# Basic Assessment
# And
# Environmental Management Plan

For

## Corobrik (Pty) Ltd:
## Driefontein Operational Site

## Kiln and Brick Yard Expansion Project

On

Portion 23 of the farm Driefontein 355 IQ

**GDARD APPLICATION REFERENCE NUMBER:**

002/17-18/E0194

February 2018

**Submitted by**

Environmental Consultants (Pty) Ltd

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## OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

As per GN 326 EIA Regulations as published 7 April 2017, a guideline and objective to conduct a Basic Assessment Report has been promulgated.

The objective of the environmental impact assessment process is to, through a consultative process—

a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
b) identify the alternatives considered, including the activity, location, and technology alternatives;
c) describe the need and desirability of the proposed alternatives;
d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
(i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
(ii) the degree to which these impacts—
(aa) can be reversed;
(bb) may cause irreplaceable loss of resources; and
(cc) can be avoided, managed or mitigated; and
e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
(i) identify and motivate a preferred site, activity and technology alternative;
(ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
(iii) identify residual risks that need to be managed and monitored.

A basic assessment report must contain the information that is necessary for the competent authority to be consider and come to a decision on the application, and must include—

(a) details of—
(i) the EAP who prepared the report; and
(ii) the expertise of the EAP, including a curriculum vitae;
(b) the location of the activity, including:
(i) the 21-digit Surveyor General code of each cadastral land parcel;
(ii) where available, the physical address and farm name;
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is—
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;
(d) a description of the scope of the proposed activity, including—
(i) all listed and specified activities triggered and being applied for; and
(ii) a description of the activities to be undertaken including associated structures and infrastructure;
(e) a description of the policy and legislative context within which the development is proposed including—
(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and

have been considered in the preparation of the report; and

(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

(g) a motivation for the preferred site, activity and technology alternative;

(h) a full description of the process followed to reach the proposed preferred alternative within the site, including

(i) details of all the alternatives considered;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

(iv) (the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts—

a) (aa) can be reversed;

b) (bb) may cause irreplaceable loss of resources; and

c) can be avoided, managed or mitigated;

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;

(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the possible mitigation measures that could be applied and level of residual risk;

(ix) the outcome of the site selection matrix;

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;

(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including—

(j) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and

(k) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures

(i) an assessment of each identified potentially significant impact and risk, including— cumulative impacts;

(ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk;

(iii) the probability of the impact and risk occurring;

(iv) the degree to which the impact and risk can be reversed;

(v) the degree to which the impact and risk may cause irreplaceable loss of resources; and

(vi) the degree to which the impact and risk can be avoided, managed or mitigated;

(l) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;

(m) an environmental impact statement which contains—

(i) a summary of the key findings of the environmental impact assessment;
(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

(n) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;
(p) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;
(s) an undertaking under oath or affirmation by the EAP in relation to
    a. the correctness of the information provided in the reports;
    b. the inclusion of comments and inputs from stakeholders and I&APs;
    c. the inclusion of inputs and recommendations from the specialist reports where relevant; and
    d. any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
(u) any specific information that may be required by the competent authority; and
(v) any other matters required in terms of section 24(4)(a) and (b) of the Act.

(2) **Where a government notice by the Minister provides for the basic assessment process to be followed, the requirements as indicated in such a notice will apply.**

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# PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

## 1 APPLICANT DETAILS

**GDARD APPLICATION REFERENCE NUMBER:** 002/17-18/E0194

| | |
|---|---|
| Name of Applicant: | Corobrik (Pty) Ltd |
| Tel No: | (031) 560 3134 |
| Fax No: | (031) 565 1532 |
| Postal Address: | P.O. Box 201367<br>Durban North<br>4016 |
| Physical Address: | Corobrik (Pty) Ltd: Driefontein Operational Site<br>Portion 23 of the farm Driefontein 355 IQ<br>Carletonville<br>Gauteng |

## 2 CONTACT PERSON AND CORRESPONDENCE ADDRESS

### 2.1 Details

#### 2.1.1 Details of the EAP

| | |
|---|---|
| Name of the Practitioner: | Dr. P. Erasmus and Ms C. Lambrechts |
| Tel No: | 012 543 3808 |
| Fax No: | 086 621 0294 |
| E-mail address: | info@prescali.co.za |
| Postal Address | P.O. Box 2544<br>Montana Park<br>0159 |

#### 2.1.2 Expertise of the EAP

##### *2.1.2.1 The qualifications of the EAP (with evidence)*

- Dr. P. Erasmus has qualifications in Zoology and Biochemistry and further studied in Zoology and Marine pollution. She is registered as a Pri Sci Nat. (SACNASP), Natural Professional Scientist, for Ecological Sciences, Registration number 116207. Her qualifications are provided in Appendix 1.
- Ms. Lambrechts has qualifications in Zoology and Environmental Management. She is registered as a Cand.Sci.Nat. (SACNASP), Candidate Natural Scientist, Registration number 100003/17. Her qualifications are provided in Appendix 1.

##### *2.1.2.2 Summary of the EAP's past experience (In carrying out the Environmental Impact Assessment Procedure)*

- Dr. P. Erasmus has 9 years of applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
  - Department: Water Affairs and Forestry (DWAF);
  - M2 Environmental Connections (Pty) Ltd;

- Prescali Environmental Consultants (Pty) Ltd.

- Ms. Lambrechts has 4 years of applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
  - Geo Pollutions Technology cc;
  - M2 Environmental Connections cc;
  - Prescali Environmental Consultants (Pty) Ltd.

# 3 DESCRIPTION OF THE PROPERTY

## 3.1 Site Location

**Table 3-1: Property description and surveyor codes**

| | | | |
|---|---|---|---|
| **Farm Names:** | Driefontein 355 IQ | Portion 23 | |
| **Application area (Ha):** | Driefontein 355 IQ | Portion 23 | 227.0139 |
| **Magisterial district:** | Carltonville | | |
| **Distance and direction from nearest town:** | Corobrik (Pty) Ltd: Driefontein is located in Merafong City (Westrand District Municipality), Gauteng Province. | | |
| **21 digit Surveyor General Code for each farm portion:** | T0IQ00000000035500023 | | |

## 3.2 Locality map (show nearest town, scale not smaller than 1:250 000)

(*Show nearest town, scale not smaller than 1:250000).*

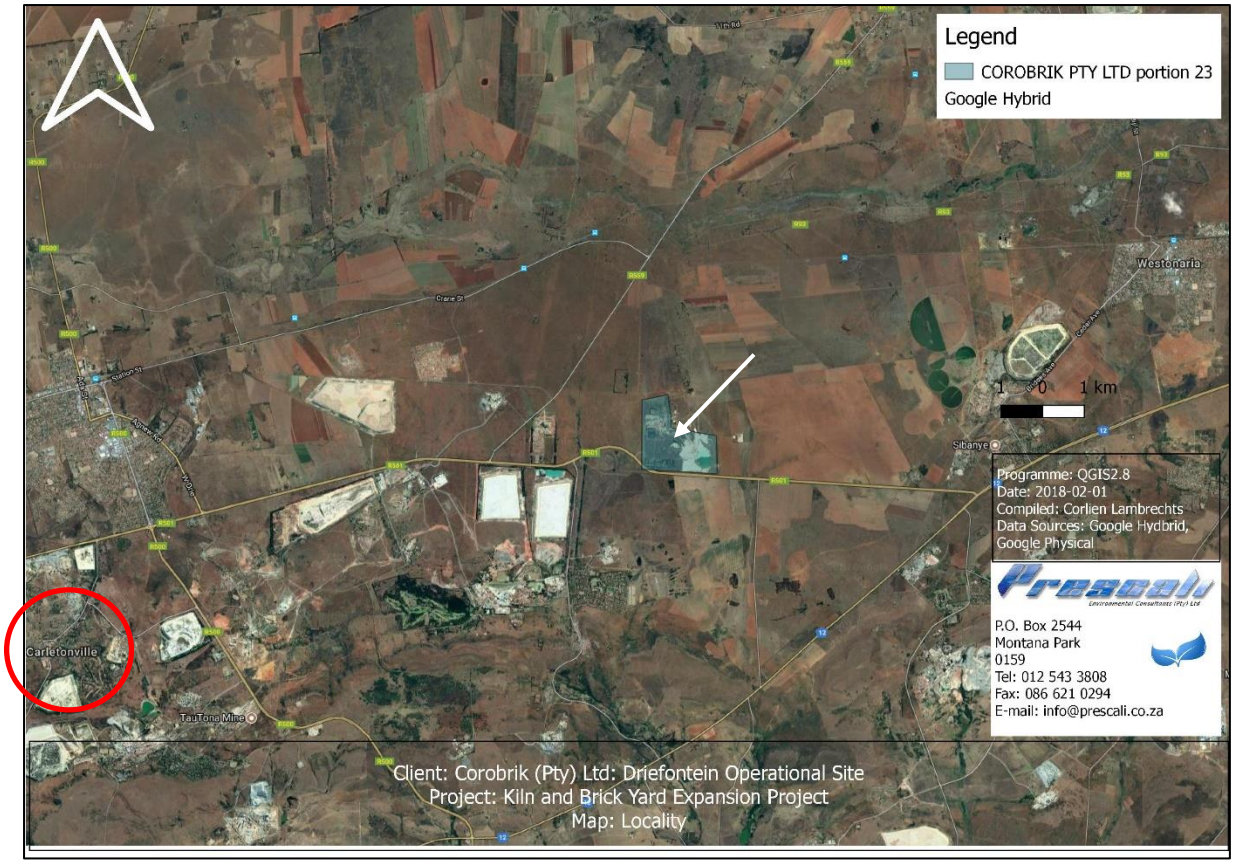



**Figure 3-1: Regional Locality map of Corobrik (Pty) Ltd (with Carletonville indicated in Red)**

## 3.3 Description of the scope of the proposed overall activity

*Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site.*

Corobrik Driefontein Operational Site is an existing brick making facility (with associated mining right) on Portion 23 of the farm Driefontein 355 IQ located in Merafong City (Westrand District Municipality), Gauteng Province.

The project area is located approximately 11.2 km to the south-west of Westonaria, 10.6 km to the north-west of Glanharvie and 3.2 km to the north-east of Sibanye Gold East Village Residential area.

The project will involve the construction and operation of two new kilns (2 x 550 000 brick each) and associated brick yard and other associated support infrastructure. The following Listed activities as per the 2017 regulations in terms of NEMA, 2008 (Act No. 108 of 1998) were identified: Listing notice 1:27, 34,35 and 67 and Listing Notice 3: 12 and 26. A Basic Assessment Process will thus be followed.

Figure 3-2 indicates the location of the activities and the site in relation to the municipal boundaries. Figure 5-1 provides the layout plan showing the new infrastructure and support area to be constructed and operated.

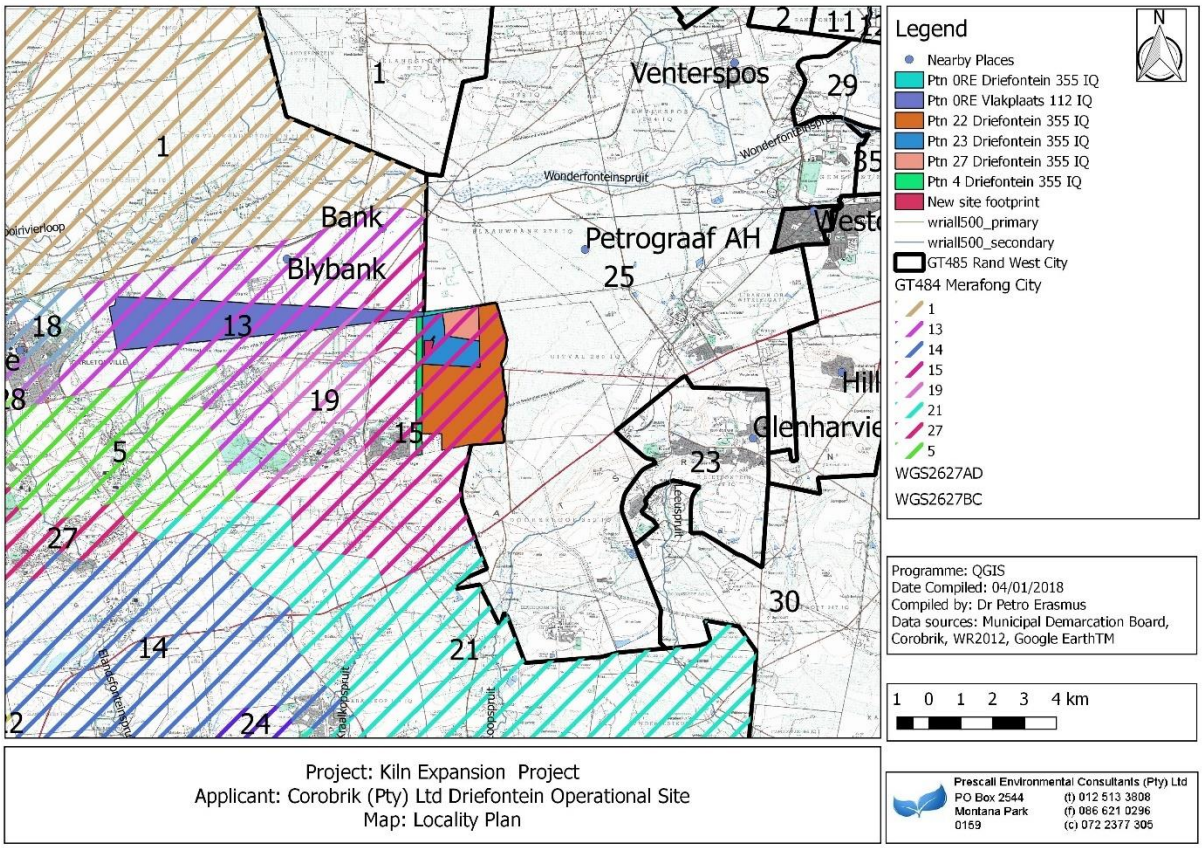



**Figure 3-2: Locality Plan**

# 4 LISTED AND SPECIFIED ACTIVITIES

**Table 4-1: Listed activities triggered**

| Name of Activity | Aerial Extent of The Activity | Listed Activity | Applicable Listing Notice | Waste Management Authorisation |
|---|---|---|---|---|
| **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc.** **E.g. for mining**, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.) | **Ha or m²** | (Mark with an **X** where applicable or affected). | ***(GNR 327, GNR 325 or GNR 324) of 7 April 2017*** | (Indicate whether an authorisation is required in terms of the Waste Management Act).**(Mark with an X)** |
| The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—<br>(i) the undertaking of a linear activity; or<br>(ii) maintenance purposes undertaken in accordance with a maintenance management plan. | 14 Ha | X | 327: LN1: 27 | N/A |
| | | | | |
| The expansion of existing facilities or infrastructure for any process or activity | 14 Ha | X | 327: LN1: 34 | N/A |

