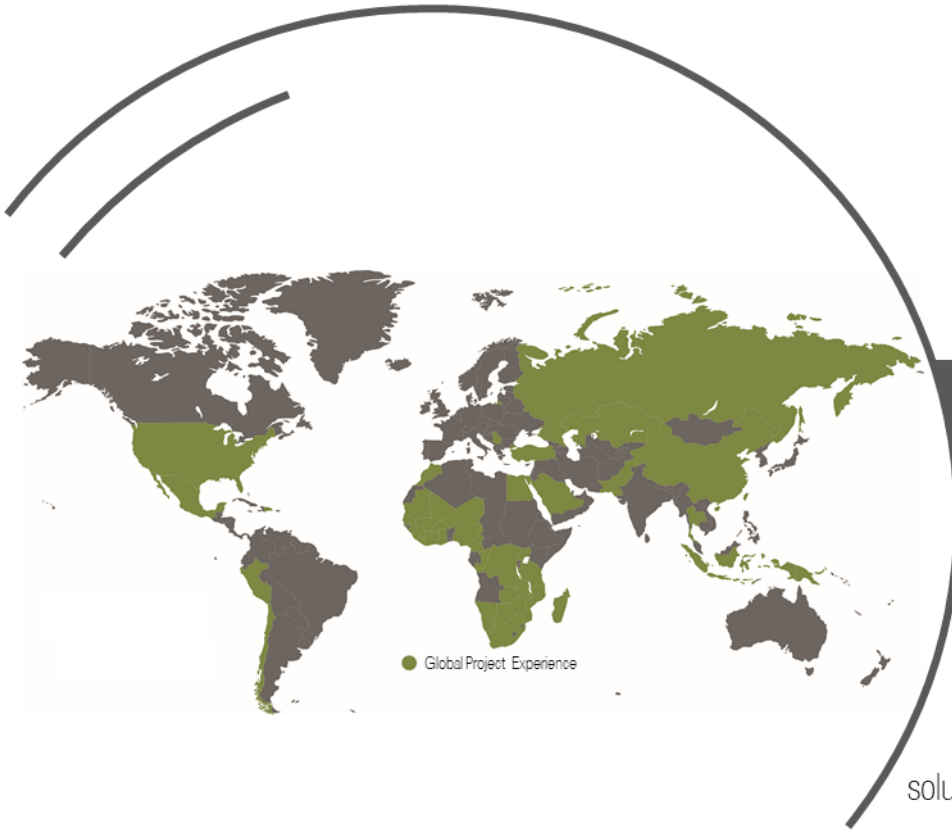

DIGBY WELLS
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Environmental Authorisation Process for the Lisbon Prospecting Right Application

Closure Plan and Environmental Risk Assessment

Prepared for:
PalRho Exploration Proprietary Limited

Project Number:
PAL6882

March 2021

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Report Type:	Closure Plan and Environmental Risk Assessment
Project Name:	Environmental Authorisation Process for the Lisbon Prospecting Right Application
Project Code:	PAL6882

Name	Responsibility	Signature	Date
Brett Coutts	Report Compiler & Cost Assessment		March 2021
Leon Ellis	1st Review		March 2021
Claire Wannenburgh	Report Reviewer		March 2021

DETAILS AND DECLARATION OF THE SPECIALIST

Digby Wells and Associates (South Africa) (Pty) Ltd

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Full name:	Brett Coutts
Title/ Position:	Principal Consultant
Qualification(s):	BSc Honours
Experience (years):	13 Years
Registration(s):	IAIAsa

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.

March 2021

Signature of the Specialist *Date*

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ACRONYMS, ABBREVIATIONS AND DEFINITION

AIP	Alien Invasive Plants
BA	Basic Assessment
BAR	Basic Assessment Report
CV	Curriculum Vitae
ALARP	As Low As Reasonably Practicable
ARP	Annual Rehabilitation Plan
ºC	Celsius
dBA	A-weighted decibels
Digby Wells	Digby Wells Environmental
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EMP	Environmental Management Plan
EMPR	Environmental Management Programme Report
ERR	Environmental Risk Assessment Report
FDG	Fluorodeoxyglucose
FP	Financial Provision
FY	Financial Year
GG	Government Gazette
GIS	Geographic Information System
GN R1147	Financial Provisioning Regulations, 2015 (Government Notice No. 1147 published in GG 39425
ha	Hectares
HIRA	Hazard Identification and Risk Assessment
I&APs	Interested and Affected Parties
km	Kilometre
LM	Local Municipality
LUP	Land Use Plan
m	Metre
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MR	Mining Right

MRA	Mining Right Area
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	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)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PalRho	PalRho Exploration Proprietary Limited
PM	Particulate Matter
PPP	Public Participation Process
PRA	Prospecting Right Area
RC	Reverse Circulation
RCP	Rehabilitation, Decommissioning and Mine Closure Plan
SANAS	South African National Accreditation System
SANS	South African National Standards
SCC	Species of Conservation Concern
SHEQ	Safety, Health, Environment and Quality
SLP	Social and Labour Plan
SoW	Scope of Work
ToR	Terms of Reference
VAT	Value Added Tax
WULA	Water Use License Application
WWTW	Waste Water Treatment Works

Legal Requirement		Section in Report
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 4
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to above
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 5
cA	And indication of the quality and age of the base data used for the specialist report;	Section 20
cB	A description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	N/A
(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 20
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of the equipment and modelling used;	Section 20.1
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	Section 9
(g)	an identification of any areas to be avoided, including buffers;	N/A
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 21
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 10
(k)	any mitigation measures for inclusion in the EMPr;	Section 11
(l)	any conditions/aspects for inclusion in the environmental authorisation;	N/A
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 17
(n)	a reasoned opinion (Environmental Impact Statement) -	N/A

Legal Requirement		Section in Report
	whether the proposed activity, activities or portions thereof should be authorised; and	N/A
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	N/A
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 19
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Still to be included
(q)	any other information requested by the competent authority.	N/A

1. Introduction

PalRho Exploration Proprietary Limited (hereafter PalRho), an indirect subsidiary of Ivanhoe Mines Ltd., wishes to undertake prospecting activities on the farm Lisbon 288KR which is located within the Limpopo Province. PalRho intends to obtain a Prospecting Right through the completion of a Prospecting Right Application (PRA) in terms of Section 16 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

The proposed project triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 4 December 2014, as amended) (the "EIA Regulations, 2014") promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The project specifically triggers activities in Listing Notice 1, thus requiring a Basic Assessment (BA) process to be undertaken. This process requires a comprehensive public consultation process.

This document serves as the Closure and Environmental Risk Assessment in support of the Environmental Authorisation (EA) to be completed for the aforementioned PRA.

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

- Closure Plan (CP) aligned with the minimum requirements for a Final Rehabilitation, Decommissioning and Closure Plan (Appendix 4 of GN R.1147), including a third-party closure cost estimate; and
- Environmental Risk Assessment Report (ERR) in accordance with the minimum requirements for an ERR (Appendix 5 of GN R.1147).

The proposed exploration is a Greenfields project in the planning phase for exploration activities. The Annual Rehabilitation Plan (Appendix 3 of GN R.1147) will be addressed during subsequent annual revisions of the closure planning.

Apart from the requirements of the GN R.1147 regulations, which are summarised in this report, closure planning is also required to be compliant with additional legislation, which is summarised in Section 8.

2. Project Locality

The Lisbon farm is located in the Limpopo Province and falls under the Mokopane Magisterial District. The Lisbon 288KR Prospecting Right area is located approximately 10 km southwest of the town of Mokopane in the Limpopo Province. The project area amount to total area of 2,543.1 ha. The PRA is applicable to the properties included in Table 2-1. The locality map in Figure 2-1.

