
Soils	• Erosion status; • Preferential flow paths; • Compaction; • Increased runoff; • Soil contamination; and • Vegetation cover.	• Areas of concern must be inspected in the wet, and dry season, specifically after a large rainfall event; • If soil is polluted, treat the soil using in-situ bioremediation; • If in-situ treatment is not possible then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification, and Disposal of Hazardous Material, and disposed of at an appropriate, permitted or licensed disposal facility; • Repair any damage caused by erosion; • The deposition of eroded materials and the understanding of volumes moved concerning the plan should be assessed monthly by the Environmental Practitioner (EP); • Continuous erosion monitoring of rehabilitated areas should be undertaken, and zones with excessive erosion should be identified. Erosion can either be quantified or the occurrence there-of simply recorded for the specific location; • Revegetate bare areas, and remove AIPs where necessary; • There must be no planting of alien plants (e.g. black wattle, eucalyptus, and pampas grass) anywhere within the OC1 Area: • The transportation of soils or other substrates infested with AIPs should be strictly controlled; • Traffic should be limited where possible while the vegetation is establishing; • Implement grazing control to prevent overgrazing, and allow pastures to establish; • The area must be fenced, and animals should be kept off the area until the vegetation is self-sustaining; and • Implement annual monitoring to identify areas of concern early, and implement rehabilitation as soon as possible.	• The EP can be trained to take soil samples, and send it to a South African National Accreditation System (SANAS) accredited laboratory; • Results must be sent to a Soil Specialist to assess the results and write a short memo regarding soil fertility, and contamination including possible mitigation measures; • The Mine Manager and the EP should ensure soil contamination monitoring on-site, especially where hydrocarbons are stored, and applied; • EP to give training to sub-contractors, and all workers on the operational procedures, and mitigation measures; and • The Mine Manager and the EP should be responsible to determine the effectiveness of erosion control structures.	• Annual (one-yearly) soil monitoring during the Construction Phase; • Biannual (two-yearly) soil monitoring during the Operational Phase, preferable one survey after the rainy season (March to May), and one after the dry season (July to September); • Biannual (two-yearly) soil monitoring during the Decommissioning Phase, preferable one survey after the rainy season (March to May), and one after the dry season (July to September); and • Annual (one-yearly) soil monitoring after Decommissioning, and Rehabilitation until Closure is achieved.	Monitoring and reporting.
Air Quality	Dust.	Dust and PM_{10} monitoring using the ASTM Method. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) Dust Control Regulations (2013) and applicable regulations and guidelines.	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	Monthly.	Monitoring.
Noise	Noise disturbance.	Investigating noise impacts is based on guidelines provided by the SANS.	Environmental Coordinator.	Monthly for first 3 months, thereafter quarterly.	Monitoring and reporting.

Aspect	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of the Monitoring Programmes)	Frequency	Type of Requirement (Monitoring, Auditing and/or Reporting)
Surface Water	Water quality.	Water quality monitoring should continue to sample points in the Limpopo River and the non-perennial pan within the Project Area. Parameters should include, but are not limited to: pH, Electrical Conductivity, Aluminium, Sulphates, Phosphates, Iron, Manganese, Calcium, Magnesium, Nitrate, Ammonia, Fluoride, Chloride, Total dissolved solids, Suspended Solids; Sodium, Uranium, Potassium, heavy metals (e.g. As, Ni, Cu, Pb, Cr, Bo, Hg). It is also recommended to monitor water quality within the mine water dams or water containment facilities to determine the concentration levels in case of an overflow and for a more accurate estimate of the salt balance.	Environmental Officer.	• Monthly monitoring during operation and decommissioning; (hydrocarbons can be done on a quarterly basis); and • Monitoring needs to carry on three years after the project has ceased, as is standard or best practice to detect residual impacts.	Monitoring and reporting.
	Water quantity.	Flow monitoring should be carried out between flow linkages to obtain accurate flow volumes.		In operational areas where automatic flow meters are in place, daily records need to be kept.	
	Physical structures and Storm Water Management Plan (SWMP) performance.	Personnel should have a walk around facilities to determine the facilities conditions and pick out any anomalies such as leaks or overflows and system malfunctions. Storm water channels, and existing mine dams are inspected for silting and blockages of inflows, pipelines for hydraulic integrity; monitor the overall SWMP performance.		Continuous process and yearly formal report.	
	Meteorological data.	Measure rainfall to provide more accurate rainfall records, if possible.		Real time system with tipping bucket rain gauge or alternatively using bulk rain gauge.	
Groundwater	Groundwater quality.	Parameters to be monitored should include, but are not limited to: Macro Analysis (i.e. Ca, Mg, Na, K, SO_4, NO_3, F, Cl), Trace Metals (Al, Fe, Mn and other trace metals) using ICP scanning, pH and Alkalinity and TDS and EC. Groundwater qualities after mine closure need to comply with the qualities as stipulated in the Water Use Licence Application (WULA) and the appropriate standards set by the Department of Water and Sanitation (DWS) and SANS.	Samples should be collected by an independent groundwater consultant, using best practice guidelines and should be analysed by a SANAS accredited laboratory.	Monthly monitoring during construction, operation, decommissioning and for at least 3 years after closure, or until rehabilitation has reached a sustainable state with no further changes.	Monitoring and reporting.
Aquatics	Water quality.	Water quality should be tested on a biannual basis at each monitoring site to determine the extent of change from baseline results.	Qualified aquatic ecologist.	Annual basis: comprises of a single survey during the dry season for the Study Area and a single survey	Monitoring and reporting.

