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Lodestone Namibia (Pty) Ltd:

Small Scale Magnetite Mining, Dordabis

REPORT FOR
RENEWAL OF ENVIRONMENTAL CLEARANCE ON:
MINING LICENCE 182, Phase 1

Final

C072 December 2019

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Disclaimer

This Environmental Report was written for
the iron ore mining project undertaken by
Lodestone Namibia (Pty) Ltd.

It was compiled by Colin Christian, Environmental Scientist
as environmental consultant to Lodestone Namibia (Pty) Ltd.
Colin Christian and Lodestone Namibia (Pty) Ltd take no responsibility for the
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ABBREVIATIONS

CCA	Colin Christian & Associates CC (Environmental Consultants)
CCES	Colin Christian, Environmental Scientist (Environmental Consultant)
DFS	Definitive (or Bankable) Feasibility Study
EC	Environmental Clearance (issued by the Environmental Commissioner)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPL	Exclusive Exploration Licence
I&APs	Interested and Affected Parties
MET	Ministry of Environment & Tourism
ML	Mining Licence
MME	Ministry of Mines & Energy
PID	Public Information Document
SLR	SLR Consulting Namibia (Pty) Ltd (Responsible for the groundwater and surface water assessments)

Lodestone Namibia (Pty) Ltd:
Small Scale Magnetite Mining

REPORT FOR
RENEWAL OF ENVIRONMENTAL CLEARANCE ON:
MINING LICENCE 182, Phase 1

EXECUTIVE SUMMARY

Background and Purpose of this Report

Lodestone Namibia (Pty) Ltd is the holder of Mining Licence No. 182 since November 2014. Lodestone received an Environmental Clearance for a greater mining proposal in July 2014.

Lodestone is also the holder of EPL 7352, but a separate EIA and EMP (CCES, Oct.2019) has already been submitted to MET for ongoing exploration.

This current report is for the small scale mining of magnetite, and accompanies an application for an Environmental Clearance for this interim activity.

To date Lodestone has conducted only small scale mining of magnetite on a portion of the southern ore outcrop within the ML 182 area. Mining began in July 2015 and ended in March 2016, while extraction of magnetite from stockpiled material continued intermittently as required. Separation by means of a dry magnetic process avoided the need for crushing, milling, and wet-processing plant.

The very limited extent and small volumes of mining, and the nature of mining and processing activities have all had far less environmental impact to date than was envisaged in the EIA by Colin Christian & Associates CC (CCA, 2013). Please refer to Section 2.2.2 and Table 2 (p.9) of the present report for a comparison of the original proposals versus actual activities to date.

Lodestone now proposes to resume this small scale mining and extraction of magnetite as soon as an Environmental Clearance can be renewed. This interim activity is proposed to continue until the new feasibility study and funding for the full scale project has been secured.

Factors that have delayed the full scale implementation of the original project proposals (outlined in that EIA (CCA 2013) have been the low price of iron ore on world markets, and the smaller mining licence area that was issued by MME. The latter has necessitated re-planning of the mine that will lead to a full update of the EIA after the detailed proposals and mine plan become available in 2020.

Because the mine has not yet been fully developed, none of the off-site infrastructure has yet been developed. A water supply pipeline, powerline, upgrades of road intersections and matters related to the Hoffnung rail siding are all in the planning process at present. Once the proposals are developed these will be subjected to environmental assessments, where necessary.

Project Impacts on the Environment: Past and Expected from the Small Scale Operation

Baseline information is available in the EIA (CCA 2013) on the condition of the environment prior to the commencement of mining. That EIA included specialist studies most of which are still relevant – for example vegetation, fauna and birds, archaeology, and groundwater. The specialist study on Fauna and Birds was recently updated (Irish, 2019) to reflect changes in the IUCN conservation status of certain species. This had no material influence on the current environmental recommendations as the level of impacts on faunal populations are considered to be very low.

A site inspection was carried out in May 2018 to determine the impacts of the mining activities to date, and the following conclusions were drawn in that regard: -

- The extent and tonnages mined and processed to date have been a small fraction of those originally proposed;
- The operation has been very compact, limited to a small area of the "southern ore deposit";
- No blasting was required as only the overburden was mined from shallow pits;
- No crushing was necessary and no processing plant was constructed;
- No water was used for processing, it was a dry magnetic separation process;
- No significant impacts on groundwater levels or quality have been reported and none are considered likely to have occurred;
- No wet tailings were established. Only some stockpiles of materials remain to be crushed later when the full project is developed;
- The vegetation that was removed was mostly common or even "encroacher species" of thorn bush. Care was taken to conserve 'special' species such as Shepherds trees;
- Two years after excavation grass had covered much of the excavations and stockpile areas;
- Impacts of dust were considered to be insignificant and no complaints were reported;
- Some alien invasive plant species existed before mining and a new one was introduced to the vegetable garden in the site camp. Recommendations for eradication were made to Lodestone in May 2018 and in this report. Ongoing monitoring by Lodestone and repeated eradication is essential;
- Visual impacts from the C23 tar road have arisen from excavations and stockpiles close to that road. These impacts can be remediated;
- Overall the environmental impacts have been at a reasonably low level. A photographic record has been made and examples provided to illustrate this Report.

Recommendations for Mitigation of Environmental Impacts, & EMP

Recommendations have been made throughout this report for the management of environmental impacts, when the small scale mining of magnetite is resumed. An Environmental Management Plan was added as Section 8, which should be included in contracts with the mining contractor(s).

Assuming that the full scale mining project proceeds, the area affected to date will become a deep mine pit in time. Thus the impacts on the same area will be far more extensive and more intensive. However, in the unlikely event of the full scale mine not being developed within a few years, then recommendations have been made for rehabilitation of the existing pits and stockpiles etc.

Recommendations for environmental compliance monitoring have also been made.

Public Consultations on this Project

Although no public participation is required for renewal of an Environmental Clearance (S.Angula, MET, pers comm) Lodestone agreed to the distribution of a Public Information Document to update the registered Interested & Affected Parties about the proposed resumption of this activity. No responses were received, and no complaints about the project operations have been reported.

Legal & Policy Update

An update of the Legal and Policy Register by Envirolex (2012) was carried out by Envirolex (2018) and is presented in Appendix G. Readers are referred to the full text there.

Recommendations for an Environmental Clearance

It is recommended that an Environmental Clearance (EC) can be issued for the resumption of small scale magnetite mining within ML 182 as an interim measure. The product is needed by industry in Namibia.

The EC should be subject to compliance with the recommendations for environmental management in this EIA and EMP. In the unlikely event that mining does not proceed to the full scale development the recommendations for rehabilitation should also be a condition of the EC.

The EC should also be subject to a revision and update of the EIA & EMP (CCA, 2013) in response to the new Mine Plan and Project Proposals once they become available (scheduled for early 2020). The updates need to include some specialist studies where there is reason to believe that the assessed impacts may have changed due to changes in proposals or the location of activities - such as the processing plant and co-disposal of tailings with waste rock.

The recommended EC will not be applicable to any off-site infrastructure as those activities will be the subject of separate applications in due course (see section 3.3.2).

****

1 INTRODUCTION

1.1 Project Proponent & Holder of Mining Licence - ML182

Lodestone Namibia (Pty) Ltd is the holder of Mining Licence - ML182 - for the mining of iron ore. The Ministry of Mines and Energy (**MME**) granted this Mining Licence in November 2014.

Lodestone Namibia is also the holder of Exclusive Prospecting Licence – EPL 7352. However, exploration on that EPL has been dealt with under a separate EIA (CCES, October 2019).

Lodestone's company registration, directors, operations officer, and contact details are provided in the title page of this report.

To date Lodestone has conducted only small scale mining of magnetite, as will be explained in Section 1.3 and Section 2.2.2 below. They intend to resume this interim activity as soon an Environmental Clearance can be obtained from MET.

1.2 The Environmental Consultants

Colin Christian, Environmental Scientist, was appointed by Lodestone to undertake the necessary environmental consulting services to enable them to apply for Renewal of the Environmental Clearance. Sub-consultants include P.Watson (updated report on legislation), M.Fidler (communications and secretarial assistance) and K.Dierkes (mapping).

Colin Christian & Associates CC (**CCA**) undertook the original Environmental Impact Assessment (**EIA**) & Environmental Management Plan (**EMP**) for mining, together with several specialist sub-consultants (CCA, 2013 – Volume 1: Report and Volume 2: Appendices – including specialist studies). That report was submitted to the Ministry of Environment & Tourism (**MET**). The Namibian company, CCA, has been closed but Colin Christian as professional Environmental Scientist is still available to serve clients in Namibia, from South Africa.

Colin Christian's CV is presented in **Appendix A**.

1.3 Background to this Study

The low price of iron ore on the world market has not enabled Lodestone to implement the full project proposals that were outlined in the EIA (CCA, 2013). Instead, Lodestone has conducted only small scale mining of magnetite for supply to local industry.

A further challenge emerged because the Mining Licence area was smaller than was originally applied for by Lodestone. This necessitated changes to the Mine Plan and Project Proposals, which will only become available early in 2020. Those changes will necessitate a full update of the EIA (CCA, 2013). However, Lodestone needs to apply now for Renewal of their Environmental Clearance – in order to resume the small scale mining of magnetite as an interim activity.

A discrepancy also arose between the co-ordinates in the Mining Licence and a survey by Strydom & Associates Land Surveyors. The final boundaries of the ML 182 are still to be resolved. However, it is understood that the co-ordinates used in Table 1 below have been approved by MET and, for now, mining and processing activities will be restricted within these boundaries. Any adjustments to accommodate the updated mining project proposal and mine layout are expected to be finalised early in 2020.

The original Environmental Clearance (**EC**) was issued by the Environmental Commissioner in July 2014. This is presented in **Appendix B**.

Although mining had not been in progress after its expiry the Environmental Clearance needed to be renewed. In April 2018 Mr. C. Mosch asked Mr. C. Christian to undertake the necessary environmental consulting services. A site inspection was conducted in May 2018, a Public Information Document was issued with Lodestone's prior approval, and a Draft Report for Renewal of the EC was compiled and submitted to the client for comment.

It then became known to Mr Christian that the ML area was smaller than originally proposed by Lodestone, a fact that had not been communicated to me earlier. This necessitated changes to the Mine Plan, which in turn necessitated changes to the terms of reference for this environmental report.

1.4 Terms of Reference: Renewal of Environmental Clearance

The requirements of MET for the Renewal of an Environmental Clearance had been established by a telephonic conversations with Ms Saima Angula in 2018. She explained that public participation was not required for renewal of an EC, but an Environmental Report should be compiled that included information on the impacts of the project to date.

The new Terms of Reference were discussed via emails and a telephone conversation with Mr Daniel Castelyn and set out in a Proposal by Colin Christian, Environmental Scientist in October. The Scope of Work would include: -

A Public Information Document - sent to registered I&APs providing an update on activities and explaining the scaled down project to date, and updated maps showing the smaller ML area.

A site inspection had been carried out in May 2018 and since no mining had taken place since then the information was still sufficiently up to date - to provide an account on the condition of the environment which had been affected by Lodestone's activities. A photographic record of the site had been compiled in May 2018 with waypoints.