Table 2-1: Lisbon PRA Properties

Farm	Portion	21 Digit Code
Lisbon 288KR	1	T0KR00000000028800001
Lisbon 288KR	4	T0KR00000000028800004
Lisbon 288KR	6	T0KR00000000028800006
Lisbon 288KR	7	T0KR00000000028800007
Lisbon 288KR	8	T0KR00000000028800008
Lisbon 288KR	9	T0KR00000000028800009
Lisbon 288KR	10	T0KR00000000028800010
Lisbon 288KR	11	T0KR00000000028800011
Lisbon 288KR	12	T0KR00000000028800012
Lisbon 288KR	13	T0KR00000000028800013
Lisbon 288KR	14	T0KR00000000028800014
Lisbon 288KR	15	T0KR00000000028800015
Lisbon 288KR	16	T0KR00000000028800016
Lisbon 288KR	17	T0KR00000000028800017
Lisbon 288KR	18	T0KR00000000028800018
Lisbon 288KR	19	T0KR00000000028800019

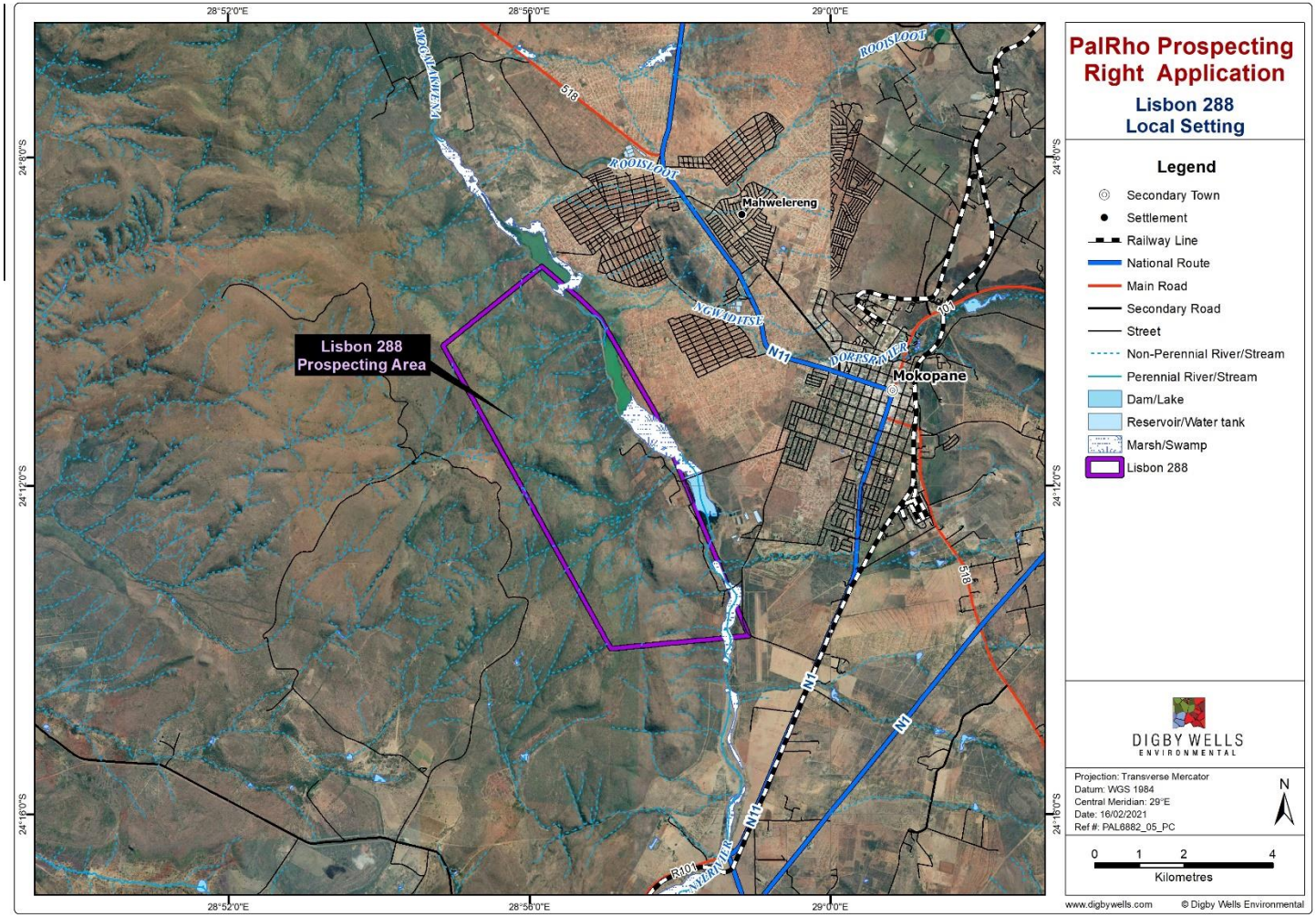

Figure 2-1: Locality map

3. Description of the Activities to be Undertaken

PalRho wish to apply for a Prospecting Right to conduct prospecting activities on the farm Lisbon 288KR. The mineral to be prospected includes Platinum, Palladium, Rhodium, Ruthenium, Iridium, Osmium, Platinum Group Elements, Gold, Copper, Cobalt, Nickel, Vanadium, Chromium, Iron, Phosphate Ore, Fluorspar, Tin Ore and Rare Earth Metals (including Scandium).

The project is located within an area dominated by sediments of the Transvaal Supergroup and intrusive rocks of the Bushveld Complex, namely the Northern or Potgietersrus Limb of the Bushveld Complex.

3.1. Prospecting Operations

Prospecting activities will include both invasive and non-invasive methods. Non-invasive methods include data capturing of all relevant geological data, a geophysical survey which utilises digital data to confirm proposed drill locations and structures as well as analytical work of the samples taken. Invasive methods will include the core drilling (approximately ten holes) to ascertain the stratigraphy sequence and reef horizons of the ore body.

3.2. Prospecting Infrastructure

No permanent infrastructure will be constructed as part of the prospecting activities. Activities associated with the prospecting operations include:

- The establishment of temporary access routes / tracks which will make use of the shortest distance from an existing road;
- The clearing of vegetation for the drill rig;
- The establishment of three sumps / trenches to separate and store oil, sludge and water; and
- Rehabilitation following the prospecting activities.

3.3. Prospecting Process

Should the Prospecting Right be granted, the following steps will be undertaken in line with the Prospecting Work Programme, including drilling activities:

- Permission to Drill;
- Drilling Process; and
- Rehabilitation Process.

3.3.1. Permission to Drill

A borehole drilling plan is first compiled by the project appointed geologist. Once completed, a stakeholder engagement process is followed by which the landowners and/or lawful

occupiers are informed of the project. A lead negotiator is then appointed to negotiate with the relevant landowners and/or lawful occupiers to obtain signed agreements to drill the boreholes in respect of their respective portions. Once signed, the landowners and/or lawful occupiers will be given an opportunity to accompany the drill contractor to the site where drilling has been proposed. The locations of the drill sites are dependent on the environmental and heritage sensitivities of the prospecting area. Once the parties have agreed on the location of the borehole, the drill contractor will complete a risk assessment prior to undertaking any drilling activities and determine suitable mitigation measures to minimise environmental damage and to avoid areas of sensitivity. Additionally, where possible, large trees will be avoided and minimal vegetation removed.

3.3.2. Drilling Process

Once all approvals have been obtained, the vegetation is cleared and the drill sites are constructed. Existing farm roads are utilised where possible. Should new roads be required, these roads are firstly discussed with the landowners/lawful occupiers and incorporated within the signed agreement. Based on discussions with the landowners/lawful occupiers, these roads are usually left for them to use once the prospecting boreholes have been drilled. Should the roads not be required, they will be left to naturally revegetate. If no vegetation is established within three months after rehabilitation then re-seeding needs to be completed.

During the drill process, waste is kept to a minimum and spillages are cleaned up should they occur. All waste is segregated and removed off site when waste bins are full. All hazardous waste will be removed by a hazardous waste collector, while general waste is disposed of at a municipal landfill site.

The proposed drilling locations indicating where boreholes are proposed to be drilled is provided in Figure 3-1. It should however be noted that these boreholes are estimated locations and changes to the actual locations of boreholes may change based on information available at the time that prospecting is commenced with.

3.3.3. Rehabilitation Process

Once the boreholes have been drilled and the core samples taken, the boreholes will be capped and marked in the event that PalRho wishes to access the boreholes again. All infrastructure is then removed. The prospecting areas are backfilled, taking care not to allow compaction of the soil. The vegetation is then allowed to naturally re-establish itself and blend into the original landscape. The rehabilitation of the site will be monitored by PalRho and the site will be vegetated with indigenous vegetation, if necessary.