Aspect	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of the Monitoring Programmes)	Frequency	Type of Requirement (Monitoring, Auditing and/or Reporting)
	Habitat quality.	The application of the Index for Habitat Integrity (IHI) should be done on a site basis for the Limpopo River. The Invertebrate Habitat Assessment System (IHAS) must be applied at each monitoring site prior to sampling.		during the wet season at the monitoring points indicated. However, due to the characteristic nature of the Study Area (i.e., dry nature of the Limpopo River during the dry season), the biannual surveys should be undertaken during early wet season – for the low-flow assessment – and during late wet season – for the high-flow assessment.	
	Macroinvertebrates.	This must be done through the application of the latest SASS5, incorporated with the application of the MIRAI as outlined in the Aquatic Study.		Macroinvertebrate and fish assemblages must be assessed biannually.	
	Fish assemblages.	Sampling must be done utilising standard electro-narcosis techniques followed by the application of FRAI for applicable reaches.			
Wetlands	Degradation of wetland PES.	Wetland monitoring should ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks at highlighted in Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.	The environmental officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Bi-annual monitoring for 5 years after mine closure.	Monitoring.
Social	Stakeholder engagement.	Engagement with stakeholders and employees regarding closure related aspect and formulisation of a retrenchment and downscaling policy demonstrating training initiatives and skills development assisting in employees being upskilled, which would help individuals to seek for alternative employment at the time of closure.	Qualified social scientist.	Engagement, training and skills development policies during operational phase.	Records of correspondence, training matrices and records of training.
Safety	Area safety.	Ensure dangerous mining areas, such as open quarry areas, have been appropriately bunded and appropriate signage erected.	Registered engineer.	Visual inspections and sign off report by a registered engineer.	Signed off report by registered engineer.
Topography	Post-mining topography.	Ensure that the post-mining topography is as close to the pre-mining topography by re-contouring the study area. Ensure that surface water and drainage lines are rehabilitated to pre-mining condition.		Monthly monitoring for 5 years after final rehabilitation.	Monitoring.
Visual	Appearance of post-mining area.	Ensure that all disturbed areas are rehabilitated to a state as close as possible to the pre-mining state.		Monthly monitoring for 5 years after final rehabilitation.	Monitoring.

Aspect	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of the Monitoring Programmes)	Frequency	Type of Requirement (Monitoring, Auditing and/or Reporting)
Audit Reports	EMPr Conditions	To determine compliance to EMPr conditions.	Environmental Officer/Independent Third Party.	Annual EMPr audits.	Audit Report.
	Financial Provision Update.	To ensure that the mine is compliant with the financial provision regulations and that there is sufficient funding provided by the mine for closure and rehabilitation cost and meets the requirements as stipulated in Regulation 11 (1) of the New Financial Provisioning Regulations.	Environmental Officer/Independent Third Party.	Annually and must be audited by an independent auditor.	Financial Provision Report submitted to the DMR.