The relevant specialists would be contacted who had provided reports for the EIA (CCA, 2013) – in order to confirm that they were happy that their reports were still applicable to the current project activities. Of relevance in this regard were vegetation, fauna, archaeology, and groundwater.

The Legal and Policy Register had been updated in 2018, and this report would be included.

A "Renewal of EC" Report would be compiled and submitted to the Environmental Commissioner with an Application for Renewal of the Environmental Clearance.

An Environmental Management Plan would be included in the report that was adapted to the small scale activities which Lodestone proposes to resume, including closure and rehabilitation

in the event unlikely event of the project not proceeding to the full scale development that was proposed in 2013.

This Report should be read in conjunction with the original EIA & EMP (CCA, 2013).

1.5 Project Location

ML 182 is situated adjacent to the tar road C23 to Dordabis. It is shown by the solid red outline in **Figures 1 & 2**. The ML area includes parts of two farms - Tsatsachas 87 and Elisenhöhe 88. It is entirely west of the Schaf River.

The ML 182 is considerably smaller than the mining licence area that Lodestone originally applied for. The extent of ML 182 is now approximately 1306.95 hectares. By comparison, the originally proposed bounadries shown in the EIA (CCA, 2013) extended further to the west and the south (see dotted red outline in **Figure 2**) and enclosed approximately 4248 hectares. That dotted red boundary line no longer exists.

This current Report deals only with ML 182. **Table 1** provides the updated co-ordinates.

Table 1: **Co-ordinates of ML 182**

Licence Points	Latitude (deg, min, sec)	Longitude (deg, min, sec)
1	S 22 º 48 ' 39.47 "	E 17 º 29 ' 19.54 "
2	S 22 º 49 ' 08.58 "	E 17 º 31 ' 26.14 "
3	S 22 º 50 ' 11.26 "	E 17 º 32 ' 34.11 "
4	S 22 º 51 ' 13.16 "	E 17 º 32 ' 41.79 "
5	S 22 º 50 ' 38.46 "	E 17 º 31 ' 24.53 "
6	S 22 º 50 ' 30.32 "	E 17 º 31 ' 06.65 "
7	S 22 º 50 ' 19.18 "	E 17 º 30 ' 49.38 "
8	S 22 º 49 ' 46.44 "	E 17 º 30 ' 03.57 "
9	S 22 º 49 ' 39.13 "	E 17 º 29 ' 53.99 "
10	S 22 º 49 ' 30.70 "	E 17 º 29 ' 45.75 "

The exploration licence area EPL 7352 (yellow outline) is a much bigger area - shown here just for reference. EPL 7352 superceded the original EPL 3112 that was referred to in the EIA. However, following the advice of Ms Saima Angula at MET, exploration activities on EPL 7352 have been dealt with in a separate EIA report (CCES, Oct 2019).

To date mining has been limited to part of the Southern Ore Body - a small outcrop close to the tar road. **Figure 3** is a Google Earth image of the site that has been affected by mining and its surroundings. Note that the disturbance visible there included bush clearing for drilling exploration as well as mining. No exploration or mining excavation has been done since the google Earth image (2018) so it fairly represents the current state of the environment.

The mine excavations with adjacent stockpiles of ore, cover an area estimated at 400m x 200m. A smaller loading bay has been used near the entrance from the tar road. The site camp further north is approximately 170m x 130m.

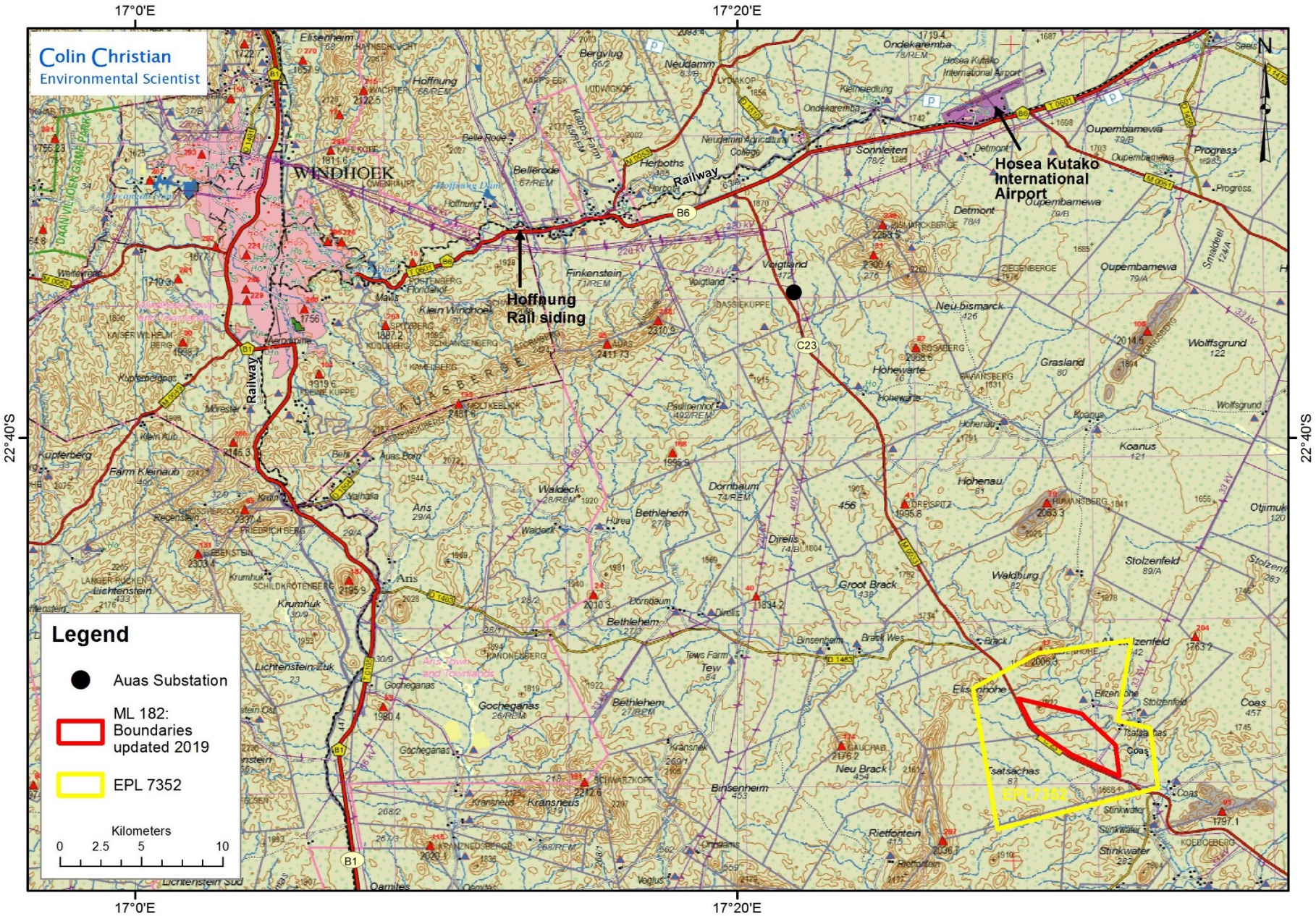


Figure 1: Location of Mining Licence 182 – in red (EPL 7352 is also shown just for reference – in yellow)

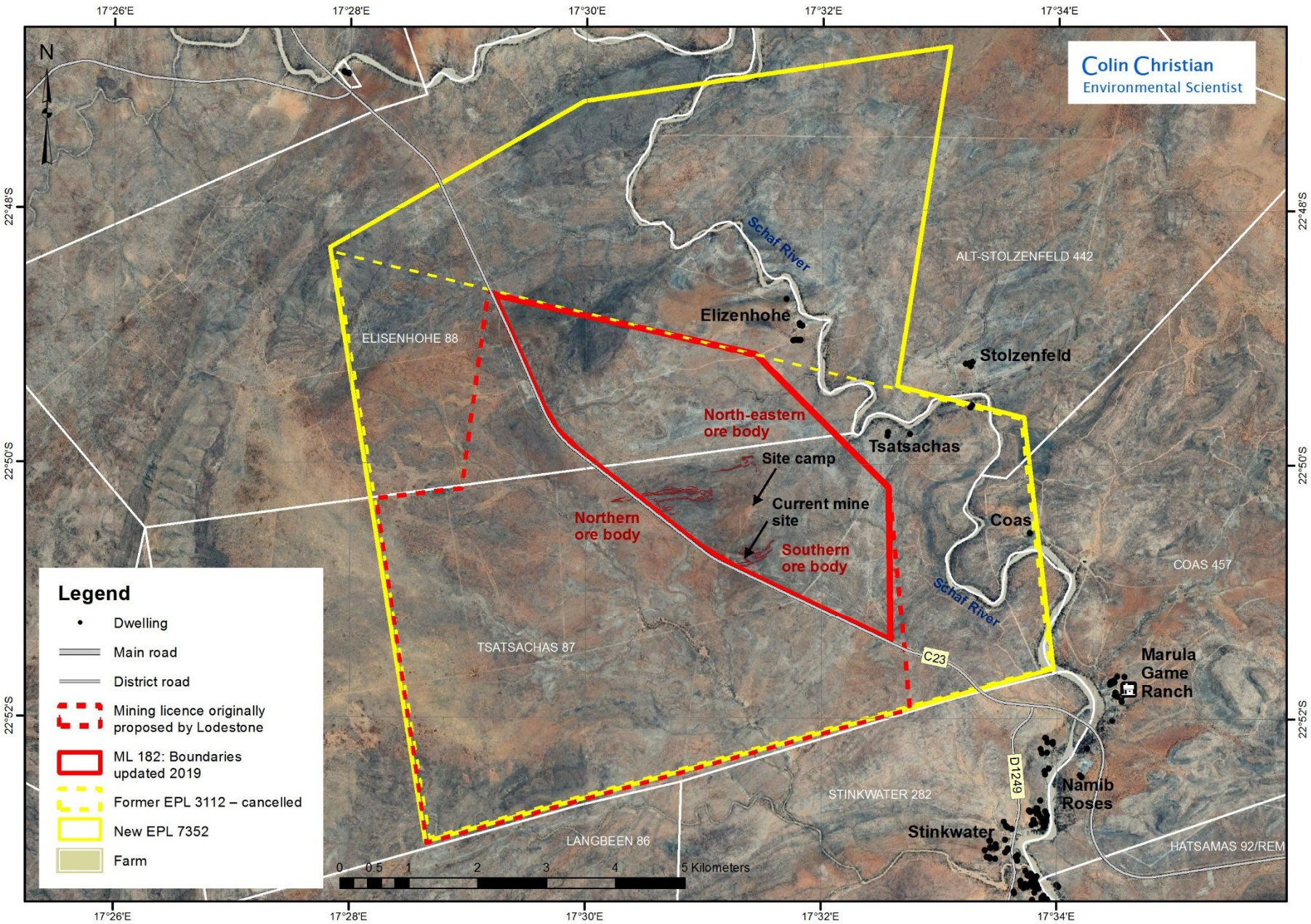


Figure 2: Orthophoto Map of ML 182 (and EPL 7352)