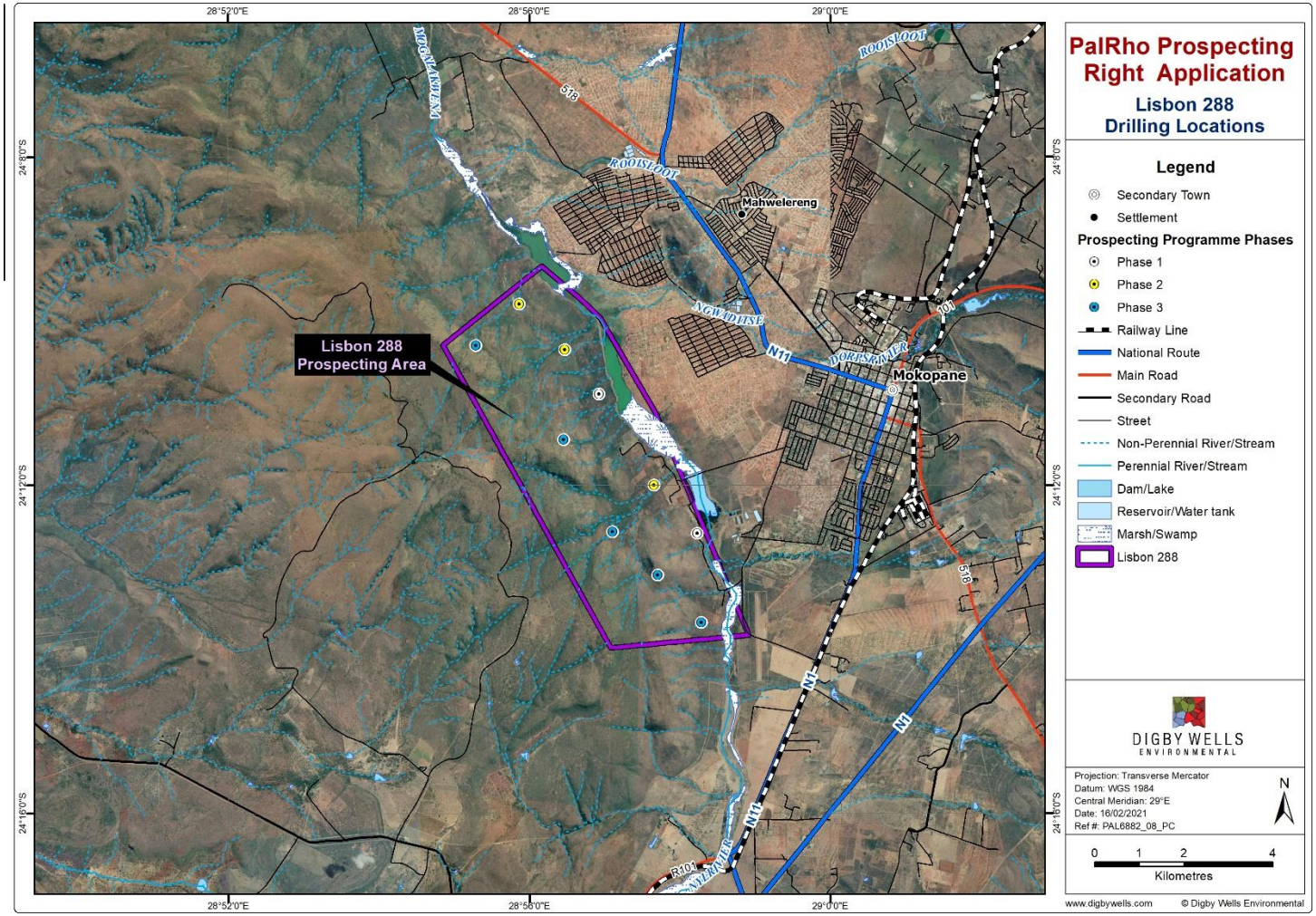

Figure 3-1: Location of Prospecting Boreholes

4. Details of Specialist

Brett Coutts is a Principal Consultant at Digby Wells. He received a Bachelor of Science and Honours degree in Zoology and Environmental Science from the University of Witwatersrand. Brett assists with the management and co-ordination of all relevant studies related to rehabilitation and certain ecological project. This includes the compilation of rehabilitation plans and undertaking of rehabilitation assessments.

In addition to this, Brett assists within the Biophysical Department with the management of specialist studies that are undertaken by the department and is also responsible for the compilation of the Geographic Information System (GIS) component of Biodiversity Land Management Plans (BLMP) and undertaking ecological assessments.

5. Report Structure and GN R.1147 Checklist

The closure plan is structured to align with the minimum requirements set out in Appendix 4 of GN R.1147. The requirements are provided in Table 5-1 along with the reference to the relevant section in this report.

Table 5-1: Minimum Requirements of a Closure Plan

Reference	Requirement	Report Section
3a	Details of- (i) the person or persons that prepared the plan; (ii) the professional registrations and experience of the preparers	Section 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	Section 9 Section 3

Reference	Requirement	Report Section
	(dd) how infrastructure and structures (including ponds, residue stockpiles etc.) develops during operations;	
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; (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 (v) an explanation of changes to the risk assessment results, as applicable in annual updates to the plan;	Section 10
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; (vii) a detailed description of the assumptions made to develop closure actions in the absence of detailed knowledge on site	Section 0, 7 and 13

	conditions, potential impacts, material availability, stakeholder requirements and other factors for which information is lacking;	
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; (ii) a map of the proposed final post-mining land use;	Section 12
3f	Closure actions, including— (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; (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;	Section 11 and 14
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 15
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; (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 6
3j	Relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;	Section 17
3k	Closure cost estimation procedure, which ensures that identified rehabilitation, decommissioning, closure and post-closure costs,	Section 20

	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 ± 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; (iii) 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; and	
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; (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; (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; and	Section 17

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).	Section 18.1

6. Limitations and Assumptions

The compilation of this Report is based on the following assumptions and limitations:

- The information contained within this Closure Plan is based on the current layout plans and information provided by PalRho;
- If there is a significant change or addition of other infrastructure areas, the Closure Plan will need updating to cater for the change;
- 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; and
- This report must be considered as a living document and should be updated as additional information become available and as monitoring and rehabilitation progresses.

7. Closure Overview

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 local community/stakeholders should realise

New information should be incorporated as it becomes available and advances in technology and rehabilitation methods considered. The widely accepted approach of improving the site body of knowledge through monitoring and feedback throughout the life cycle of the project (Figure 7-1) should be adopted for the Project.

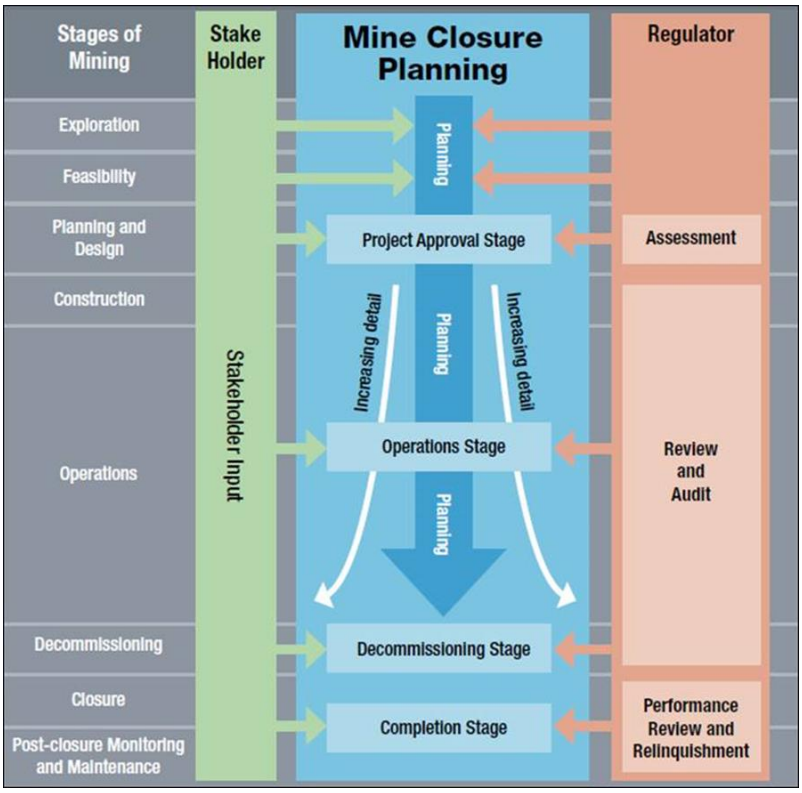

Figure 7-1: Integrating Stages of Closure Planning

[Source: (DMP & EMPA, 2015)]

7.1. Closure Design Principles

Rehabilitation is an on-going programme designed to restore the physical, chemical and biological quality or potential of air, land and water regimes disturbed by exploration/mining to a state acceptable to the regulators and to post end land users. The activities associated with rehabilitation 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 closure is to obtain legal approval and community/stakeholder agreement that the condition of the closed operation meets the requirements of those entities, whereupon the company's legal liability is terminated.