15 Organisational Capacity

Human resource programmes and annual financial provisions for UCD, over a five year period, are provided in the Social and Labour Plan (SLP). The SLP should cover the following aspects:

- Human Resource Development programme, which includes:
  - Skills development;
  - Career progression plans;
  - Bursaries; and
  - Employment equity.
- Local Economic Development programme, which includes:
  - Infrastructure and poverty alleviation projects;
  - Measures to improve nutrition and living conditions; and
  - Procurement progression plan:
    - Process for the management of downscaling and retrenchment towards the end of the mine life, which includes establishment of a future forum.
- Mechanisms to retain jobs provide alternative solutions and ameliorate negative social and economic impacts.

15.1 Training and Capacity Building

Training requirements for each employee should be planned as follows:

- Skills Development Plan:
  - Workplace Skills Plan.
- Adult Basic Education and Training:
  - Portable Skills Provision.
- Outcome-based Education, Training and Development;
- Career Progression Plan;
- Mentorship Plan:
  - Employee Mentorship Plan; and
  - Historically Disadvantaged South Africans (HDSA) Empowerment Partner and Mentorship Programmes.
- Bursary Plan:
  - Internships; and
  - Further Education and Training.

- Employment Equity Plan:
  - Women in Mining; and
  - HDSA participation in management.

15.2 Health, Safety and Environment

Training requirements for each employee must be planned as follows:

- The departmental managers are responsible for identifying personnel whose work directly impacts the health, safety, quality and environment;
- The Environmental and Risk Managers are responsible for identifying Health and Safety training needs of all persons working for or on behalf of the company;
- A training matrix must be used to schedule training for all persons working for or on behalf of the operation;
- The Organisational Performance department processes, analyses and co-ordinates the required training schedule as per the training matrix for each person working for or on behalf of the operation;
- The training programmes for all persons working for or on behalf of the operation must at least cover, but not necessarily be limited to:
  - Conformance to policies, procedures and work instructions;
  - Emergency procedures and response;
  - Non-conformance reporting;
  - Legislation requirements for site (management and supervisory personnel) work place area or tasks (operational personnel);
  - Knowledge of hazards and impacts (actual and potential) in relevant areas for relevant activities or tasks;
  - Required measuring and monitoring to ensure compliance;
  - Handling, use and disposal of hazardous chemicals in relevant areas/functions;
  - Competence regarding health, safety, quality, environmental, and railway safety issues pertaining to specific tasks;
  - General Health and Safety awareness;
  - Contractors;
  - Visitors; and
  - ISO 14001:2015 and ISO 45001.

15.3 Environmental Awareness

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform the mine's employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid contamination or the degradation of the environment.

16 Closure Cost Determination

Two costings have been provided for within this RCP, the one costing is aligned to the requirements outline in GNR 1147

Although the DMR costs are included, the GNR 1147 methodology is outlined below, as this will supersede the DMR costing in subsequent annual updates. The closure cost methodology is also determined in accordance with the broader legislative requirements presented in Section **Error! Reference source not found.**.

16.1 GNR 1147 Closure Costing

16.1.1 Approach and Methodology

The costing methodology employed in the GNR 1147 costing is summarised as follows:

- Conduct a document review of available information and compile a HIRA (Section **Error! Reference source not found.**) to distil an initial set of rehabilitation actions to p rovide a basis for the costing;
- Compile an itemised layout plan indicating the battery limits for the closure costing based on the above;
- Populate a site-specific closure costing spreadsheet using the Digby Wells GNR 1147 aligned template to develop a costing model;
- Determine the site-specific closure and rehabilitation unit rates based on the Digby Wells rates database, interaction with rehabilitation contractors and from experience in the implementation of similar projects; and
- Documenting the methodology, outcomes and forward working plan to address the identified knowledge gaps.