| Name of Activity | Aerial Extent of The Activity | Listed Activity | Applicable Listing Notice | Waste Management Authorisation |
|---|---|---|---|---|
| where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding—<br>(i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;<br>(ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or<br>(iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day. *An amendment to the air quality licence is required for the new kilns* | | | | |
| The expansion of residential, retail, recreational, tourism, commercial or institutional developments on land previously used for mining or heavy industrial purposes, where the increased development footprint will exceed 1 000 square meters;<br><br>excluding—<br>(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or<br>(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or<br>(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land. *The area to be used for the kilns and new brick yard falls under the mining right area for Driefontein* | 14 Ha | X | 327: LN1: 35 | N/A |
| Phased activities for all activities— | 14 Ha | X | 327: LN1: 67 | N/A |

| Name of Activity | Aerial Extent of The Activity | Listed Activity | Applicable Listing Notice | Waste Management Authorisation |
|---|---|---|---|---|
| (i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;<br>excluding the following activities listed in this Notice-<br>17(i)(a-d); 17(ii)(a-d); 17(iii)(a-d); 17(iv)(a-d); 17(v)(a-d); 20; 21; 22; 24(i); 29; 30; 31; 32; 34; 54(i)(a-d); 54(ii)(a-d); 54(iii)(a-d); 54(iv)(a-d); 54(v)(a-d); 55; 61; 64; and 65; or (ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.<br>*For Vegetation clearance and kiln development* | | | | |
| The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.<br>c. Gauteng<br>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;<br>ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or<br>iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.<br>*Approximately 14 Ha of Critical Biodiversity or Ecological support area will be cleared* | 14 ha | X | 324: LN3: 12 | N/A |
| Phased activities for all activities—<br>i. listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or | 14 ha | X | 324: LN3: 26 | N/A |

| Name of Activity | Aerial Extent of The Activity | Listed Activity | Applicable Listing Notice | Waste Management Authorisation |
|---|---|---|---|---|
| ii. similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices—where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; —excluding the following activities listed in this Notice—<br>7; 8; 11; 13; 20; 21; and 24.<br>*For Vegetation clearance* | | | | |

## 5 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

*Provide a plan drawn to a scale acceptable to the competent authority but not less than 1:10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site.*

Please refer to Figure 5-1. The project will involve the construction and operation of two new kilns and associated brick yard and other associated support infrastructure. This will be an expansion of the current activities on the Driefontein footprint and will consist of the following infrastructure:

- Kilns;
- Brick yard / Stockyard;
- Sewer line;
- Overland conveyer;
- Gate house;
- Storm water channel;
- Admin building;
- Factory;
- Office parking;
- Truckers ablution blocks;
- Truck stop area;
- Unpaved stock yard;
- Earth works platform; and
- Vegetation clearance.

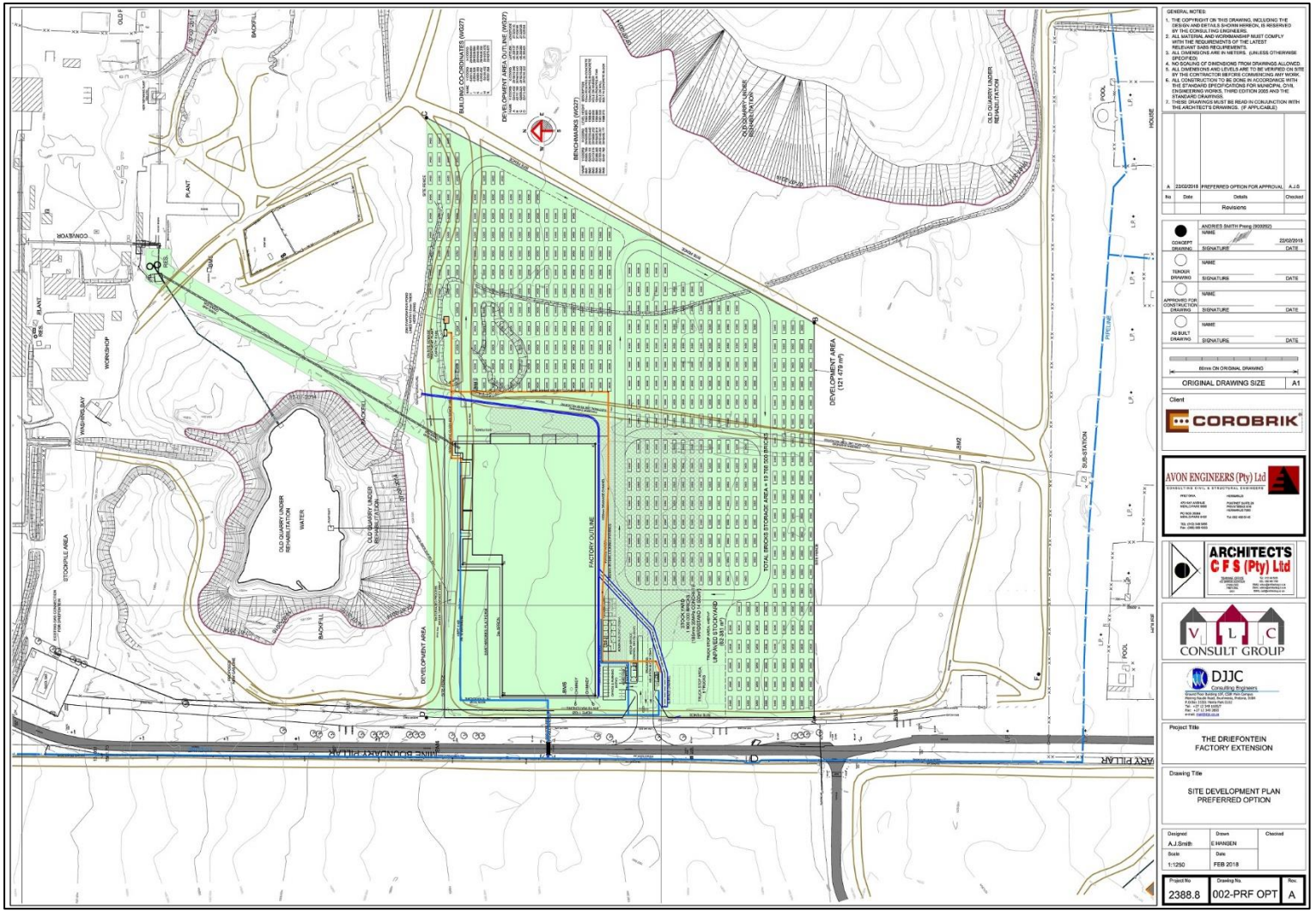



**Figure 5-1: Proffered Site Development (Layout) plan**

### 5.1.1 Commodity to be mined (Mineral Deposit)

Corobrik is an existing clay mining operation. No new mining will be initiated as part of the construction of the new kilns and brick yard as per this application with the Gauteng Department of Agriculture and Rural Development (GDARD).

## 6 POLICY AND LEGISLATIVE CONTEXT

| **Applicable Legislation And Guidelines Used To Compile The Report** | **Reference Where Applied** | **How Does This Development Comply With And Respond To The Legislation And Policy Context** |
|---|---|---|
| *(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)* | *(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)* | *(E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)* |
| Constitution of South Africa | N/A | Application made for environmental authorisation. |
| National Environmental Management Act, 1998 (Act No. 107 of 1998) | Section 6 and Section 4 | Application made for environmental authorisation from GDARD. |
| National Environmental Management: Air Quality Act (AQA), 2004 (Act No. 39 of 2004) | Yes | Amendment to Air Emissions Licence is required and is applied for to the District Municipality. |
| Air Pollution and Prevention Act, 1965 (Act No. 45 of 1965) | Yes | Amendment to Air Emissions Licence is required and is applied for to the District Municipality. |
| National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and National Spatial Biodiversity Assessment | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| Environment Conservation Act, 1989 (Act No. 73 of 1989) | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| National Water Act, 1998 (Act No. 36 of 1998) | N/A | No amendment to the current WUL is required as part of the new activities proposed. |
| Water Act, 1956 (Act No. 54 of 1956) | N/A | N/A |
| Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965) | N/A | Amendment to Air Emissions Licence is required and is applied for. |
| National Heritage Resources Act, 1999 (Act No. 25 of 1999) | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| Mine Health and Safety Act, 1996 (Act No. 29 of 1996) | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| Hazardous Substances Act, 1973 (Act No. 15 of 1973) | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. |
| Provincial ordinances | N/A | All the necessary steps have been taken to ensure the legislation has been complied with. An application for the removal of listed plant species will be submitted as required. |

# 7 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

*(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).*

Corobrik is the largest manufacturer, distributor and exporter of bricks and allied building products in Africa. Corobrik was established in Durban in 1902 and owns factories in Avoca, Driefontein, Glencoe, Lawley, Midrand, Odendaalsrus, Phesantekraal, Polokwane, Rietvlei, Springs and Witbank and employs over two thousand people countrywide.

In 2003, Ownership of Corobrik (Pty) Ltd changed with BEE Entity AKA Capital (Pty) Ltd acquiring 25% of the share capital of the company.

In 2007, Corobrik was selected and sponsored by the Department of Labour to develop courses in bricklaying, plastering, tiling, painting and carpentry. In 2008, Corobrik becomes the first company in Africa to begin selling carbon credits, gained from their savings in carbon emissions due to Lawly factory's fuel switch programme and within the same year, Corobrik was re-organised to facilitate the allocation of 26% of the share capital to the Corobrik Staff Trust for the benefits of all employees.

In 2009, Driefontein factory fuel switch programme was awarded for the switching from coal to natural gas in the brick drying process and thereby significantly reducing its emissions[1]. The Corobrik Driefontein factory was awarded its first carbon credits for its fuel switch programme.

In 2010, 42 students obtained bricklaying and paving skills in a programme launched by Corobrik. The Corobrik Building Training Centre in the Western Cape was sponsored by the Department of Public Works to provide the 42 students with bricklaying and paving skills.

The Corobrik manufacturing processes are based on sound environmental practices, designed to lessen the impact of their business on the environment. Corobrik adhere to the Minerals and Mine, Health and Safety Acts. The key activities in the quarrying and manufacturing operations that contribute to sustainable development:

- Operations are located in rural and semi-rural areas, to provide long term employment to neighbouring communities.
- Social and labour plans exist for operations within the framework of the New Order Mining Rights.
- An approved Environmental Management Plan for each quarry and process, which provides for its rehabilitation and reuse as a nature reserve around a pollution free dam, recreational area, landfill use or land for commercial/residential development.

Corobrik aims to reduce its carbon footprint by being as energy efficient as possible during the manufacture and delivery of products, as well as using cleaner burning fuel:

- Six factories are fired on natural gas with further conversions to natural gas under investigation.
- Corobrik is far advanced with SANS14001 environmental management system certification at its operations.[2]

The proposed expansion of the Corobrik operations at Driefontein, with the additional kilns and associated brickyards, will boost the number of employees that may be employed within the Corobrik operation. This may entail the following positive impacts:

[1]Website: http://www.energy.gov.za/files/esources/kyoto/2011/20110722%20PDD_Fuel%20Switch%20at%20Corobriks%20Driefontein%20Brick%20Factory%20in%20South%20Africa(NoTrackChanges).pdf
[2] https://www.corobrik.co.za/environment

- Social upliftment;
- Increased job creation with area; and
- Growth of economy.

## 7.1 Motivation for the overall preferred site, activities and technology alternative

### 7.1.1 Preferred site

The preferred site is the one currently in use by Corobrik (Pty) Ltd: Driefontein as they are an existing operation and the space available on the site will be utilised. The proposed kiln expansion activities fall within their larger current footprint.

### 7.1.2 Preferred Activities

#### *7.1.2.1 Mining methods*

Currently mining is active on the Corobrik (Pty) Ltd: Driefontein premises to obtain clay for the making of bricks, but no new mining activities related to Corobrik forms part of this application. The activities related to this application is the construction of two new Kilns and sbrickyard with associated infrastructure.

### 7.1.3 Technology alternatives

The process currently at Corobrik entails open cast clay mining and stockpiling. The raw materials are processed through a Primary and Secondary crushing process to a clay storage facility. Thereafter, the material is fed into a Steele 90 extruder. After extrusion the clay column is fed through a Slug cutter and push-through-cutter, before the individual bricks are set onto kiln cars for indexing through a tunnel dryer. After drying, the kiln cars enter a tunnel kiln where the required temperature is achieved with the use of Sasol natural gas via a series of gas burners. The drying and firing cycle takes approximately seven days.