Rehabilitation can be divided into two different streams, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation is implemented during the operational phase in conjunction with the exploration activities. Concurrent rehabilitation aims to limit the extent of surface disturbances, reduce cumulative impacts and decrease the cost of rehabilitation measures required during decommissioning and closure. Concurrent rehabilitation must be carried out within the context of the approved EMPr and incrementally address the objectives of the Closure Plan.

The primary concerns for decommissioning and rehabilitation are to ensure public safety and health and environmentally stable conditions compatible with the surrounding environment,

and consequently minimise the environmental impacts caused by exploration activities. The overall objective is to have socially, economically, and environmentally sustainable development. Typical closure principles include: (DMRE policies and ICMM):

- Safeguard safety and health of animals and humans;
- Promote long term physical and chemical stability;
- Rehabilitate land to ensure a functioning post exploration ecosystem on a desired trajectory and aligned with the planned post closure land use;
- Limit risk exposure (safety, environmental, financial, legal etc.) through active management and planning; and
- Implement cost effective measures, reducing the need for long term care and maintenance to achieve relinquishment.

7.2. Closure Objectives

Aligned with the closure approach and principles, the following initial closure objectives are proposed for the Lisbon Prospecting Application:

- Implement responsible closure practices and leave a closed exploration site that does not represent a risk to the health and safety of people or animals ;
- Minimize potential adverse effects to environmental quality, such as surface or ground water impacts;
- Rehabilitate or remove any waste or potentially hazardous substances from site;
- Rehabilitate disturbed areas to a suitable land capability to ensure the constructive integration and alignment of the rehabilitated site with the surrounding land use mix;
- Ensure proactive and constructive stakeholder engagement with individuals, communities and relevant authorities regarding the proposed end land use;
- Reduce the requirement for long-term monitoring and maintenance by establishing stable landforms;
- Comply with national regulatory requirements; and
- Obtain a closure certificate.

8. Legal Requirements

Section 41 (1) of the MPRDA has been repealed and in terms of Section 24(P) of the NEMA, as amended, which provides that an applicant 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;

- Decommissioning and closure of the prospecting activities;
- Remediation of latent or residual environmental impacts which become known in the future;
- Removal of building structures and other objects; or
- Remediation of any other negative environmental impacts.

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 (GN R.1147). For the purposes of this report, the closure cost estimate and respective reports are in line with the requirements of the Financial Provisioning Regulations, 2015.

Regulation 10 of the Financial Provisioning Regulations, 2015 requires an applicant to determine the quantum of 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 as reflected in the ARP as per the minimum content prescribed by Appendix 3 of the Regulations (not compiled yet as no rehabilitation activities are planned for the next 12 month);
- Final rehabilitation, decommissioning and closure as reflected in a Closure Plan 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 (Refer to Section 10.1).

Applicable legislation is outlined in Table 8-1.

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:

- Land Rehabilitation Guidelines for Surface Coal Mines. Land Rehabilitation Society of Southern Africa, CoalTech, Minerals Council of Southern Africa. 2018;
- Best Practice Guidelines (BPGs) series developed by the Department of Water Affairs (DWA) (2007); and
- Integrated Mine Closure, good practice guideline 2nd edition. International Council of Mining and Metals, 2019 (ICMM, 2019).

Table 8-1: 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 –
	a) Prevent pollution and ecological degradation;
	b) Promote conservation; and
	c) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development
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.*
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NE<BA)	NEMBA 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, 2014 published (GN R.599 in GG 37886 of 1 August 2014) ; ▪ 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 (GG 34809, GN R.1002, 9 December 2011).
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) (GN R 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.
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; and
	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.

Applicable legislation and guidelines	Details
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- a) Rehabilitation of the adverse environmental impacts of the listed or specified activities; b) Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water; c) Decommissioning and closure of the operations; d) Remediation of latent or residual environmental impacts which become known in the future; e) Removal of building structures and other objects; and/or f) Remediation of any other negative environmental impacts. 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 (Government Notice No. 1147 published in GG 39425). Regulation 6 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, calculated based on the actual costs of implementation of the measures required for: a) Annual rehabilitation, as reflected in Annual Rehabilitation Plans (ARPs); b) Final rehabilitation, decommissioning and closure of the mining operations as per the Closure Plans which includes the findings of the Environmental Risk Assessment Report (ERR); and Remediation of latent or residual environmental impacts as identified in the ERR.

9. Baseline Environmental Setting

The description of the baseline environmental setting is provided below. This initial closure plan is developed based on desktop level specialist investigations.

9.1. Fauna and Flora

The section below details the baseline assessment conducted for fauna and flora.

9.1.1. Flora

9.1.1.1. Regional Vegetation

As described by Mucina & Rutherford (2012), the Lisbon 288KR Project Area falls within the Makhado Sweet Bushveld (SVcb 20), Waterberg Mountain Bushveld (SVcb 17) and Waterberg Magaliesberg Summit Sourveld (Gm 29) vegetation types. The vegetation types fall within two of the nine South African plant Biomes, namely the Savanna and Grassland. The Grassland Biome is situated primarily on the central plateau of South Africa, and the inland areas on Kwa-Zulu Natal and the Eastern Cape provinces. This biome is rich in fauna and flora but is under threat due to agricultural activities, expansion of mining and industrial activities. The Savanna Biome predominates in the northern regions of South Africa and almost encompasses the entire Grassland Biome.

Makhado Sweet Bushveld

It occurs on the plains south of the Soutpansberg, east of the Waterberg and on the apron surrounding the Blouberg and Lerataupje Mountains and extends into the Polokwane Plateau with an altitude of 850-1 200m. The landscape and vegetation are characterised by short and shrubby bushveld with a poorly developed grass layer. The conservation status is considered Vulnerable with only around 1 % statutorily conserved, mainly in the Bellevue Nature Reserve. Approximately 27% of the vegetation type has been transformed, primarily due to cultivation and urbanisation. The southwestern half of the unit has densely populated rural communities.

Waterberg Mountain Bushveld

This bushveld expands across the Waterberg Mountains and stretches to the north of Bela-Bela and west of Mokopane. The altitude sits at around 1 000-1 600m, which is slightly lower than the Waterberg-Magaliesberg Summit Sourveld (Gm 29). The rugged mountains are tasselled with vegetation such as *Faurea saligna* and *Protea caffra* on the higher slopes that grades into the Gm 29. The transition occurs through the broad-leaved deciduous bushveld (*Diplorhynchus condylocarpon*) on rocky footslopes to *Burkea Africana-Terminalia sericea* in the lower-lying valleys. The grass layer is moderately well developed. The conservation status is Least Threatened.

Waterberg-Magaliesberg Summit Sourveld

This sourveld can be observed in isolated patches on the summits of the Waterberg with altitudes reaching up to 2 088m. the landscape features include summit positions such as

crests with steep rocky scarps covered with wiry tussock grasslands. Patches of open *Protea caffra* savannoid vegetation and open shrubland *Englerophytum magalismontanum* are typical of this sourveld. Summits are characterised by high spatial heterogeneity influencing the soil profile, drainage and hydrological conditions. The varying aspects are generally associated as important predictors in biodiversity. The conservation status is listed as Least Threatened.

9.1.2. Fauna

This section will cover various groups of animals including mammals, birds, reptiles, amphibians and invertebrates.

9.1.2.1. Mammals

Mammals form a vital component of ecosystems. Not only are they important for nutrient cycling, habitat modification, consumers of plants and seed dispersal but they're also a considerable component of predators in healthy ecosystems

9.1.2.2. Birds

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological condition are linked to land cover. As the land cover of an area changes, so do the types of birds in that area. Land cover is directly linked to habitats within the project area. The diversity of these habitats should support many different species.

According to the South African Bird Atlas Project (SABAP2), almost 290 species of birds have been identified in the designated QDS.