16.1.2 Closure Costing Assumptions and Qualifications

The closure costing is based on the following assumptions developed from the information provided:

- Three GN R. 1147 cost estimates have been provided, first year of mining, 10 year forecast and Life of Mine;
- For the first year of mining the following assumptions have been made:

- It is assumed that the plant will not be constructed within the first year, however allowance has been made for rehabilitation of the footprint as it is assumed that this will be undertaken;
- It is assumed that the laboratory, workshops and change house will not be constructed within the first year;
- No coal will be mined within the first year, thus cost associated with the removal of the crushed coal stockpile and product stockpiles infrastructure has been excluded. Provision has been made for rehabilitation of the footprints;
- A portion of the open pit (OC1) boxcut will be developed during the first year, thus provision has been included for backfilling of material into the boxcut in the event that the mine closes within the first year of mining (assumed three months of material);
- The topsoil stockpiles will be much smaller in size and allowance has been made for rehabilitation of 20 ha for these footprints during the first year;
- As a result of no coal being mined within the first year of disturbance, provision for rehabilitation of the discard dump footprint (5 ha allowance, as it is assumed that some clearing of the areas will be undertaken for development of the footprint) only has been provided for;
- The soft waste dump will only be 5 ha in size, as a result of construction activities associated with the boxcut;
- No provision has been made for the hard waste dump as it is assumed that this will only be established after the first year of construction as the boxcut expands;

- For the 10 year forecast the following assumptions have been made:
  - All infrastructure is assumed to be constructed and operational;
  - Provision has been made to backfill a portion of the pit with material extracted from the first year of mining, including the discard material that will be utilised as backfill. It is assumed that the last six months of discard material will be required to be backfilled into the pit;
  - It is assumed that there will be a final void approximately 60 ha in extent and provision has been made to place a berm around the pit perimeter; and
  - It is assumed that only half the footprints of the discard facility, soft and hard waste dumps will require rehabilitation.
- For the Life of Mine forecast the following assumptions have been made:
  - All infrastructure is assumed to be constructed and operational;
  - Provision has been made to backfill a portion of the pit with material extracted from the first year of mining, including the discard material that will be utilised as backfill.

It is assumed that the last six months of discard material will be required to be backfilled into the pit;

- It is assumed that concurrent rehabilitation will be undertaken during the Life of Mine;
- It is assumed that there will be a final void approximately 60 ha in extent and provision has been made to place a berm around the pit perimeter; and
- All disturbed footprints will require rehabilitation.

- The backfilled volumes for the pit have been estimated based on the resource estimate information provided. It has been assumed that there will be a 30% recovery of coal, thus 70% discard volume will be generated, which will be utilised as backfill material;
- Costs associated with concurrent rehabilitation have been excluded, as this is assumed to be an operational cost as concurrent rehabilitation will be undertaken, during the operational Life of the Mine;
- The closure costing addresses decommissioning, demolition, surface rehabilitation, the final closure and monitoring of the site. Other aspects that are not addressed in this costing include staffing, separation packages, retraining or reskilling, implementation of projects linked to the Social and Labour Plan etc.;
- It is assumed that third party contractors would be commissioned to establish on site (preliminary and general costs included) and implement the mass earth works, infrastructure demolition, site clean-up, related rehabilitation work and the post rehabilitation monitoring and maintenance;
- The Preliminary and General costs are applied as a percentage of the total infrastructure demolition and rehabilitation costs (15%). If the current amendments to GN R. 1147 circulated for comment are promulgated, this figure will probably increase to align with industry standards;
- Unless firm agreements with the next land users are in place, it is assumed that all infrastructure will be demolished and removed from site;
- Aligned with the requirements of international accounting standards and GN R.1147, no discounting of potential value recovered from the sale of the plant, steel or other material removed from site is considered;
- No legal due diligence was done as part of this assessment;
- The closure costing is based on the information provided by Universal Coal;
- A contingency of 10% has been allowed for in the closure cost model. The contingency considers price fluctuations related to plant hire, fuel prices, possible omissions and uncertainties in the cost estimate; and
- The closure cost estimate for GN R. 1147 does not include VAT.

