

Final Rehabilitation,
Decommissioning and
Closure Plan, Incorporating
an Annual Rehabilitation Plan
and Environmental Risk
Assessment

NOOISABES 51 PROSPECTING RIGHT

DMR REFERENCE NUMBER: NC 30/5/1/1/2/11997 PR

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## BLACK MOUNTAIN MINING NOOISABES 51 PROSPECTING RIGHT APPLICATION

#### FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE PLAN

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#### 1. INTRODUCTION

Black Mountain Mining (Pty) Ltd (the Applicant) has submitted an application for a Prospecting Right in terms of Section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) and an Application for Environmental Authorization in terms of Chapter 6 of GNR 982 promulgated under the National Environmental Management Act (Act 107 of 1998) (NEMA) to prospect for ferrous & base metals (Copper Ore, Iron Ore, Zinc Ore, Lead Ore, Manganese Ore, Nickel and Molybdenum) and all associated metals and minerals, precious stones (Diamond), nuclear fuels (Uranium) and all associated metals and minerals.

The proposed project that will aim to ascertain if economically viable mineral deposits exist within the application area. In order to undertake prospecting activities, Black Mountain Mining will require a Prospecting Right in terms of the Mineral and Petroleum Resources Development Act (MPRDA, Act No.28 of 2002). The Applicant is also required to obtain an Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA, Act No. 107 of 1998) which involves the submission of a Basic Assessment Report (BAR). Environmental Impact Management Services (Pty) Ltd (EIMS) have been appointed by Black Mountain Mining to compile the BAR (this report) in support of the Prospecting Right application submitted by EIMS on behalf of Black Mountain Mining, which in turn will be submitted to the DMR for adjudication.

In accordance with Section 24P of the NEMA the Applicant must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. This Final Rehabilitation, Decommissioning and Closure Plan (FRDCP) aims to meet this requirement and has been prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147).

According to the regulations, financial provision must be made for rehabilitation and remediation; decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and remediation and management of latent or residual environmental impacts which may become known in the future. In order to address these requirements, this document includes an annual rehabilitation plan, a final rehabilitation, decommissioning and mine closure plan, and an environmental risk assessment report.

Table 1 below lists the specific requirements that must be contained in each of the three plans as per the NEMA GNR 1147 Appendices 3, 4 and 5, as well as the associated section in this report where each requirement is addressed.

TABLE 1: NEMA GNR 1147 APPENDIX 3, 4 AND 5 REQUIREMENTS AND ASSOCIATED SECTIONS WHERE THEY ARE ADDRESSED

| No.  | Requirement                         | Relevant Section |
|------|-------------------------------------|------------------|
| Annu | al Rehabilitation Plan – Appendix 3 |                  |

| No.     | Requirement   | Relevant Section  |
|---------|---|---|
| 3 (a)   | details of the person or persons that prepared the plan, and timeframes of implementation of the current, and review of the previous rehabilitation activities;   | Section 2   |
| 3 (b)   | the pertinent environmental and project context relating directly to the planned annual rehabilitation and remediation activity;  | Section 3.1.1   |
| 3 (c)   | results of monitoring of risks identified in the final rehabilitation, decommissioning and mine closure plan with a view to informing rehabilitation and remediation activities;  | To be confirmed after the first implementation of the Annual Rehabilitation Plan. |
| 3 (d)   | an identification of shortcomings experienced in the preceding 12 months;   | Section 4   |
| 3 (e)   | details of the planned annual rehabilitation and remediation activities or measures for the forthcoming 12 months;  | Section 4   |
| 3 (f)   | a review of the previous year's annual rehabilitation and remediation activities;   | Section 4   |
| 3 (g)   | costing;  | Section 4   |
| Final F | Rehabilitation, Decommissioning and Mine Closure Plan – Appen   | dix 4   |
| 3 (a)   | details of the person or persons that prepared the plan;  | Section 2   |
| 3 (b)   | the context of the project, including material information and issues that have guided the development of the plan, an overview of the environmental context, the social context regarding closure activities and post-mining land use, stakeholder issues and comments, and the mine plan and schedule for operations;   | Section 3.1   |
| 3 (c)   | findings of an environmental risk assessment leading to the most appropriate closure strategy;  | Section 3.2   |
| 3 (d)   | design principles, including the legal and governance framework, the closure vision, objectives and targets, alternative closure and post closure options, a motivation for the preferred closure action, details of the closure and post closure period, details associated with any on-going research on closure options, and details of assumptions made to develop closure actions; | Section 3.4   |
| 3 (e)   | a proposed final post-mining land use;  | Section 3.5   |
| 3 (f)   | closure actions required;   | Section 3.6   |
| 3 (g)   | a schedule of actions for final rehabilitation, decommissioning and closure;  | Section 3.6   |
| 3 (h)   | an indication of the organisational capacity that will be put in place to implement the plan, including the organisational structure;   | Section 3.8   |
| 3 (i)   | an indication of gaps in the plan;  | Section 3.9   |
| 3 (j)   | relinquishment criteria for each activity or infrastructure in relation to environmental aspects with auditable indicators;   | Section 3.10  |
| 3 (k)   | the closure cost estimation procedure;  | Section 3.11  |

| No.    | Requirement  | Relevant Section |
|--------|--|------------------|
| 3 (1)  | monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps;  | Section 3.12     |
| 3 (m)  | 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 3.12     |
| Enviro | onmental Risk Assessment – Appendix 5  |                  |
| 3 (a)  | details of the person or persons that prepared the plan;   | Section 2        |
| 3 (b)  | details of the assessment process used to identify and quantify the latent risks;  | Section 5.1      |
| 3 (c)  | management activities;   | Section 5.2      |
| 3 (d)  | costing;   | Section 5.2      |
| 3 (e)  | monitoring, auditing and reporting requirements.   | Section 5.2      |

### 2. DETAILS OF THE SPECIALIST

The details of the professionals who contributed to the preparation of the annual rehabilitation plan (ARP), final rehabilitation, decommissioning and mine closure plan (FRDCP) and environmental risk assessment (ERA) are provided in Table 2.

TABLE 2: DETAILS OF SPECIALIST1

| Name            | Role  | Qualifications/<br>Experience   | Professional Registrations   |
|-----------------|---|---|--|
| GP Kriel        | Environmental<br>Scientist / Project<br>Manager / EAP | M.Env.Sci. ~9 years environmental consulting experience.                          | South African Council for Natural<br>Scientific Professions- Registered<br>Professional Natural Scientist<br>(Environmental Science 400202/09)<br>Water Institute of Southern Africa -<br>Member |
| Liam<br>Whitlow | Environmental<br>Scientist                            | BSc Hons Environmental Management. ~15 years environmental consulting experience. | South African Council for Natural<br>Scientific Professions- Registered<br>Professional Natural Scientist<br>(Environmental Science 400148/08)   |

<sup>&</sup>lt;sup>1</sup> According to the 2015 Financial Provisioning Regulations "Specialist" is defined as "specialist" means an independent person or persons who is qualified by virtue of his or her demonstrable knowledge, qualifications, skills or expertise in the mining, environmental, resource economy and financial fields.

## 3. FINAL REHABILITATION, DECOMISSIONING AND CLOSURE PLAN (FRDCP)

According to the NEMA GNR 1147 the objective of the final rehabilitation, decommissioning and closure plan, is to identify a post-mining land use that is feasible through-

- a) Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
- b) Outlining the design principles for closure;
- c) Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
- d) Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
- e) Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
- f) Identifying knowledge gaps and how these will be addressed and filled;
- g) Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- h) Outlining monitoring, auditing and reporting requirements.

This section of the report aims to achieve these objectives.

#### 3.1. PROJECT AND ENVIRONMENTAL CONTEXT

This section aims to provide context and focus attention on the material information and issues that have guided the development of this FRDCP. Further details on the project and environmental context can be obtained from the Basic Assessment Report.

#### 3.1.1. PROJECT CONTEXT

Please refer to the detailed description of the project as provided for in Section 2 of the BAR. The planned invasive prospecting activities, which would require inclusion in the FRDCP are extracted and described in Section 3.1.1.2 to Section 3.1.1.5.

#### 3.1.1.1. LOCATION

The proposed Nooisabes 51 Prospecting Right Area is on Portion 1 and Remaining Extent of the Farm Nooisabes 51 and is located between 32 to 53 kilometres west of the town of Aggeneys and 58 to 75 kilometres north east of the town of Springbok, Namaqualand District, Northern Cape Province.

The table below indicates the farm portions that fall within the Prospecting Right Application Area.

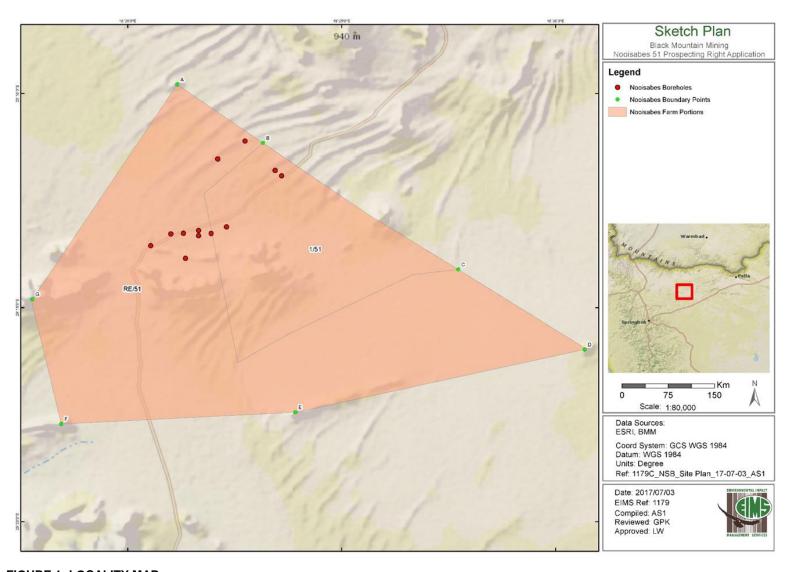
**TABLE 3: LOCALITY DETAILS** 

| Farm Name (s)                                      | Nooisabes 51 Portion 1 and Remaining Extent   |
|--|---|
| Application Area (Ha)                              | The area is 16592.682 hectares (sixteen thousand five hundred and ninety two point six eight two)   |
| Magisterial District                               | Namakwaland   |
| Distance and direction from nearest town           | The area is located approximately 32 to 53 kilometres west of the town of Aggeneys and 58 to 75 kilometres north east of the town of Springbok, Namaqualand District, Northern Cape Province. |
| 21 digit Surveyor General<br>Code for each Portion | C0530000000005100001 (1/51) C0530000000005100000 (RE/51)  |

**TABLE 4: APPLICATION AREA BOUNDARY COORDINATES** 

| FARM                              | POINT No. | X-COORDINATE | Y-COORDINATE |
|-----------------------------------|-----------|--------------|--------------|
| Nooisabes 51 Prospecting<br>Right | А         | 18.352637    | -29.163099   |
| g                                 | В         | 18.386051    | -29.185884   |
|                                   | С         | 18.462079    | -29.235129   |
|                                   | D         | 18.511302    | -29.266298   |
|                                   | E         | 18.398593    | -29.290703   |
|                                   | F         | 18.307434    | -29.295264   |
|                                   | G         | 18.296127    | -29.246736   |

Please refer to Figure 1 for a locality map.