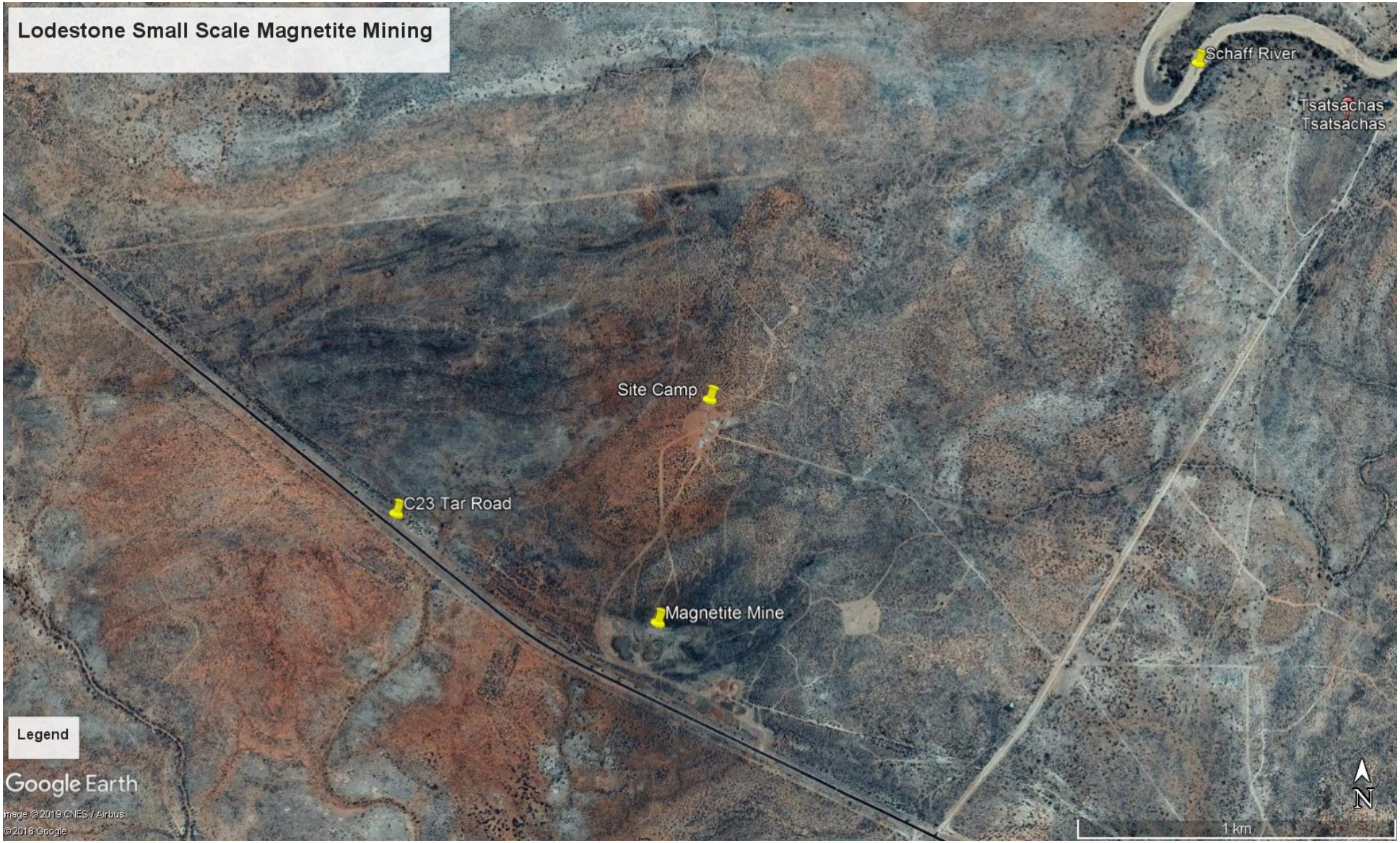


Figure 3: Google Earth Image of Mining & Exploration Area Affected to Date

1.6 Approach and Methodologies

Since this report is for Renewal of an Environmental Clearance and not a new EIA the approach and methologies have been determined as follows.

- A brief comparison will be made in this report between the activities originally proposed versus those that were actually implemented.

- A site inspection was carried out in May 2018 to determine the actual impacts of mining activities to date and recommend mitigation where necessary.

- Discussions were held with four of the Specialists who contributed to the EIA (CCA, 2013) regarding the applicability of their reports to the small scale mining operation – vegetation, fauna, archaeology, and groundwater.

- A discussion is included on the expected impacts of the resumption of small scale magnetite mining – as a short term interim activity.

- An EMP for interim mining is included, to manage the impacts of operations and guide rehabilitation if that becomes necessary.

2 PROJECT PROPOSAL VERSUS ACTUAL ACTIVITIES TO DATE

2.1 Need and Desirability of Small Scale Magnetite Mining

As mentioned earlier, the low price of iron ore has delayed the full implementation of the mine, processing plant, tailings and other on site activities. In order to generate some revenue Lodestone has been able to supply magnetite to a cement plant in Namibia, which requires this in their manufacturing process.

2.2 Proposal (2013) for Mining & Processing versus Actual Activities (2014 to date)

The following two subsections set out a brief comparison of the original proposals versus the greatly reduced scope of the project to date.

2.2.1 Original Proposals in Brief

The EIA (CCA, 2013, section 2) provided a detailed project proposal for the full development of the mine site, processing plant, tailings disposal facility and related activities for Phase 1 mining. However, for the reasons mentioned earlier, especially the low price of iron ore on the global market, it has not been possible to implement those proposals so far.

Originally it was proposed to mine the hill on the “Southern Ore Body” (See Figure 2) resulting in a deep pit in the bedrock north of the tar road. This would require blasting.

The full development would also require reconstruction of a short section of the C23 tar road, on a new alignment, to allow mining where the existing road traverses the ore deposit.

The ore was to be crushed next to the open cast mine, then conveyed to a milling plant south of the tar road. Water would then be added before passing the slurry through a mechanical separation process. This would involve a gravity separation process, including spirals, to produce an iron rich concentrate – an entirely mechanical (not chemical) process.

Some of the water was to be recovered in a tailings thickening plant. The tailings (mainly silica) were to be conveyed to a tailings disposal site south of the tar road.

Mine buildings and other on-site infrastructure were proposed.

None of the above proposals has been implemented to date.

2.2.2 Actual Activities & Proposed Resumption of these Interim Activities

As an interim operation, Lodestone had to reduce the scale and scope of the project drastically, producing only small volumes of high grade magnetite.

It will be apparent that the actual activities have been far less extensive, and far less intense and the environmental impacts have been less significant than those predicted in 2013.

All the actual mining activities have taken place north of the tar road and very close to the excavations on the “Southern Ore Body”.

Excavation has so far been limited to weathered overburden that could be removed by an excavator. The depth of excavation was generally less than 3 metres. No blasting was necessary. No crusher or milling plant was built. The excavated material was simply screened. Rock fragments that did not pass through the screen reported to a stockpile awaiting full project implementation (crushing etc) - in due course.

Removal of the magnetite was achieved by means of a simple magnetic separator – in a dry process. The product was stockpiled near the site entrance, then loaded with a front end loader onto road trucks for transport to the client in Namibia.

Water for domestic use only was supplied from a borehole near the temporary site camp. Consumption was estimated at 1 – 2 cubic metres per day.

To date the project has only employed 9 full time staff, mainly in security and caretaking roles.

Lodestone reported that this small scale mining and separation began in July 2015. Mining ceased in March 2016 when stockpiles of ore were sufficient to meet current orders. Separation of magnetite continued until March 2017 and then stopped. Loading and transport of the product continued until May 2018. Separation, from screenings, was resumed in August 2019.

As an indication of the very small magnitude of actual operations compared with the original proposals, **Table 2** provides a comparison of the volumes and activities to date.

Table 2: **Comparison of Tonnages & Activities: Proposed versus Actual to Date**	
Activities Originally Proposed (EIA, 2013)	**Interim Activities Actually Implemented since 2014 (intermittently) & Proposed to be Resumed**
Proposed mining rate was **1 million tonnes** in the first year, increasing to a maximum **6.5 million tonnes per annum** in the third year.	Excavating of loose overburden amounted to approximately **100,000 tonnes** to date since 2014.
Crusher installation, and proposed crushing of ore **3.4 million tonnes** per annum	Crusher not required or installed. Only screening to size the material.
Waste rock produced at **3.1 million tonnes per annum** disposed in a waste rock dump	Small stockpiles of waste rock resulted from screening estimated at **25,000 tonnes to date**.
Peak production of iron concentrate at **1.2 million tonnes per annum** – both magnetite and haematite	Total production of magnetite **17,000 tonnes of magnetite** produced since 2014.
Tailings disposal **2.8 million tonnes per annum** at a tsf south of the tar road.	No tailings facility – only small stockpiles of overburden after removal of magnetite but probably still containing haematite.

Lodestone intends to resume this small scale mining of magnetite in the same way - as soon as an Environmental Clearance is obtained from MET. This is proposed to continue until the DFS and funding for the final full scale project has been secured.

2.2.3 Future Planning

Lodestone is currently replanning the mine layout, processing plant, and tailings etc., to be developed north of the tar road, instead of south of it. Thus it will be more compact and fit within the smaller mining licence boundaries. Further details of the amended proposals for the full development will become available after January 2020. In response to the revised proposals, the EIA (2013) will be updated.

2.3 No Off-Site Infrastructure

The EIA (CCA, 2013) and the Environmental Clearance covered only the activities at the mine site.

None of the proposed off-site infrastructure has been developed thus far.

Refer to Section 3.3.2 below, regarding future assessment of a pipeline, powerline, road and rail proposals, which will be essential to support the full scale development of the project.

3 PROJECT IMPACTS ON THE ENVIRONMENT: PAST, CURRENT & PROPOSED

3.1 Condition of the Project Environments before 2014 – before Mining

The **EIA (CCA, 2013) Volumes 1 Report** provided descriptions of project environments based on fieldwork, and several specialist reports including: - topography, soils, vegetation, fauna, birds, archaeology, geohydrology, surface water, farming, communities, etc. The specialist reports are all contained in **Volume 2 Appendices** – and the reader is referred to those detailed accounts.

Three of those specialist reports provided baseline information on the condition of the environment prior to the start of mining, which is still relevant in relation to the impacts of small scale magnetite mining (section 3.2, below) and the proposed resumption of this activity. This was confirmed in discussions with the authors. The original reports were by: -

- Vegetation (B. Curtis, 2011): No significant change has occurred in the composition of the vegetation since that date. The report covered an area that included the whole ML 182 area, as well as several habitats that occur south of the C23 tar road, which are no longer affected by current mining proposals;

- Fauna (J. Irish, 2012): Mammals, Reptiles, Amphibians, Birds & Invertebrates. This report covered the same area as the Vegetation report mentioned above. Since the habitats have not changed (except for the very small disturbed area) there is no reason to believe that the faunal populations would have changed significantly, other than due to seasonal changes or temporary veld condition. Irish (2019) has updated the IUCN conservation status of the relevant species - his updated report is presented in **Appendix C** to this report.