16.2 Site specific costing assumptions

The closure costing is informed by the following site-specific assumptions:

- Temporary/mobile structures will be removed by relevant contractors or if belonging to Universal will treated as movable assets and relocated prior to closure;
- Concrete will only be demolished up to 1000 mm below natural ground level, prior to application of general rehabilitation measures;
- All inert waste (i.e. building rubble) will be disposed on site (used as backfill material for the open pits or dam basins) or buried 1m underground during decommissioning;
- A maximum load and haul distance of 1km was allowed with respect to backfilling of the pit;
- All areas where structures have been removed will be shaped, ripped, top soiled and vegetated;
- Internal powerlines will be dismantled and removed, all external powerlines are Eskom's responsibility and excluded from this estimate;
- The liners will be removed from the silt traps and dams, the footprint areas will be rehabilitated;
- All tar, gravel and haul roads will be ripped, shaped and rehabilitated;
- Asphalt from the tar roads will be recovered and stored in a central location, it is assumed that the tar can be reused by a third party for road construction / maintenance;
- There will be final void that will remain and the costs are based on such;
- Discard material will be utilised as backfill material;
- All the material currently stockpiled on surface will be used for backfilling and rehabilitation of the open pit allowance is made to rehabilitate the footprint areas;
- Coal veneer from, Run of Mine (RoM) stockpile areas and general disturbed plant and tip areas will be recovered and incorporated onto the discard backfill prior to final rehabilitation;
- All areas where carbonaceous material has been removed will be shaped, top soiled, ripped and vegetated;
- Dalyshope will be a new mine with clean and dirty water systems in place and functioning from inception and as a result no costs have been included at this stage for clean-up of contaminated areas;
- All shaping will be done with the aim of aligning surface water runoff with the site wide drainage framework to ensure free draining landforms that limit the risk of erosion;
- All placed topsoil will be ripped prior to vegetation establishment to alleviate compaction;

- Revegetation activities include soil amelioration based on dedicated sampling and analysis, seed bed preparation and seeding with an appropriate seed mix;
- Costs currently exclude any post closure liabilities associated with water treatment;
- Groundwater and surface water monitoring has been provided for a period of 10 years with respect to the GN R. 1147 costing; and
- All rehabilitated areas will be monitored and maintained for a period of 3 years.

16.3 GNR 1147 Methodology

Section 24(P) in the NEMA as amended, provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts.

This is regulated by the Financial Provision Regulations (2015) (GN R. 1147), of which Regulation 10 requires a Mining Right Applicant to determine the financial provision through detailed itemisation of all activities and costs.

For the purposes of this Project, the 2020 cost assessment estimate was compiled in line with the requirements of GN R. 1147 which prescribes the minimum content requirements for documents used in the compilation of the financial provision estimate.

This model calculates the cost of demolishing, removing and rehabilitating each component of the mining area infrastructure, based on the Environmental Management Programme (EMPr), Mining Works Programme (MWP) and other related information provided to Digby Wells.

Infrastructure and mining areas have been measures electronically, based on information provided by Universal Coal. All measured areas and infrastructure have been mapped and itemised using GIS software.

For ease of reference, the estimates are provided for the areas listed below, detailing the infrastructure / disturbed areas contained within them[6]:

- Area 1: Plant & Related Infrastructure.
- Area 2: Water Management Facilities.
- Area 3: Other Infrastructure.
- Area 4: Stockpiles, Dumps and Pit.
- Area 5: Offices.
- Area 6: Linear Infrastructure.
- Area 7: General Rehabilitation.

[6] The infrastructure and other areas which will be affected by mining activities were measured from plans and documents provided by Universal Coal. All measured areas and infrastructure were mapped using GIS software. The areas indicated above are applicable to the LoM and 10-year forecast calculations. For the first year of disturbance FP calculations amendments were made to the areas.

16.4 DMRE Methodology

Digby Wells calculated the financial provision for the Project in accordance with the legislative requirements presented above. The financial provision model was compiled using Microsoft Excel, and comprises of the following:

- An input sheet, containing measurements of the infrastructure;
- A standard rate sheet; and
- A summary sheet, which summarizes the costs for closure.

16.4.1 Rates

The 2005 DMR Master Rates published by the DMR are no longer accurate. The 2005 rates have therefore been escalated using an average annual Consumer Price Index (CPI) obtained from Statistics South Africa (refer to Table 16-1) (http://www.statssa.gov.za/publications/P0141/P0141March2020.pdf).