Initially, the Corobrik drying process used coal for the drying process and the operation has switched to natural gas, which is much safer, less emissions associated with the use of natural gas and therefore safer and more environmentally friendly.

Natural drying of the bricks will not be an ideal method, as it is time-consuming and weather dependant and has quality impacts on the bricks produced by Corobrik (Pty) Ltd: Driefontein.

## 7.2 Full description of the process followed to reach the proposed preferred alternatives within the site

*NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout*

### 7.2.1 Details of the development footprint alternatives considered.

With reference to the site plan provided as **Error! Reference source not found.** 5 and the location of the individual a ctivities on site, provide details of the alternatives considered with respect to:

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;

(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

**Table 7-1: Evaluation of Site Configuration Options**

| CRITERIA FOR COMPARISON | PREFERRED LAYOUT, APPENDIX 5 |
|---|---|
| Incorporated within the project site | Yes. |
| Material Transport and process flow | Good. |
| Soils | No difference in impacts between sites. |
| Potential Dust nuisance to residence | No difference in impacts between sites. |
| Potential for contamination of surface water | No infrastructures within 1:50 or 1:100 year flood line. |
| Geology and fracture/ fault intensity | No difference in impacts between sites. |
| Potential exposure to spills and seepage | Low/insignificant risk of affecting groundwater. |
| Safety | Good, no difference in impact between sites. |
| Potential ecological harm | No significant difference, the preferred terrain is the one to be developed which falls within an already impacted site. |
| Biodiversity, fauna and flora | No significant difference, the preferred terrain is the one to be developed which falls within an already impacted site. |
| Visual intrusion | No significant difference. |
| Impact on land use | No significant difference. |
| Impact on archaeological interest sites | No significant difference. |
| Socio-economic impacts | No significant difference. |

### 7.2.2 Preferred development footprint within approved site

Please refer to Figure 5-1 and Table 7-1 above. The approved site for application is the farm portions as indicated and the development of the new Kilns and brickyard is ideal in terms of material movement around site and on an already impacted site within close proximity of the current operations of Corobrik (Pty) Ltd: Driefontein.

### 7.2.3 Details of the development footprint: alternatives considered.

With reference to the site plan provided as **Error! Reference source not found.** and the location of t he individual activities on site, details of the alternatives considered with respect to various aspects is provided in the sections below.

#### *7.2.3.1 The property on which or location where it is proposed to undertake the activity;*

Please refer to Section 7.1.1 as no other feasible alternatives are applicable in terms of the property for development. Corobrik (Pty) Ltd: Driefontein is an existing operation with limited development space in terms of areas which is already impacted/degraded. The development of infrastructure on an already impacted area closely associated with the current infrastructure is the best suited (brown fields versus green fields).

#### *7.2.3.2 The type of activity to be undertaken*

With regards to the project activities to be undertaken on site please refer to Section 7.1.2 as no other alternatives are applicable to the applicant/application other than choosing the most favourable position for minimizing impacts.

#### *7.2.3.3 The design or layout of the activity*

The final layout has been designed to be favourable in terms of the current operations at Corobrik (Pty) Ltd: Driefontein and the surrounding environmental features. Two options were investigated for the

location of the brick laying area and the preferred option is indicated in Figure 5-1. The alternative as originally indicated in the background information document (Figure 7-1) was changed as a result of the distance from the most southern location of the brick yard to the kilns. It is more feasible to have the brick yard closer to the kilns due to cost involved in transporting the bricks.

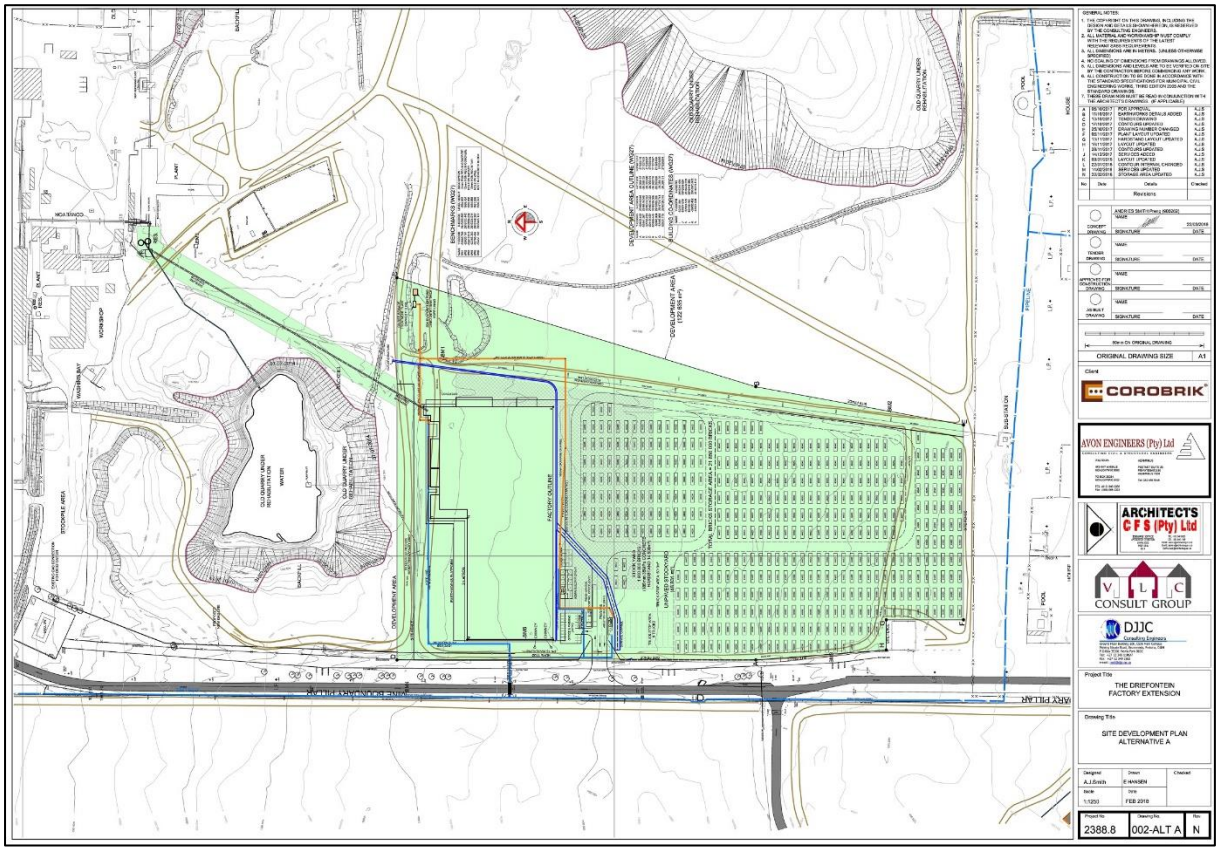



**Figure 7-1: Alternative site layout plan (not preferred option)**

### *7.2.3.4 The technology to be used in the activity*

Please refer to Section 7.1.3 above. The kilns will be gas fired due to the reduced environmental impacts when compared to coal fire.

### *7.2.3.5 The operational aspects of the activity*

No other alternatives were investigated as the operational aspects of these activities will have minimal impacts, while the construction phase will have the largest impacts. Emergency and maintenance measures to ensure that the Corobrik Driefontein complies with the Safety, Health and Environmental codes of practice (SHEQ) should ensure that these new areas function properly and safely during the operational phase.

### *7.2.3.6 The option of not implementing the activity*

The no-go option refers to the alternative of the proposed development not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environment and the status quo of the area would remain. Another aspect of the no go option is that the capacity of Corobrik (Pty) Ltd: Driefontein does not increase and this will thus prevent additional employment opportunities from being generated.

# 8 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

*Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.*

## 8.1 Notification of I&AP's

Following the project initiation, correspondence will only be directed to registered I&AP's after they have registered after being identified as an I&AP and invited to register. Accordingly, to ensure that all potential I&AP's were made aware of the project and had the opportunity to register, the initial advertising was as thorough as possible.

### 8.1.1 Newspaper Advertisement

Newspaper adverts had been placed within the local newspapers of the immediate areas, Carletonville on 11 January 2018 and the Randfontein Herald on 12 January 2018.

### 8.1.2 Site Notice

To inform the surrounding public, I&APs, communities and immediately adjacent landowners of the proposed, site notices was placed at various sites and locations which are visible and accessible in relation to the current Corobrik (Pty) Ltd: Driefontein area (and where the new activities are proposed).

To inform the surrounding public, I&APs, communities and immediately adjacent landowners to farm about the proposed Environmental authorisation application, site notices were placed at various places and locations which are visible and accessible within and surrounding the Corobrik project area.

**Table 8-1: Site notice placement details**

| | |
|---|---|
| A3 Posters placed within the project area | • At the Corobrik footprint/mining site<br>• On the roads leading to Corobrik (Pty) Ltd |

### 8.1.3 Direct Notification of Identified I&AP's

A Background Information Document (BID) was compiled giving detail on the applicant, the Environmental Assessment Practitioner (EAP), the scope and locality of the proposed project, the environmental impact assessment process, purpose and process of public participation and included an invitation to register as an I&AP and provide comment which was distributed to all of the registered interested and affected parties. Site notices and background information documents (BID) were distributed for various stakeholders, farmers and I&APs within the Corobrik area. Distribution was done on the 10th of January 2018.

I&AP's who participated in the Public Involvement Process by attending meetings, providing comments in writing and making verbal contact will be included in this list. Government authorities will also be captured as registered I&APs. The BID documentation was sent to all of the registered and identified I&AP's. Stakeholders on the database will be notified of the availability of the application reports via email, fax and post. The reports will also be made available at the Local Municipality Offices.

## 8.2 Public Meetings

A public meeting is proposed for the 23 March 2018 at 10h00 am. Please refer to Attendance register included in Appendix 6 and the summary of comments and issues that were included in Section 8.3 within Table 8-2.

The concept of open meetings will be adopted because it allows for more interaction between project proponents and members of the community/public and entails one to one discussions and small group discussions, picture and map illustrations about the proposed mining project in pursuit of full comprehension by I&APs about the proposed project.

## 8.3 Summary of issues raised by I&APs

*(Complete the table summarising comments and issues raised, and reaction to those responses)*

The table below will be updated with the comments received during the public meeting to be scheduled.

**Table 8-2: Summary of issues raised by I&APs**

| **Interested and Affected Parties** | | **Date** | **Issues raised** | **EAPs response to issues as mandated by the applicant** | **Section and paragraph reference in this report where the issues and or response were incorporated.** |
|---|---|---|---|---|---|
| List the names of persons consulted in this column, and | | **Comments Received** | | | |
| Mark with an X where those who must be consulted were in fact consulted. | | | | | |
| **AFFECTED PARTIES** | | | | | |
| **Landowner/s** | | | | | |
| Corobrik | X | N/A | | | |
| **Lawful occupier/s of the land** | | | | | |
| Corobrik | X | N/A | | | |
| | | | | | |
| **Landowners or lawful occupiers on adjacent properties** | | | | | |
| Nico Gewers | X | 09/01/2018 | Thanks Erica, for the heads-up. We would keep an eye on this and possibly also register directly as I&APs, in addition to Koos & Karel. It is important for Dr Erasmus to note that our proposed PV Solar Facility (~200 MW) with a large number of solar panels and other infrastructure, | Please take note of the comment from Sibanye Gold as it may have an impact on your receptors? | |

| **Interested and Affected Parties** | | **Date** | **Issues raised** | **EAPs response to issues as mandated by the applicant** | **Section and paragraph reference in this report where the issues and or response were incorporated.** |
|---|---|---|---|---|---|
| List the names of persons consulted in this column, and | | **Comments Received** | | | |
| Mark with an X where those who must be consulted were in fact consulted. | | | | | |
| | | | would be to the east/northeast of the proposed Corobrick kiln and brickyard expansion also along the R501, and excessive dust, etc. from the brickyard operations could increase the frequency of solar panel washing at the PV Plant, and hence maintenance costs. But we need to discuss this as a focus group, and get a sense of the results from their AQ study. Thanks. | | |
| Jevon Martin | X | 10/01/2018 | Please find attached the .kmz of the plant layout, including all power line routes options catered for in our Basic Assessment Report. Environmental Authorisations were granted for both the plant and the power line servitudes. Please do not distribute this .kmz outside of your direct project team. Can you please send us a | Thank you very much for the information we will not distribute it outside of our team as requested and I am sure Natasha can use the information. Please see attached layout plan for the new activities at Corobrik. I will request a map of the whole of the operations from Andries. | |

| **Interested and Affected Parties**<br>List the names of persons consulted in this column, and<br>Mark with an X where those who must be consulted were in fact consulted. | | **Date**<br>**Comments Received** | **Issues raised** | **EAPs response to issues as mandated by the applicant** | **Section and paragraph reference in this report where the issues and or response were incorporated.** |
|---|---|---|---|---|---|
| | | | layout of the operations and proposed expansion? | | |
| **Municipal councillor:** | **X** | N/A | | | |
| | | | | | |
| **Municipality** | | | | | |
| Itani Mashamba | | 13/02/2018 | To make comments on the project. Formal comments will be made based on the report that will be send to my office. | | |
| **Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS** | | | | | |
| N/A | | | | | |
| **Communities** | | | | | |
| N/A | X | | | | |
| **Dept. Land Affairs** | | | | | |
| N/A | X | | | | |
| **Traditional Leaders** | | | | | |
| N/A | X | | | | |
| **Dept. Environmental Affairs** | | | | | |
| GDARD | X | Comment raised by GDARD at meeting held with the authorities on Tuesday, 5 | Dust mitigation measures must be addressed<br>Impacts on agricultural activities must be addressed and may need additional mitigation measures | It was determined that air quality impacts occur most significantly to the south-south-west of the operations.<br>1. Simulated results showed that exceedances of the HF, NO2, SO2, PM2.5 and dust fallout | |

| **Interested and Affected Parties**<br>List the names of persons consulted in this column, and<br>Mark with an X where those who must be consulted were in fact consulted. | | **Date**<br>**Comments Received** | **Issues raised** | **EAPs response to issues as mandated by the applicant** | **Section and paragraph reference in this report where the issues and or response were incorporated.** |
|---|---|---|---|---|---|
| | | December 2017 at 14h00 | An AEL application must be submitted | assessment criteria are not likely to occur beyond the boundary or at any of the receptors during the operational phase.<br>2. Simulated results showed that exceedances of the PM10 fallout assessment criteria are likely to occur just beyond the boundary but not at any of the receptors during the operational phase. See section 3.3.3 and section 4 for more information within the Air Quality report.<br>This will be done as part of the AEL amendment process. | |
| **Other Competent Authorities affected** | | | | | |
| N/A | X | | | | |
| **OTHER AFFECTED PARTIES** | | | | | |
| | | | | | |
| **INTERESTED PARTIES** | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# 9 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES.