9.1.2.3. Reptiles

Reptiles are ectothermic (cold-blooded) meaning their internal basal temperature is influenced by their surrounding external environment, as a result, reptiles are dependent on environmental heat sources. Thus, many reptiles regulate their body temperatures by basking in the sun, or warmer surfaces (or substrates). Substrates are an important determining factor for identifying which habitats are suitable for which species of reptile. Rocky outcrops and suitable woody vegetation would increase habitat and intern diversity of reptiles within the Project Area.

9.1.2.4. Amphibians

Amphibians are viewed to be good indicators of changes to the whole ecosystem as they are sensitive to changes in the aquatic and terrestrial environments (Waddle, 2006). Most species of amphibians are dependent on the aquatic environment for reproduction. Additionally, amphibians are sensitive to water quality and ultraviolet radiation because of their permeable skin (Gerlanc, 2005).

18 species of amphibian have previously been recorded.

9.1.2.5. Invertebrates

Butterflies are a good indication of the various habitats available in a specific area (Woodhall, 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised (Woodhall, 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and to identify.

9.2. Aquatic Ecology

The following sections aim to outline the biodiversity within the aquatic ecosystems associated with the proposed prospecting area. The presence of species of potential conservation importance and sensitive taxa was also identified.

9.2.1. Associated Aquatic Ecosystems

The proposed prospecting area is largely associated with the Mogalakwena River, specifically Sub-quaternary Reach (SQR) SQR A61G-00353, with a small portion of the area within the upper reaches of the A61F-000333 SQR and lower reaches encompassing a portion of the Nyl River (SQR A61E-00386). In addition, a small portion of the eastern boundary of the prospecting area intersects the Rooisloot River (i.e. SQR A61F00276).

9.2.1.1. Desktop Information

According to the gathered Present Ecological State (PES), Ecological Importance (EI) and Ecological Sensitivity (ES) for the associated river ecosystems (DWS, 2014), all systems are considered to be in a largely modified state (Ecological Category D) and of Moderate EI and ES (Table 9-1).

Table 9-1: PESEIS Information for the Considered Aquatic Ecosystems

Component	Mogalakwena River (SQRs A61F-00353 & A61F-00333)	Nyl River (A61E-00386SQR)
Present Ecological Status	**D**	**D**
Ecological Importance	Moderate	Moderate
Ecological Sensitivity	Moderate	Moderate
SQR Length (km)	4.48 & 13.90 respectively	33.49

The gathered information further highlights existing impacts contributing to the modified conditions of the rivers in the form of water quality, agricultural encroachment, bed and channel disturbance, sedimentation, abstraction, dam construction, erosion, alien vegetation encroachment, overgrazing/trampling, urban runoff and vegetation removal.

Important and taxa with relative sensitives are expected within the considered rivers (discussed in further detail below). However, due to the mostly dry nature of the project area, especially the Mogalakwena River (DWS, 2014), the probability of occurrence of said taxa is expected to be low, hence the Moderate EI and ES classifications.

9.2.2. Expected Aquatic Biodiversity

Focus was paid on the potential macroinvertebrate and ichthyofaunal compositions within the Mogalakwena River as part of the assessed/considered aquatic biodiversity.

With the inclusion of the Nyl River section, a total of 40 macroinvertebrate taxa are expected to be present within the considered aquatic ecosystems (DWS, 2014) According to the expected macroinvertebrate list, only a single taxa (Elmidae) with a preference/dependence on high flow velocities (> 0.6 m^3) is expected to occur within the aquatic ecosystems. No taxa that highly sensitive to physio-chemical (i.e. water quality) modifications are expected within the river. However, some taxa such as Atyidae, Hydracarina, Chlorocyphidae, Chlorolestidae, Aeshnidae, Elmidae and Dixidae are classified as moderately intolerant to water quality deterioration/changes.

In addition, and according to the gathered desktop information (DWS, 2014), a total of 14 fish species are expected within the considered Mogalakwena and Nyl reaches. Each species sensitivity ratings towards physio-chemical and no-flow conditions have been provided for together with their conservation status according to the IUCN List of Threatened Species.

Of the expected fish species, only a single species is moderately intolerant to physio-chemical modifications (i.e. *Micropanchax johnstoni*) and a single species moderately intolerant to no-flow conditions (i.e. *Labeobarbus marequensis*). Based on specialist experience within the project area, it is unlikely that all of these species are currently present within the considered aquatic ecosystems, especially in light of the non-perennial nature of the river compounded by the severe pollution sources observed from the associated urban areas.

On the contrary, a single species of conservation concern classified as Vulnerable (i.e. *Oreochromis mossambicus*) is expected within the systems and is known to be present within the lower portion of the Mogalakwena. This species and some of the other species of low probability of occurrence, such as *Micropanchax johnstoni* and *Labeobarbus marequensis*, have the potential to be utilising the large dams within the river as refuge areas from the dry conditions. However, ground truthing will be needed to accurately determine this.

9.3. Wetlands

The accepted methodology from the Department of Water and Sanitation (DWS) (Department of Water Affairs and Forestry, 2005) as well as the “Updated manual for identification and delineation of wetlands and riparian areas” (Department of Water Affairs and Forestry, 2008) states the four wetland indicators as Soil Wetness Indicators (SWI), Soil Form indicator (SFI), Vegetation and Terrain Unit Indicator (TUI). The wetland delineations were solely based on the TUI.

Terrain indicators help to identify areas in the landscape where wetlands are more likely to occur. The topography is typically the physical characteristics of an area with a variation of soils against the slope, each with its own characteristics because of its relative position in the landscape and terrain.

The topography of the Project Area is of the Highveld Lower Ecoregion with gentle, rolling grassland slopes and many valley systems. Detailed imagery and contours, allows the geomorphic setting of the wetland and catchments to be understood and the HGM to be determined. Terrain indicators are important for understanding the specific functionality of the wetland and determining the potential risks from anthropological activities on the wetland.

The topography of the Project Area consist of steep slopes on the west of the Floodplain, with ridges associated with these systems.

Based solely on any available contour data and high-resolution aerial imagery, the freshwater resources within the vicinity of the proposed project were delineated into the following hydrogeomorphic (HGM) units:

- Hillslope seepage wetlands connected to a watercourse (HS);
- Valley bottom wetlands with a channel (CVB);
- Valley bottom wetlands without a channel (UVB); and
- Floodplain.

Figure 9-1 illustrates the wetland delineations for the Project Area. The wetlands cover approximately 977.14 hectares (ha) which amounts to 38.4% of the total 2543.1 ha Project Area. The breakdown of the wetland types area is detailed in Table 9-2.

Table 9-2: Wetland HGM Units of the Project Area

HGM Unit	Area (ha)
Hillslope seepage wetlands connected to a watercourse (HS)	36.12
Valley bottom wetlands with a channel (CVB);	345.73
Valley bottom wetlands without a channel (UVB)	164.63
Floodplain	430.67
Total Wetlands (ha)	**977.14**