The rates are based on CPI rates (obtained from statssa Website) for the period from January 2020 – August 2020.

Table 16-1: Annual Escalation Rates

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CPI (%)	4.70%	7.10%	11.5%	7.10%	4.30%	5.00%	5.60%	5.70%	6.10%	4.60%	6.40%	5.3%	4.70%	4.25%	3.35%

16.4.2 DMR Classification

The DMR Guideline Document classifies a mine according to a number of factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

- The mineral mined;
- The risk class of the mine;
- Environmental sensitivity of the mining area;
- Type of mining operation; and
- Geographic location.

Once the risk class (i.e. Class A, B or C) and the sensitivity of the area where the mine is located (i.e. Low, Medium or High) had been determined using the appropriate tables (Table 16-2, Table 16-3, Table 16-4 and Table 16-5), the unit rates for the applicable closure components were identified.

Table 16-2: Primary Risk Class for Type of Mineral Mined (Ubuntu Mine Class Highlighted in Red)

Mineral	Ore	Size: large if > than (tpm)	Primary Risk Class			
			Large Mine		Small Mine	
			Mine & Mine Waste	Mine, Mine Waste, Plant & Plant Waste	Mine & Mine Waste	Mine, Mine Waste, Plant & Plant Waste
Antimony		1000	A	A	C	C
Asbestos		0	A	A	A	A
Base metals (Copper, Cadmium, Cobalt, Iron ore, Molybdenum, Nickel, Tin, Vanadium)	Sulphide	10 000	A	A	C	A
	Oxide	10 000	C	A	C	A
Coal		0	A	A	A	A
Chrome		10 000	C	A	C	C
Diamonds and precious stones		10 000	C	B	C	C
Gold, silver, uranium		10 000	B	A	B	A
Phosphate		10 000	C	B	C	C
Platinum		10 000	C	B	C	B
Mineral sands (Ilmenite, Titanium, Rutile, Zircon)		10 000	C	B	C	C
Zinc and Lead		10 000	C	A	C	A
Industrial Minerals (Andalusite, Barite, Bauxite,		10 000	C	C	C	C

Mineral	Ore	Size: large if > than (tpm)	Primary Risk Class			
			Large Mine		Small Mine	
			Mine & Mine Waste	Mine, Mine Waste, Plant & Plant Waste	Mine & Mine Waste	Mine, Mine Waste, Plant & Plant Waste
Cryolite, Fluorspar)						

Table 16-3: Criteria Used to Determine the Area Sensitivity

Sensitivity	Sensitivity Criteria		
	Biophysical	Social	Economic
Low	▪ Largely disturbed from natural state, ▪ Limited natural fauna and flora remains, ▪ Exotic plant species evident, ▪ Unplanned development, ▪ Water resources disturbed and impaired.	▪ The local communities are not within sighting distance of the mining operation, ▪ Lightly inhabited area (rural).	▪ The area is insensitive to development, ▪ The area is not a major source of income to the local communities.
Medium	▪ Mix of natural and exotic fauna and flora, ▪ Development is a mix of disturbed and undisturbed areas, within an overall planned framework, ▪ Water resources are well controlled.	▪ The local communities are in the proximity of the mining operation (within sighting distance), ▪ Peri-urban area with density aligned with a development framework, ▪ Area developed with an established infrastructure.	▪ The area has a balanced economic development where a degree of income for the local communities is derived from the area, ▪ The economic activity could be influenced by indiscriminate development.

Sensitivity	Sensitivity Criteria		
	Biophysical	**Social**	**Economic**
High	▪ Largely in natural state, ▪ Vibrant fauna and flora, with species diversity and abundance matching the nature of the area, ▪ Well planned development, ▪ Area forms part of an overall ecological regime of conservation value, ▪ Water resources emulate their original state.	▪ The local communities are in close proximity of the mining operation (on the boundary of the mine), ▪ Densely inhabited area (urban/dense settlements), ▪ Developed and well-established communities.	▪ The local communities derive the bulk of their income directly from the area, ▪ The area is sensitive to development that could compromise the existing economic activity

Table 16-4: Weighting Factor 1 – Nature of Terrain

	Flat	Undulating	Rugged
Weighting factor 1: Nature of the terrain/ accessibility	1.00	1.10	1.20

Note:

- Flat - Generally flat over the mine area;
- Undulating - A mix of sloped and undulating areas within the mine area; and
- Rugged - Steep natural ground slopes (greater than 1:6) over the majority of the mine area.