*(The environmental attributed described must include socio- economic, social, heritage, cultural, geographical, physical and biological aspects)*

***The best suited alternative was already used during the design of the new Kilns and brickyard development and therefore the descriptions of these will be captured in the Baseline environment (Refer to Section 10).***

# 10 BASELINE ENVIRONMENT

*(The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)*

## 10.1 Type of environment affected by the proposed activity

*(Its current geographical, physical, biological, socio- economic and cultural character)*

### 10.1.1 Geology

Available 1:250 000 geological maps suggest that Corobrik Driefontein is located in an area underlain by shale, sandstone and coal belonging to the Karoo Supergroup, underlain with dolomite. Percussion drilling has confirmed this information, suggesting that the site under discussion is in fact underlain by about 29 m thick shale (Karoo Supergroup), as well as about 10 m thick chert (breccia) with <5% intermittent soft sandy clay (wad) and dolomite, both from the Malmani Subgroup, Transvaal Supergroup. Dolomite underlies this site from 41.5 m depth. No rock outcrop occurs on this site (Avon Engineers, email 20 Feb 2017 (Geo Pollution Technologies - Gauteng (Pty) Ltd, 2018)).

Dolomite bedrock underlies the site for the new proposed development from 41.5 m below existing ground level. It is overlain by between 2 m thick transported gravelly soil, 30 m shale, followed by10 m thick chert (breccia) with <5% wad.

The wad-rich chert (breccia) layer is regarded as a potential receptacle directly above the dolomite bedrock. However, an analysis of the borehole data concluded that there is a low to medium risk of small to medium size sinkhole, and low risk of doline formation, i.e., an Inherent Risk Class 2. The Dolomite Area Designation is D3.

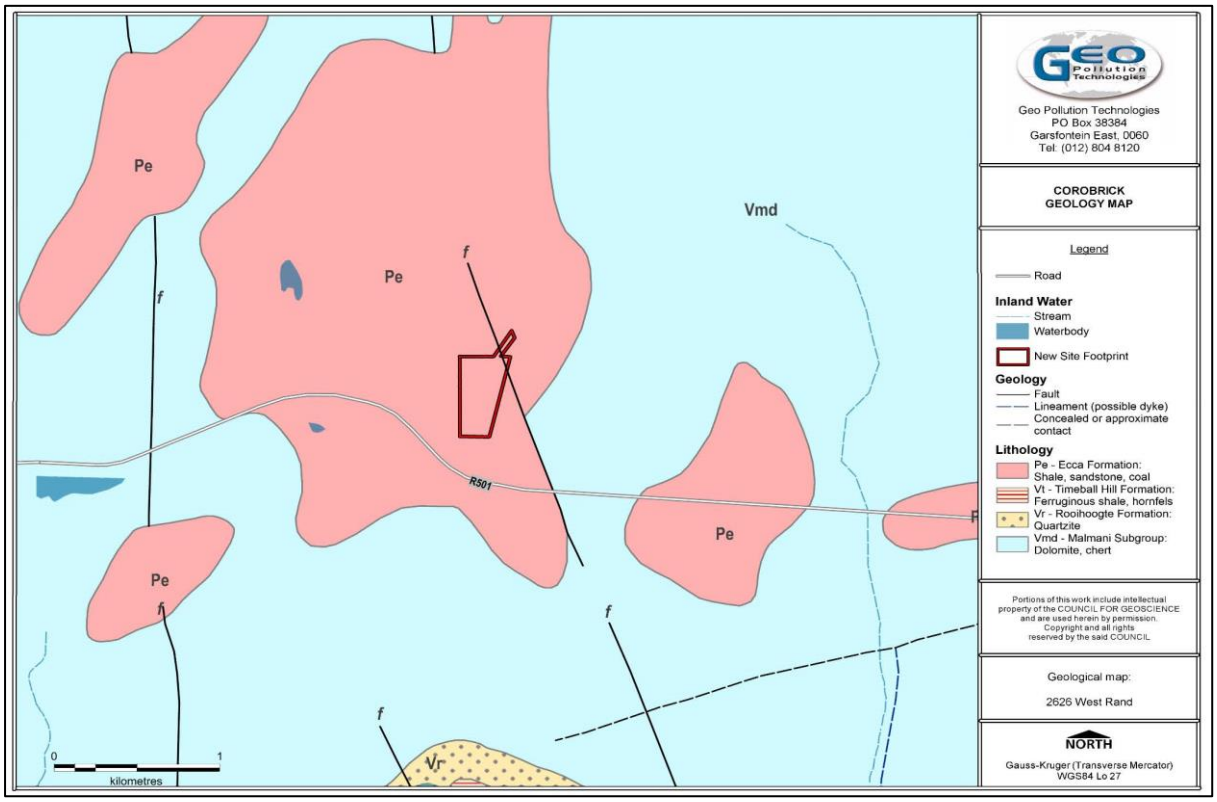



**Figure 10-1: Corobrik Geology Map**

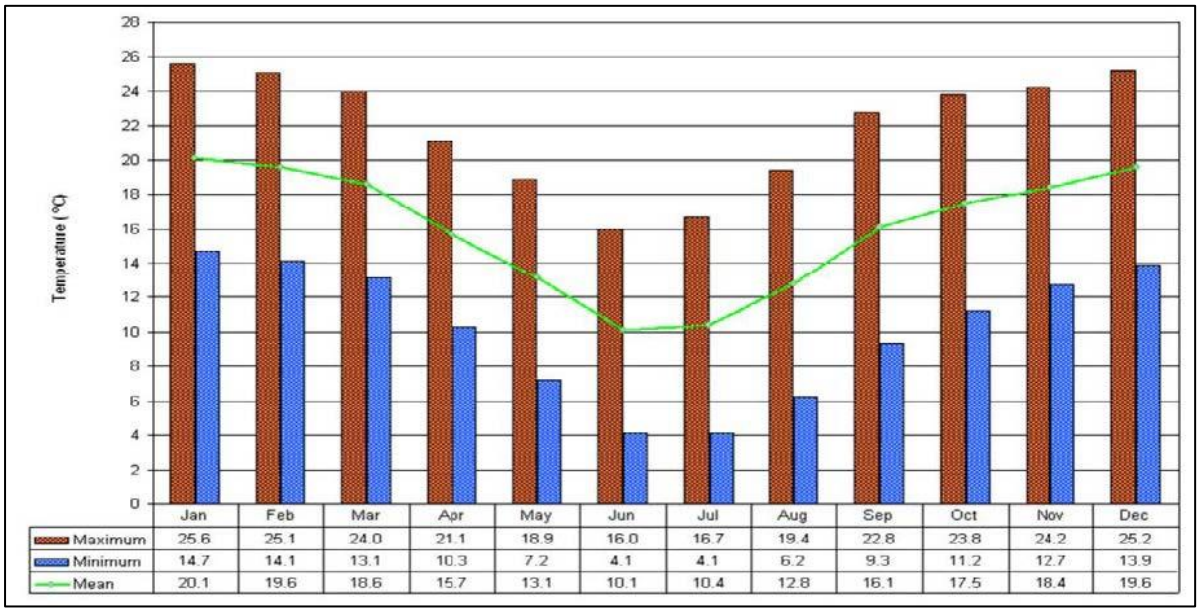
### 10.1.2 Climate

The nearest South African Weather Services (SAWS) station to Corobrik Driefontein (with complete and detailed information) is O.R. Tambo International Airport, located approximately 75 km north-east of the project site. As there are no major topographical barriers between the proposed project site and the weather station, it is fair to presume that the long-term weather data recorded at the airport will be representative of the climatic conditions experienced on the study site.

South Africa is characterised by distinct seasonal variation in temperature and rainfall. This is particularly evident on the Highveld where average maximum and minimum temperatures vary between 25.6°C and 4.1°C. Rain occurs predominantly during the summer months, from October to March. Details of the climatic conditions recorded at the SAWS station at O.R. Tambo are presented below. For wind data, please refer to the Air quality section, specifically Section 10.1.9.4, where descriptive wind data and wind roses are shown for the area of Corobrik (Pty) Ltd: Driefontein operations.

#### *10.1.2.1 Temperature*

The monthly average of daily temperatures, illustrating the long-term monthly mean, minimum and maximum temperatures are presented in the figure below. As is typical throughout South Africa, there is a distinct seasonal variation in temperature. The mean monthly temperatures are highest (>25°C) between December and February which are typically summer months. Temperatures gradually drop with the lowest temperatures being recorded during June and July (minimum temperatures of 4°C), which are typically winter months on the South Africa Highveld.

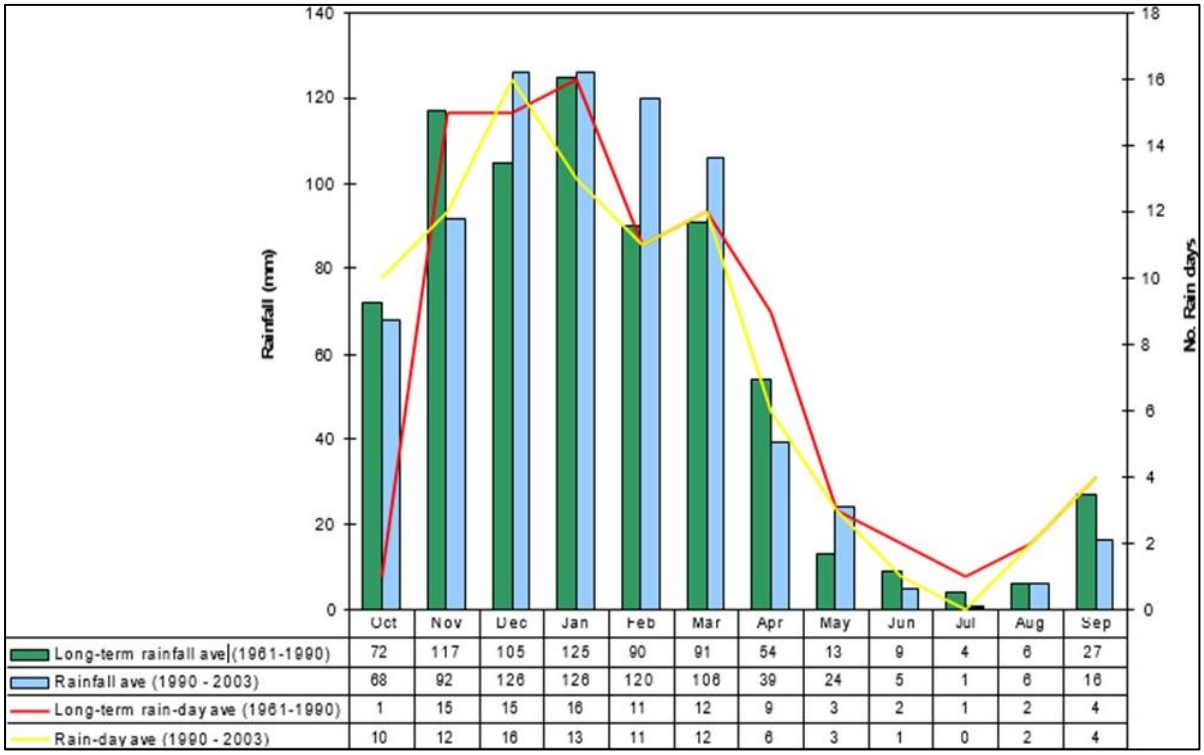



| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum | 25.6 | 25.1 | 24.0 | 21.1 | 18.9 | 16.0 | 16.7 | 19.4 | 22.8 | 23.8 | 24.2 | 25.2 |
| Minimum | 14.7 | 14.1 | 13.1 | 10.3 | 7.2 | 4.1 | 4.1 | 6.2 | 9.3 | 11.2 | 12.7 | 13.9 |
| Mean | 20.1 | 19.6 | 18.6 | 15.7 | 13.1 | 10.1 | 10.4 | 12.8 | 16.1 | 17.5 | 18.4 | 19.6 |

**Figure 10-2: Long-term monthly maximum, minimum and mean temperature recorded for the O.R Tambo SAWS station**

### *10.1.2.2 Rainfall and Evaporation*

The region is characterised by summer rainfall, with 84% of the annual rainfall occurring between October and March. During these months, rain falls over a period of more than ten days in a month (potential for rain every three days). During the drier months, on average rainfall is recorded for three days in a month (potential for rain every ten days).




| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Long-term rainfall ave (1961-1990) | 72 | 117 | 105 | 125 | 90 | 91 | 54 | 13 | 9 | 4 | 6 | 27 |
| Rainfall ave (1990 - 2003) | 68 | 92 | 126 | 126 | 120 | 106 | 39 | 24 | 5 | 1 | 6 | 16 |
| Long-term rain-day ave (1961-1990) | 1 | 15 | 15 | 16 | 11 | 12 | 9 | 3 | 2 | 1 | 2 | 4 |
| Rain-day ave (1990 - 2003) | 10 | 12 | 16 | 13 | 11 | 12 | 6 | 3 | 1 | 0 | 2 | 4 |

**Figure 10-3: The average rainfall and average number of rain days recorded for the SAWS station at O.R. Tambo**

The annual average evaporation for this weather station is 2160 mm. Based on long-term averages, the highest monthly evaporation is recorded during October, despite the fact that the highest average temperatures are recorded between December and February.