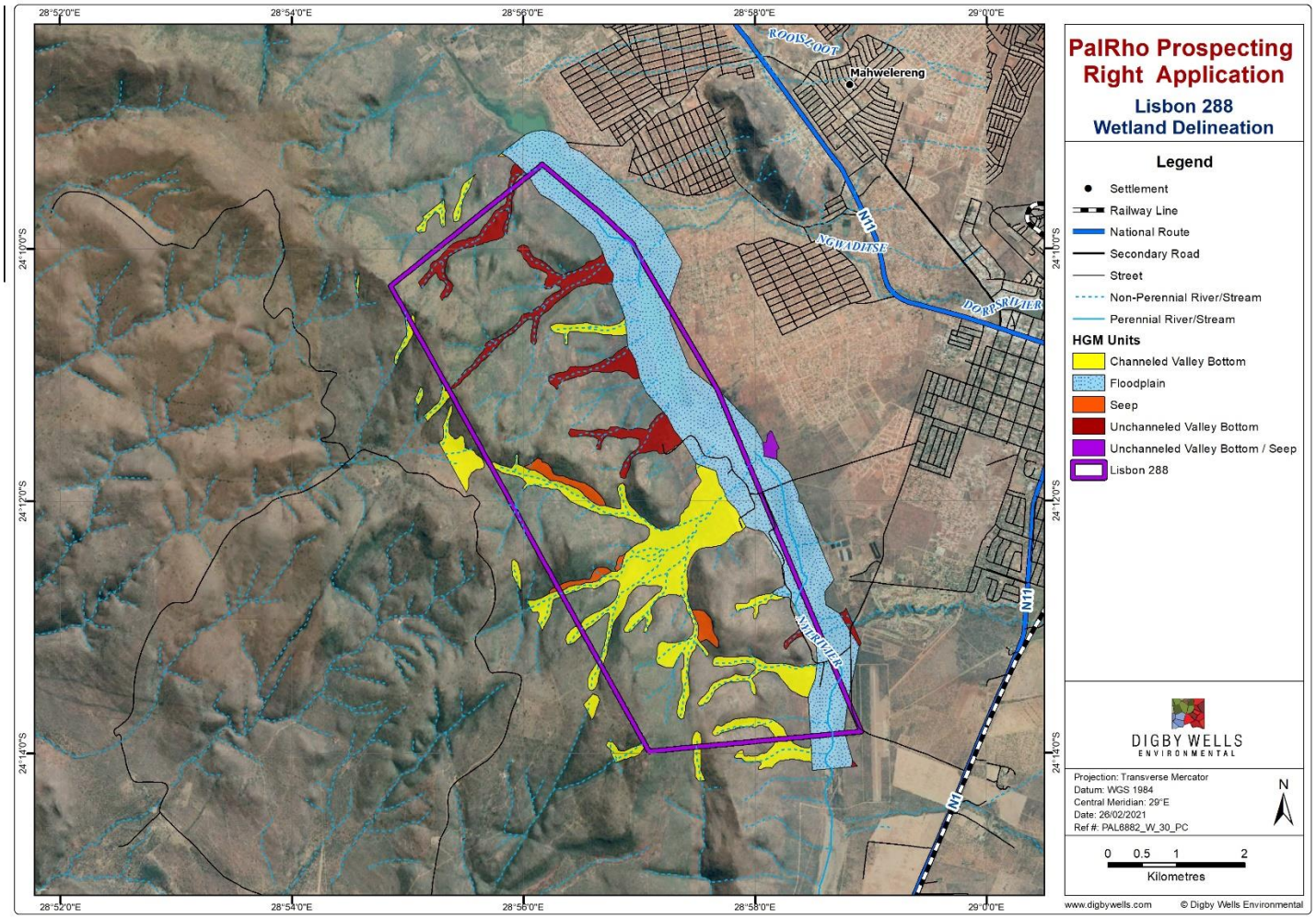

Figure 9-1: Wetland Delineation of Lisbon 288KR

9.4. Socio-economic Background

This requirement of GN R.1147 (Regulation b (ii)) will be addressed in the subsequent phases.

9.4.1. Public participation

This requirement of GN R. 1147 b (iii) will be addressed in the subsequent phase.

10. Objective of 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.

10.1. Risk Assessment Methodology

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation. A baseline hazard identification and risk assessment (HIRA) was completed as part of the financial provision update. The baseline HIRA is based on a qualitative method. The following process steps were taken:

- A general discussion on hazards and “driving forces” was used to determine things that could “go wrong” during closure of the site;
- The boundaries of the project were defined;
- Areas within the exploration 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 10-1 below.

Table 10-1: Risk levels

Colour	Descriptor	Action	Sign-off
	Extremely Intolerable	Immediate Action	General Manager
	Highly Intolerable	Short term action required	Senior Management
	ALARP[1]	Heightened Action	Section Manager
	Maintain	Ensure levels of control	Supervisor

The six types of risk have been outlined and included in the risk matrix.[2] These are, in no order of priority:

- Health and Safety Risk;
- Natural Environment Risk;
- Social Risk;
- Reputational Risk;
- Legal Risk; and
- Financial Risk.

A qualitative Severity and Likelihood Matrix was used during the risk estimation as shown below in Table 10-2.

The severity and likelihood definitions are provided in Table 10-2. 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.

[1] As low as reasonably practicable

[2] HB 436:2004, Risk Management Guidelines, Companion to AS/NZS 4360:2004

Table 10-2: 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	Intolerable	Intolerable	Intolerable	Intolerable	Intolerable	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	Intolerable	Intolerable	Intolerable	Intolerable	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	Intolerable	Intolerable	Intolerable	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	Intolerable	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

10.2. Risk Analysis Results

Potential unwanted events for and during closure were identified and discussed. All unwanted events are listed below in Table 10-3 below.

Nine (9) 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).

Five events were ranked (2) as highly intolerable, six (6) as ALARP and one (1) ranked maintain. All of the above are the raw risks without mitigation.

Table 10-3: Summary of Risk Assessment Conducted

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	
Prospecting Activities	Socio-economic impact - devalued licence to operate in subsequent exploration/mining activities	Social unrest impacting on future licence to operate	Social	C	J	Highly Intolerable	Implement Public Participation according to prescribed legislation Continually engage stakeholders and relevant authorities to ensure alignment Update and submit the GN R.1147 suite of closure planning and costing documents annually as required to the DMR Actively participate in local security and social forums Ensure that nuisance factors like dust and noise generation and surface disturbances are limited as far as possible Engage surrounding land users and potential end land users regarding end land use planning , rehabilitation methodologies and planned outcomes	E	I	Maintain	Complaints register to be developed. Ongoing stakeholder engagement.
Prospecting Activities	Colonisation of AIPs	Colonisation of alien invasive species into areas that have been disturbed	Natural Environment	D	J	ALARP	Limit the extent of the disturbed area	E	I	Maintain	Develop and implement protocols for identifying and eradicating AIPs Provide training and promote continual awareness amongst operational personnel

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	
Prospecting Activities	Loss of Land Capability and Land Use	Altered land use - cumulative impact of poor rehabilitation practice and reduced land capability - soil compaction	Natural Environment	D	J	ALARP	Limit extent of disturbances. Limit vehicle traffic to disturbed areas only Rip all disturbed areas to alleviate compaction prior to vegetation establishment. Shape and level areas to ensure a free draining landform Rip all disturbed areas to alleviate compaction Ameliorate soil chemistry based on dedicated fertility sampling and analysis Seed areas with a suitable species mix sources from reputable suppliers to ensure quality conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met	E	I	Maintain	Develop rehabilitation methodology based on site specific conditions Involve relevant specialists as required Provide for management and accurate implementation through and onsite Environmental Control Officer (ECO). Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period Ensure effective contracting and materials sourcing
Prospecting Activities	Potential inadequate budget for the rehabilitation of the prospecting sites.	Failure to rehabilitate and close the prospecting sites 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 rehabilitation and closure funds are available to rehabilitate the drill sites. Annually update financial provision liabilities. Conduct annual rehabilitation where possible.

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	
Prospecting Activities	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	D	J	ALARP	Rehabilitation specialist contracted to design post-exploration landscape designs and rehabilitation contractors are aware of rehabilitation requirements.	E	H	Maintain	Ensure rehabilitation is conducted using a clear plan Ensure rehabilitation contractor is aware of rehabilitation requirements (include in contract).
Prospecting Activities	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	D	J	ALARP	Maintain operational monitoring programmes to ensure that credible monitoring data is available. Monitoring and maintenance of rehabilitated areas. Conduct concurrent rehabilitation.	E	H	Maintain	Continuous monitoring and maintenance of rehabilitated areas. Conduct rehabilitation as per the rehabilitation plan.
Prospecting Activities	Possible sedimentation of streams, rivers and wetlands.	Erosion from exposed surfaces leading to sedimentation of water resources.	Natural Environment	D	J	ALARP	Limit the extent of surface disturbances Construct storm water control measures, if required, based on storm water modelling Implement vegetation establishment on disturbed areas as soon as possible	E	H	Maintain	Undertake rehabilitation according to Landform design criteria

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	
Prospecting Activities	Possible pollution originating from hydrocarbon sources	Contamination of soil and groundwater resources should hydrocarbon material not be managed correctly.	Natural Environment	D	I	ALARP	Ensure preventative measures and protocols are adhered to for breakdowns, parking and servicing equipment Provide training on protocols and emergency procedures Keep emergency equipment and spill kits onsite Deal with all spillages (major and minor) immediately	D	H	Maintain	
Prospecting Activities	Possible dust generation during decommissioning and closure of the prospecting sites.	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	

11. Initial rehabilitation and Closure Measures

The rehabilitation and closure actions required to address the identified risks are summarised in Table 11-1. Only the scheduled closure scenario is described for the Lisbon Prospecting Project, once activities are implemented on site the Closure Plan should be updated to include an unscheduled closure scenario. Actions should be implemented during the operational phase to reduce the financial burden at closure (concurrent rehabilitation).