**FIGURE 1: LOCALITY MAP** 

#### 3.1.1.2. DESCRIPTION OF PLANNED INVASIVE ACTIVITIES

These activities result in land disturbances e.g. sampling, drilling, etc. Please refer to the Project Schedule in Table 5 below.

#### a) Drilling

The targeting of all drilling activities will be dependent on the results obtained during the preceding phases of prospecting, namely the geological mapping and geophysical surveying.

Diamond drilling will be of the standard HQ or NQ size. Down hole surveys will be done every 50m in each hole. Core will be marked, logged, photographed and sampled according to the standard of the applicants logging and sampling procedures.

Down the hole geophysical surveying will take place upon completion of the exploratory boreholes along with Ground Electromagnetic (EM) surveys to determine positions of conductors.

Rehabilitation of drill sites will be done according to an approved Environmental Management Plan.

Percussion Rotary Air Blast (RAB) drilling may be carried out for pre-collaring of diamond drill boreholes or for obtaining samples if significant depth of cover is encountered over particular targets.

#### b) Assaying

Rock chip / soil samples will be sent to a laboratory of the applicant's choice to be crushed, split, pulverized and assayed. Samples from core will be split using a core cutter before being sent to the laboratory for analysis.

#### c) Metallurgical Test Work

Metallurgical test work would start during phase 7 of the prospecting work programme. These tests will be done by and in consultation with a preferred and accredited Laboratory of the applicant's choice.

#### Phase 4: Boreholes

The initial planned invasive prospecting activities will consist of diamond drill boreholes drilled to appropriate depths to target any anomalies identified during Phases 2 & 3 of the non-invasive portion of the prospecting work plan. The work will consist of:

- Access and drill site preparation
- Diamond core drilling
- Sampling and assaying
- Quality assurance and quality control programs
- Down hole geophysics
- Rehabilitation of drill sites
- Recording & Integration of data

#### Phase 7: Boreholes

This phase of boreholes would determine the continuity of mineralization & potential deposit size. The work will consist of:

- Access and drill site preparation
- Widely spaced diamond drilling and analyses to confirm grade / tonnage potential
- Sampling and assaying
- Quality assurance and quality control programs
- Metallurgical test work
- Rehabilitation of drill sites
- Recording & Integration of data

#### Phase 8: Boreholes

This phase of boreholes would provide enough information to be able to calculate an inferred resource. The work would consist of:

- Access and drill site preparation
- Close spaced infill diamond drilling and analyses to determine actual grade / tonnage
- Sampling and assaying
- Quality assurance and quality control programs
- Metallurgical test work
- Geotechnical drilling program
- Rehabilitation of drill sites
- Recording & Integration of data

#### 3.1.1.3. PROPOSED PROSPECTING SCHEDULE

The proposed prospecting project schedule is summarised in Table 5.

TABLE 5: TIMEFRAMES EACH OF THE PROPOSED ACTIVITIES

| Phase   | Year 1 | Year 2 | Year 3 | Year 4 | Year5 |
|---|--------|--------|--------|--------|-------|
| Phase 1 (0-6months)  Desktop Study: Literature Survey /  Review / acquisition of data | Х      |        |        |        |       |
| Phase 2 (6-12 months) Geological field mapping  | X      |        |        |        |       |
| Phase 3 (12-24 months) Regional Ground Geophysical Surveys                            |        | X      |        |        |       |

| Phase                        | Year 1 | Year 2 | Year 3 | Year 4 | Year5 |  |
|------------------------------|--------|--------|--------|--------|-------|--|
| Phase 4 (24-34 months)       |        |        | Х      |        |       |  |
| Target Prospecting Boreholes |        |        | ^      |        |       |  |
| Phase 5 (34-36 months)       |        |        | Х      |        |       |  |
| Data Compilation             |        |        | ^      |        |       |  |
| Phase 6 (36-42 months)       |        |        |        |        |       |  |
| Detailed Ground Geophysical  |        |        |        | X      |       |  |
| Surveys                      |        |        |        |        |       |  |
| Phase 7 (42-48 months)       |        |        |        |        |       |  |
| Widely Spaced Prospecting    |        |        |        | Х      |       |  |
| Boreholes                    |        |        |        |        |       |  |
| Phase 8 (48-60 months)       |        |        |        |        |       |  |
| Closely Spaced Prospecting   |        |        |        |        | X     |  |
| Boreholes                    |        |        |        |        |       |  |

As per the Financial Provisioning Regulations (2015) this FRDCP will require regular review, amendment and updating. Such updating will include a review of the status of prospecting activities completed, underway and planned. At present no prospecting right has been issued to the applicant and consequently there are no previous prospecting activities or disturbed areas which can be reported on.

#### 3.1.2. ENVIRONMENTAL AND SOCIAL CONTEXT

The description and definition of the pre-prospecting environmental context is critical to ensure that the ultimate closure objectives and associated end land-use are achieved. In this regard please refer to Section 6 of the BAR for a detailed description of the receiving environment applicable to this specific project. Based on the description of the receiving environmental and social context, this FRDCP is based on the understanding that no invasive prospecting activities will be undertaken within the following constraint areas:

- Watercourses and Wetlands:
- Heritage sites or features;
- Existing servitudes for pipelines, powerlines; and
- Residential Areas.

The description of the baseline environment (on site and surrounding) was obtained from the studies undertaken by the specialist team and in conjunction with EIMS. All specialist studies undertaken for the proposed Nooisabes 51 Prospecting Right project are included as supporting technical appendices to the BAR. The key environmental aspects related to the prospecting right area are summarised in the remainder of this Section.

#### 3.1.2.1. CULTURAL AND HERITAGE AND PALEONTOLOGY

Archaeological CRM reports consulted sketched a two-tiered cultural layering of the landscape, including a Stone Age and Colonial Period occupation. The extremely arid landscape, characterized by flat drainage plains, or peneplains of red Hutton sands, aeolian sands dating back to the Quaternary, are intersected by granite inselbergs protruding above the peneplains and including amongst others the Aggeneys, Black and Gamsberg Mountains. This landscape is reasonably inferred to represent a basic Holocene landscape, with much wetter conditions having had prevailed throughout the Plio- and Pleistocene, or during Earlier (ESA) and Middle Stone Age (MSA) times.

The ESA Acheulean is poorly represented and documented by means of mostly singular bifaces, or handaxes. It was reported that low density lithic scatters containing ESA, MSA and Later Stone Age (LSA) typological samples, in cases found in a workshop context. Said deposits identified on Gamsberg probably represents the most significant ESA Acheulean associated deposits as yet identified, but reported on as surface scatters only, with a totally eroded, lagged context, situated on the exposed granite substrate of Gamsberg itself. Of particular ESA significance is the identification of the Victoria West Industry, invariably referred to as ESA, a later ESA, a component of the first transitional period (between the ESA and MSA), and an early expression of a prepared core and flake technique, which came to maturation during the MSA as the Levallois technique, although continuous evolution of the Victoria West to the Levallois is yet to be proven. Morris (2013d) reported on a Victoria West Industry on the property Bloemhoek characterized by prepared cores, associated with notably long blades and a low incidence of handaxes and cleavers. The report by Morris is of particular significance with direct reference to the reported on extent of the Victoria West Industry, a technological Industry that has received markedly little attention in Stone Age research considering its prominence in lithic technological development.

The MSA is reported on widely in archaeological CRM reports, characterised by an amorphous, fairly crude typology, with quartz having been the primary raw material used, but including production on quartzite and to a lesser extend local dolerite and other raw materials. Deposits are in general described as of low archaeological significance, based on the low ratio of artefacts present at recorded findspots, but including reference to poor typology, a direct result of the primary raw material used; quartz simply not having knapping qualities suitable to prepared technological techniques. Sites identified to date are recorded mostly from the peneplains, but including a few assemblages from mountainous areas, as identified at Gamsberg, but an environmental preference for the peneplains, rather than mountainous areas seems to have prevailed during MSA times. MSA scatters or occurrences are reported on widely in archaeological CRM reports, identified mostly as singular type assemblages, in a few cases associated with ESA lithic samples, and more often in association with LSA.

The LSA of the greater terrain is of intriguing heritage significance, effectively defining the 'Bushmanland' deposits. Prior to 2kya LSA hunter-gatherers (San, or Bushmen) settled primarily along the Orange River and the coastline, with extensive pre-pottery LSA assemblages, in both spatial extent and with reference to deposit depth confirming this. By 2kya LSA herder groups (Khoe, Khoe-khoen or Khoi) moved into South Africa, with the Great Namaqua (or Nama) occupying the greater Northern

Cape area, but with smaller groups such as the Namnykoa recorded to have settled along the Orange River corridor and the Eniqua in the area west of Aggeneys. The influx of Khoe groups into the original San area of occupation resulted in a forced displacement, with San bands seeking refuge from sociopolitical pressures deeper into the interior, the hinterland, the area named 'Bushmanland' during Colonial Period times. San occupation of 'Bushmanland' is thus fairly recent, dating to between 2-1kya and extending into Colonial Period times. San bands were small, directly associated with the harsh, arid environmental conditions of 'Bushmanland', an environment that at its best allowed a notably low carrying capacity, of both humans and game. Accordingly, the 'Bushmanland' LSA hunter-gatherer sites are small, low density sites, more than often characterized by simple ephemeral artefact scatters, reflecting small San bands, extremely mobile across the landscape. San bands may well have gathered in greater numbers during more favourable conditions, for example after a good rainy season, but this also being reported times when hostile Khoe groups would venture into the interior. Competition between LSA herders and LSA hunter-gatherer groups mark the first archaeologically recorded displacement and marginalization of the San in the Northern Cape.

By 1770 Colonial 'trekboers' moved into the area, initially, very similar to the San, living a transhumance existence; seasonal migration of farmers with their livestock from the hinterland to the coast were commonplace, and especially in the harsh, arid interior strife competition over natural resources prevailed, often resulting in livestock raids by San groups and farmer commandos retaliating, inevitably ensuing in a number of skirmishes. Early travelogues by Thomson (1827) and Dunn (1931), who visited 'Bushmanland' in 1824 and 1827 respectively provide interesting vestiges of the early Colonial Period / indigenous social geography. As early as 1863 Anthing reported on conflict between the 'trekboers' and the San, locally known as 'Obseses', in the Gamsberg and Namiesberg areas, describing skirmishes as 'genocidal' in nature. Dunn (1931) writes of a 'Gora' (or 'Gorra', '!Gora', or waterhole in the rock) near 'Ghaums' (or 'Gams'), stating that 'At this water an affray took place between the Boers and Bushmen. The Bushmen scherms, made of stones, still remain, as well as the marks of the bullets on the rocks'. A further record of conflict between the 'trekboers' and the San was relayed in the Cape Argus, July 1973: 'Aggeneys is the name of a kloof on Vickie Burger's farm... Long before the turn of the century, the Bushmen had several strongholds in the mountains between Pofadder and Springbok and from these they carried out raids on the farmers. Finally the farmers could no longer tolerate the marauding Bushmen and formed a commando which followed the spoor of the Bushmen and the livestock that they had stolen to the kloof, which is today known as Aggeneys. Near the kloof they split into three parties which surrounded the trapped bushmen at a spring near the confluence of the three ravines. The Bushmen were wiped out and the kloof became known as The Place of Blood'.