- Archaeology (J.Kinahan, 2011 & 2012). These studies were limited to the three ore outcrops within the ML 182 area. Field studies found evidence of precolonial specularite mining during the last 1000 years but the sites were “shallow, unstratified, and did not warrant further investigation”. Kinahan concluded that these sites have “no further archaeological potential and that no further assessment and mitigation of the Lodestone project is required”. This applies to the current ML 182 area, **not** the whole of EPL 7352.

In brief, the mining licence area lies within high quality commercial cattle farming land that has experienced very little human impact apart from those related to cattle farming, fencing, provision of boreholes and watering points, and access tracks. Some of the neighbouring farms are also developed for wildlife resources and hunting.

Various factors, both natural and ranching-related, have combined to encourage bush encroachment – which is a widespread problem in Namibia’s savanna ecosystems (De Klerk, 2004) and (CCA, 2010). *Acacia mellifera* (Swarthaak) is one of the most dominant of the encroacher species in this area. However, the level of bush density does not yet preclude grasses and cattle ranching, which is the main land use in the ML area.

Minor infestations of an alien invasive weeds, *Datura* species, were found in 2011 on top of the koppie known as the "Southern Ore body" and other ore outcrops (Curtis, 2011) - before Lodestone started their activities.

The Stinkwater community – a very old informal settlement, is situated to the south of the ML area along the Schaff River. Many of these residents work on the Namib Rose Farm nearby, but many others are unemployed.

Since 2013, very little has changed in the mining licence area and surroundings. Only a large house has been built east of the Schaff River, just outside the boundaries of the Mining Licence area.

Up till 2014, Lodestone's activities were limited to drilling for mineral exploration, for water resources, and for monitoring boreholes. Small areas were cleared of bush – just sufficient to permit access to the sites for drilling. Given the problem of bush encroachment, these small intrusions had no adverse impact on the natural environment. The site camp area was more extensive and shows a bare patch (see **Figure 3,** above) but the area is still fairly insignificant.

Drill sites had self-rehabilitated as grass has began to grow through the small amount of drill chips that were spread neatly around the boreholes.

No compliance monitoring was commissioned by Lodestone, but an inspection was carried out by an independent environmental scientist in May 2018. This found the affected areas to be clean - free of litter and contractors' rubbish, and no spills of diesel or other contaminants were found.

It can therefore be concluded that the impacts of Lodestone's exploration activities up to 2014 were minimal, and were also largely reversible.

3.2 Impacts of Small Scale Mining & Processing: Past- & Proposed- Interim Operations

3.2.1 Context

Lodestone was mining and producing magnetite on a very small scale from July 2015 to March 2016, while processing and stockpiling continued until March 2017, and loading until May 2018. Minor processing of the screenings was resumed from August 2019 until present.

Lodestone now proposes to resume the small mining operations to supply magnetite to Namibian industry. The impacts are expected to be very similar to those already observed and explained as follows.

This section presents the findings of a one day site inspection in May 2018, reflecting the impacts of mining-related activities. Communications with Lodestone staff - Mr Mosch, and on site Mr. Lategan – provided information on those activities.

Overall, the extent of the impacts appears to have been limited to the footprint of the activities – i.e. excavation, stockpiling, dry processing, loading, site camp, drilling sites and vehicle tracks. These sites are mostly evident in the Google Earth image - **Figure 3** above.

Photographs were taken in May to illustrate this sub-section. They were waypointed by GPS, and recorded to provide a basis for future comparison.

Recommendations for rehabilitation or mitigation of future impacts are made where necessary. However, it should be noted that once the project becomes fully developed, the entire "Southern Ore Body" - where surface mining has taken place thus far – will be mined away. Therefore the recommendations below would only be applicable if the full development is delayed by a few years or more.

3.2.2 Bush Removal

Most of the bush that was removed for excavations and stockpiles was fairly dense *Acacia mellifera* and other common species. The EIA had identified a few 'special' species of small trees on the 'koppie', but all were widespread and no unique habitat was found in the ML area. Removal of vegetation was unavoidable, and when the project becomes fully implemented this whole hill will be mined away.

3.2.3 Excavations

An excavator removed the loose material from the surface to a depth not exceeding approximately 3 metres. The topsoil was not separated (as recommended in the EIA & EMP) because it all contained magnetite that could be removed. However, the dry separation process meant that the topsoil could be retained and stockpiled after removing the magnetite.

Although the topsoil was not yet replaced (due to likely future excavations), grass re-established itself on parts of the exposed surfaces following two summer rainfall seasons. The affected surfaces mostly appear to be stable, but grass needs to be established to prevent erosion in the long term – unless further mining is implemented soon.

- *Recommendation*: Plough the bare surfaces (e.g. **Figures. 4 & 5,** below) along the contours (or hoeing in contour strips). This will loosen the compacted soil, facilitate infiltration of rainwater, and allow grass seed to get trapped in the little hollows thus formed. Natural dispersal of seed by wind should then be sufficient to complete the rehabilitation.

At the head of the excavations is a vertical "wall" has been left (+ - 3metres) which will erode if left for a prolonged period (refer to **Figures 4 & 7** below). This erosion will also aggravate the visual impacts of scarring on the hillside.

- *Recommendation*: If mining does not continue soon, all steep cut slopes should be trimmed back to the natural angle of repose (the gradient of the adjacent uncut slopes). This will allow grass to establish and stabilise these cut slopes.

Note that the above recommendation is **not** applicable if the full mining development proceeds within a few years – because the whole hill will then be mined away.

IMG 1921. May 2018

Figure 4: The Main Excavations on the western side of the 'koppie' - the "Southern Ore Body".

IMG 1917. May 2018

Figure 5: The lower (western) part of the main excavations showing variable grass cover.

IMG 1934. May 2018

Figure 6: Another part of the excavations. The rough surface has enabled grass seed to get trapped so the grass has re-established fairly well.

IMG 1929. May 2018

Figure 7: The upper part of the main excavations – showing the cut face that is susceptible to erosion, and should be trimmed off unless excavations are to continue within a few years.

IMG 1942. May 2018

Figure 8: Minor rill erosion into an excavated area is cutting back into the track to the site camp.

If excavated areas are to be left for an extended period, then minor rill erosion can be arrested easily as follows.

- *Recommendation*: Fill eroding rills with waste rocks (of a size nominally 2cm – 10cm). This will cause soil to be trapped, and grass to grow, which will heal the gulley.

Overall, the impacts of bush removal and small scale excavation to date are assessed as being of low significance. These impacts are easily remediable, if necessary.

3.2.4 Stockpiles & Processing

Excavated material was passed through screens to remove the fine material, from which the magnetite was then removed by magnetic separation. The course material reported to separate stockpiles where it will await crushing once the full project is developed. No crusher has been necessary yet.

The environmental impacts of the above activities would have been minor - dust emissions from excavations and stockpiles, erosion by rainfall runoff, and visual impacts. These activities were not in operation at the time of the site visit and no dust monitoring system was installed. However, it is considered unlikely that dust would have been a significant problem as the scale of these operations was so small, and the nearest dwelling is over 2 km away. Lategan (pers comm for Lodestone) stated that no complaints were received from neighbours.

Grass had grown on parts of the stockpiles after two summer rainfall seasons. Only in the event of the project being inoperative for a period of a few years or more would further rehabilitation of stockpiles be needed.

IMG 1915. May 2018

Figure 9: Stockpile at the main excavation, with some natural grass cover after two summer seasons.

IMG 1955. May 2018

Figure 10: Stockpiles of screened material. Pooling of water for more than a few days needs to be avoided.

IMG 1926. May 2018

Figure 11: A view westwards from the crest of Southern Ore Body towards the C23 tar road, showing excavations (left) and stockpiled screenings (right).

IMG 1957. May 2018

Figure 12: Coarse screenings awaiting crushing at a later stage. An earth berm below the area of excavations and stockpiles was made, which is beneficial to contain rainfall runoff on site.

3.2.5 Loading Bay with Stockpiles

IMG 1925. May 2018

Figure 13: The loading bay at the entrance from the C23 tar road, with stockpiles of product and screenings. Coarse pieces of quartzite, being a by-product, may be sold to landscapers.

IMG 1954. May 2018

Figure 14: The loading area with equipment and stockpiles.

IMG 1958. May 2018

Figure 15: Loading the magnetite product onto a truck for delivery. Dust was minimal and loading is infrequent in the present scale of operation.

3.2.6 Site Camp

The site camp was found to be orderly and clean. Large trees were preserved.

IMG 1906. May 2018

Figure 16: The site camp and store area, with an unproductive borehole in the foreground. Shepherd's trees were conserved as shown above. The site is clean/ free of litter.

IMG 1935. May 2018

Figure 17: Equipment in the Site Camp.

IMG 1936. May 2018

Figure 18: Site Camp and Excavator with Shepherds tree carefully conserved.

Clearing of this camp area removed mostly the dominant *Acacia mellifera* thornbushes, while care was taken to conserve special trees such as *Boscia albitrunca* (Shepherds tree) – a protected species. The impact on vegetation is not significant. However, if the site camp becomes disused for a period of a few years or more, then the compacted surface will need to be ploughed / ripped to enable grass to grow.

The site camp is maintained free of litter and is tidy. Domestic waste was reported to be bagged and removed on a weekly basis to the municipal waste disposal site in Windhoek.

3.2.7 Alien Invasive Vegetation

Syringa trees in Site Camp

Staff at the site camp made two small vegetable gardens and these have several alien Syringa trees (*Melia azedarach*) growing in both gardens. A staff member at the site camp thought that the seeds probably came in with the compost they used. Syringa is a highly invasive species, and both the leaves and seeds are poisonous to humans and livestock, chickens etc. Therefore this weed must be completely eradicated. This is possible before it has an opportunity to spread. More photographs are provided in **Appendix D** to assist with identification, as well as more details regarding methods of eradication.

- *Recommendation*: It is essential that all these Syringa trees and their seedlings be removed without delay before they flower and set seed. Two methods are recommended.
    - Digging them out is effective only if **all** the roots are removed. If the tap root is deep this can be difficult.
    - Alternatively, the use of arboricide is recommended – a mixture of Garlon and Diesel applied to the stems after cutting should be effective. Avoid getting the mixture on the vegetables!

- *Recommendation*: It is very likely that more seeds remain dormant in the soil and will germinate in time. Therefore **monitoring** is essential for the next few years, and **further eradication** will be necessary.

IMG 1941. May 2018

Figure 19: Several small Syringa (*Melia azedarach*) trees are growing in both the vegetable gardens in the site camp. These alien invasive plants must be removed without delay.