Table 11-1: Summary of Rehabilitation and Closure Actions per area

Areas	Concurrent rehabilitation	Closure Measures
Drill sites	The following measures should be implemented for all drilling sites. (Table 15-1): • Shape and level areas to ensure a free draining landform aligned with the surrounding surface water drainage framework • Rip all disturbed areas to alleviate compaction • Ameliorate soil chemistry based on dedicated fertility sampling and analysis • Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality • Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met • Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period	The following measures should be implemented at closure for the drill sites (Table 15-1) : • Shape and level areas to ensure a free draining landform aligned with the surrounding surface water drainage framework • Rip all disturbed areas to alleviate compaction • Ameliorate soil chemistry based on dedicated fertility sampling and analysis • Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality • Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met • Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period
Tracks developed for access to drill sites	None, tracks to remain to access wells and rehabilitated drill sites as required.	The following measures should be implemented at closure: • Shape and level areas to ensure a free draining landform aligned

Areas	Concurrent rehabilitation	Closure Measures
		with the surrounding surface water drainage framework. • Rip all disturbed areas to alleviate compaction. • Ameliorate soil chemistry based on dedicated fertility sampling and analysis. • Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality. • Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met. • Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period.
Boreholes	• Remove and dispose drill sludge and drill chips or residue • Loosen topsoil, apply mulch, fertiliser and seed. • Place drill socks down boreholes to remove hydrocarbons that might exist in the borehole water. • Test boreholes for contamination with hydrocarbons. • Capping and casing of boreholes.	• Remove and dispose drill sludge and drill chips or residue • Loosen topsoil, apply mulch, fertiliser and seed. • Test and analyse boreholes for contamination with hydrocarbons. • Capping and casing of boreholes.

12. Proposed End Land Use

A post exploration land use plan should be developed during the next phase of development and incorporated into the subsequent annual updates of this closure plan as information becomes available. Initial indications are that the post exploration land use should align with the existing land uses.

13. Alternative Closure Strategies

The proposed initial approach is to rehabilitate the surface disturbances of the drill sites and associated tracks to a predetermined land use (e.g. grazing) through implementing accepted and appropriate rehabilitation measures. The following alternatives could be explored:

- Engage with current landowners and land users in terms of leaving the disturbed areas unrehabilitated for alternative use that may include developing farm infrastructure (e.g. sheds, workshops, lay down areas etc), planting crops or alternate vegetation to the proposed grassland seed mix; and
- Leaving the tracks developed to access the drill sites for use by the current / future land users to supplement the existing farm road network.

14. Threats Opportunities and Uncertainties

The uncertainties and identified knowledge gaps are addressed in Section 21 of this report. An initial list of opportunities that can be capitalised on and threats that should be minimised has been compiled. The opportunities and threats should be continually revisited and updated as knowledge gaps are addressed.

14.1. Opportunities

The following opportunities could be leveraged to the projects benefit through proactive management:

- Closure planning has commenced in the early stages of this project, an initiative that will provide time to develop and refine effective and lasting closure strategies that will reduce risks and deliver known outcomes at implementation;
- The ability to compile data from the initial drilling through operations to build a risk-based closure approach specific to each drilling location;
- 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; and
- Relatively small surface disturbances that can be rehabilitated to align with the surrounding agricultural land use mix.

14.2. Threats

The absence of proactive management of the following identified threats could lead to project underperformance or failure. Most of these aspects will be addressed through the Environmental Authorisation Process and PPP although active management is required to place the project on the front foot in terms of closure planning:

- Potential animosity from current land users due to a perceived “loss of place”. The project will be exploring and developing potential resources to mine in future, which could impact on landowners in the event mining is undertaken;
- Inefficient communication and management of stakeholders and authorities expectations regarding post closure land capabilities and land uses;
- 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;
- Not having a clearly defined QA/QC system and appropriately experienced engineer / site manager to manage each aspect of the drilling development and closure;
- Failing to engage in rigorous contract development to ensure efficient and accurate implementation by contractors onsite; and
- Waste generation onsite, potential waste classifications and disposal that may be required at closure.

15. Preliminary Closure Schedule

The closure schedule addresses the timing of rehabilitation and closure activities performed during the decommissioning and post-closure phases. A preliminary closure schedule has been developed in line with the closure objectives defined in Section 7.2. Closure of the exploration activities is currently indicated at the end of Year 5. The pre-site relinquishment period covers the monitoring and maintenance activities in years 6 – 9. It is proposed that two holes will be drilled in Phase 1, 3 holes in Phase 2 and 5 holes is Phase 3. This would allow for an overlap with respect to post closure monitoring of sites that have already been rehabilitated.

Table 15-1: Preliminary Rehabilitation and Closure Schedule

Activity	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6 - 9
Phase 1 (Exploration)						
Phase 2 (Delineation)						
Phase 3 (Evaluation)						
Post Closure Monitoring						

Initial timeframes indicate that the first five sites can be rehabilitated, during year 4 of the drilling programme. The rehabilitation monitoring and maintenance will be conducted for three years and monitoring will continue for 5 years.

16. Audits, Reporting Requirements and Monitoring Plan

Initial monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps are shown in Table 16-1. 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 16-1: Internal, External and Legislated Audits

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

17. Monitoring Plan and Site Relinquishment Criteria

The management measures for the pre-site relinquishment period at specific areas are provided in Table 17-1 and primarily consist of monitoring and maintenance. 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 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. It is assumed that post closure monitoring will continue for 3-5 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 following aspects should be monitored during the post-closure phase:

- Soil fertility;
- Erosion control;
- Dust control;
- Vegetation establishment on rehabilitated areas; and

- Alien invasive plant species.

Table 17-1: Post Closure Monitoring Programme

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		
Soil Management				
Erosion	• Conduct a visual assessment to determine areas of potential erosion • Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	• Bi-annually for at least 3 years after decommissioning or as deemed necessary	• No evidence of significant erosion • Erosion control measures (if any) are in place and effective	As required: • Re-shape areas to ensure that they are free-draining • Ameliorate soils and reseed bare patches based on soil fertility analysis ▪ Repair and stabilisation of erosion gullies and sheet erosion
Soil fertility	• Undertake a visual assessment and delineate areas where poor vegetation growth has occurred • Submit soil samples to an accredit soil laboratory to conduct soil fertility analysis (if required)	• Annually until soil fertility supports the final land use or for at least 3 years after decommissioning or as deemed necessary	• Self-sustaining vegetation establishment	As required: • Apply follow-up amelioration as informed by soil fertility analysis
General site status	• Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site	• Once-off following implementation of rehabilitation measures	• Waste/rubble free sites	As required: • Clear remnant rubble and dispose of accordingly
Topography	• Conduct a visual assessment to determine areas of potential erosion • Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs	• During decommissioning period	• No evidence of significant erosion • No evidence of water ponding on rehabilitated areas • The final profile achieved must be acceptable in terms of surface water drainage requirements and the end land use objectives	As required: • Re-shape areas to ensure that they are free-draining • Refer to end land use approach and refine measures to be implemented in achieving the desired final land use
Terrestrial Ecosystem Health Management				
Vegetation re-growth	• Determine whether re-growth of vegetation communities is on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-species present in the adjacent areas	• Yearly for at least 3 years after decommissioning or as deemed necessary	• Limited to no erosion • Self-sustaining vegetation ecosystem	As required: • Reshape areas to ensure free drainage • Ameliorate soils and reseed bare patches based on soil fertility analysis

Component / Aspect	Monitoring		Performance / success criteria	Corrective action
	Methodology	Frequency / duration		

	• Inspect rehabilitated areas to assess vegetation re-growth and provide for early detection of erosion
	• Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape
	• Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement of growth performance and species abundance will be carried out to determine:
	  ◦ Plant basal cover and species abundance in the grassed areas. Estimates of vegetation canopy and ground cover as well as height
	  ◦ Distribution, growth and survival of woody species (if any)
	  ◦ Dominant plant species (woody and herbaceous)
	  ◦ Presence of exotic invasive species, and degree of encroachment
	  ◦ Browsing or grazing intensity
	  ◦ Notes regarding erosion, such as, type, severity, degree of sediment build-up
	  ◦ Species composition and richness
				• Rip hard stand areas as required to alleviate compaction and promote regrowth

Invasive alien species	• Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.) • Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation.	• Yearly for at least 3 years after decommissioning or as deemed necessary	• Limit and/or prevent declared Category 1, 2 and 3 invader species establishing • Minimise extended threat to ecosystems, habitats or other species • Increase the potential for natural systems to deliver goods and services • Minimise economic or environmental harm or harm to human health	As required: • Foliar application technique • Cut-stump technique • Revisit mitigation measures • Continue control and management

18. Organisational Capacity

The following closure organisational considerations have emerged as good practice and is suggested for consideration. Once the relevant persons have been selected then the training and capacity building needed for closure can be determined.