Fair records of LSA lithic deposits are present in archaeological CRM reports, with sites often being in lagged contexts and associated with earlier MSA deposits, again more than often identified on the peneplains but including small shelter sites. LSA sites are routinely described as small ephemeral scatters of lithic artefacts, with quartz being the primary raw material used for artefact production, and similar to described MSA assemblages, of a poor amorphous typology. Grinding grooves are frequently associated with LSA deposits, and a number of upper grinding stones have been recorded. Ostrich eggshell fragments and fine grit tempered ceramic have been found at select LSA sites. The

microlandscape seems to have been key in LSA site locality, with sites often reported on as situated in close proximity to a 'Gora' or waterhole. Morris (2013d) reported on a Rock Art site, situated at the foot of the Swartberg (Black Mountain) on the Farm Zuurwater, but the presence of Rock Art associated with LSA deposits remain extremely low. A limited number of LSA sites yielded typical Colonial Period artefacts, including porcelain fragments, bottle glass and rusted enamel.

Morris (2013a) reported on a LSA site at an 'inkruip', a crevice to the southern side of Gamsberg, and interpreted the site as a 'genocide' site; most probably the site reported on by Dunn (1931). A word of caution is raised here with regards to the assignation of archaeological sites to historically reported on incidents. Whilst the site description by Morris provides for a confirmed LSA site, and the locale of the site reasonably coincides with that reported on by Dunn, the absence of the historically reported on bullet holes in Morris' text and photographic record remain concerning. It is suggested that clear definition be given for sites described as 'genocide' sites, and that specific conflict related data, such as bullet holes, bullet casings etc. be collected that distinctly differentiates 'genocide' LSA sites from LSA occupation sites.

Records of grave sites are notably low. Orton (2016) reported on a possible grave, while Webley & Halkett (2012) commented on a number of stone cairns present on the Aroams photovoltaic study site, which may or may not be graves. Stone cairns reported on are not georeferenced, though basic recommendations, in the event of these being graves, or graves being encountered during the course of development are included in the report recommendations. Webley & Halkett (2012) speculated that stone cairns identified may also be early prospecting remains. An alternative possibility for stone cairns on the landscape is offered; what is in the Eastern Cape referred to by the Xhosa name 'izivivane', small stone piles that marked the well-wishing of a journey. The practise is reasonably inferred to have been adopted by Later Iron Age (LIA) Xhosa groups after large scale migration into the Eastern Cape during the 18th Century and the associated displacement and marginalization of resident Khoe groups. Demarcation of migration or travel routes have been reported on amongst various LSA (and LIA) indigenous populations. It needs to be noted that stone cairn graves across 'Bushmanland' may be Khoe graves, with the Khoe known to have periodically ventured into 'Bushmanland', or even Colonial Period graves, but non-Christened LSA hunter-gatherer graves would by virtue of cultural tradition not be surface demarcated.

As mentioned, by 1770 Colonial 'trekboers' moved into the area, essentially living a transhumance existence, a lifestyle that dominated Western Colonial Period occupation of 'Bushmanland' well into the first third of the 20th Century. By 1930 the development of drilling technology allowed the exploitation of sub-surface water resources, boreholes and the characteristic wind pump on the landscape marking the first permanent farming, and associated therewith permanent settlement of farmers in the area. Mineral exploration of the greater area is fairly recent, dating back to 1928 in the Aggeneys area, but it was not until the 1970s that mining started to play vital role in the economic sector of the region.

With reference to the above, typical Colonial Period sites reported on in archaeological CRM reports remain scarce. Morris (2011) recorded a portion of the old Springbok-Aggeneys-Pofadder road with periodic cast cement milestones still visible (and associated with a fair degree of period related debris,

including bottle glass and metal cans). A packed stone walled feature on the Farm Zuurwater can reasonably be ascribed to the Colonial Period. Boer War fortifications are still visible in the Aggeneys area, and low-keyed mining/ prospecting impact have been reported on Webley & Halkett (2012).

Farms Haramoep, Oonab, Amam and Nooisabes: Chief Surveyor General (CSG) records (SD diagrams) could be obtained from the relevant directorate for the farms Haramoep 53, Oonab-Noord 609 (originally part of the Farm Oonab 52) and Amam 46, though no CSG record could be obtained for the Farm Nooisabes 51. The farms Haramoep 53, Oonab 52 and Amam 46 were all first registered in 1894, with Oonab-Noord 609 subdivided from Oonab 52 in 1960. It can reasonably be inferred that the Farm Nooisabes 51 was also registered in 1894, or the years immediately before or after 1894. Farm names, Haramoep, Oonab, Amam and Nooisabes are all inferred to be of Khoe origin, however the meanings of the names are not recorded or known (Nienaber & Raper 1977).

The Nooisabes 51 prospecting is proposed by means of a phased approach, including a desktop study, geological field mapping, semi-regional geophysical ground based survey and invasive techniques, including assaying and drilling. Only the impact of invasive techniques is to be considered with reference to requirements of the NHRA 1999. The impact of assaying, rock chip and soil sample collection, is negligible with reference to the recorded archaeological and cultural heritage of the greater terrain. The Phase 1 AIA focussed on field assessment of the proposed drill positions. Twelve (12) drill positions are proposed on the Farm Nooisabes, two (2) of which were not subjected to Phase 1 AIA field assessment including BH0111 and BH0081, due to accessibility constraints. Drill positions BH0111 and BH0081 are both situated in the Koa Valley dune system. It is recommended that development (drilling) at the locales proceed, based on the assumption that the Koa Valley dune system is largely anthropogenically sterile, as has been identified at nine (9) drill positions proposed and assessed, situated in the dune system.

Infrequent surface gravel lenses, containing low densities of MSA and LSA lithic artefacts do feature on the Hutton sand peneplain of Nooisabes, in character and artefact typology very similar to low density Stone Age lithic scatters identified on Haramoep, though none of the proposed Nooisabes drill positions will impact on such lenses. All drill positions proposed on the peneplain of Nooisabes are situated in areas of anthropogenic sterile red Hutton sands.

A summary of the findings at each borehole location are provided in TABLE 6.

TABLE 6: HERITAGE FINDINGS SUMMARY (ARCHAEOMAPS, 2017)

| Drill Location | Site Number | Site Description | Co-ordinates           | Recommendations  |
|----------------|-------------|------------------|------------------------|--|
| Nooisabes 51   |             |                  |                        |  |
| BH0111         | -           | -                | S29.18516°; E18.37902° | Site not assessed – Recommended that development proceed |

| BH0081 | -           | -                                       | S29.19210°; E18.36837° | Site not assessed – Recommended that development proceed   |
|--------|-------------|---|------------------------|--|
| BH039  | -           | -                                       | S29.19651°; E18.39073° | N/A  |
| BH0091 | -           | -                                       | S29.19867°; E18.39330° | N/A  |
| BH0061 | -           | -                                       | S29.21853°; E18.37181° | N/A  |
| BH0051 | -           | -                                       | S29.22112°; E18.36583° | N/A  |
| BH0041 | -           | -                                       | S29.22112°; E18.36583° | N/A  |
| BH0031 | -           | -                                       | S29.22201°; E18.36096° | N/A  |
| BH0021 | -           | -                                       | S29.22100°; E18.35507° | N/A  |
| BH0011 | -           | -                                       | S29.22130°; E18.35010  | N/A  |
| BH0101 | -           | -                                       | S29.22585°; E18.34233° | N/A  |
| BH0071 | Site KOA-04 | MSA & LSA<br>workshop lithic<br>scatter | S29.23079°; E18.35581° | Drilling impact on identified lithic scatter recommended without the developer having to comply with additional heritage compliance requirements |

Notice of the proposed Prospecting Right Application has been uploaded onto the South African Heritage Resources Agency's (SAHRA) website, South African Heritage Information System (SAHRIS).

Drill Position BH0071 / Site KOA-04 - MSA and LSAWorkshop Lithic Scatter - S29.23079°; E18.35581°

The drill position BH0071 / Site KOA-04 MSA and LSA lithic scatter characterizes the peneplain on which the drill position is situated as well as the quartz outcrops, the raw material source. Artefacts are found across the area in typical workshop context, with quartz from the outcrops having been sourced to produce artefacts. The MSA is ascribed to a Volman (1984) MSA2 and MSA3, based on flake size, while the LSA is represented by amacrolithic industry. Typologically artefacts are extremely crude, with both assemblages, found in lagged context on the surface of the outcrops and peneplain, comprising primarily of amorphous flakes and cores. Artefact ratios (artefacts: m²) across the area are varying, but fairly high, with ratios of 5-25: 1 recorded.

**Site Significance and Recommendations:** The Site KOA-04MSA and LSA lithic scatter found in a typical workshop context at the raw material source utilized for artefact production comprises a Stone Age archaeological site, as defined and protected by the NHRA 1999. The site is ascribed a SAHRA Low Significance and a Generally Protected IV-C Field Rating. Drilling at drill position BH0071 will

directly impact on the identified Site KOA-04 archaeological lithic occurrence. Based on the small impact footprint of drilling versus the extensive lithic occurrence size it is recommended that drilling proceed without the developer having to comply with additional heritage compliance recommendations.

#### 3.1.2.1. PALAEONTOLOGY (BANZAI ENVIRONMENTAL)

As specialist Palaeontological assessment was undertaken by Banzai Environmental and the findings of this assessment are described in this section. Please refer to Appendix G for the specialist report.

The Proterozoic granite-gneiss basement rocks of the Namaqua-Natal Metamorphic Province do not contain any fossils because they are igneous in origin or too highly metamorphosed (Almond & Pether 2008), and their palaeontological sensitivity is correspondingly low (Almond & Pether 2008, Almond 2008).

Late Caenozoic superficial deposits may occasionally contain important fossil biotas, e.g. bones, teeth and horn cores of mammals as well as reptiles remains. Non-marine molluscs (bivalves and gastropods), ostrich egg shells, trace fossils (for example calcretised termitaria, coprolites), and plant remains such as peats or palynomorphs in organic-rich alluvial horizons. In pan sediments siliceous diatoms have been recovered. These fossil assemblages are mostly sparse, low in diversity, and occur over a wide geographic area; hence the palaeontological sensitivity of the deposits within the study region is rated as low.

Consequently, pending the discovery of significant new fossil material here, no further specialist studies are considered to be necessary. Thus, the proposed Nooisabes 51 prospecting right project, may be authorised as the whole extent of the development footprint is not considered as sensitive in terms of palaeontological resources.

#### 3.1.2.2. SOCIO-ECONOMIC

The proposed Nooisabes 51 Prospecting Project will be situated on Portion 1 and Remaining Extent of Nooisabes 51. The area is located approximately 32 to 53 kilometers west of the town of Aggeneys and 58 to 75 kilometers north east of the town of Springbok, Namaqualand District, Northern Cape Province. The prospecting area falls within ward 1 of Nama Khoi Local Municipality within Namakwa District Municipality (NDM).

The main economic activities within the NDM are agriculture and mining. Stock farming in the District includes sheep, cattle and goat farming and is the key contributor to the agricultural sector. Ostrich farming is also practised within the District. Flower bulbs and wool production are also important contributors to the agricultural sector. The Orange River plays a key role in the regions' agricultural activities and alluvial diamond mining activities.