Table 16-5: Weighting Factor 2 – Proximity to Urban Area

	Urban	Peri-urban	Remote
Weighting factor 2: Proximity to urban area where goods and services are to be supplied	1.00	1.05	1.10

The classification of Dalyshope has been summarised in Table 16-6.

It must be noted, however, that of the 18 closure components that exist, only three are influenced by the risk class and sensitivity; the remaining 15 have a standard multiplication factor, irrespective of the class or sensitivity.

Table 16-6: Mine Classification

Mine	Risk Class	Sensitivity	Terrain	Proximity to Urban Area
Dalyshope	A	High	Flat	Remote

16.5 Calculation Summary

The closure cost calculation is aligned with the Financial Provision Regulations, 2015 (GN R. 1147) as amended. The estimated financial provision for the first year, 10 year forecast and LoM for Dalyshope is **R77,788,977, R654,911,299** and **R539,699,486** respectively (excl. VAT). The closure cost estimate breakdown is included Table 16-7 below.

Table 16-7: 1st Year, 10 Year and LoM Closure Cost Summary

Area and Description	1 Year Disturbance	10 Year Forecast	Life of Mine
Infrastructure and Rehabilitation			
Area 1: Plant & Related Infrastructure	R54,028	R6,307,727	R6,307,727
Area 2: Water Management Facilities	R3,339,752	R3,339,752	R3,339,752
Area 3: Other Infrastructure	R16,576,314	R21,883,713	R21,883,713
Area 4: Stockpiles, Dumps and Pit	R32,332,853	R472,053,325	R376,323,718
Area 5: Offices	R311,024	R311,024	R311,024
Area 6: Linear Infrastructure	R4,040,913	R7,327,864	R7,327,864
Sub-total	**R56,654,884**	**R511,223,405**	**R415,493,798**
Monitoring and Maintenance			
Monitoring Costs 10 years (Groundwater and Surface water)	R3,960,050	R3,960,050	R3,960,050
Monitoring Costs 3 years (Vegetation)	R45,904	R157,632	R213,425
Maintenance Costs 3 years (Vegetation)	R2,964,417	R11,764,361	R16,158,763
Sub-total	**R6,970,371**	**R15,882,042**	**R20,332,238**

Preliminary and General	R8,498,233	R76,683,511	R62,324,070
Contingency	R5,665,488	R51,122,341	R41,549,380
TOTAL	**R77,788,977**	**R654,911,299**	**R539,699,486**

The closure cost calculation using the DMRE rule-based model has been undertaken for the first year of mining and the Life of Mine. The estimated financial provision for the DMRE rule-based model is **R 31,634,761** and **R 337,542,083** respectively (Incl. VAT). The closure cost estimate breakdown is included Table 16-8 below.

Table 16-8: 1st Year and LoM Closure Cost Summary

Component	Description	Total Cost (1st Year)	Total Cost (LoM)
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	R 0	R 102,466
2 (A)	Demolition of steel buildings & Structures	R 5,600,085	R 6,322,457
2 (B)	Demolition of reinforced concrete buildings & structures	R 2,906,154	R 35,515,406
3	Rehabilitation of access roads	R 2,366,126	R 3,273,835
4(A)	Demolition & rehabilitation of electrified railway lines	R 0	R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines	R 0	R 0
5	Demolition of housing &/or administration facilities	R 1,387,725	R 1,387,725
6	Open pit rehabilitation including final voids & ramps	R 1,108,758	R 89,512,919
7	Sealing of shafts, adits & inclines	R 0	R 0
8(A)	Rehabilitation of overburden & spoils	R 1,522,679	R 21,089,102
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	R 0	R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	R 1,031,808	R 38,653,121
9	Rehabilitation of subsided areas	R 0	R 0
10	General surface rehabilitation	R 1,189,804	R 2,736,656
11	River diversions	R 0	R 0
12	Fencing	R 2,726,478	R 2,726,478
13	Water management	R 229,319	R 18,513,530
14	2 to 3 years of maintenance & aftercare	R 429,193	R 10,193,622
15(A)	Specialist studies	R 0	R 0
	Total cost + Weighting Factor 2	**R 22,547,941**	**R 253,030,047**
	Preliminary and General	R 2,705,753	R 15,181,803
	Contingency	R 2,254,794	R 25,303,005
	VAT (15%)	R 4,126,273	R 44,027,228
	Grand Total (Incl. VAT)	**R 31,634,761**	**R 337,542,083**