Datura shrubs, several locations

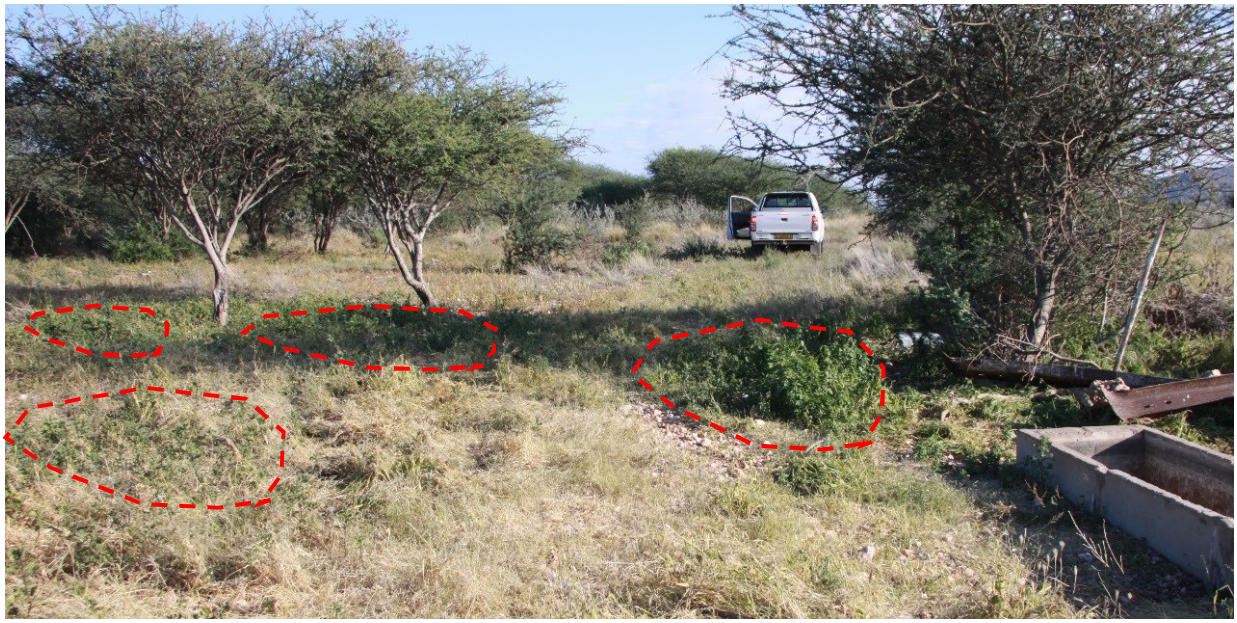
Two species of alien invasive Datura were found on site – *Datura innoxia* and *Datura ferox*. They look very similar and should be treated the same way. Datura species are poisonous to humans and animals. Further **photos for identification** are provided in **Appendix D**, as well as details for eradication.

Figure 20, below shows an infestation of Datura at the cattle trough, near the eastern boundary of the ML area. Others occur on top of the "Southern Ore body" koppie – which have been present since 2011.

- *Recommendation:* All Datura plants must be eradicated wherever they are found. They are easily removed by hoeing /digging as they are not deep rooted. However, care must be taken to remove all the roots - not just chop the stem off.

  Selective herbicides - that kill broadleaved plants but not grasses - can be used but this requires more training of staff.

- *Recommendation:* Datura seeds may remain viable in the soil for years before germinating. Therefore monthly monitoring is recommended to detect any new plants – followed by eradication before they flower and make seed.



IMG 1909. May 2018

Figure 20: Alien invasive Datura weeds (outlined in red) amongst grasses. Refer to **Appendix D** for identification - photographs of seed pods and flowers.

3.2.8 Drill sites - for Groundwater Exploration

In 2015 several boreholes were drilled and pump tested (SLR, 2015) to establish whether there may be sufficient groundwater for processing. Further pump testing was carried out by SLR in 2019 (Bittner, SLR, pers comm). It was concluded that groundwater resources were not sufficient for processing water for the fully developed project. However, the separation of magnetite to date has been a dry magnetic process. Water has only been used for domestic purposes since drilling exploration ceased.

IMG 1908. May 2018

Figure 21: The site of the borehole that is in use. Grass has grown through the small amount of drill chips remaining.

IMG 1911. May 2018

Figure 22: A typical borehole three years after drilling, grass growing through the drill chips that were left.

3.2.9 Tracks

Access tracks were made and some existing farm tracks were used during drilling exploration. Most of these have revegetated well without intervention.

IMG 1912. May 2018

Figure 23: Tracks to drilling sites, like this one, are in the process of self-rehabilitation - grass has grown spontaneously.

3.2.10 Visual impacts

The area supports tourist and hunting lodges, and visual impacts are amongst the concerns voiced by interested and affected parties during the EIA (CCA, 2013).

Some of the excavations and stockpiles are visible from the C23 tar road. Athough the visual impact is relatively minor at this stage, rehabilitation would be recommended if the project does not proceed further in the next few years. The recommendations in this report would need to be further detailed in response to the materials available at some future time.

Figures 24, 25 & 26, below give an idea of what can be partly seen from the tar road - although the overall visibility is less from the tar road.

IMG 1945. May 2018

Figure 24: **Part of the main excavation of the hillside, and a stockpile that is visible from the tar-road. These should be remediated - if mining is to be delayed for some years**.

IMG 1946. May 2018

Figure 25: Similarly these stockpiles are partly visible from the tar road, but they could be removed if the material is not used.

IMG 1947. May 2018

Figure 26: One of the stockpiles near the tar road has a fairly good grass cover and resembles a natural landform, but could be further landscaped and rehabilitated if necessary.

3.2.11 Impacts on Neighbours & Communities

Lodestone currently employs nine (9) people from the Stinkwater Community, mainly in security and caretaker roles.

Lodestone (Lategan, pers comm) reported that there have been no complaints from neighbours and relationships with neighbours are good.

3.2.12 Overall Impression

Based on the site inspection, information supplied by Lodestone, and lack of complaints from neighbours, it is evident that the environmental impacts to date have been very limited. The small scale of operation has been the main reason for this, as well as an effort by Lodestone to minimise the impacts on vegetation, keep the site free of litter and rubbish, prevent spills of oil or diesel, and keep the site camp clean and tidy.

The unavoidable impacts that have occurred can be remediated if the full scale mining development does not proceed.

Impacts beyond the footprint of activities have been prevented, e.g. by making a berm to prevent rainfall runoff from leaving the disturbed area.

The environmental impacts of the small scale magnetite mining to date have been far less than those envisaged in the EIA (CCA, 2013) for which the Environmental Clearance was granted.

3.2.13 Monitoring and Reporting

While the site appears to have been managed adequately, Lodestone has not kept records of their environmental management activities, and no monitoring reports have been submitted.

MET expects that mining companies should submit bi-annual environmental monitoring reports. Self monitoring may be accepted in cases of very simple operations like the current one, but the following is recommended: -

- Lodestone should submit an environmental management report to MET twice per year when operations are in progress. **Internal** monitoring records should be kept on a monthly basis.

- It is recommended that, for a very simple operation such as the current one, compliance monitoring by an **independent**, qualified environmental consultant, should be undertaken once per year and a report submitted to MET.

3.3 Future Update of Project Proposals for Full Scale Mining, and Infrastructure, & Update of EIA & EMP

3.3.1 Future Full Development at the Mine Site (ML182)

The EIA and EMP for Mining, Phase 1 (CCA, 2013), including the specialist studies, were based on Lodestone's project proposals at that time.

However, the fact that the Mining licence boundaries are smaller than those applied for has necessitated a change in the mine plan / layout and certain proposals. For example consideration will be given to co-disposal of waste rock with the tailings. The impacts of some project activities will need to be re-assessed, for example where an activity has changed or planned for a new location.

Details of the new mine plan and project proposal are expected to become available early in 2020. At that stage Lodestone intends to commission a complete update of the EIA and EMP for the mining, processing plant, tailings and all on-site activities.

Some of the specialist studies will need to be updated in response to the changed proposals. Consultations with specialists are already in progress but appointments can only be made when the fully developed proposals and new mine plan are available.

The EMP will need to be revisited and further detailed in response to the new proposals. This will apply also to mine closure and rehabilitation – which needs to be planned from the start in order to ensure that long term plans can be implemented cost-effectively.

Also as recommended in 2013, monitoring and reporting programmes are required to be established, including dust, groundwater, alien invasive plants, blasting impacts and other impacts as indicated in the EIA and EMP.

Community involvement and benefits is another area that needs to be considered in more detail prior to the implementation phase. Residents of the Stinkwater & Dordabis informal settlements need employment, and potential secondary economic opportunities may be found through engagement between Lodestone and leading community members.

Furthermore, the EIA & EMP covered the mine site, but the off-site infrastructure was not assessed because no detailed proposals had been developed yet.

3.3.2 Future Development of Off-Site Infrastructure

Proposals are currently being developed for the supporting infrastructure outside of the ML 182 area. Some of these activities will require Environmental Clearances, supported by EIAs and EMPs.

1. Abstraction of water from Oanob Dam and a new pipeline to the mine. Discussions with NamWater are needed, and discussions on route planning with the design engineers.

2. A 132kV powerline from Auas substation to the mine. Discussions with NamPower and the design engineers are needed, including route planning and bird-friendly design.

3. Reconstruction of a short section of the C23 tar road, on a new alignment through the farm Tsatsachas, to accommodate the mine pit. This can probably be assessed as part of the mine site EIA & EMP mentioned in 2.2.3 above.

4. The Hoffnung railway siding is the proposed location to transfer the ore (in containers) from road trucks to rail trucks. Two road intersections on the B6 tar road will need to be upgraded to accommodate heavy ore trucks. Discussions with Roads Authority and a proposed design are needed to ensure road safety. A suggested noise study is also being considered.

5. Maintenace of the railway line westwards from Hoffnung to facilitate more heavy trains per day. Maintenance is not a listed activity in terms of the Regulations (2012) under the Environmental Management Act (2007).

Discussions with MET are needed to determine exactly what is required in each case.

It is anticipated that the EIAs and EMPs will be commissioned in 2020 once the project proposals are sufficiently developed.

4 GROUNDWATER RESOURCES & QUALITY

4.1 Background Data on Water Resources and Quality

During the EIA (CCA, 2013) concerns were raised by farmers about potential impacts of abstraction on groundwater levels, and potential risk of contamination of groundwater or surface water.

For this reason this chapter draws attention to the water studies that have been conducted to date, before and since 2013. Although they are not relevant to the small scale magnetite mining, they form part of the process of study that Lodestone has embarked on towards development of the full mining and processing project in due course.

SLR Consulting Namibia (Pty) Ltd undertook several specialist studies on groundwater and surface water independently for Lodestone (SLR, 2013 a - g). These were presented in the EIA (CCA, 2013: Volume 2: Appendices D to J). These reports provided valuable baseline information on groundwater quality and levels at that time. The results were integrated into the EIA and were also submitted to MET.

These included: -

- drilling and test pumping of monitoring boreholes,
- a desk study and a hydrocensus,
- a hydrology assessment (surface water),
- preliminary geochemical assessment,
- a site wide water balance,
- groundwater modelling – of the likely transport of any potential contaminants, and
- a specialist Environmental Impact Assessment on Groundwater and Surface Water.

New monitoring boreholes provided valuable baseline data on water levels and quality in 2013 – as a basis for comparison once full implementation of the project begins. Since this has not yet materialized, Lodestone has not commissioned any subsequent monitoring of those boreholes designated for that purpose. However, drilling for exploration of groundwater resources in 2015 provided further baseline information (SLR, Dec 2015). Further test pumping in 2019 was conducted by SLR.