Nama Khoi is considered the hub of the NDM in terms of economic activities with a 41.7% contribution to the NDM Gross Domestic Product (GDP). Mining is a very crucial industry in the Namakwa District Municipality, contributing 52.3% towards the district GDP and 21.3% towards employment.

The education levels in the NDM are low. Approximately half of the population over 20 years old within the District have some secondary education and a very small percentage obtained Grade 12 qualification.

#### 3.1.2.3. GEOLOGY AND TOPOGRAPHY

The development footprint is underlain by the Mid Proterozoic (Mokolian) basement rocks of the Namaqua-Natal Metamorphic Province (Bushmanland Group) and Cenozoic superficial deposits. The Namaqua-Natal Province is primarily highly metamorphosed sediments and volcanic rocks (e.g. gneisses, schists, quartzites, amphibolites) plus major granitic and gabbroic (norite) intrusions, which are dated between 2050 and 1000 Ma (million years ago; Cornell et al., 2006).

Various types of superficial deposits of Late Caenozoic (Miocene to Pliocene to Recent) age occur throughout the Karoo Basin (Partridge et al. 2006). In palaeontological terms the Quaternary superficial deposits have been relatively neglected. They contain pedocretes (e.g.calcretes), colluvial slope deposits, down wasted surface gravels, river alluvium, wind-blown sands as well as spring and pan sediments. Hill slopes are usually covered with a layer of colluvium or slope deposits (for example sandstone and dolerite scree).

Nama Khoi Local Municipality is characterized by coastal plains and granite hills in the west and low lying Bushmanland plains to the east of Springbok. The NDM is characterised by considerable variation in the types of soils. The area is characterised as semi-arid to arid and this indicates that the soil moisture deficit is high. The soil characteristics over most of the area are a function of insitu weathering. NDM is characterized by generally poor quality soils due to scarce or no water retaining capabilities. Due to the sandy nature of the soils within the region, many areas in the District are prone to wind erosion when the natural vegetation cover is disturbed. The erosion levels within an area depend on slopes' steepness, rainfall patterns and land-use activities in the area. Soils on steep gradients are subject to geological erosion. Extreme topography and soil characteristics within the NDM indicate that soil erosion is an important factor that limits development options (Chidley et al. 2011).

#### 3.1.2.4. FLORA

The vegetation of the general area and the proposed site is typical of the Upper Karoo and consists mainly of Karoo scrub and grass and the occasional Karoo Acacia and forms part of the vegetation in the least threatened Nama-Karoo biome (Mucina & Rutherford 2006). There are several biomes within the NDM, these are the:

- Desert Biome;
- Fynbos biome;
- Nama Karoo biome;
- Succulent Karoo biome; and
- Azonal Vegetation types.

The Nama Khoi Local Municipality contains 37 vegetation types of which 23 are endemic; this indicates the high degree of diversity in the region.

As illustrated in Figure 5 in the BAR, the prevalent biome in the application area is the Nama Karoo Biome. The vegetation types anticipated in the application area are those associated with the Bushmanland Arid Grassland, Bushmanland Inselberg Shrubland, Bushmanland Vloere and the Bushmanland Sandy Grassland.

#### 3.1.2.1. FAUNA

The NDM has a rich biodiversity, it contains all, or the majority of, five of the nine Succulent Karoo Ecosystem Programme's geographic priority areas. The majority of these five areas are outside of formally protected areas, therefore in order to conserve these areas, favourable land-use practices must be implemented (Todd et. al; 2009).

The Succulent Karoo is a biodiversity hotspot. There are 115 reptile species, 36 of which are endemic. The majority of the reptile species are lizards. There are 70 recorded lizard species, 30 of these are endemic. Four of the recorded 38 snake species are endemic. There are eight tortoise species in the Succulent Karoo hotspot and three of these species are endemic. Of the 17 recorded frog species, five are endemic, this includes the Desert Rain Frog (*Breviceps macrops*). Eighteen out of the 70 scorpion species are endemic. There are also several insect groups with high endemism; Monkey Beetles (*Rutelinae: Hoplini*), wasps and various specialised bees. The Namakwa Pollen Wasp (*Ceramius rex*) is confined to small refuge populations. There are 269 recorded bird species and 24 are near-endemic. There are 78 mammal species including four small endemic mammals (SKEP, 2003).

The Succulent Karoo and Nama Karoo provide habitats for the Riverine Rabbit (*Bunolagus monticularis*). The Riverine Rabbit is endemic to the semi-arid Great Karoo and parts of the Klein Karoo, and is Critically Endangered. The Riverine Rabbit is a habitat specialist that occupies the discontinuous and dense vegetation associated with the seasonal rivers of the Karoo. These areas along the rivers are however favoured for livestock grazing and crop growing (EWT, 2010). The fauna that inhabits the Khai Ma Local Municipality include, amongst others, the endemic Red Lark which occurs in the Koa River Valley. It is also expected that a wide variety of unique invertebrates are found in the area especially the south-facing slopes of the inselbergs and kloofs that have a much more moderated micro-climate. The aquatic pans in the region provide habitat for wading birds when inundated. Domestic animals within the NDM include sheep, goats, cattle, horses and donkeys. Stock farming is one of the major economic sectors within the NDM and it includes sheep, goat and cattle farming. Horses and donkeys are used for agricultural activities and as a mode of transport by the local people. Karoo Hoogland and Hantam Local Municipalities are the main agricultural centres where stock farming is the main economic activity (Chidley et al, 2011).

#### 3.1.2.1. HYDROLOGY

The prospecting area is located in the Lower Orange Water Management Area within the D82C and D82D quaternary catchments (Refer to Figure 4 below). The Lower Orange WMA is the furthest downstream in the Orange River Basin and as such is affected by upstream activities. Flows are largely supported by means of releases from Gariep and Vanderkloof dams in the Upper Orange WMA. Ninety

percent of the runoff generated in the two Orange River WMAs is generated in the Upper Orange WMA. Approximately 60% of the runoff generated in the Lower Orange comes from the Fish River in Namibia which enters the Orange River close to the river mouth (DWAF, 2004).

A number of non-perennial streams traverse the application area, some of these streams are within 100m of the proposed borehole locations. The DWS should be consulted to determine the applicability of Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (GN 704). It is also recommended that the applicable watercourses be groundtruthed and delineated prior to commencement of the invasive prospeciting activities, and where required, consideration should be given to the adjustment of these borehole locations to be at least 100m away from the mapped hydrological fearures.

Livestock farming is practised over most of the area. Large parts of the WMA contain conservation areas. Cultivation is restricted to isolated patches where higher rainfall occurs, and extensive irrigation is practised in the fertile alluvial soils along the Orange River valley. Irrigation water is supplied by releases from the Vanderkloof Dam.

Large mining operations occur in various parts of the WMA. There are no large urban developments or power stations. Groundwater plays a major role in meeting the water requirements of the towns and rural settlements along the tributaries of the Orange.

Irrigation is the dominant water use sector in the Lower Orange WMA, representing 94% of the total requirement for water of 1 130 million m³/a. Water requirements for urban, rural and mining use respectively represents 3%, 2% and 1% of the total water requirements in the WMA. Virtually all of the irrigation developments are situated along the main stem of the Orange River, with most of the irrigation being for high-value orchard crops (DWAF, 2004). Water is transferred from the Orange River for urban and mining use. Water requirements in this regard are small and are associated with towns such as Springbok, Steinkopf and Port Nolloth, as well as the mines in the area (Childey et al, 2011).

The Lower Orange WMA is in surplus which is available for allocation to users or to large projects and also ecological reserve at Orange River mouth Ramsar site (DWAF, 2004).

#### 3.1.2.2. DESCRIPTION OF CURRENT LAND USES

The properties were previously largely undisturbed and were and are presently mainly used for grazing of sheep and cattle. Existing farm houses, powerlines, fencing, windmills and minor roads are an example of the infrastructure that may be located within the application area. The existing land uses within the proposed Prospecting Right Application area include vacant and grazing land.

#### 3.1.3. STAKEHOLDER ISSUES AND COMMENTS

A public participation process as required by the NEMA 2014 EIA regulations will be undertaken for the proposed prospecting. In this regard please refer to Section 6.2 and Appendix B of the BAR for a comprehensive record of the process followed and comments received. Once comments have been received, an extract from the Comments and Responses Report (CRR) which relate to final rehabilitation, decommissioning and closure activities will be provided in this section. The comments

and issues raised through the public participation will be considered and inform the compilation of this FRDCP.

#### 3.2. ENVIRONMENTAL RISK ASSESSMENT

Section 8 of the BAR provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed prospecting. This risk assessment assesses each identified environmental impact by considering the consequence of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood of the impact occurring. The BAR further considers other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, to determine a prioritisation factor (PF) which is applied to the Environmental Risk to determine the overall significance.

Table 7 lists the environmental impacts and risks identified and assessed in the EIA/ Basic Assessment, which relate to final rehabilitation, decommissioning and closure of the prospecting. The EMPr addresses the management and mitigation of environmental impacts associated with the preceding phases whilst the annual environmental rehabilitation plan (to be prepared and reviewed annually) will provide for the planning and financial provisioning for the concurrent and progressive rehabilitation and remediation activities.

The applicable conceptual closure strategy to avoid, manage and mitigate the impacts and risks are also included in Table 7, together with the re-assessment of the environmental risk. The environmental risk assessment of the impacts associated with final rehabilitation, decommissioning and closure will inform the most appropriate closure strategy for the prospecting. It is expected that, in most cases, if all the management and mitigation measures identified in the EIA/ Basic Assessment and EMPr are adhered to and successfully implemented, then no latent or residual environmental impacts will remain. Impacts that are classified as high risk post-mitigation will be considered as latent environmental impacts and financial provision will be provided to remediate these specific impacts. Please see Section 5 for further details.