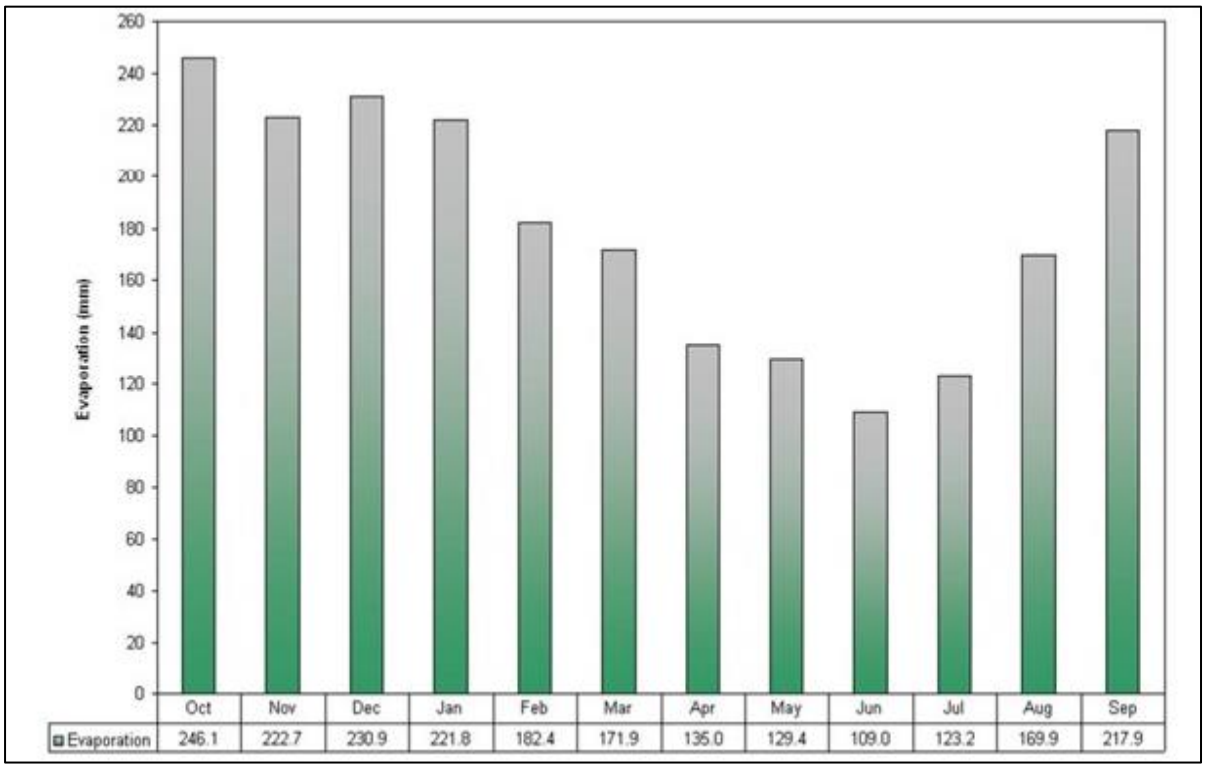



**Figure 10-4: Mean monthly evaporation**

### 10.1.3 Topography

The topography (shown in Figure 10-5) can normally be used as a good first approximation of the hydraulic gradient in the unconfined aquifer. This discussion will focus on the slope and direction of fall of the area under investigation, features that are important from a groundwater point of view.

The area across the site boundaries is relatively flat with a general slope from the R501 road in south to office buildings in the north of the site. There are three (3) pits across the site which will serve as accumulation point for some surface and most groundwater (if encountered).

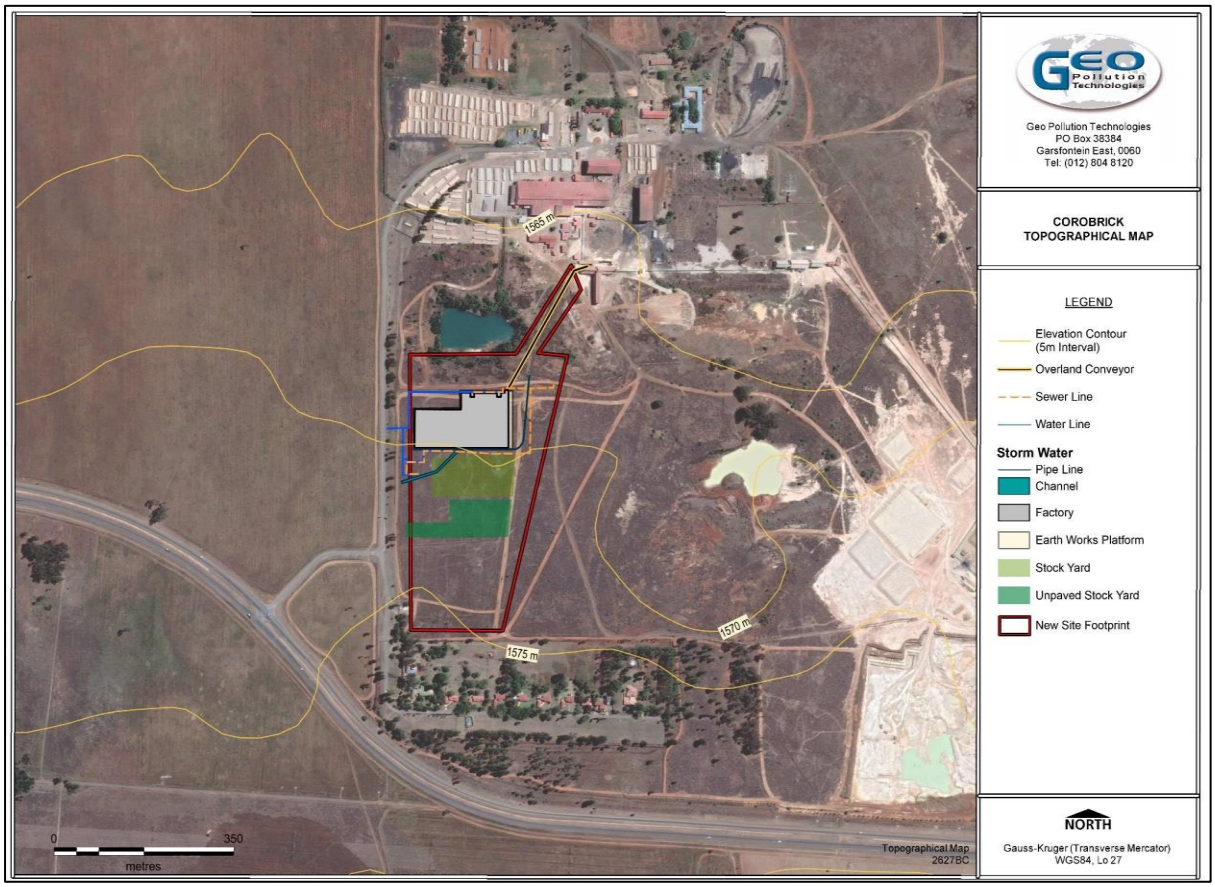



**Figure 10-5: Topographical map**

### 10.1.4 Land Capability

#### *10.1.4.1 Land Use*

The area immediately surrounding the Corobrik Driefontein operations is currently utilised for agriculture and mining. Please refer to the Land use map which shows the large yellow areas as mining areas and the red dots as mineral points and mining activities (Figure 10-42).

### 10.1.5 Surface water

#### *10.1.5.1 Catchments*

The proposed project site falls within the Upper Vaal Water Management Area and the C23E Quaternary Catchment. The nearest watercourse is 2.5 km from the project site and is a tributary of the Wonderfonteinspruit. Runoff from the site of the proposed infrastructure feeds the Wonderfonteinspruit and from there the Mooirivierloop.

The project site falls into the C23D-01384 Sub Quaternary Region (SQR) (DWA, 2013). The lower Wonderfonteinspruit, otherwise known as the Mooirivierloop occurs after the confluence with the Rietfonteinspruit and the C23E-01266 SQR. The PES of the lower Wonderfonteinspruit is seriously modified (class E). This PES is largely attributed to industrial activities, waste water treatment works, townships and instream habitat modification (DWA, 2013; Table 6-3). It is further stated that the majority of the Wonderfonteinspruit exists within a pipeline which presents serious instream modification. Due to the presence of substantial impacts and the low confidence in the presence of fish in the SQR the ecological importance and sensitivity is viewed as low.

The main impacts currently on the Wonderfonteinspruit are:

- Extensive underground mining in the region, which has reduced the local groundwater level, created numerous sinkholes, and likely caused a long-term reduction in the flow of systems.
- Piping the system for 32 km which has completely changed the dynamics of the system.
- Poor water quality within the system.
- Polluted sediments.
- Deterioration in Fish Health.

**Table 10-1:PES and EIS for the Lower Wonderfonteinspruit SQR**

| Component | C23D-01384 (Lower Wonderfonteinspruit) |
|---|---|
| Present Ecological Status (PES) | Class E (Seriously modified) |
| Ecological Importance | Low |
| Ecological Sensitivity | Low |

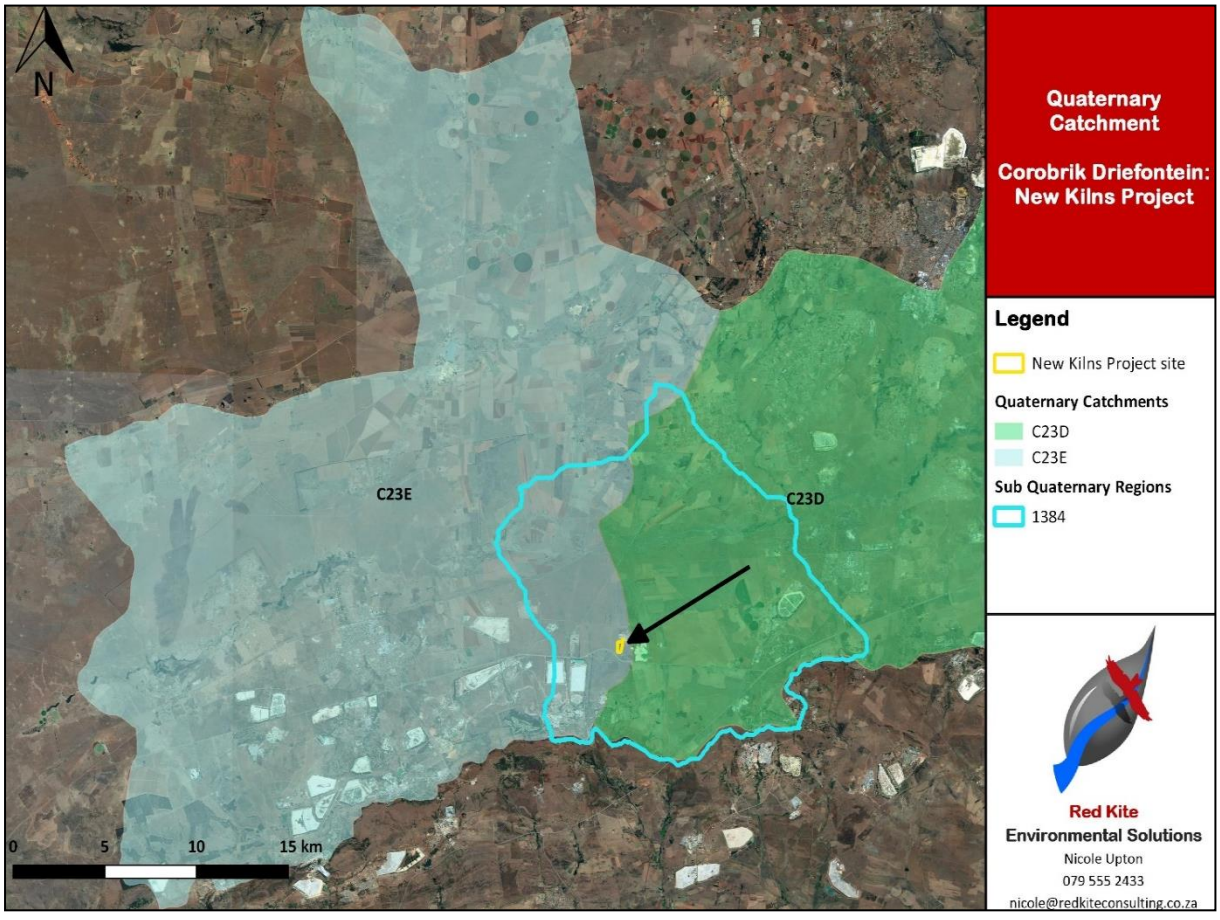



**Figure 10-6:Quaternary catchments and SQR**

#### *10.1.5.2 Mean Annual Runoff*

Natural Mean Annual Runoff (MAR) for the C23E equates to 13.41 $Mm^3$. Mean Annual Runoff for the relevant Quaternary Catchment, as acquired from WR2012, is indicated in the table below. WR2012 indicated a 39.4% decrease in MAR from WR2005 for the quaternary catchment.