It is understood that it has now been concluded that the available groundwater is **not** sufficient for processing on a sustainable basis. Therefore Lodestone has decided to return to their original proposal of a pipeline from Oanob Dam – as mentioned in section 3.3.2 above.

4.2 Details of Groundwater Exploration and Use since 2013, and Consideration of Impacts

The following activities regarding groundwater have been carried out since 2013.

Until 2014, groundwater from a borehole about 3km south of the mine camp was used for mineral-exploration drilling. The volumes of water used are not known but any impact on groundwater resources would have been limited to the period of abstraction – i.e. short term.

For the purpose of processing the iron ore in the **fully developed project**, it was originally proposed to construct a pipeline from Oanab Dam to the mine to meet a demand of 900,000 m^3 of raw water per annum.

However, facing the low iron ore prices and the necessity to consider a **reduced scale** of mining and processing, Lodestone decided to explore the available resources and they commissioned the drilling and test pumping of boreholes for abstraction of groundwater for this purpose. The target for water production was a volume of 30 m^3/hour, i.e. a total of 720 m^3/day. On an annual basis, this would have amounted to no more than 260 000 m^3/year.

The drilling was carried out by contractors in October and November 2015 on the farm Tsatsachas.. Twelve (12) boreholes were drilled, of which five (5) were successful. These were pump-tested to determine sustainable abstraction rates and water quality parameters (SLR, Dec.2015). The locations of the various boreholes are presented in **Figure 27**.

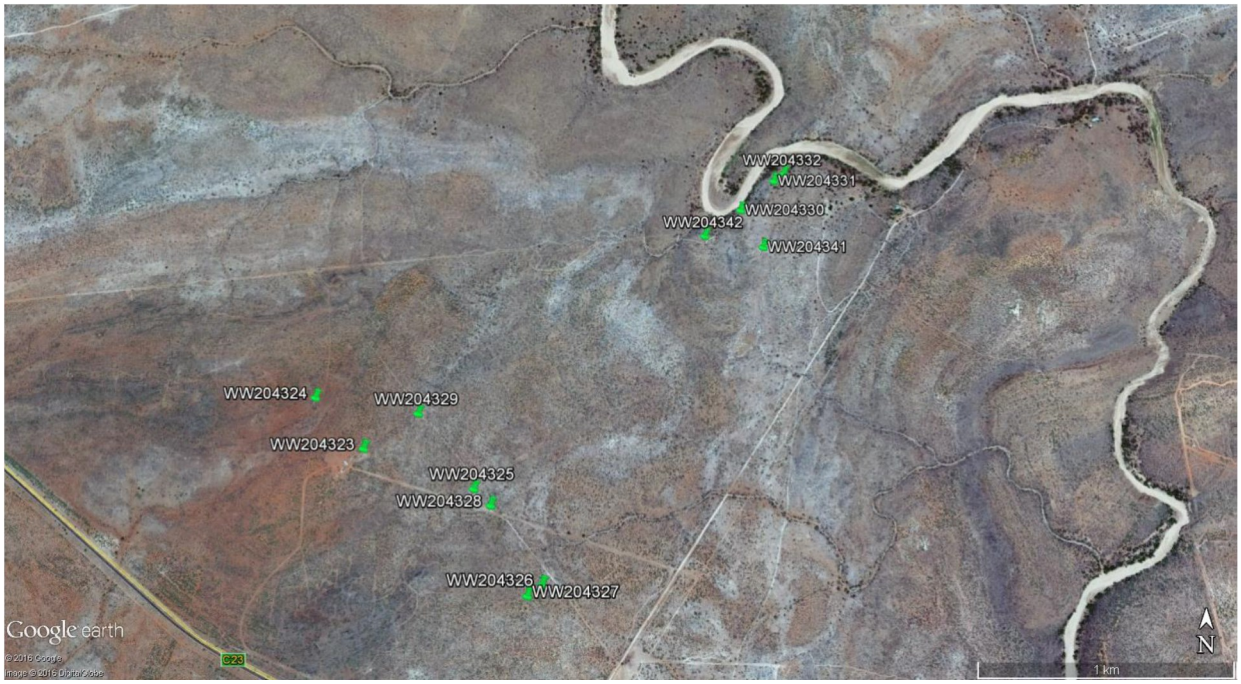


Figure 27. Locations of the twelve boreholes drilled to explore water resources. (SLR, Dec.2015).

The total available water from the 5 successful boreholes amounts to 600m^3/day. However there is doubt about the sustainability of such yield and therefore: -

- SLR recommended specific limits to the rates of pumping.

- SLR also recommended that a monitoring programme be set up to ensure that abstraction does not exceed the sustainable yield – if these boreholes are exploited in future.

In fact these boreholes have **not** been used for mining and processing to date, and the scale of the project was reduced even further, while separation of magnetite only was achieved with a dry process. Therefore only water for **domestic purposes** was required. This consumption was estimated by Lodestone at 1 – 2 m^3/day. It was abstracted from borehole WW 204325 - about 450m east of the site camp. Because the yield was too low to support mining and processing, SLR recommended that this borehole be used for monitoring purposes only. However, as an interim measure, and at a rate of less than 2 m^3/day for domestic use, the impact on groundwater resources would have been insignificant (G. Madec, SLR, pers comm).

Additional pump testing was conducted by SLR in 2019 but they concluded that sustainable yields are insufficient to meet the required demand for processing water and it would be inadvisable to attempt to run the mine on groundwater (Bittner, SLR pers comm).

Lodestone has therefore returned to their original proposal to obtain water from Oanob Dam via a new pipeline to be constructed.

Groundwater (potable) may be used for domestic purposes only.

Since no major abstraction of water for processing has taken place, and water for drilling purposes was of short duration, **no significant impact on groundwater levels would be expected**.

Furthermore, given the very small extent and shallow (3 metre) depth of mining to date, it is very **unlikely that any significant impact on water quality could have occurred**. Only the weathered overburden was excavated.

4.3 Future Updates & Reassessment of Ground and Surface Water

Because of the future changes in the Mine Plan / Layout for the full development, including changes in the location of tailings and co-disposal with waste rock, it will be necessary to re-assess the impacts of the project on groundwater parameters. This can only be done once the full details of the Mine Plan become available early in 2020.

Lodestone intends to commission updates and reassessment of the potential impacts on groundwater.

Further planning and engineering the site to manage stormwater runoff will also be required.

At the same time a comprehensive monitoring plan will be needed – for all aspects of surface water and ground water – levels and quality.

The various Reports by SLR mentioned above will provide valuable baseline data from the Monitoring Boreholes that were established for this purpose. Once the project is fully developed it will be possible to compare groundwater levels and quality data with the data that was recorded prior to any mining activities.

5 PUBLIC CONSULTATIONS ON THIS PROJECT

A comprehensive Public Participation Programme was conducted during the course of the EIA from 2011 to 2013, and a detailed account was provided in the EIA.

Public participation is **not** a requirement by MET for the Renewal of an Environmental Clearance. However, the Directors of Lodestone agreed that this would be an opportune time to provide an update on their activities to registered Interested & Affected Parties (I&APs).

Therefore, a Public Information Document (PID), dated 31 October 2019, was distributed by email to registered I&APs who had provided email addresses. This would have reached most of the neighbouring farm owners - being the people who are potentially most affected by the small scale project. The PID is presented in **Appendix E**.

Few members of the informal settlements including Stinkwater have access to email, but Maureen Fidler contacted some who were willing to help communicate the contents of the PID to the local communities – namely, Nicky Tobias, Delvyrien Bock, and Reinholdt Van Wyk.

Nine (9) people from the nearby Stinkwater Community are employed by Lodestone on site. Therefore it is likely that this community is aware of activities at the mine - at least informally.

Up till the date on this report no responses to the PID have been received.

Once the revised mine plan for the full scale project becomes available (early in 2020) further public participation will be conducted to update communities on the revised proposals.

An updated Register of Interested & Affected Parties for the current / proposed small scale operation, is presented in **Appendix F.**

6 LEGAL & POLICY UPDATE

A Register of the Legislation & Policies that are relevant to environmental management in Namibia was compiled by Peter Watson (Envirolex, 2012) and included as an Appendix in the EIA (CCA, 2013).

Peter Watson updated that Register (Envirolex, 2018) which is presented in **Appendix G**.

Legislation and policy that relates to the Environment in Namibia is not a discreet body of law, but exists in many different acts, regulations and ordinances which are administered by several different Government Ministries. International laws and policies to which Namibia is a signatory are also included within the ambit of "Environmental Law". Given the broad scope of Namibian environmental legal and policy provisions, this register may not be fully comprehensive.

Occupation Health and Safety (OHS) is not usually considered part of EIA's but Watson has touched on this subject as well, although not comprehensively. OHS on mining and industrial projects is normally handled by specialists in that field. Colin Christian, Environmental Scientist does not provide consulting services nor take responsibility for occupational health and safety issues.

The Constitution of Namibia, as the supreme law of the country provides a background against which all environmental law can be interpreted. For example Article 95(l)) states: -

> "The State shall actively promote and maintain the welfare of the people by adopting, inter alia policies aimed at the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future: in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory ".

Article 144: regarding International Law states : -

> "Unless otherwise provided by this Constitution or Act of Parliament, the general rules of public international law and international agreements binding upon Namibia under this Constitution shall form part of the law of Namibia. "

The Environmental Management Act (Act 7 of 2007) provides twelve Principles for sound Environmental Management which are very important in guiding all developments.

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

3. (1) The principles set out in subsection (2) –

> (a) guide the implementation of this Act and any other law relating to the protection of the environment;
>
> (b) serve as the general framework within which environmental plans must be formulated; and
>
> (c) serve as guidelines for any organ of state when making any decision in terms of this Act or any other law relating to the protection of the environment.

(2) The following are the principles of environmental management: -

(a) renewable resources must be used on a sustainable basis for the benefit of present and future generations;

(b) community involvement in natural resources management and the sharing of benefits arising from the use of the resources, must be promoted and facilitated;

(c) the participation of all interested and affected parties must be promoted and decisions must take into account the interest, needs and values of interested and affected parties;

(d) equitable access to environmental resources must be promoted and the functional integrity of ecological systems must be taken into account to ensure the sustainability of the systems and to prevent harmful effects;

(e) assessments must be undertaken for activities which may have a significant effects on the environment or the use of natural resources;

(f) sustainable development must be promoted in all aspects relating to the environment;

(g) Namibia's cultural and natural heritage including, its biological diversity, must be protected and respected for the benefit of present and future generations;

(h) the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term must be adopted to reduce the generation of waste and polluting substances at source;

(i) the reduction, re-use and recycling of waste must be promoted;

(j) a person who causes damage to the environment must pay the costs associated with rehabilitation of damage to the environment and to human health caused by pollution, including costs for measures as are reasonably required to be implemented to prevent further environmental damage;

(k) where there is sufficient evidence which establishes that there are threats of serious or irreversible damage to the environment, lack of full scientific certainty may not be used as a reason for postponing cost-effective measures to prevent environmental degradation; and

(l) damage to the environment must be prevented and activities which cause such damage must be reduced, limited or controlled.