TABLE 7: IMPACT ASSESSEMENT FOR REHABILITATION, DECOMMISSIONING AND CLOSURE.

| Aspect   | Impact                           | Pre-Mitigation<br>Risk | Suggested Mitigation Measures  | Post-Mitigation<br>Risk | Closure<br>Options                                 |
|--|----------------------------------|------------------------|--|-------------------------|--|
| Site preparation and vegetation clearance                    | Clearance of vegetation          | -8.00                  | Avoid and control through implementation of EMP mitigation measures  Consideration of I&AP comments in BAR, compliance with NHRA provisions and regulations  | -7.00                   | Rehabilitate disturbed areas. On-going monitoring. |
|  | Pollution of<br>Soils            | -4.50                  | Avoid and control through implementation of EMP mitigation measures  | -2.5                    | Rehabilitate disturbed areas. On-going monitoring. |
|  | Introduction of alien vegetation | -6.75                  | Use of indigenous species for rehabilitation, immediate rehabilitation of areas where construction is completed, rehabilitation monitoring   | -3.00                   | Rehabilitate disturbed areas. On-going monitoring. |
|  | Dust                             | -4.50                  | Limit unnecessary movements and trips, Apply dust suppressing techniques where dust receptors will be affected.  | -2.50                   | Rehabilitate disturbed areas. On-going monitoring. |
| Target Prospecting<br>Boreholes & Widely<br>Spaces Boreholes | Surface Water                    | -6.00                  | A number of non-perennial streams traverse the application area, some of these streams are within 100m of the proposed borehole locations. The DWS should be consulted to determine the applicability of Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (GN 704). It is also recommended that the applicable | -3.50                   | Rehabilitate disturbed areas. On-going monitoring. |

| Aspect  | Impact                           | Pre-Mitigation<br>Risk | Suggested Mitigation Measures  | Post-Mitigation<br>Risk | Closure<br>Options   |
|---|----------------------------------|------------------------|--|-------------------------|--|
|   |                                  |                        | watercourses be groundtruthed and delineated prior to commencement of the invasive prospecting activities, and where required, consideration should be given to the adjustment of these borehole locations to be at least 100m away from the mapped hydrological features.   |                         |  |
|   | Groundwater                      | -6.00                  | Where shallow aquifers are encountered, a survey of the drinking water/ livestock watering boreholes should be undertaken (within 5km of the prospecting borehole sites). A detailed groundwater monitoring programme should be developed for these drinking water/ livestock watering boreholes and pre- and post-prospecting water quality samples should be taken.  Where drinking water/ livestock watering boreholes are to be affected then the advice of a hydrogeologist should be sought with regards to the need for plugging and casing of the prospecting boreholes. | -3.50                   | Rehabilitate<br>disturbed<br>areas.<br>On-going<br>monitoring. |
| Temporary waste storage (General and Hazardous waste) | Generation and disposal of waste | -6.00                  | Remedy through clean-up and waste disposal  Avoid and control through implementation of preventative measures  | -4.50                   | Rehabilitate<br>disturbed<br>areas.<br>On-going<br>monitoring. |

It is important to note that the environmental risk assessment will be revised and updated on an annual basis to ensure that this FRDCP remains applicable to the actual and predicted environmental impacts and risks.

#### 3.3. ENVIRONMENTAL INDICATORS AND MONITORING

Table 8 provides a list of the identified environmental impacts identified for the rehabilitation, decommissioning and closure of the Prospecting. In addition, environmental indicators are identified for each impact, together with proposed monitoring requirements. The indicators and monitoring will aim to inform ongoing rehabilitation and remediation activities. These indicators will also inform the assessment of whether the closure objectives have been adequately met.

TABLE 8: ENVIRONMENTAL INDICATORS AND MONITORING REQUIREMENTS

| Activities         | Phase                           | Size and Scale of Disturbance | Mitigation Measures   | Compliance<br>with<br>Standards | Time Period for Implementation               |
|--------------------|---------------------------------|-------------------------------|---|---------------------------------|--|
| Borehole Closure   | Decommissionin<br>g and Closure | Short term and localized      | <ul> <li>All prospecting boreholes that will not be required<br/>for later monitoring or other useful purposes<br/>should be plugged and sealed with cement to<br/>prevent possible cross flow and contamination<br/>between aquifers;</li> </ul> | NWA<br>DWAF BPG                 | Throughout<br>Decommissioning<br>and Closure |
|                    |                                 |                               | <ul> <li>Cement and liquid concrete are hazardous to the<br/>natural environment on account of the very high<br/>pH of the material, and the chemicals contained<br/>therein. As a result, the contractor shall ensure<br/>that:</li> </ul>       |                                 |  |
|                    |                                 |                               | <ul> <li>Concrete shall not be mixed directly on the ground;</li> </ul>   |                                 |  |
|                    |                                 |                               | <ul> <li>The visible remains of concrete, either solid,<br/>or from washings, shall be physically removed<br/>immediately and disposed of as waste,<br/>(Washing of visible signs into the ground is<br/>not acceptable); and</li> </ul>          |                                 |  |
|                    |                                 |                               | o All excess aggregate shall also be removed.   |                                 |  |
| Removal of surface | Decommissionin g                | Short term and localized      | All infrastructure, equipment, and other items used during prospecting will be removed from the site.   | MPRDA<br>Rehab Plan             | Decommissioning                              |
|                    |                                 |                               | <ul> <li>Compaction of soil must be avoided as far as<br/>possible. The use of heavy machinery must be<br/>restricted in areas outside of the proposed<br/>prospecting sites to reduce the compaction of<br/>soils.</li> </ul>                    |                                 |  |

| Activities       | Phase               | Size and Scale of Disturbance | Mitigation Measures  | Compliance<br>with<br>Standards | Time Period for Implementation |
|------------------|---------------------|-------------------------------|--|---------------------------------|--------------------------------|
| Removal of waste | Decommissionin<br>g | Small scale and localized     | Any excess or waste material or chemicals, including drilling muds etc. must be removed from the site and must preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled must be disposed of at a suitably licensed waste facility.   | NWA<br>DWAF BPG                 | Decommissioning                |
| Rehabilitation   | Rehabilitation      | All disturbed areas           | <ul> <li>Restoration and rehabilitation of disturbed areas must be implemented as soon as prospecting activities are completed;</li> <li>Sites must be restored to the original condition with vegetation cover (where applicable) equalling the surrounding vegetation cover;</li> <li>All debris and contaminated soils must be removed and suitably disposed of;</li> <li>Contours and natural surrounding must be reformed;</li> <li>Natural drainage patterns must be restored;</li> <li>All surface infrastructure on site must be removed;</li> <li>Temporary access routes/roads must be suitably rehabilitated; and</li> <li>Sites must be monitored by the ECO (including relevant specialist's inputs if, necessary) for adequate rehabilitation until the desired rehabilitation objectives have been achieved.</li> </ul> | MPRDA<br>Rehab Plan<br>NEMA     | Rehabilitation                 |

| Activities | Phase                | Size and Scale of Disturbance | Mitigation Measures   | Compliance<br>with<br>Standards | Time Period for Implementation |
|------------|----------------------|-------------------------------|---|---------------------------------|--------------------------------|
| Monitoring | Post-<br>Operational | All rehabilitated areas       | The post-operational monitoring and management period following decommissioning of prospecting activities must be implemented by a suitable qualified independent party for a minimum of one (1) year unless otherwise specified by the competent authority.  The monitoring activities during this period will include but not be limited to:  Biodiversity monitoring; and  Re-vegetation of disturbed areas where required.  Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management. | MPRDA<br>Rehab Plan             | Post-operation                 |

#### 3.4. DESIGN PRINCIPLES

#### 3.4.1. LEGISLATIVE AND GOVERNANCE FRAMEWORK

The requirement for final rehabilitation, decommissioning and closure stems primarily from the legislative requirements of the MPRDA and the NEMA. The relevant extracts from each of these are presented in this section. Please also refer to Section 3 of the BAR for an overview of other enviro-legal requirements which may influence closure planning.

## 3.4.1.1. MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT, ACT 28 OF 2002

The following extracts relate to the principle of closure for any right issued under the MPRDA:

- Section 43(1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.
- Section 43(4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.
- Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to health and safety and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the environmental authorisation have been addressed.
- Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in subsection (2), as the case may be, must plan for, manage and implement such procedures and such requirements on mine closure as may be prescribed.
- Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an environmental authorisation, are prescribed in terms of the National Environmental Management Act, 1998.

# 3.4.1.2. MINERAL AND PETROLEUM RESOURCES DEVELOPMENT REGULATIONS The following extracts from the MPRDA Regulations are specifically applicable to the preparation of this FRDCP:

Regulation 51 (a)(i): An environmental management programme contemplated in section 39(1) of the Act must include the following: A description of the environmental objectives and specific goals formine closure:

- Regulation 54: Quantum of financial provision:
  - (1) The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for
    - a. premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.
    - b. decommissioning and final closure of the operation; and
    - c. post closure management of residual and latent environmental impacts.
  - (2) The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision
    - a. in consultation with a competent person;
    - b. as required in terms of the approved environmental management programme or environmental management plan; or
    - c. as requested by the Minister.
- Regulation 56: Principles for mine closure: In accordance with applicable legislative requirements for mine closure, the holder of a prospecting right, mining right, retention permit or mining permit must ensure that -
  - (a) the closure of a prospecting or mining operation incorporates a process which must start at the commencement of the operation and continue throughout the life of the operation;
  - (b) risks pertaining to environmental impacts must be quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of a prospecting or mining operation;
  - (c) the safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) are complied with;
  - (d) residual and possible latent environmental impacts are identified and quantified;
  - (e) the land is rehabilitated, as far as is practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and
  - (f) prospecting or mining operations are closed efficiently and cost effectively.
- Regulation 61: Closure objectives- Closure objectives form part of the draft environmental management programme or environmental management plan, as the case may be, and must
  - (a) identify the key objectives for mine closure to guide the project design, development and management of environmental impacts;
  - (b) provide broad future land use objective(s) for the site; and

- (c) provide proposed closure costs.
- Regulation 62: Contents of closure plan: A closure plan contemplated in section 43(3)(d) of the Act, forms part of the environmental management programme or environmental management plan, as the case may be, and must include -
  - (a) a description of the closure objectives and how these relate to the prospecting or mine operation and its environmental and social setting:
  - (b) a plan contemplated in regulation 2(2), showing the land or area under closure;
  - (c) a summary of the regulatory requirements and conditions for closure negotiated and documented in the environmental management programme or environmental management plan, as the case may be;
  - (d) a summary of the results of the environmental risk report and details of identified residual and latent impacts;
  - (e) a summary of the results of progressive rehabilitation undertaken;
  - (f) a description of the methods to decommission each prospecting or mining component and the mitigation or management strategy proposed to avoid, minimize and manage residual or latent impacts;
  - (g) details of any long-term management and maintenance expected;
  - (h) details of a proposed closure cost and financial provision for monitoring, maintenance and post closure management;
  - (i) a sketch plan drawn on an appropriate scale describing the final and future land use proposal and arrangements for the site;
  - (j) a record of interested and affected persons consulted; and
  - (k) technical appendices, if any.

#### 3.4.1.3. NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

Prior to 8 December 2014, the environmental aspects of mining activities were regulated in terms of the MPRDA. Recent legislative amendments and the drive towards a 'one environmental system' have resulted in the inclusion of the requirement for rehabilitation, decommissioning and closure planning and associated financial provisions into the NEMA. Specific sections of the act are extracted below:

- Section 24P: Financial provision for remediation of environmental damage:
  - (1) An applicant for an environmental authorisation relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.
  - (2) If any holder or any holder of an old order right fails to rehabilitate or to manage any impact on the environment, or is unable to undertake such rehabilitation or to manage such impact,

the Minister responsible for mineral resources may, upon written notice to such holder, use all or part of the financial provision contemplated in subsection (1) to rehabilitate or manage the environmental impact in question.