The establishment of a multi-disciplinary closure committee to ensure that closure planning is carried out in terms of the relevant legal requirements and company policies. The committee can help ensure that rehabilitation and closure planning is integrated with operational planning and execution. Figure 18-1 below shows typical key roles that may be identified for a closure committee as defined by ICMM (2019).

The role of the closure champion in a committee is critical, as the champion will be responsible for liaising with other key leaders within the organisation. The community liaison and development officer engages with the relevant stakeholders, which can be actioned through a stakeholder forum. The technical specialists focus on addressing the knowledge gaps and guides rehabilitation implementation. The finance officer ensures that sufficient funds are available for closure.

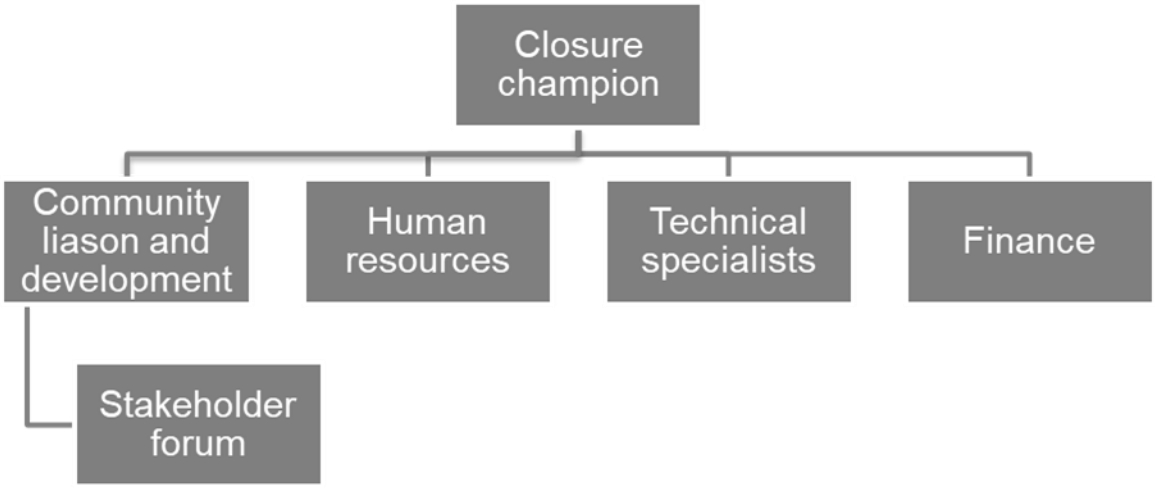

Figure 18-1: Typical Closure Committee Roles

18.1. Motivation for Amendments

This report is the initial Closure Plan that will form the basis of subsequent annual updates, no amendments are made at this stage of reporting.

19. Stakeholder Participation

Engagement with stakeholders will be undertaken as part of the formal environmental authorisation process. A stakeholder Issues and Comments Register will be developed as part of the planned process and incorporated into the Closure Plan in the next annual update.

20. Closure Cost Determination

The closure cost assessment for the Lisbon Prospecting Project is aligned with The Financial Provisioning Regulations, 2015 (GN R. 1147 of 20 November 2015) (as amended) published under the NEMA. The closure costs are also determined in accordance with the broader legislative requirements presented in Section 8.

20.1. Approach and methodology

The costing methodology employed is summarised as follows:

- Conduct a document review of available information) and compile a ERR (Section 10) to distil an initial set of rehabilitation actions (Section 11) to provide 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 GN R.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.

20.2. Closure Costing Assumptions and Qualifications

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

20.2.1. General

- The closure costing addresses decommissioning, surface rehabilitation, plugging of boreholes, the final closure and monitoring and corrective action of the site. Other aspects that are not addressed in this costing include staffing, separation packages, retraining or reskilling etc;
- The closure costs represent present day value, no discounting or nett present value calculations have been included;
- It is assumed that third party contractors would be commissioned to establish on site (preliminary and general costs included) and implement the decommissioning, 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 (12%). If the current amendments to GN R.1147 circulated for comment are promulgated, this figure will probably increase to align with industry standards;
- Aligned with the requirements of international accounting standards and GN R.1147, no discounting of potential value recovered from the sale of recoverable material is considered;
- No legal due diligence was done as part of this assessment;
- The closure costing is based on the information provided by the client;
- A contingency of 10% has been allowed for in the financial provision. The contingency considers price fluctuations regarding plant hire, fuel prices, possible omissions and uncertainties in the cost estimate; and
- The closure cost estimate does not include VAT.

20.2.2. Site specific costing assumptions

20.2.2.1. Drill sites

- Movable assets (temporary offices and ablutions) will be removed from site for sale and/or re-used, the cost associated with dismantling and transport of these items are not included in the cost determination;
- It is assumed that no topsoil will be stripped prior to establishing the drilling sites, the in-situ soils will be ripped and revegetated as part of rehabilitation;
- It is assumed that minimal (if any) storm water management measures will be required for each site. Recontouring of these measures is included in the levelling and shaping allowance for each drill site;
- Unless firm agreements are in place with the next land user, all fencing will be dismantled and removed from site;
- The water within each borehole will be analysed to make sure it is free of any hydrocarbons;
- All boreholes will be capped and sealed;
- Allowance has been made to rehabilitate a disturbed area of 145 m^2 for each drill site;
- It is assumed that no water, sludge or large waste storage facilities will be constructed on site and no contaminated material will require removal and disposal at closure; and
- It is assumed that effective operational measures will be implemented on site to prevent hydrocarbon spillages, and that potential spillages will be dealt with through the implementation of proper management procedures. No allowances have been made to remove and dispose of contaminated soils.

20.2.2.2. Roads

- The exact area that will be cleared for roads / tracks was not received and an estimated area for roads / tracks were included;
- Allowance is made for shaping and levelling tracks accessing the drill sites followed by ripping to alleviate compaction, soil amelioration and vegetation establishment; and
- Drainage lines will also be re-established where disruption due to the roads occurred.

20.2.2.3. Post Closure Monitoring and Maintenance

- Allowance for rehabilitation monitoring over rehabilitated areas has been made for a 3-year period.

20.2.2.4. Residual Closure Costs

The outcomes of the risk assessment indicate that no residual risks are anticipated at this stage of the project planning.

20.3. Closure Cost Summary

A summary of the initial scheduled closure costs for the Lisbon Project is provided in Table 18-1 and amounts to **R 387,617** (excl. VAT).

Table 20-1: Summary of the initial closure costs

	Digby Wells Environmental
	PalRho Exploration Proprietary Limited, Lisbon, PAL6882 Revision: 0
Area and Description	**End of Operation**
Infrastructure and Rehabilitation	
Area 1: Prospecting Sites and Boreholes	R56,250
Area 2: Access Roads	R207,600
Sub-total	**R263,850**
Monitoring and Maintenance	
Monitoring Costs (Vegetation)	R16,328
Maintenance Costs (Vegetation)	R49,392
Sub-total	**R65,720**
Preliminary and General (12%)	R31,662
Contingency (10%)	R26,385
GRAND TOTAL	**R387,617**

21. Identified Gaps

The following additional information is required to improve the resolution and accuracy of the closure planning and associated costing:

- Detailed layout plans of the drill sites including planned infrastructure, size of the disturbed area, waste management and water management facilities and potable water supply;
- Continued feedback with all stakeholders with relevance to rehabilitation and closure planning; and
- Confirmation of any wetland areas in and around the exploration areas.

22. Closing Statement

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 outcome, but it will also reduce the financial burden at closure. This initial Closure Plan provides a sound foundation for developing detailed rehabilitation measures to close the exploration activities safely and sustainably and according to the closure objectives.

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