**Table 10-2: Mean Annual Run-off for the C23E Catchments (WR2005)**

| Catchment | Catchment Area ($km^2$) | MAR (mcm) |
|---|---|---|
| C23E | 850 | 6.05 |

#### *10.1.5.3 Surface Water Quality*

No surface water samples were taken from the Wonderfonteinspruit or its tributary situated nearer to the project site as the tributary is approximately 2.5 km from the project site and the Wonderfonteinspruit is more than 5 km from the site and the system is piped for 32 km which has completely changed the dynamics of the system. Another factor taken into account was the current water quality of the Wonderfonteinspruit and Mooiloopspruit which have been severely affected by the gold mining activities located in their catchments. The Wonderfonteinspruit, has been identified in a number of studies as the site of significant radioactive and other pollution, generally attributed to the mining and processing of uraniferous gold ores in the area.

Corobrik Driefontein has an ongoing surface water monitoring programme for the three quarries which are currently used for the retention of storm water generated on site as well as the effluent from the existing waste water treatment plant. Data obtained from this monitoring programme will be considered in this report as it will be representative of the impacts the operation is likely to pose to the receiving water environment.

**Table 10-3: Surface water sampling points**

| No | Sampling point name | Location |
|---|---|---|
| 1 | Treatment plant effluent | S 26°21'00.79'', E 27°31'52.75'' |
| 2 | Quarry B | S 26º21'15.62'', E 27º31'38.54'' |
| 3 | Quarry C | S 26º21'24.36'', E 27º31'58.69'' |
| 4 | Quarry D | S 26º21'29.31'', E 27º32'25.01'' |


**Figure 10-7: Surface water sampling points at Corobrik (Pty) Ltd: Driefontein**

Data from the three most recent water quality reports are presented in the tables below. The water samples collected at the quarries and the dam was compared to limits set in Regulation 22.9 (2)(c) of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996). The water sample taken of the treated sewage effluent was compared to limits specified in GN665 dated 6 September 2013, Revision of General Authorisations in terms of Section 39 of the National Water Act 36 of 1998, for wastewater discharged into a water resource.

The Turbidity for all three quarries exceeded the maximum allowable limit over the sampling period as set by Regulation 22.9 (2)(c) of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA). Turbidity is a measure of the suspended particles or degree of cloudiness of water. High turbidity in itself does not necessarily pose a health risk, but implies a high concentration of suspended particles in the water.

The samples collected at Treatment Plant Exit (effluent) contained concentrations of Ammonia, Nitrite/Nitrate, Zinc, Copper and Manganese that exceeded the maximum allowable limit as set by the GN665 published in terms of the National Water Act, 1998 (Act No. 36 of 1998). The pH of the water was below the allowed range and indicated increased acidity.

The pH of a solution indicates the hydrogen ion concentration in the solution. The pH of the samples taken at the Treatment Plant Exit was below the recommended range and indicated increased acidity.

Nitrate is the end product of the oxidation of ammonia and nitrite. High levels of nitrates / nitrites in effluent water may indicate that untreated sewage is still present in the water. The health effects of consuming water with high nitrate levels are diarrhoea, nausea, tiredness and fatigue. Nitrates are very

soluble and do not bind to soils and have a high potential to migrate to ground water. Nitrates/nitrites are likely to remain in water until consumed by plants or other organisms.

Metals including copper are usually removed from effluent water during the treatment process by processes including stabilisation / pH adjustment, coagulation, flocculation, addition of lime and other chemicals.

Manganese is the twelve most abundant minerals found in soils and is associated with a dark tea-like colour of some water sources. It may be neurotoxic if concentrations in excess of the limit are ingested. A form of neuro-degeneration similar to Parkinson's disease called Manganism has been linked to manganese exposure amongst miners exposed to water containing high levels of manganese.

Zinc oxide irritates the respiratory tract. Inhalation of dust or fume may cause metal fume fever. Effects may be delayed. Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged inhalation exposure may cause asthma.

A high concentration of ammonia could be due to blasting activities, the use of fertilisers or ammonia containing cleaning solutions, or contamination with untreated animal waste or raw sewage in the area. High levels of ammonia may lead to formation of nitrites and/or nitrates in the water. The environmental impact of water containing high levels of nitrates is the formation of algae blooms and eutrophication of water bodies. Nitrates are very soluble and do not bind to soils and have a high potential to migrate to ground water.

**Table 10-4: Surface water quality data at Driefontein quarries**

| Sampling point | Quarry B (2) | | | Quarry C (3) | | | Quarry D (3) | | | Maximum Allowable Limit (As per MHSA) |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter (mg/l) | June 2017 | August 2017 | October 2017 | June 2017 | August 2017 | October 2017 | June 2017 | August 2017 | October 2017 | |
| pH | 7.72 | 7.38 | 7.32 | 6.39 | 6.50 | 7.25 | 7.54 | 7.43 | 7.08 | ALL: 5.5 – 9.5, REC: 6 – 9 |
| EC | 21.8 | 11.6 | 21.4 | 4.30 | 3.10 | 3.77 | 14.8 | 13.6 | 12.4 | MAX: 300 mS/m, REC: 70 mS/m |
| Turbidity (NTU) | 1.07 | 55.4 | 2.70 | 141 | 78.5 | 104 | 58.8 | 47.8 | 11.9 | MAX: 5 NTU, REC: 1 NTU |
| Total Dissolved Solids | 144 | 82 | 142 | 78 | 48 | 62 | 92 | 88 | 82 | 1000 |
| Total Hardness | 58 | 34 | 66 | 8 | 8 | 7 | 45 | 39 | 35 | 650 |
| Ammonia | BDL | 0.24 | BDL | BDL | 0.37 | BDL | BDL | 0.20 | 0.21 | 1.0 |
| Magnesium | 5.07 | 3.17 | 5.44 | 1.05 | 0.91 | 0.97 | 6.06 | 3.53 | 4.71 | 100 |
| Calcium | 14.8 | 8.40 | 17.3 | 1.66 | 1.71 | 1.30 | 7.97 | 9.83 | 6.17 | 150 |
| Potassium | 22.6 | 2.57 | 17.8 | 1.82 | 1.17 | 1.46 | 3.36 | 2.74 | 2.32 | 50 |
| Sodium | 7.72 | 7.70 | 9.20 | 2.49 | 2.50 | 3.3 | 12.3 | 8.33 | 12.0 | 400 |
| Chloride | 6.17 | 9.02 | 8.82 | 3.51 | 5.34 | 3.81 | 7.92 | 10 | 8.14 | 600 |
| Sulphate | 26.3 | 15.3 | 24.0 | 19.30 | 12.9 | 22.3 | 12.3 | 15.2 | 10.3 | 600 |
| Nitrite | BDL | BDL | 0.23 | BDL | BDL | BDL | BDL | BDL | BDL | Sum = 10 |
| Nitrate | 0.15 | 0.80 | 0.49 | 0.67 | 0.99 | 0.29 | 0.31 | 0.86 | BDL | |
| Fluoride | 1.11 | BDL | 0.80 | BDL | BDL | BDL | 0.77 | 0.20 | 0.61 | 1.5 |
| Zinc | 0.02 | 0.20 | 0.12 | 0.01 | 0.01 | BDL | BDL | 0.24 | BDL | 5.0 |
| Cadmium | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 20 |
| Copper | 1.54 | 3.81 | 1.53 | 3.84 | 3.50 | 3.12 | 3.13 | 6.62 | BDL | 1000 |
| Iron | BDL | 400 | BDL | 1250 | 350 | 670 | 28.8 | 340 | BDL | 1000 |
| Lead | BDL | 1.82 | BDL | BDL | 1.57 | 2.05 | BDL | 1.81 | BDL | 100 |
| Manganese | BDL | 10.0 | BDL | BDL | 40.0 | 10.0 | BDL | BDL | BDL | 1000 |
| Selenium | 6.86 | BDL | BDL | 5.78 | BDL | 1.11 | 6.06 | BDL | BDL | 50 |
| Below Detection Limit (BDL) | | | | | | | | | | |

**Table 10-5: Water quality data for treated effluent from the sewage treatment plant at Driefontein**

| Parameter (mg/l) | June 2017 | August 2017 | October 2017 | National Water Act (GN665) |
|---|---|---|---|---|
| pH | 5.09 | 4.01 | 6.84 | 5.5 – 9.5 |
| Conductivity | 57.0 | 62.7 | 33.1 | MAX: 150 mS/m (70 mS/m above intake) |
| Total Suspended Solids (mg/l) | 24.8 | 22.8 | 0.40 | 25 |
| Chemical Oxygen Demand (mg/l) | 48.0 | BDL | BDL | 75 |
| Soap, Oil or Grease (mg/l) | BDL | BDL | BDL | 2.5 |
| Ammonia | 7.61 | 7.70 | BDL | 6.0 |
| Free Chlorine | BDL | BDL | BDL | 0.25 |
| Nitrite & nitrate | 35.1 | 40.2 | 15.5 | Sum = 15 |
| Fluoride | 0.21 | 0.25 | BDL | 1.0 |
| Zinc | 0.29 | 0.23 | 0.26 | 0.1 |
| Hexavalent Chromium | BDL | BDL | BDL | 0.05 |
| Cyanide | BDL | BDL | BDL | 0.02 |
| Ortho-Phosphate | 5.29 | 5.85 | 2.01 | 10 |
| Arsenic | BDL | BDL | BDL | 0.02 |
| Boron | 0.02 | 0.02 | 0.08 | 1.0 |
| Cadmium | BDL | BDL | BDL | 0.005 |
| Copper | 0.03 | 0.04 | 0.03 | 0.01 |
| Iron | BDL | BDL | BDL | 0.3 |
| Mercury | BDL | BDL | BDL | 0.005 |
| Lead | BDL | BDL | BDL | 0.01 |
| Manganese | 0.13 | 0.10 | 0.03 | 0.1 |
| Selenium | BDL | BDL | BDL | 0.02 |

#### *10.1.5.4 Resource Class and Quality Objectives*

On 22 April 2016, the Minister of Water and Sanitation, published the Classes and Resource Quality Objectives of water resources for catchments of the Upper Vaal WMA, as GN No. 468 in Government Gazette No. 39943. This notice provides a summary of the water resource classes and ecological categories for Integrated Units of Analyses (IUAs).

IUAs are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; or Class II: indicating moderate protection and moderate utilisation; and Class III: indicating sustainable minimal protection and high utilisation. The table below indicates the Resource Class set for the C23E Quaternary Catchment, within which proposed project site is situated, as well as its Ecological Category.

**Table 10-6: Water Resource Class and Ecological Category for the C23E Quaternary Catchment (DWS, 2016)**

| IUA | Water Resource Class for IUA | Biophysical Node Name | Quaternary Catchment | River Name | PES | REC |
|---|---|---|---|---|---|---|
| Mooi River (UL) | III | UL.1 | C23E | Mooirivierloop (tributary of Mooi river) | E | D |

**River Quantity RQOs:** No river quantity RQOs were set for the Wonderfonteinspruit.

**Water Quality RQOs:** There are numerous water quality RQOs that have been set. These include three

main categories – nutrients, system variables and metal concentrations. The water quality RQOs for the following constituents are as follows:

- Electrical Conductivity < 111mS/m
- Phosphate < 0.125 mg/l
- Nitrates/Nitrites < 4 mg/l
- Fluoride < 3.0 mg/l
- Aluminium < 150 µg/l
- Arsenic < 130 µg/l
- Cadmium (hard) < 5 µg/l;
- Chromium (VI) < 200 µg/l
- Copper (hard) < 8.0 µg/l
- Mercury < 1.7 µg/l
- Manganese < 1300 µg/l
- Lead (hard) < 13.00 µg/l
- Selenium < 30 µg/l
- Zinc < 36 µg/l
- Chlorine < 5.0 µg/l
- Endosulfan < 0.2 µg/l
- Atrazine < 100 µg/l
- Uranium (U) < 15 µg/l

**Aquatic Ecology RQOs:** The aquatic ecology RQO for the ecosystem components have been set at an Ecological Category of D (> 42) for instream habitat, the macroinvertebrate community and the fish community. The overall ecological categories for the Wonderfonteinspruit have also been set at a D category.

#### *10.1.5.5 Current Land Use and Water Demands*

From the Department of Water and Sanitation's (DWS) water use database, the registered water users within the affected quaternary catchment includes towns and residential areas (Carletonville and surrounding towns) in upper reaches, mining in upper reaches, agriculture and pivot irrigation.

The area immediately surrounding the Corobrik Driefontein operations is currently utilised for agriculture and mining.

#### *10.1.5.6 Surface Water Resources*

The nearest watercourse is 2.5 km from the project site and is a tributary of the Wonderfonteinspruit. Runoff from the site of the proposed infrastructure feeds the Wonderfonteinspruit and from there the Mooirivierloop.

With regards to man-made water resource the following is applicable. Five quarries are located at the Driefontein operation, four of which are no longer operational. Quarry D is currently being excavated is located outside of the 500 m project site buffer and Quarry A has been infilled with brick waste and overburden and is no longer considered a surface water resource.

Excavation of Quarry B ceased approximately 50 years ago and has been allowed to revegetate naturally. Quarry B is used as a storm water retention pond and water from the quarry is used in the brick making process. The quarry is being infilled with brick waste. Quarry C is currently being backfilled and has been allowed to naturally revegetate. Storm water run-off accumulating in the quarry is used

for dust suppression at the operation.

Riparian vegetation was present in close proximity to the old quarries. Riparian vegetation in this unit includes species such as *Juncus effusus, Phragmites australis* and *Cortaderia jubata*.

**Figure 10-8: Quarry B**

**Figure 10-9: Quarry C**

### *10.1.5.7 Wetlands*

During the site survey an area to the east of the project site (refer to Figure 10-10) was identified as having wetland characteristics based on the plant species identified to occur in this area. Vegetation associated with wetland or riparian conditions (obligate and facultative wetland species), such as *Juncus effusus* and *Paspalum scrobiculatum* were found to occur in patches south-west of the project site, indicating possible wetland conditions. The herbaceous layer is dominated by species of the Poaceae family such as *Andropogon chinensis, Eragrostis capensis, E. gummiflua, E. lehmanniana, E. racemosa, E. tricophora, Melinis repens, Paspalum scrobiculatum* and *Themeda triandra*.