- (3) Every holder must annually-
  - assess his or her environmental liability in a prescribed manner and must increase his or her financial provision to the satisfaction of the Minister responsible for mineral resources; and
  - b. submit an audit report to the Minister responsible for mineral resources on the adequacy of the financial provision from an independent auditor.
- (4) (a) If the Minister responsible for mineral resources is not satisfied with the assessment and financial provision contemplated in this section, the Minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision. (b) Any cost in respect of such assessment must be borne by the holder in question.
- (5) The requirement to maintain and retain the financial provision contemplated in this section remains in force notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002 to the holder or owner concerned and the Minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.
- (6) The Insolvency Act, 1936 (Act No. 24 of 1936), does not apply to any form of financial provision contemplated in subsection (1) and all amounts arising from that provision.
- (7) The Minister, or an MEC in concurrence with the Minister, may in writing make subsections (1) to (6) with the changes required by the context applicable to any other application in terms of this Act.
- Section 24R: Mine closure on environmental authorisation:
  - (1) Every holder, holder of an old order right and owner of works remain responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and sustainable closure thereof notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002, to the holder or owner concerned.
  - (2) When the Minister responsible for mineral resources issues a closure certificate, he or she must return such portion of the financial provision contemplated in section 24P as the Minister may deem appropriate to the holder concerned, but may retain a portion of such financial provision referred to in subsection (1) for any latent, residual or any other

- environmental impact, including the pumping of polluted or extraneous water, for a prescribed period after issuing a closure certificate.
- (3) Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of a mine as may be prescribed.
- (4) The Minister may, in consultation with the Minister responsible for mineral resources and by notice in the Gazette, identify areas where mines are interconnected or their impacts are integrated to such an extent that the interconnection results in a cumulative impact.
- (5) The Minister may, by notice in the Gazette, publish strategies in order to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.

#### 3.4.1.4. FINANCIAL PROVISIONING REGULATIONS

On 20<sup>th</sup> November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA. The regulations aim to regulate the determine and making of financial provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. These regulations provide for, inter alia:

- Determination of financial provision: An applicant or holder of a right or permit must determine and make financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations, as contemplated in the Act and to the satisfaction of the Minister responsible for mineral resources.
- Scope of the financial provision: Rehabilitation and remediation; decommissioning and closure activities at the end of operations; and remediation and management of latent or residual impacts.
- Regulation 6: Method for determining financial provision An applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:
  - Annual rehabilitation annual rehabilitation plan
  - Final rehabilitation, decommission and closure at end of life of operations rehabilitation, decommissioning and closure plan; and
  - o Remediation of latent and residual impacts environmental risk assessment report.
- Regulation 10: An applicant must-
  - ensure that a determination is made of the financial provision and the plans contemplated in regulation 6 are submitted as part of the information submitted for consideration by the Minister responsible for mineral resources of an application for environmental authorisation, the

associated environmental management programme and the associated right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002; and

- Provide proof of payment or arrangements to provide the financial provision prior to commencing with any prospecting, exploration, mining or production operations.
- Regulation 11: Requires annual review, assessment and adjustment of the financial provision. The review of the adequacy of the financial provision including the proof of payment must be independently audited (annually) and included in the audit of the EMPR as required by the EIA regulations.

#### 3.4.1.5. OTHER GUIDELINES

The following additional guidelines which relate to financial provisioning and closure have been published in the South African context:

- by the DWS and aims to provide a logical and clear process that can be applied by mines and the competent authorities to enable proper mine closure planning that meets the requirements of the relevant authorities. This guideline is aimed primarily at larger scale mines and does not specifically address closure issues related to closure of prospecting activities, however certain principles related to closure and water management are relevant. The following technical factors which should be considered during closure, and which are likely to relate to prospecting activities, have been considered:
  - Land use plan: directly interlinked with water management issues insofar as water is required to support the intended land use- in this regard the surrounding communities and the land uses implemented rely on available ground and surface water to be sustained. Management of water quality and quantity has been identified as an aspect to be covered in this FRDCP.
  - O Public participation and consultation: consultation is fundamental to closure and there is a need for full involvement of stakeholders in the development of the final closure plans, and in the agreement of closure objectives- in this regard this FRDCP has been made available through the Basic Assessment public participation process for comment by relevant stakeholders.
- Guideline for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine: The objectives of the guideline include the need to improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of mining activities. Whilst this guideline predates the recent NEMA Financial Provisioning Regulations, it does contain certain principles and concepts that remain valid and have been considered in this FRDCP.

#### 3.4.2. CLOSURE VISION, OBJECTIVE AND TARGETS

The vision, and consequent objective and targets for rehabilitation, decommissioning and closure, aim to reflect the local environmental and socio-economic context of the project, and to represent both the corporate requirements and the stakeholder expectations.

The receiving environment within which the prospecting activities will be undertaken include the following key land-uses:

🥌 Grazing land; and

#### Vacant land.

With reference to Section 3.1.3, the stakeholders will be consulted during the public participation process for the BAR and their comments relating to closure, decommissioning and rehabilitation will be considered in terms of this document.

With reference to both the environmental context of the project and the feedback from the consultation process the vision for closure is to: Ensure that the post closure land use aligns with the surrounding land-use and does not affect the sustained utilisation of the land.

In practice the post closure land-use will depend on the pre-prospecting land-use applicable to the specific location of the invasive prospecting activities. This FRDCP aim to address the key closure objectives which are likely to remain consistent for the majority of the prospecting activities.

Driven by the closure vision and with due consideration of the project context the following closure objective are presented:

- Set the course for eventual ecosystem restoration, including the restoration of the natural vegetation community, hydrology, and wildlife habitats.
- Prevent future environmental issues related to lateral movement through the borehole.
- Protection of water resources.
- Ensure that land is usable, in alignment with surrounding land uses.

Please refer to Table 8 for the stipulated targets related to these closure objectives.

#### 3.4.3. ALTERNATIVE CLOSURE AND POST CLOSURE OPTIONS

There are various alternative closure and post closure options available. The identification and consideration of the most suitable alternatives are driven by, inter alia the following considerations:

- The ability of the selected alternative to adequately meet the specified closure vision and objectives.
- The efficiency, viability, and practicality of the selected alternative.
- The alignment with the local environmental and socio-economic context and associated opportunities and constrains.

Table 9 presents some available options and alternatives related to the process of abandoning and closure of a prospecting site. This reassessment must be utilised to select the most appropriate and responsible closure option. The options in the table below that are marked with an "X" are considered the preferred options.

**TABLE 9: CLOSURE ALTERNATIVES** 

| Prospecting A<br>Activity  | Aspect   | Options | Comment   |
|----------------------------|----------|---------|---|
| Prospecting P<br>Boreholes | Plugging | Yes     | In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines, all prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and |

| Prospecting<br>Activity | Aspect                    | Options      | Comment  |
|-------------------------|---------------------------|--------------|--|
|                         |                           |              | sealed with cement to prevent possible cross flow and contamination between aquifers.                                      |
|                         |                           | No           | The option of not plugging the borehole, but mealy sealing with cement.  |
|                         | Surface<br>Infrastructure | Complete     | In order to allow unhindered land use of the prospecting area, it is suggested that all surface infrastructure be removed. |
|                         |                           | Retain       | Surface infrastructure would typically remain for possible future use by the landowner or the applicant.                   |
|                         | Access roads              | Rehabilitate | The intention is to rehabilitate the area, including the access route, to the pre-prospecting condition.                   |
|                         |                           | Retain       | In certain instances, the landowner may request the retention of the access route.   |

As mentioned previously the final closure and decommissioning of a prospecting borehole site must be preempted by a site specific assessment and where applicable the implementation of the most appropriate rehabilitation and closure strategy. Furthermore, the annual review of this FRDCP must where applicable include an assessment and adjustment of the closure strategy to reflect the most recent technical development and industry best practice, as well as any lessons learnt from the implementation of closure on this project.

## 3.4.4. MOTIVATION FOR PREFERRED CLOSURE OPTION

With reference to Sections 3.4.2 and 3.4.3, the preferred closure option is as follows:

- In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines, all prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and sealed with cement to prevent possible cross flow and contamination between aquifers.
- In order to allow unhindered land use of the prospecting area, it is suggested that all surface infrastructure be removed.
- Rehabilitate access routes.

It is anticipated that the closure option presented above, together with monitoring over a 2 year post closure period, will achieve the stipulated closure objective. This closure option is in line with industry best practice and the requirements of the MPRDA Regulations.

#### 3.4.5. CLOSURE PERIOD AND POST CLOSURE REQUIREMENTS

The closure period is defined as the period between the cessation of prospecting activities, and the completion of active rehabilitation actions on the applicable site. It is important to note that the nature of prospecting drilling is such that closure may be implemented for individual boreholes as and when the analysis ends.

Following successful completion of the active closure actions it is suggested that a further post closure period be assigned to allow for monitoring of the success of closure. It is anticipated that a period of 2 years be permitted for ongoing post closure monitoring. This post closure monitoring will include the following:

- Inspection of borehole plug integrity; and
- Vegetation composition.

#### 3.4.6. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this FRDCP:

- The following assumptions have been made and used as the basis for the financial provision calculations:
  - Post closure land use to resemble the pre-prospecting land use and vegetative cover.
  - Depth per borehole: ~250m
  - Distance of access track (requiring rehabilitation): ~ 2000 m total.
  - The access roads prepared for the prospecting activities will be rehabilitated during closure.
  - The closure actions and associated period will commence as soon as a borehole is abandoned.
  - It is assumed that the entire length and diameter of the prospecting borehole will be plugged/ cemented.
- It is assumed that the management and mitigation measures suggested in the BAR relating to ongoing environmental management will be complied with. This includes post drilling clean-up and rehabilitation.
- lt is assumed that the drilling, will be carried out in accordance with industry best practice and that permeable zones are adequately isolated (including the usable ground water aquifers).

## 3.5. FINAL POST PROSPECTING LAND USE

As discussed above the final post closure land use will depend on the specific site circumstances. It is proposed that prior to initiating closure that a suitably qualified specialist is appointed to undertake an assessment and consult with the landowner, and prepare a site specific decommissioning plan for submission to DMR for review and approval. For the purposes of this FRDCP it is assumed that the post closure land use will be natural grassland utilised for livestock grazing.

## 3.6. CLOSURE ACTIONS

#### 3.6.1. INTEGRATED REHABILITATION AND CLOSURE PLAN

The main aim in developing this rehabilitation plan is to mitigate the impacts caused by the prospecting activities and to restore land back to a satisfactory standard. It is best practice to develop the rehabilitation plan as early as possible so as to ensure the optimal management of rehabilitation issues that may arise. It is important that

the project's closure plan is defined and understood before starting the process and is complementary to the rehabilitation goals. Rehabilitation and closure objectives need to be tailored to the project at hand and be aligned with the EMPR. The overall rehabilitation objectives for this project are as follows:

- Maintain and minimise impacts to the ecosystem within the study area;
- Re-establishment of the pre-developed land capability to allow for a suitable post-mining land use;
- > Prevent soil, surface water and groundwater contamination;
- Comply with the relevant local and national regulatory requirements; and
- Maintain and monitor the rehabilitated areas.

Successful rehabilitation must be sustainable, and requires an understanding of the basic baseline environment, as well as project management to ensure that the rehabilitation program is a success.

It is noted that an application for environmental authorisation must be submitted for closure in accordance with Activity 22 Listing Notice 1:

The decommissioning of any activity requiring -

- I. a closure certificate in terms of Section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or
- II. A prospecting right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure.