The Environmental Management Act (2007) became effective, with Regulations in 2012 (Government Notice 29 of 2012). The Regulations deal with requirements for EIAs and Environmental Clearances as well.

As a mere introduction to the broad scope of Watsons report, the legislation includes: -

- Water,
- Soil conservation,
- Nature conservation,
- Forest products (any woody vegetation),
- Minerals & Mining,
- Hazardous substances,

- Health & Safety,
- Public Health,
- Air pollution (now applicable to all of Namibia, except Caprivi)
- Petroleum products and energy,
- Electricity, including generation,
- Explosives,
- Heritage issues,
- Aviation,
- Road traffic and transport, and
- Foreign Investment.

The reader is referred to the full text of Watson's updated report in **Appendix G**, since no summary can be adequate.

7 CONCLUSIONS & RECOMMENDATIONS

Lodestone received an Environmental Clearance in July 2014 for mining. This was issued by MET in response to the EIA and EMP by Colin Christian & Associates cc (CCA, 2013). The Mining Licence (ML 182) was issued by MME in November 2014.

The original EPL 3112 lapsed and was superceded by EPL 7352 - shown in Figure 2 above. A separate EIA has already been submitted to MET (CCES, October 2019) for future mineral exploration on EPL 7352, Phase 1. Therefore this report does not deal with the impacts exploration, which have been minor in any event.

This report deals with small scale magnetite mining within the ML 182 area.

Lodestone has conducted only small scale mining and separation of magnetite thus far. The excavation of weathered overburden was conducted from July 2015 to March 2016. The separation by a dry magnetic process started at the same time and continued until March 2017. The separation process from stockpiled material was resumed in August 2019. Loading from stockpiles to road trucks was done when required for supply to Namibian industry.

Due to the low price of iron ore it has not been possible for Lodestone to implement the full development according to the project proposals that were outlined in the EIA (CCA, 2013).

An additional complication is that the Mining Licence boundaries – as issued by MME - were much smaller than those originally proposed and applied for by Lodestone.

For the above reasons Lodestone is currently replanning the Mine Layout and project proposals so that the full development can be implemented as soon as possible. As soon as the revised Project Proposals are available (early in 2020) Lodestone intends to commission a full update of the EIA and EMP (CCA, 2013).

This Report should be read in conjunction with that original EIA, including the specialist studies in the Appendices, Volume 2 of that EIA Report.

In the meantime, Lodestone intends to resume their small scale mining of magnetite as an interim activity. For this they require that the Environmental Clearance be renewed by MET. The purpose of this report is to fulfil the requirements for an Application for Renewal of the Environmental Clearance, and to recommend management measures for the interim operation.

This present study has sought to evaluate the environmental impacts of the mining to date, and make recommendations for mitigation of any issues arising that are specific to the small scale operation, including closure and rehabilitation if the major development does not proceed within the next few years.

Based on a site inspection in May 2018, the following conclusions can be drawn regarding the environmental impacts to date.

- The scale of the mining to date has been extremely small compared with the original tonnages that were planned.

- The site of mining has been a small portion of the hillside on the “Southern Ore Body”. Stockpiling, screening, magnetic separation and loading to trucks have been limited to small adjacent areas - in a very compact operation.
- No blasting, no crushing and no processing plant were used.
- Depth of excavations has been limited to about 3 metres (maximum) in weathered overburden. These excavations have been well managed and are freely draining. No bedrock has been excavated so there is no deep pit.
- No tailings were established, only small stockpiles of materials that will be crushed later or waste rock for disposal on site or further processing according to plans that are still being developed.
- No water was used for processing. It was a dry magnetic separation process.
- Groundwater was used only for drilling exploration (short duration), and ongoing small volumes for domestic purposes.
- Due to the above facts, no significant impact on groundwater levels is suspected and no complaints were reported.
- No impacts on groundwater quality are suspected because: - only weathered overburden has been excavated (not bedrock), no crushing was done, and no wet tailings deposited. For the above reasons, no monitoring of groundwater has actually been done to date. However, monitoring boreholes were drilled, and baseline data was established in 2013 and 2015 for future comparison.
- Vegetation that was removed was mostly common, even encroacher species of thorn bush.
- In the site camp, special trees like *Boscia* (Sherherds tree) were retained when the thorn bushes were cleared.
- By May 2018 grass had re-established on the excavated areas and much of the stockpiles.
- The impacts of dust have not been monitored but the scale and nature of activities are unlikely to have caused any problem. No complaints from neighbours were reported.
- Alien invasive Syringa trees had been inadvertently introduced (probably as seed in compost) in vegetable gardens in the site camp. Recommendations were made to Lodestone in May 2018 for the immediate eradication before they flower and set seed. This threat is still very local and it can and must be eliminated before it spreads.
- Other alien invasive plants, such as Datura existed in the affected area before Lodestone started any activities. Recommendations have been made also for ongoing monitoring and eradication – for all alien invasive species – to prevent spreading caused by project activities.
- All other impacts appear to have been limited to the footprint of the activities.
- Visual impacts from the C23 tar road exist. Stockpiles and excavations are visible but can be remediated.
- All the activities have had a very low level of impact on the environment – due to the reduced extent and nature of activities that were implemented. The site can be rehabilitated if necessary.

- Photographic records have been made with waypoints for future reference if needed.

Recommendations for ongoing management of the small scale magnetite mining have been made in this report above. An Environmental Management Plan (EMP) has been added in Section 8, which can be included in contracts of the mining contractor(s) – to be appointed by Lodestone.

Because the areas affected by excavations and stockpiles thus far are on the ore body, the impacts of operations to date will be obliterated by full scale mining if the full project proceeds. In the unlikely event that the full project is not implemented, the EMP has made preliminary recommendations for rehabilitation of the excavations and stockpiles.

Environmental Monitoring is needed, even if the small scale operation proceeds, because MET requires regular compliance reports. Both internal monitoring by Lodestone, and by a suitably qualified independent environmental consultant are necessary. MAWF, in terms of their abstraction permit, also requires reports on borehole monitoring - if the intended abstraction takes place. However it is understood that minor domestic abstraction does not require this.

No public participation is required by MET for Renewal of an Environmental Clearance. However, a Public Information Document was sent to registered Interested & Affected Parties to update them about the small mining operation and the proposed resumption of this activity. No responses were received. Further information updates will be distributed when the new Mine Plan and Proposals become available.

Lodestone has reported that relations with neighbours are good and no complaints have been received.

The small project employs about 9 people from the nearby Stinkwater Community – mainly in security and caretaker roles.

The availability of magnetite has benefitted local industry in Namibia – namely a cement plant.

An update of the Legal and Policy Register (Envirolex 2012) was carried out by Envirolex (2018). Readers are referred to the full text in Appendix G. Some relatively minor changes and additions to legislation have occurred. Lodestone must update themselves and comply with all updated legislation.

It is recommended that an Environmental Clearance (EC) can be issued for the resumption of small scale magnetite mining within ML 182 as an interim measure so that Lodestone can generate some revenue while awaiting the full development.

The EC should be **subject to compliance with the recommendations in this EIA and EMP**. In the unlikely event that mining does not proceed to the full scale development the recommendations for rehabilitation should also be a condition of the EC.

The EC should also be **subject to a revision and update of the EIA & EMP (CCA, 2013)** to reflect the new Mine Plan and Project Proposals once they become available. The updates need to include any specialist studies where there is reason to believe that the assessed impacts may have changed.

The recommended **EC will not be applicable to any off-site infrastructure** as those activities will be the subject of separate applications in due course (see section 3.3.2 above).

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8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction to this EMP

Lodestone intends to use a Mining Contractor once the small scale mining and separation of magnetite is resumed. This EMP presents recommendations for mitigation of environmental impacts in the form of Environmental Specifications. These should be included in Contracts with the mining company and enforced by Lodestone on site.

These Specifications need to be considered throughout the planning stage and implemented during the operations, rehabilitation, and post-completion stages.

Lodestone and the Contractor will need to be familiar with the Report above, particularly Section 3.2.

8.2 Roles & Responsibilities

8.2.1 Lodestone Directors & Chief Operations Officer & Staff

The Directors of Lodestone Namibia (Pty) Ltd carry ultimate responsibility for compliance with the Environmental Management Plan and the recommendations in the EIA. Lodestone and their staff shall ensure that: -

- They and all staff are familiar with the EIA and EMP (in so far as they can have an influence on the impacts),
- All activities are planned and implemented with the EMP in mind,
- The EMP is included in Contracts of contractors and subcontractors,
- Appropriate training is provided so that site staff know what is required of them and the reasons for it,
- A competent member of staff is designated with monitoring and enforcement of the Specifications on a daily basis and compiling a monthly report on compliance,
- In conjunction with monitoring and reporting, a photographic record is maintained of any issues of non-compliance where appropriate (this is useful also for training),
- Financial provision is made for implementation, internal monitoring and management on site,
- Monitor monthly for alien invasive plants and ensure that they are eradicated timeously and repeatedly. Infestations shall be recorded with a GPS to help ensure that a comprehensive approach is taken to follow up work,
- Environmental Compliance Reports are compiled and submitted to MET normally twice per year, and to the Environmental Scientist,

- Commission independent monitoring by a qualified Environmental Scientist at least once per year, or more frequently if appropriate to the level of impact,
- Ensure compliance with all legislation.

8.2.2 The Environmental Scientist as Consultant

The Environmental Scientist was appointed as Consultant to compile this Report and EMP. It is also necessary to appoint an Environmental Scientist to: -

- Discuss and make recommendations to Lodestone should any issues arise that have not been anticipated and update the EMP if necessary,
- Undertake periodic independent compliance monitoring and report to Lodestone and to MET,
- Conduct training - as commissioned by Lodestone - when needed,
- Include a photographic record in reports where possible,
- Assist in monitoring for alien invasive plants (although he cannot be on site monthly).

8.2.3 Contractors, Sub-contractors, Transport drivers and all Site Personnel

All Contractors, Sub-contractors, and all site personnel, shall: -

- Comply with the Environmental Specifications,
- Comply with all legislation,
- Be familiar with the Report above and understand the reasons for the Specifications,
- Designate a competent member of staff who shall have the responsibility for monitoring and enforcing compliance on behalf of the contractor,
- Discuss, with Lodestone's management, any difficulties in achieving compliance so that solutions can be sought.

8.2.4 Communication between all Parties

Environmental Management requires a joint effort by all parties. Communication is therefore very important. Therefore all parties shall: -

- Maintain open communication about environmentsal issues at all times,
- Report and discuss any non-compliance, in order to improve management of the environmental impacts,
- Monitoring and enforcement should not be a negative "policing" approach but should encourage awareness and understanding of the need for environmental management,
- All parties should see themselves as part of the environmental management team.

8.3 Environmental Specifications

8.3.1 Natural Vegetation

- Where excavation is necessary the vegetation will be destroyed – that is unavoidable. However, where other activities are planned such as stockpiles, they shall be sited, as far as practically possible, where mostly common species occur – e.g. *Acacia mellifera* (Swarthaak), *Catophractes alexandrii*, *Lycium bosciifolium*, and *Tarchonthus camphoratus.*

- Where practically possible the planning of activities shall endeavor to avoid damage or removal of large trees and evergreen species. For example *Acacia erioloba* (Cameeldoring), *Boscia albitrunca* (Shepherds tree / Witgat), and all protected species.