The possible wetland area is situated within 100 m of the project site. However, it is important to note that the wetland was preliminarily delineated on the presence of obligate plant species and as an indication of further wetland delineation studies to be undertaken. It is recommended that a wetland delineation based on soil profiles be undertaken to verify the presence of a wetland system.

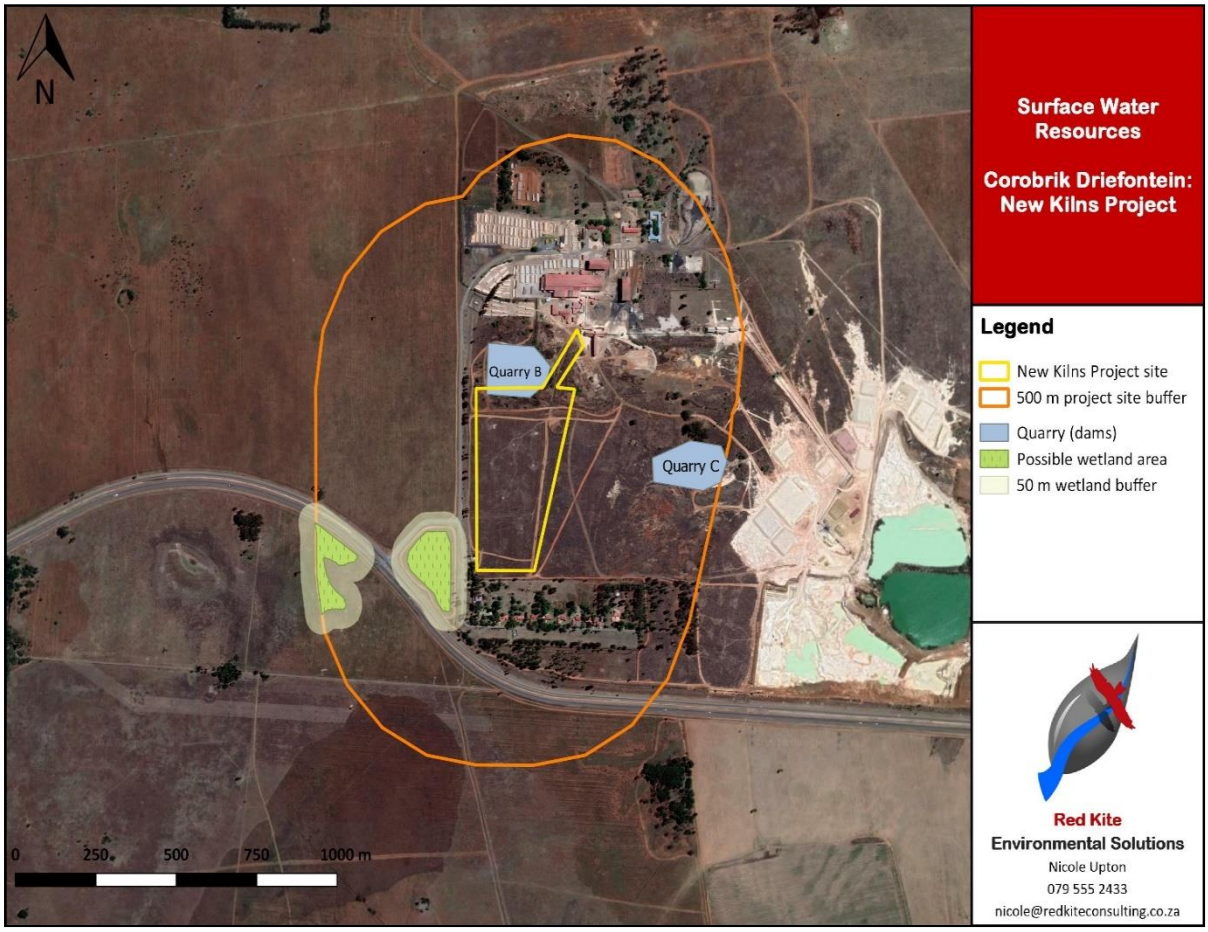



**Figure 10-10: Surface water resources relevant to the New Kilns Project**

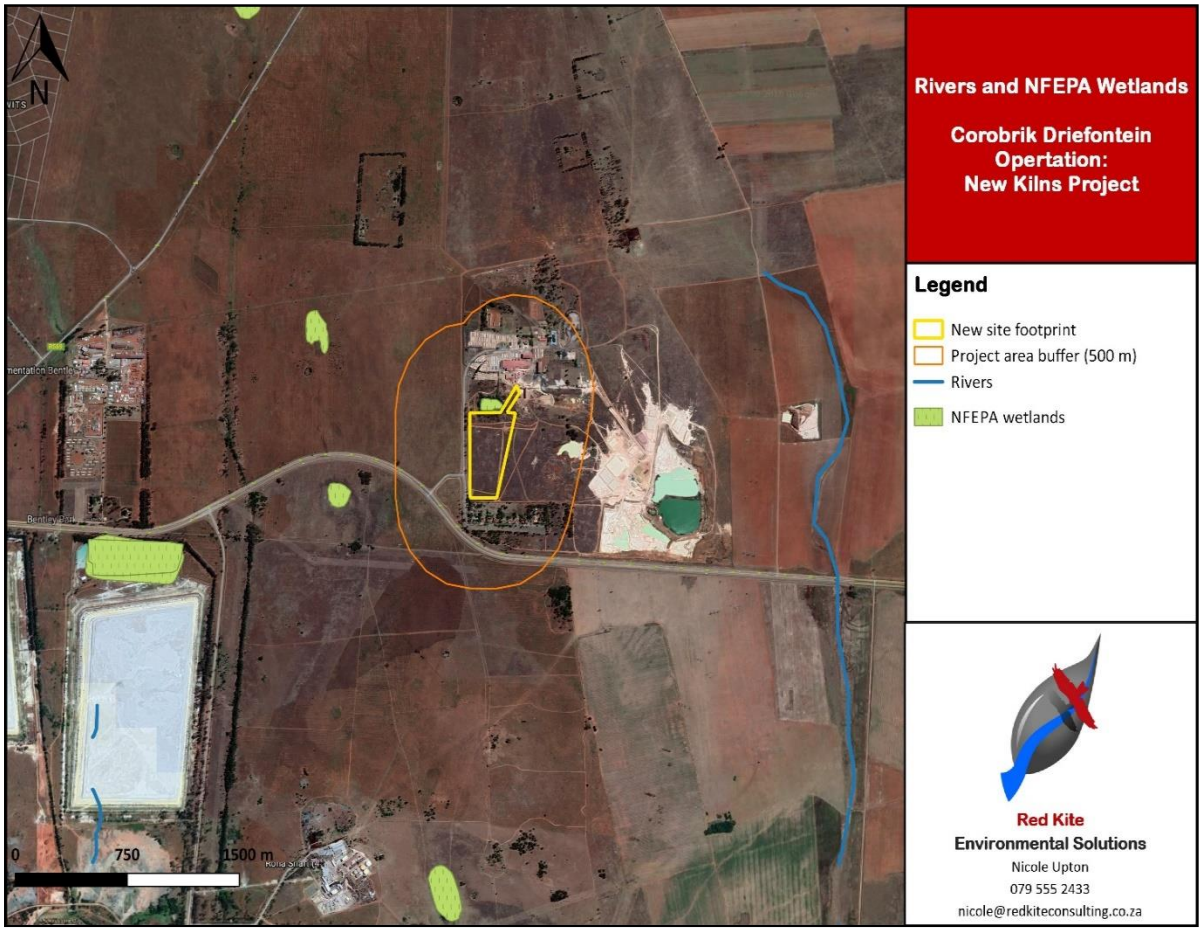



**Figure 10-11: NFEPA wetlands and rivers surrounding the project area**

### *10.1.5.8 Sensitivity*

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses as far as possible. A development proposal should only to be considered compatible with the biodiversity sensitivities of the site if all sensitive areas are avoided and are incorporated into an open space system.

The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive. Rules for buffer zone widths are as follows:

- 30 m for wetlands occurring inside urban areas; and
- 50 m for wetlands occurring outside urban areas.

Note that these buffer zones are essential to ensure healthy functioning and maintenance of wetland ecosystems. Larger buffer zones may be required for wetlands supporting sensitive species (refer to mapping rules in species-specific sections). Therefore, a buffer of 50 m around the possible wetland area has been indicated as high sensitivity. However, it is important to note that the wetland was preliminarily delineated on the presence of obligate plant species and as an indication of further wetland delineation studies to be undertaken.

Riparian zones and buffer zones must be designated as sensitive according to the following mapping rules.

The riparian zone must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones".

- A 100 m buffer zone from the edge of the riparian zone for rivers/streams outside urban areas; and
- A 32 m buffer zone from the edge of the riparian zone for rivers/streams within urban areas.

Note that these buffer zones are essential to ensure healthy functioning and maintenance of aquatic ecosystems and also function as wildlife corridors and refugia. Larger buffer zones may be required for aquatic ecosystems supporting sensitive species (refer to mapping rules in species-specific sections). The nearest watercourse to the project site is approximately 2.5 km away. Therefore, this watercourse does not feature in the sensitivity mapping.

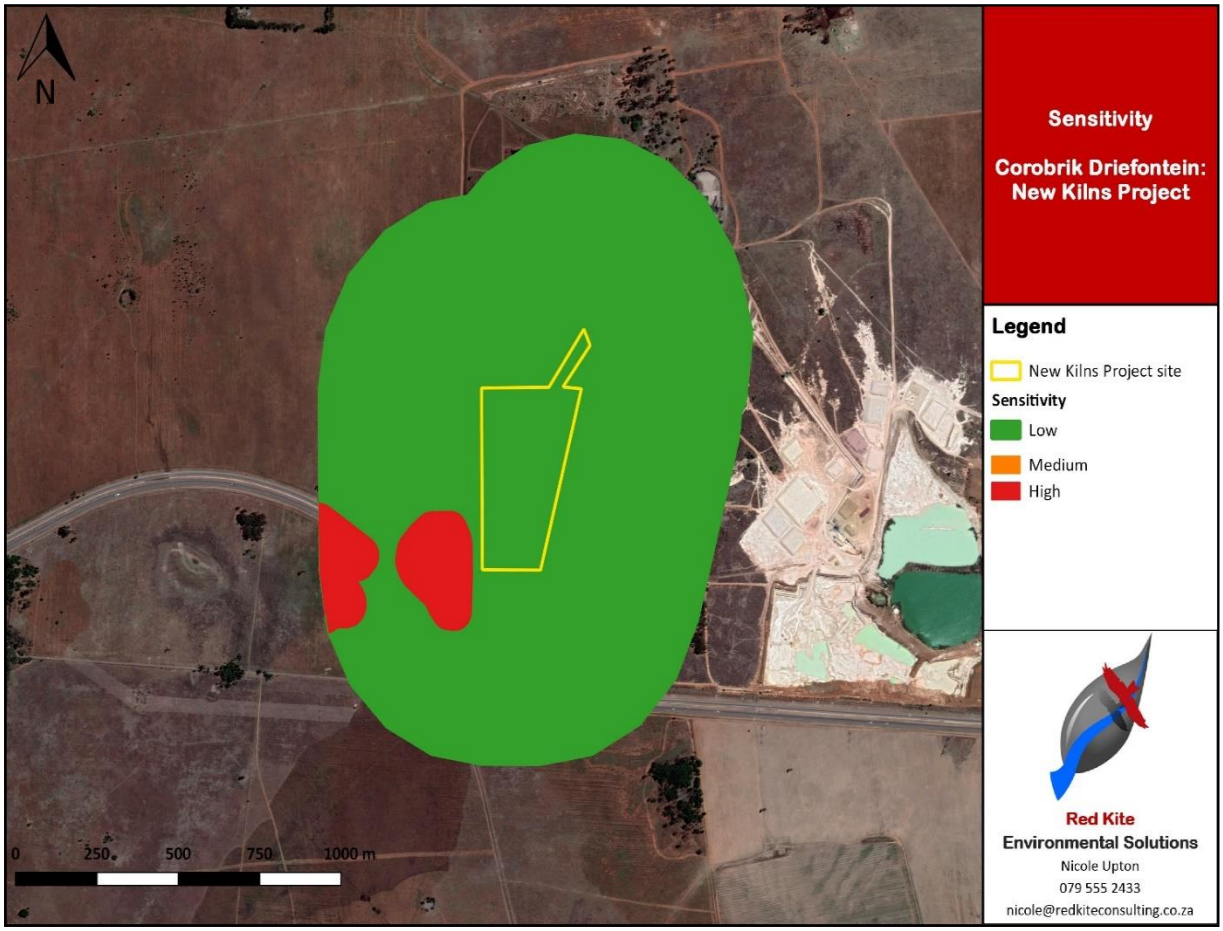



**Figure 10-12: Surface water sensitivity map**

### 10.1.6 Natural Vegetation

A specialist investigation was done for the areas to be impacted by the new activities in 2018 by Red Kite Environmental Solutions (Red Kite Environmental Solutions (Pty) Ltd, 2018)

#### *10.1.6.1 Desktop assessment*

##### *10.1.6.1.1 Regional vegetation*

One vegetation types (Mucina & Rutherford, 2006) occur in the studied area, namely the Carletonville Dolomite Grassland (Gh15) (Figure 10-13). The descriptions of Gh15, was summarized (2006).