#### 3.6.2. PHASE 1: MAKING SAFE

In line with the DWAF (2008). Best Practice Guideline A6: Water Management for Underground Mines. All prospecting boreholes that will not be required for later monitoring or other useful purposes should be plugged and sealed with cement to prevent possible cross flow and contamination between aquifers. Cement and liquid concrete are hazardous to the natural environment on account of the very high pH of the material, and the chemicals contained therein. As a result, the contractor shall ensure that:

- Concrete shall not be mixed directly on the ground;
- The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste, (Washing of visible signs into the ground is not acceptable); and
- All excess aggregate shall also be removed.

#### 3.6.3. PHASE 2: LANDFORM DESIGN, EROSION CONTROL AND REVEGETATION

Landform, erosion control and re-vegetation is an important part of the rehabilitation process. Landform and land use are closely interrelated, and the landform should be returned as closely as possible to the original landform. Community expectations, compatibility with local land use practices and regional infrastructure, or the need to replace natural ecosystems and faunal habitats all support returning the land as closely as possible to its original appearance and productive capacity. This requires the following:

- Shape, level and de-compact (where necessary) the final landscape after removing all the project infrastructure, dress with topsoil and, where necessary, vegetate with indigenous species. Commission specialists to assist in planning re-vegetation and the management of environmental impact, as required.
- Remove access roads with no beneficial re-use potential by deep ripping, shaping and levelling after the removal and disposal of any culverts, drains, ditches and/or other infrastructure. Natural drainage patterns are to be reinstated as closely as possible.
- Shape all channels and drains to smooth slopes and integrate into the natural drainage pattern.
- Construct contour banks and energy dissipating structures as necessary to protect disturbed areas from erosion prior to stabilisation.
- > Promote re-vegetation through the encouragement of the natural process of secondary succession.
- Natural re-vegetation is dependent on de-compaction of subsoils and adequate replacement of the accumulated reserves of topsoil (for example, over the borehole sites), so as to encourage the establishment of pioneer vegetation.
- Remove alien and/or exotic vegetation.
- Undertake a seeding programme only where necessary, and as agreed with the re-vegetation specialist.

#### 3.6.4. PHASE 3: MONITORING AND MAINTENANCE

The post-operational monitoring and management period following decommissioning of prospecting activities must be implemented by a suitable qualified independent party for a minimum of two (2) year unless otherwise specified by the competent authority.

The monitoring activities during this period will include but not be limited to:

- Biodiversity monitoring; and
- Re-vegetation of disturbed areas where required.

Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed prospecting activities and incorporated into post closure monitoring and management.

#### 3.6.5. POST-CLOSURE MONITORING AND MAINTENANCE

Prior to decommissioning and rehabilitation activities, a monitoring programme shall be developed and submitted to the relevant authority for approval, as a part of the Final Rehabilitation Plan. The programme is to include proposed monitoring during and after the closure of the prospecting borehole sites and related activities. It is recommended that the post-closure monitoring include the following:

- Confirmation that any waste, wastewater or other pollutants that is generated as a result of decommissioning will be managed appropriately, as per the detailed requirements set out in the Final Rehabilitation Plan.
- Confirmation that all de-contaminated sites are free of residual pollution after decommissioning.
- Confirmation that acceptable cover has been achieved in areas where natural vegetation is being reestablished. 'Acceptable cover' means re-establishment of pioneer grass communities over the

disturbed areas at a density similar to surrounding undisturbed areas, non-eroding and free of invasive alien plants.

Confirmation that the prospecting borehole sites are safe and are not resulting in a pollution hazard.

Annual environmental reports will be submitted to the Designated Authority and other relevant Departments for at least one year post-decommissioning. The frequency and duration of this reporting period may be increased to include longer term monitoring, at intervals to be agreed with the Designated Authority.

The monitoring reports shall include a list of any remedial action necessary to ensure that infrastructure that has not been removed remains safe and pollution free and that rehabilitation of project sites are in a stable, weed and free condition.

# 3.7. FINAL REHABILITATION, DECOMMISSIONING AND CLOSURE SCHEDULE

Table 10 presents the forecast Schedule of actions related to the final rehabilitation, decommissioning and closure, in relation to the overall forecast prospecting schedule. It should be noted that this schedule represents a cautious approach and therefore doesn't take into consideration the recommendation that final rehabilitation, decommissioning and closure may be initiated earlier in the prospecting process for individual borehole sites.

TABLE 10: SCHEDULE OF THE PROPOSED ACTIVITIES

| Phase                              | Year 1 | Year 2 | Year 3 | Year 4 | Year5 |
|------------------------------------|--------|--------|--------|--------|-------|
| Phase 1 (0-6months)                |        |        |        |        |       |
| Desktop Study: Literature Survey / | Χ      |        |        |        |       |
| Review / acquisition of data       |        |        |        |        |       |
| Phase 2 (6-12 months)              |        |        |        |        |       |
| Geological field mapping           | ^      |        |        |        |       |
| Phase 3 (12-24 months)             |        |        |        |        |       |
| Regional Ground Geophysical        |        | Χ      |        |        |       |
| Surveys                            |        |        |        |        |       |
| Phase 4 (24-34 months)             |        |        |        |        |       |
| Target Prospecting Boreholes       |        |        |        |        |       |
| Phase 5 (34-36 months)             |        |        |        |        |       |
| Data Compilation ^                 |        |        |        |        |       |
| Phase 6 (36-42 months)             |        |        |        |        |       |
| Detailed Ground Geophysical        |        |        |        | Χ      |       |
| Surveys                            |        |        |        |        |       |
| Phase 7 (42-48 months)             |        |        |        |        |       |
| Widely Spaced Prospecting          |        |        |        | Χ      |       |
| Boreholes                          |        |        |        |        |       |
| Phase 8 (48-60 months)             |        |        |        |        |       |
| Closely Spaced Prospecting         |        |        |        |        | X     |
| Boreholes                          |        |        |        |        |       |

## 3.8. ORGANISATIONAL CAPACITY

Capacity of the following key roles and responsibilities must be provided for:

- The Applicant: The applicant is ultimately responsible for ensuring compliance with all the provisions of the prospecting right and associated plans, as well as other relevant legal requirements. The Applicant must ensure knowledge and understanding of the applicable legislation, guidelines and industry best practices. Where necessary the applicant must appoint suitably qualified specialists, engineers, and other internal and external resources to adequately comply with the applicable commitments and requirements. Relevant commitments made and obligations contained within the legal requirements must be adequately planned and budgeted for. The applicant must also ensure that suitable structures are put in place to effectively communicate with the affected landowners and relevant stakeholders.
- Independent Environmental Assessment Practitioner: This individual will be appointed to ensure compliance with the requirements of the FRDCP and specifically to undertake the following tasks:
  - Undertake the required pre-closure environmental site assessment, risk assessment, and landowner consultations.
  - o Prepare a site specific final closure and decommissioning plan.
  - Undertake the required periodic compliance monitoring and reporting during the closure period.
- Prospecting specialist: This individual must be a suitably qualified professional who must have relevant experience in Prospecting. Key attributes must include experience and qualifications related to the technologies applicable to prospecting site closure, as well as a thorough understanding of internationally accepted closure standards and guidelines. This specialist will be responsible for ensuring that the closure plan is implemented to ensure that the risks to the environment and surrounding communities are prevented or limited.

Further education, training and capacity building is critical to ensure that the prospecting activities align with evolving internally accepted best practice and research. In this regard the Applicant must ensure that regular review of international best practice is undertaken and where applicable implemented throughout the prospecting programme.

## 3.9. IDENTIFICATION OF CLOSURE PLAN GAPS

The key gaps applicable to this closure plan are as follows:

- The geological stratigraphy and nature of the borehole profiles is unknown. The specific geological stratigraphy will be a determining factor in the planning for closure and decommissioning.
- The impact that any existing boreholes may have on the receiving environment is unknown.

The following actions have been proposed to address these gaps:

A detailed drilling log will be prepared and maintained for each of the boreholes to ensure that the specific geological stratigraphy and sub-surface conditions are considering and inform the final site specific closure and decommissioning plan.

A site specific closure and decommissioning plan will be prepared for each invasive activities and will where applicable be informed by a specialist environmental site assessment, and risk assessment, as well as a specialist assessment and plan for borehole plugging and decommissioning.

Furthermore, the financial provisioning regulations requires that the FRDCP be revisited, assessed, and revised on an annual basis. This annual review must aim to ensure that the gaps identified above are addressed, as applicable, and the relevant financial provisioning updated.

## 3.10. RELINQUISHMENT CRITERIA

Relinquishment can be defined as the formal approval by the relevant regulating authority indicating that the completion criteria for the prospecting activity have been met to the satisfaction of the authority. In this regard the relinquishment criteria are driven by the objectives of closure and consequently the indicators applicable to each impact associated with the closure and decommissioning of the prospecting. In this regard reference is made to Table 8 which presents each identified environmental impact, the associated indicators and proposed closure targets. In summary the proposed relinquishment criteria include:

- Biodiversity and soils: The vegetation cover of the affected areas must be consistent with surrounding vegetative cover. There must be ecosystem functionality which is consistent with the surroundings. There must be no faunal mortalities associated with the prospecting.
- Social: There must be no unattended complaints. Where possible written confirmation from the affected landowner must be solicited confirming that outstanding issues have been addressed and closed out.
- Waste: There must be no waste materials remaining on site.

## 3.11. CLOSURE COST - FRDCP

At any time funds must be available for the amount of 10 years of the calculation of the sum of the rehabilitation calculation. The remainder of this section provides details on the proposed closure cost. The assumptions and limitations stated in Section 3.4.6 and Section 3.11.3, also underpin the basis of this closure cost determination.

#### 3.11.1. CLOSURE COST METHODOLOGY

The closure cost has been calculated through the following steps:

- Applicable prospecting activities are listed;
- Applicable closure actions listed for each activity;
- Cost items are listed for each action;
- Cost units and rates determined for each item (where possible on the basis of actual quotations); and
- Total cost is calculated.

#### 3.11.2. CLOSURE COST ESTIMATION

This closure cost is based on 2017 values and will require annual reassessment, revision and escalation. Table 11 provides a summary of the closure cost estimation. Please refer to Appendix A for the detailed breakdown of the anticipated closure cost for 30 boreholes.

**TABLE 11: CLOSURE COST ESTIMATION** 

| Item  | Sum of Cost (Excl VAT) |            |  |  |
|---|------------------------|------------|--|--|
| Phase 1: Preparation for closure                    |                        |            |  |  |
| Environmental Site Inspection and assessment        | R                      | 2 640,00   |  |  |
| Phase 2: Closure and rehabilitation                 |                        |            |  |  |
| Access road rehabilitation                          | R                      | 180 000,00 |  |  |
| Borehole plugging                                   | R                      | 81 600,00  |  |  |
| Borehole Surface Rehabilitation                     | R                      | 134 100,00 |  |  |
| Phase 3: Monitoring, Maintenance and Relinquishment |                        |            |  |  |
| Vegetation monitoring                               | R                      | 50 313,00  |  |  |
| Grand Total   | R                      | 448 653,00 |  |  |

#### 3.11.3. CLOSURE COST ASSUMPTIONS AND LIMITATIONS

In accordance with the prospecting works programme the following activities are included, and their associated cost assumptions:

- The following assumptions have been made and used as the basis for the financial provision calculations:
  - o Post closure land use to resemble the pre-prospecting land use and vegetative cover.
  - o The average depth of hole will depend on sand cover. Average depth of boreholes: ~250m.
  - o Distance of access track (requiring rehabilitation): 2000 m.
  - The access roads prepared for the prospecting activities will be rehabilitated during closure.
  - o The closure actions and associated period will commence as soon as a borehole is abandoned.
  - It is assumed that the entire length and diameter of the prospecting borehole will be plugged/ cemented in the event that ground water intersects the borehole.