8.3.2 Alien Invasive Plants

- Alien invasive plants are a threat to natural vegetation and shall be eradicated. The alien invasive species known to occur in ML 182 include: -

    - *Datura* (two species of shrubs), and
    - *Melia azedarach* (Syringa Tree)– found only in the site camp vegetable garden,

  Others that may occur or be inadvertently introduced include: -

    - *Prosopis* (Mesquite tree),
    - *Caesalpinia gilliesii* (Bird of Paradise Flower – woody shrub),
    - All Cactus species are also aliens but some have been planted (e.g. prickly pear). Cactuses must not be confused with Euphorbias which are indigenous and should be retained as far as possible.

  Photographs to assist with identification of a few alien plants are presented in **Appendix D**.

- Alien invasive plants shall be eradicated before mining activities – to prevent spreading, as well as during and after activities. Monthly inspections and follow up weeding is recommended. Regrowth must be removed before they flower and make seed.

- *Datura* species shall be grubbed out by hoeing, ensuring that the entire root is removed. In rocky ground where roots are difficult to dig out, the use of a selective herbicide is an alternative.

- The woody species – *Prosopis*, *Melia* and *Caesalpinia gilliesii* shall be cut down 30 – 50cm above ground and a mixture of Garlon and Diesel applied immediately to the whole stump. The mix ratio is recommended by the Garlon manufacturer.

- It is recommended that a record be kept of GPS co-ordinates of all alien plants to assist in ongoing monitoring and eradication – so that treated sites can be revisited.

8.3.3 Fire

- Fire is a significant threat to people, wildlife, grazing resources, property, vehicles, etc. It can arise from wedling or other activities that generate sparks, careless use of cigarettes or matches, or use of fire.

- No fires shall be made on site for any reason. No burning of cleared vegetation or waste, or anything else, shall be permitted.

- Broken glass or bottles can act as a magnifying glass that can start a fire. Therfore no glass objects shall be left lying around.

- Portable fire fighting equipment must always be on hand at each work station to ensure that an immediate response to fire is always available if activities that pose a fire risk (e.g. welding) have to be done on site.

- All reasonable precautions must be taken to anticipate risks and prevent accidental fire. Team leaders / foremen must regularly remind staff to be vigilant in this regard.

8.3.4 Fauna (Mammals, Reptiles, Amphibians & Invertebrates) and Birds

- Hunting, poaching and snaring of animals or birds is strictly prohibited on this project. Anyone suspected of involvement in such activities may also face prosecution under the Nature Conservation Ordinance.

- Theft of livestock is also a criminal offence and is prohibited.

- Subject to labour legislation Lodestone shall reserve the right to order that any person facing legitimate charges of misconduct may be suspended from the project.

- No litter, or rubbish shall be left on site at any time. Wire, bottles, cans can trap or cause injury to animals. Plastic is sometimes eaten by livestock - with fatal results. Therefore all rubbish shall be removed daily.

8.3.5 Soil

- The soil from which the magnetite has been removed is valuable for rehabilitation at a later stage in the project. It shall be stockpiled and protected from erosion by allowing grass to grow on it.

- Compaction of soil by vehicles on tracks or excavations can prevent grass growing and lead to soil erosion. As a precaution, tracks shall **not** be made directly up-and-down slopes but rather obliquely to the contours.

- In places where grass does not re-establish after the first summer rainfall season, bare sections of excavations or tracks shall be ripped to a depth of 150 mm to enable grass to grow.

8.3.6 Hydrocarbons and Other Hazardous Substances

- Hydrocarbons such as fuels, oils, hydraulic fluids as well as any other hazardous substances are toxic to plants and animals. They are strictly controlled by law and shall not be disposed of or leaked to the environment at all.

- All mining contractors and sub-contractors shall be familiar with: -
    - the Hazardous Substances Ordinance 14 of 1974, and
    - the Petroleum Products and Energy Act 13 of 1990.

- These laws govern the transport, storage, disposal, recycling and other aspects of managing petroleum and hazardous substances.

- Lodestone staff, and all Contractors and Subcontractors shall be familiar with the relevant legislation and ensure compliance in all respects.

- All fuel tanks shall be bunded with sufficient capacity to contain all spills.

- Drip trays shall be used when fuel is being transferred to vehicles or machines.

- Vehicles and machines shall not be serviced on site.

- In the event of any repairs on site every precaution shall be taken to ensure that no hydrocarbons or other hazardous substances can leak into the soil or water.

- In the event of any spills, the party responsible shall bear all the costs of cleanup to achieve compliance with the legislation. This may be in addition to facing prosecution under the relevant legislation.

- Final disposal or recycling of such substances or disposal of any contaminated soil shall be at a licenced waste disposal facility.

8.3.7 Solid Waste & Litter

- Littering shall not be permitted as it is unsightly and may cause fatalities to animals. For example plastic bags are sometimes eaten.

- Rubbish can trap small creatures.No wire, bottles, cans or any rubbish shall be left lying around any site at any time.

- All waste shall be discarded to suitable bins with lids that are wind- and animal- proof. Waste shall be removed regularly to a licenced waste disposal facility.

8.3.8 Groundwater

- It is not proposed to use water for processing of magnetite, but only for domestic purposes – to be supplied from existing boreholes.

- All boreholes to be used for abstraction of water shall be licenced with MAWF, and all conditions in the licence shall be met.

8.3.9 Site Camp

- No mining staff shall be housed within the mining licence area unless a very good reason can justify the necessity to do so.
- If any persons are permitted to stay in the site camp it shall be under strict supervision and conditions.
- All temporary residents shall be required to sign a Code of Ethics including the restriction to the camp, no visiting of neighbours, no consumption of alchohol or other mind-altering substances.
- No fires shall be permitted, except in designated safe places for cooking.
- Chemical toilets shall be provided and maintained in clean hygienic condition.
- No littering shall be permitted.
- No noise shall be made, especially at night.
- Water shall be used with care and not wasted.
- Any person found to be in breach of these conditions shall face suspension from the project.

8.3.10 Occupational Health & Safety

- Lodestone and all Contractors and sub-contractors shall at all times ensure compliance with all Health and Safety Regulations to protect all staff from threats to their health and safety. For example, under the Labour Act, things like dust, noise, head and eye protection must be worn according to the requirements.
- Lodestone shall commission a suitably qualified Health and Safety consultant to compile a comprehensive Health and Safety Plan. This is not provided in this EMP.

8.4 Closure and Rehabilitation (Provisional)

Since the small scale magnetite mining is an interim activity and full scale mining is proposed to be conducted on the same site in due course, this section 8.4 is applicable only in the unlikely event that full scale mining does not proceed within three years. In that event the excavations, stockpiles and other affected areas shall be rehabilitated.

The objectives of rehabilitation are set out below. Various measures to achieve those objectives are recommended. The details may need to be further developed in response to the circumstances at the time. For example, depending on the amount and type of material available in the stockpiles, and the extent of excavations.

8.4.1 Excavations

The objectives of rehabilitating the cut slopes of excavations will be to: -

- Achieve stability and safety for humans and animals,
- Eliminate visual scarring of hillsides,
- Ensure that free drainage is achieved and maintained,
- Prevent soil erosion,
- Create conditions that encourage grass to re-establish by trapping soil and seed.

Cut slopes may either be trimmed back to their natural angle of repose, or waste rock / stones could be used to fill in the cut faces to reduce the slope angle. Soil can then be spread over the fill material to achieve vegetation cover.

It is recommended that Engineering advice be obtained regarding slope stability considerations.

8.4.2 Soil & Natural Vegetation

The objectives are to: -

- Prevent soil erosion,
- Ultimately to establish vegetation

Based on past experience, grass is expected to establish itself on areas where soil is stony. However if soil has been compacted by vehicles or excavators – e.g. on tracks or excavations, the ground should be ripped (along the contours) to a depth of nominally 250mm.

Where necessary, available stockpiles of soil should be spread over areas to be rehabilitated after ripping any compacted soil.

If the available soil is in short supply, contour berms can be made from stones to prevent erosion and trap plant seed. These berms should be nominally 10cm high and 50 cm wide.

Grass should then get established naturally, and in time the woody plants and shrubs as well.

8.4.3 Stockpiles

Objectives: -

- Remove adverse visual impacts, either by removing the stockpile or shaping it to resemble natural landforms in the vicinity,
- Slope angles must be left at gradients less than the natural angle of repose,
- Use available material for rehabilitation,
- In the case of waste rock, such as silica, it can alternatively be made available to landscapers,
- Spread material evenly over sites at low slope angles to ensure slope stability, retention of soil, and ultimately the establishment of vegetation cover.

8.4.4 Alien Invasive Plants

Objectives: -

- Eliminate all alien invasive species from all areas affected by the activities of Lodestone's project and related thereto,
- Prevent spreading of these species,
- Eliminate them before they flower and set seed.

The recommendations and photographs in Section 3.2.7, Section 8.3.2, and **Appendix D** are applicable also to pre-mining, operations, post closure and rehabilitation stages.

8.4.5 "Foreign" Waste materials

Objectives: -

- Leave the site free of all litter and hazards to people, mammals, reptiles, birds, and amphibians.
- Remove all sources of potential pollution,
- Comply with legislation.

All waste that is not natural materials from the site shall be removed to an approved / licensed waste disposal facility. In the case of hazardous substances remove to a facility that is licenced to receive hazardous waste.

8.5 Environmental Compliance Monitoring

- Lodestone shall establish a regular monitoring programme on a monthly basis while mining activities are in progress, or more frequently if the nature of the activity or any non-compliance indicate that more frequent inspections are necessary. These monthly inspections shall be conducted by Lodestone's own staff and a brief written report shall be compiled after each inspection.

- MET requires the submission of monitoring reports twice per year. It is recommended that an independent, suitably qualified environmental consultant shall be appointed to undertake site inspections and reports. The appointed consultant shall also be supplied with Lodestone's internal monitoring reports and their bi-annual reports to MET.

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10 ACKNOWLEDGEMENTS

I would like to express our appreciation to all Interested and Affected Parties for their interest in this project.

I would also like to thank those people who kindly offered to assist in communicating the Public Information Document to the members of the informal communities at Stinkwater and Dordabis - namely, Nicky Tobias, Delvyrien Bock, and Reinholdt Van Wyk.

Appendix A

Curriculum Vitae of
Colin Christian Pr.Sci.Nat.
Environmental Scientist

Appendix B

Environmental Clearance Certificate

July 2014

Appendix C

Irish, J. (2019)

Faunal Biodiversity Summary for
Lodestone Iron Ore Mine, ML 182 & EPL 7532

(updated from 2012 report)

Appendix D

Alien Invasive Plants:

Photographs for Identification & Methods of Eradication

Appendix E

Public Information Document

31 October 2019

Appendix F

Updated Register of Interested & Affected Parties

Nov 2019

Appendix G

Legal & Policy Register

by Peter Watson, Envirolex

May 2018