17 Concurrent Rehabilitation Activities

There are opportunities to optimise the concurrent rehabilitation activities that potentially could occur during the life of mine, which would result in a reduction in the overall financial liability

required at closure. As the Project Area is a greenfield site, concurrent rehabilitation activities will only be assessed once the mining operation begins.

18 Stakeholder Participation

No stakeholder issues or comments have informed this RCP as it has not been presented for comments at this stage of the Project.

19 Closing Statement and Recommendations

Closure and rehabilitation are a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. Rehabilitation and closure objectives have been tailored to the project at hand with the objective of assisting Universal Coal in carrying out successful rehabilitation.

The following is recommended to assist UCD in successfully carrying out the rehabilitation and closure at Dalyshope, as well as benefitting the Universal Coal Group in its entirety:

- Develop a post mining landform design and develop and maintain a LoM materials balance to ensure a free draining landform can be constructed with the available material and topsoil resources are allocated suitably to achieve the end land use objectives;
- Ensure that future topsoil stripping is done according to the pre-mining topsoil survey, mixing topsoil and high clay content subsoils will lead to compaction that is difficult to reverse;
- Care should be taken to keep topsoil separate from subsoils and hards. Mixing increases compaction and reduces effective rooting depth for vegetation and can increase the surface water recharge into the backfilled pit and compound residual risks;
- Concurrent rehabilitation must take place where possible;
- Closure is an ongoing and iterative process, and continuous refinement of the RCP is necessary to facilitate the successful transition between the operational to decommissioning and closure phase at Dalyshope;
- Closure must be considered early in the mining cycle, at the pre-mining stage if possible, so Digby Wells therefore advises UCD to start planning closure options and operational mining designs that facilitates a seamless closure process even prior to gaining approval for the nearby mining right applications. In this regard, green technologies and building design, and modernisation of mining technology in the operational phase, will likely significantly reduce the closure environmental liability and minimise residual and latent impacts;

- A Closure Environmental Management Programme (CEMPr) which fulfils all regulatory needs to be five (5) detailed years prior to the application of a closure certificate;
- In line with the above, a detailed gap analysis should be completed to indicate specialist studies required to assist UCD with achieving closure at Dalyshope, as well as additional monitoring and maintenance requirements;
- Long-term inspection, monitoring, and maintenance of the discard facility is recommended;
- Should the LoM be significantly extended, investigations into alternative final land-uses and/or blue waste management systems should be considered as technological advances occur, that will result in community development and economic growth in line with Africa Mining Vision (2009);
- Digby Wells recommends ongoing stakeholder engagement, so the needs of key stakeholders and the community can be taken into consideration when considering closure alternatives;
- It is advised that closure planning is managed by a few single key personnel/consultants so there is a single database that holds all necessary information, specialist studies, etc and this knowledge can be easily transferred between relevant key personnel;
- The report and costs must be updated on an annual basis as per NEMA requirements. This will ensure that the liabilities are reflected as accurate as possible.
- When stripping and stockpiling topsoil as new mining areas are opened up and expanded, care must be taken and topsoil must be placed separately from overburden dumps or directly placed during concurrent rehabilitation activities;
- Ensure rehabilitation is conducted using a clear plan for the mined area's end land use. Consider post-mining landscape designs. Ensure rehabilitation contractor is aware of rehabilitation requirements;
- UCD must take cognisance that the compliance date for aligning the site wide rehabilitation and closure planning and costing with GNR 1147 has recently been extended to 19 June 2021;
- Regular groundwater monitoring must take place to determine possible changes in groundwater flow and groundwater quality; and
- AIPs must be removed on an on-going basis.

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