## 3.12. MONITORING, AUDITING AND REPORTING

The requirement to monitor and audit should be carried through all phases of the proposed prospecting. In this regard the following monitoring and auditing requirements for the pre-closure phases have been specified in the BAR and EMPR (please refer to the BAR and EMPR for further detail):

- Compliance monitoring and auditing:
  - In accordance with Regulation 26 of the NEMA EIA regulations the competent authority will indicate the extent and frequency of required environmental audits in any consequent environmental authorisations. For the purposes of this submission the following is proposed:
    - The Site Manager (normally the Project Geologist) will be responsible for daily monitoring, culminating in weekly reports which will be filed in support of an overall monthly report, which is to be submitted to the BMM Environmental Officer. Compliance with the BAR & EMPR will be audited quarterly by the BMM Environmental Officer. The officer will be responsible for quarterly site inspections and reports, culminating in the compilation of the annual performance assessment report which is to be submitted to the DMR, as per legal requirement. The results of these inspections will be documented and kept on record for the life of the prospecting operation. External

audits in the form of EMP performance assessments will be conducted every two years by an independent consultant and submitted to the DMR.

- Environmental Monitoring (as detailed in the BAR and EMPR):
  - o Waste Management; and
  - o Progressive rehabilitation.
- Review and update of Final Rehabilitation, Decommissioning and Closure Plan:
  - In accordance with Regulation 11 of the NEMA Financial Provisioning Regulations the Applicant must ensure annual review of the annual rehabilitation plan, the final rehabilitation decommissioning and closure plan, as well as the environmental risk assessment. This annual review must be audited by an independent auditor.

It is critical to continue monitoring through to the post- closure phase of the prospecting. The aim of this being to ensure that the objectives of the rehabilitation and closure plan are met. In this regard the following actions, to be adjusted based on the completion of the pre-closure site assessment, are proposed:

- Compliance monitoring and auditing: Annual (or as agreed) environmental reports will be submitted to the competent authority and other relevant stakeholders for at least 2 years post-decommissioning. The monitoring reports shall include a list of any remedial action necessary to ensure that infrastructure that has not been removed remains safe and pollution free and that rehabilitation of project sites are in a stable, weed free condition.
- Environmental Monitoring:
  - Flora: Biodiversity assessments mid wet season should be undertaken by the ECO to monitor the rehabilitation progress with regards to flora. Confirmation that acceptable cover has been achieved in areas where natural vegetation is being re-established. 'Acceptable cover' means re-establishment of pioneer grass communities over the disturbed areas at a density similar to surrounding undisturbed areas, non-eroding and free of invasive alien plants.

## 4. ANNUAL REHABILITATION PLAN

The annual rehabilitation plan aims to:

- a) review concurrent rehabilitation and remediation activities already implemented;
- b) establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- c) establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- d) identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- e) evaluate and update the cost of rehabilitation for the 12 month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

The proposed prospecting schedule (see Figure 4) indicates that no invasive work will be commenced within the first 12 months. Activities during the first year include desktop studies and database development. As such, no rehabilitation or remediation will be planned for during this period and consequently no financial provision can be costed for at present.

Within the third, fourth and fifth years of the proposed prospecting works, core drilling is planned. The nature of drilling is such that closure may be implemented for individual sites as and when the analysis is complete, or alternatively at the end of the prospecting programme. Please see Section 3.4.5 for more details. It is therefore anticipated that the annual review of the annual rehabilitation plan, as required under Section 11 of the NEMA GNR 1147, will consider the more detailed works programme at that time and provide for, schedule and budget for rehabilitation for the forthcoming 12 month period.

# 5. ENVIRONMENTAL RISK ASSESSMENT – LATENT AND RESIDUAL ENVIRONMENTAL IMPACTS

According to the Financial Provisioning Regulations (2015) the objective of the environmental risk assessment report that relates to latent and residual impacts is to:

- a) ensure timeous risk reduction through appropriate interventions;
- b) identify and quantify the potential latent environmental risks related to post closure;
- c) detail the approach to managing the risks;
- d) quantify the potential liabilities associated with the management of the risks; and
- e) outline monitoring, auditing and reporting requirements.

This section of the report aims to address these objectives separately in cases where they have not been considered in previous sections.

## 5.1. THE ASSESSMENT PROCESS USED AND DESCRIPTION OF LATENT ENVIRONMENTAL RISK

Section 7 of the BAR provides a detailed description of the environmental impact/risk identification and assessment (including the methodology and findings) undertaken for the proposed prospecting. Further details of the risk assessment methodology are detailed in the Environmental Risk Assessment under Section 3.2 of this report. As mentioned under Section 3.2, the BAR and EMPr have identified mitigation measures which, once implemented successfully, will result in the avoidance or acceptable reduction of the associated impact.

The drivers that could result in the manifestation of the latent risk are largely defined by the specifics of the site location and the geological profile surrounding each specific site. It is suggested that further investigations are conducted during annual revisions, as well as during the proposed site specific environmental assessment detailed in Section 3.9 of this document to provide more clarity on this specific issue. These investigations must include regular revision of the environmental risk assessment and consequently inform the responsible management of latent and residual impacts.

# 5.2. MANAGEMENT ACTIVITIES, COSTING AND MONITORING REQUIREMENTS

New international best practice guidelines that may be developed in the future (Section 3.4.3), will be considered in all annual updates of the financial provisions and changes to the risk assessment will be reported on. In addition, monitoring results and auditing reports, as described under Section 3.6.3, for two years after closure will inform the revised risk assessment further.

## APPENDIX A: DETAILED CLOSURE COST ESTIMATION

## **Cost Estimate**



| 1 Phase 1: Preparation for closure Environmental Site Inspection and assessment Work Officier Material Mileage km 480 R 5,50 R 2  2 Phase 2: Closure and rehabilitation Borehole plugging Material Steries Phase 2: Closure and rehabilitation Borehole plugging Material Equipment & Crew Mobilisation Plugging and grouting the borehole borehole bedrock, no groundwater expected bedrock, no groundwater | Item #          | Activity                            | Item                            | Type     | Cost Item                     | Comments  | Number       | Unit Price | Cost (Excl VAT) |
|--|-----------------|-------------------------------------|---------------------------------|----------|-------------------------------|---|--------------|------------|-----------------|
| Phase 2: Closure and rehabilitation  Borehole plugging  Material  Borehole plugging  Material  Borehole Surface Rehabilitation  Material  Materi | 1               |                                     |                                 | 1        | BMM Senior Environmental      |   |              |            | R 0,00          |
| Plugging and grouting the borrhole of the property of the prop |                 |                                     |                                 | Material | Mileage                       | km  | 480          | R 5,50     | R 2 640,00      |
| Material Equipment & Crew Demobilisation  Material Waste bin transport Bin placement and collection 2 R 450,00 R 2 Material Waste bin transport Bin placement and collection 2 R 450,00 R 30 R 450,00  | 2               | Phase 2: Closure and rehabilitation |                                 |          | Plugging and grouting the     | RC/RAB boreholes only 10m into                          | 12           | R 6 800,00 | R 81 600,00     |
| Material Demobilisation   12 R 357,00 R 42   |                 |                                     | Borehole Surface Rehabilitation | Material | Equipment & Crew Mobilisation |   | 12           | R 6 400,00 | R 76 800,00     |
| Material Waste bin rental per day 30 R 450,00 R 13  Material Waste bin rental per day 30 R 450,00 R 13  Material Waste disposal (per ton) Disposal at BMM Licenced waste disposal facility 1 R 0,00  Access road rehabilitation Material Equipment- Earth moving BMM equipment utilised for rehabilitation work  3 Phase 3: Monitoring, Maintenance and Relinquishment Vegetation monitoring Work Specialist: Ecology Specialist: Ecology Specialist: Ecology Disposal at BMM Licenced waste disposal facility 1 R 0,00  R 180  SACNASP registered ecologist/ botanist. Survey undertaken once per annum , Kathu based practitioner  Material Mileage 2 Return trips to site. 966 R 5,50 R 5  Professional Fees  Expenses  T 448  TOTAL COST (EXCL VAT)  |                 |                                     |                                 | Material |                               |   | 12           | R 3 575,00 | R 42 900,00     |
| Material Waste disposal (per ton) Disposal at BMM Licenced waste disposal facility 1 R 0,00  Access road rehabilitation Material Equipment- Earth moving BMM equipment utilised for rehabilitation work 20 R 9 000,00 R 180  3 Phase 3: Monitoring, Maintenance and Relinquishment Vegetation monitoring Work Specialist: Ecology SACNASP registered ecologist/ botanist. Survey undertaken once per annum, Kathu based practitioner  Material Mileage 2 Return trips to site. 966 R 5,50 R 5  Professional Fees  Expenses  TOTAL COST (EXCL VAT)  |                 |                                     |                                 | Material | Waste bin transport           | Bin placement and collection                            | 2            | R 450,00   | R 900,00        |
| Material   Waste disposal (per ton)   disposal facility   1  |                 |                                     |                                 | Material | Waste bin rental              | per day   | 30           | R 450,00   | R 13 500,00     |
| Phase 3: Monitoring, Maintenance and Relinquishment  Vegetation monitoring  Material  Work  Specialist: Ecology  Material  Mileage  Professional Fees  Expenses  TOTAL COST (EXCL VAT)  R 9 000,00  R 750,00   |                 |                                     |                                 | Material | Waste disposal (per ton)      | 1 .   | 1            | R 0,00     | R 0,00          |
| 3 Phase 3: Monitoring, Maintenance and Relinquishment Vegetation monitoring Work Specialist: Ecology botanist. Survey undertaken once per annum, Kathu based practitioner  Material Mileage 2 Return trips to site. 966 R 5,50 R 5  Professional Fees Expenses TOTAL COST (EXCL VAT)   |                 |                                     | Access road rehabilitation      | Material | Equipment- Earth moving       |   | 20           | R 9 000,00 | R 180 000,00    |
| Professional Fees  | 3               |                                     | Vegetation monitoring           | Work     | Specialist: Ecology           | botanist. Survey undertaken once per annum, Kathu based | 60           | R 750,00   | R 45 000,00     |
| Expenses         R 403           TOTAL COST (EXCL VAT)         R 448   |                 |                                     |                                 | Material | Mileage                       | 2 Return trips to site.                                 | 966          | R 5,50     | R 5 313,00      |
| Expenses R 403 TOTAL COST (EXCL VAT) R 448   | Professiona     | Professional Fees                   |                                 |          | -                             | •   |              |            | R 45 000,00     |
| TOTAL COST (EXCL VAT)  | Expenses        |                                     |                                 |          |                               |   | R 403 653,00 |            |                 |
|  | <b>TOTAL CO</b> | ST (EXCL VAT)                       |                                 |          |                               |   |              |            | R 448 653,00    |
| TOTAL COST + 10% CONTINGENCY (EXCL VAT)  |                 | R 493 518,30                        |                                 |          |                               |   |              |            |                 |