Distribution: In South Africa the Carletonville Dolomite Grassland is found in North West, Gauteng and marginally into the Free State Province. The Carletonville Dolomite Grassland ranges from the region of Potchefstroom to Ventersdorp and Carletonville extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in the Gauteng Province. Altitude ranges from 1360 - 1620 m, but largely 1500 - 1560 m (Musina & Rutherford, 2011).

This is a species-rich mosaic of plant community types occurring on undulating plains bisected by rocky chert ridges. It is a vegetation type that is characterized by the presence of the species, *Aristida congesta, Brachiaria serrata, Cynodon dactylon, Digitaria tricholaenoides, Diheteropogon amplectens, Eragrostis chloromelas, Eragrostis racemosa, Heteropogon contortus, Loudetia simplex, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra*, and a wide variety of herbaceous forbs and other grasses. This vegetation type is considered to be Vulnerable (Mucina & Rutherford, 2006), and whilst the conservation target is 24%, only a small extent is currently protected and 23% is considered to be transformed, mostly by cultivation (17%), urbanization (4%), forestry (1%) and mining (1%) (Mucina & Rutherford, 2006).

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, the Carletonville Dolomite Grassland is not listed in the National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009).

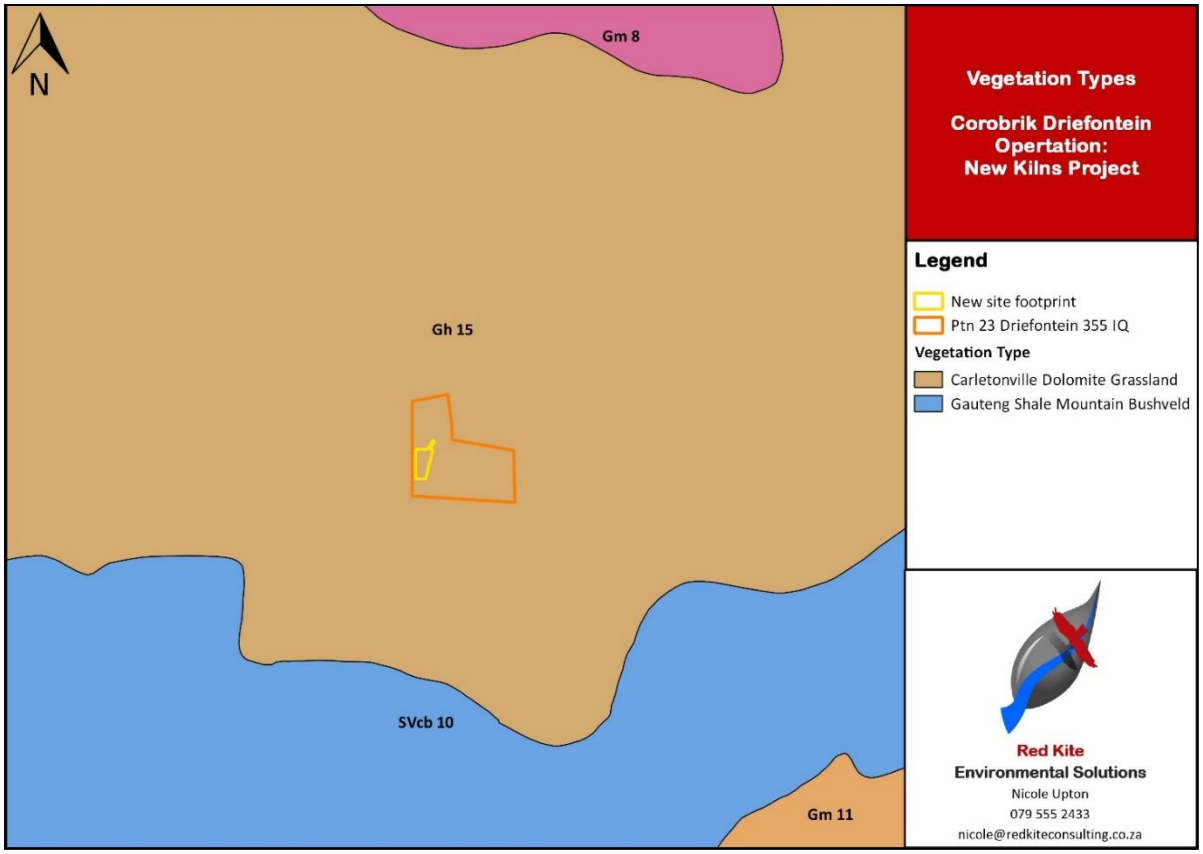



**Figure 10-13: Vegetation types of the study site**

The farm study area falls within the 2627BC Quarter Degree Square. Information on plant species

recorded for the Quarter Degree Squares (QDS) was extracted from the POSA online database hosted by SANBI. A list of plant species that have a high probability of occurring in the2627BC QDS is provided in Appendix C of the ecology study. The results indicate that approximately 63 plant species occur within the QDS, consisting of 26 families. The most prominent family is Fabaceae with eight species. Other prominent families are Malvaceae, Poceae, Cyperaceae and Cucurbitaceae all with three species in the DQS per family. The large majority of species have a perennial lifecycle and only a few annual species with the remainder having either biannual or undefined lifecycles (Table 10-7). Five exotic species are known to occur within these four grids (Table 10-8).

**Table 10-7:Floral species summary for QDS**

| Number of Families | Number of species | Perennial species | Annual species | Exotic/naturalised species |
|---|---|---|---|---|
| 26 | 63 | 57 | 4 | None |

Almost all of these species are classified with a "Least Concern" (LC) IUCN status and is therefore considered at a low risk of extinction and includes widespread and abundant species. However, some species were not classified as LC and could possibly occur within the study area. Species of conservation concern which occur in the 2627BC QDS are listed in Table 10-8**.**

**Table 10-8: Floral species of conservational concern within the 2627BC QDS**

| Species | Common name | Growth form | Conservation status |
|---|---|---|---|
| *Ilex mitis* | Cape holly | Shrub, tree | Declining – Red List of South African Plants<br>CITES Appendix II |
| *Gunnera perpensa* | River pumpkin | Herb, hydrophyte | Declining – Red List of South African Plants |
| *Khadia beswickii* | Khadi wortel | Succulent | Vulnerable – Red List of South African Plants |
| *Adromischus umbraticola* subsp. *umbraticola* | Cliff andromischus | Succulent | Near Threatened – Red List of South African Plants |

No species for the QDS were listed in the Threatened and Protected Species (ToPS) List, as published in the Government Gazette Notice No. 389 of 2013 (16 April 2013) as part NEMBA (Act No. 10 of 2004).

### *10.1.6.2 Site Survey*

The study area was investigated and under the prevailing conditions at the time of the site survey, two broad vegetation units (VUs) were identified. The VUs are as follows:

- Vegetation Unit 1 (VU1): Vegetation of the Driefontein operational area (transformed areas); and
- Vegetation Unit 2 (VU2): Grassland.

A total of 62 plant species from 27 plant families were recorded in the studied area during the site surveys. Of this number seven have medicinal uses and 21 are exotic. 300 (96%) of the plant species that were recorded are indigenous to South Africa. None of the floral species recorded during the site survey are of conservation concern.

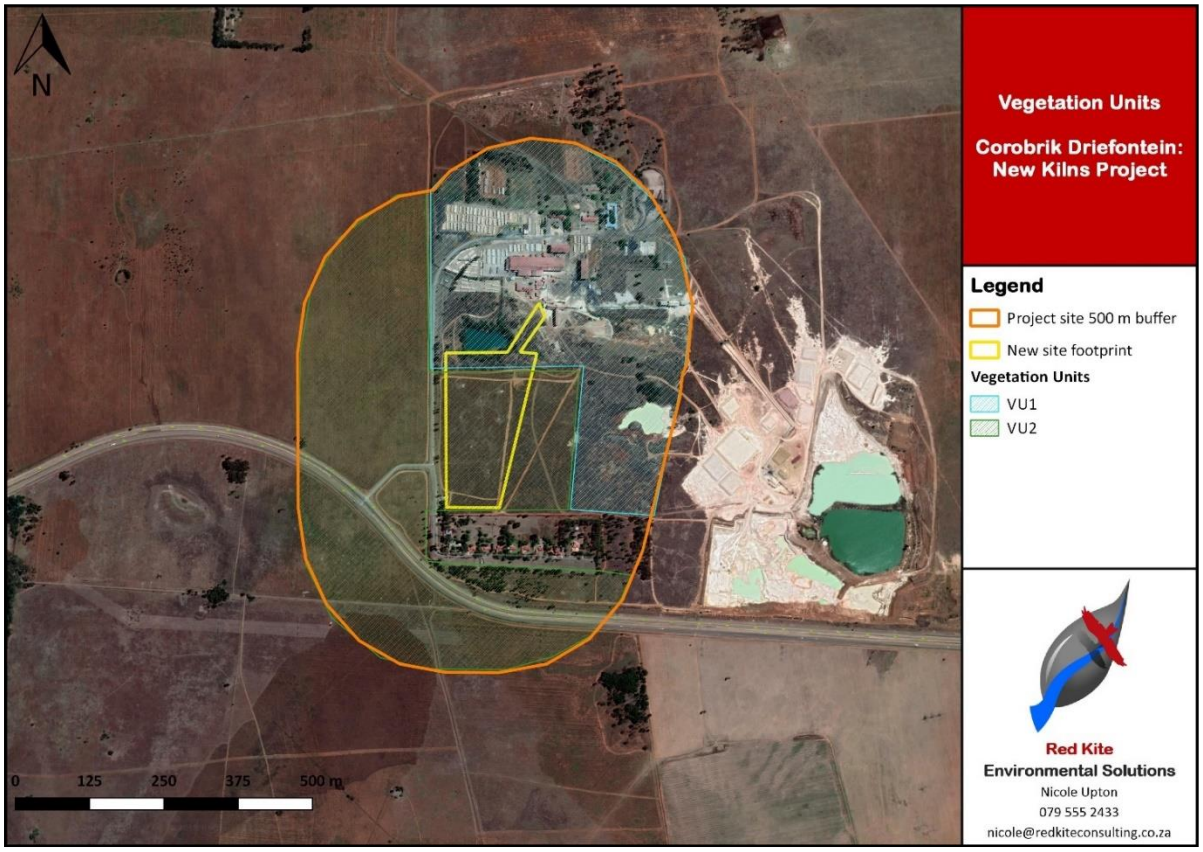



**Figure 10-14: Study area vegetation units**

#### *10.1.6.2.1 Vegetation Unit 1 (VU1)*

This Vegetation Unit includes all current operational areas of Corobrik Driefontein, including administration buildings, quarries, workshops, factories, storage areas, etc. Other than fragmented pockets, individual trees and other areas where natural vegetation has spontaneously rehabilitated, little natural vegetation remains in VU1. Two old quarries that have been allowed to naturally revegetate and are used as dams are also located in this unit.

45 plant species were recorded in this VU of which 19 species are exotic. Seven of the species identified are used for medicinal purposes. None of the species recorded for VU1 during the site surveys are considered of conservation concern. Dominant grasses include *Melinis repens, Setaria sphacelata* and *Hyperthellia dissoluta*. The shrub, Bankrupt bush (*Seriphium plumosum*) was dominant throughout the unit. Tree species in VU1 were mostly exotic, such as *Eucalyptus* sp., *Pinus* sp. and Seringa.

Riparian vegetation was present in close proximity to the old quarries, which have been allowed to naturally revegetate and are currently being used as dams. Riparian vegetation in this unit includes species such as *Juncus effusus*, P*hragmites australis* and *Cortaderia jubata.*

**Photo 1: Old quarries allowed to naturally revegetate**

**Figure 10-15: Photos of vegetation condition in VU1**

*10.1.6.2.2 Vegetation Unit 2 (VU2)*

This Vegetation Unit consists largely of grassland and includes the proposed New Kilns Project site. The unit has historically been used for agriculture and exhibits some signs of disturbance. Vegetation in this unit consists of grassland with very few trees scattered around the edges, many of which were possibly planted as wind breaks or for ornamental purposes in the past.

Thirty plant species were identified in the unit of which eight are exotic species and five have medicinal uses. The only trees recorded in this unit are, *Eucalyptus* sp., *Pinus* sp., *Acacia mearnsii*, *Melia azedarach* and *Combretum erethrophyllum* of which only the Kudubush is indigenous to South Africa. The shrub, Bankrupt bush (*Seriphium plumosum*) was dominant throughout the unit and often found in dense patches. The exotic herb, *Verbena bonariensis*, is also dominant in dense patches throughout the study site. Vegetation associated with wetland or riparian conditions (obligate and facultative wetland species) were found to occur in patches toward the southern end of the VU, indicating possible wetland conditions. The herbaceous layer is dominated by species of the Poaceae family such as *Andropogon chinensis*, *Eragrostis capensis*, *E. gummiflua, E. lehmanniana, E. racemosa, E. tricophora, Melinis repens, Paspalum scrobiculatum* and *Themeda triandra*.

**Figure 10-16: Photo 2 - Grassland conditions of VU2 (project site)**

**Figure 10-17: Photo 3 - Grassland conditions of VU2 (western field)**

*10.1.6.2.3 Ecological status of grasses*

A total of 20 grass species were found during the field surveys, 16 of which can be used to assess the grass status. Only three of these species are considered to be “Decreaser” species. Decreaser species are usually highly palatable climax grasses and are good indicators of the veld condition. These species are abundant in good veld, but they tend to decrease when the veld is overgrazed or undergrazed (Van Oudsthoorn, 1999).

Most of the other grasses are indicated as “Increaser II” species (ten species). Increaser II species are

abundant in overgrazed veld. These grasses increase as a result of the disturbing effect of overgrazing. It mostly includes pioneer and subclimax species and because they are able to produce many viable seeds, they easily become established. These species are listed in the table below.

Only two of the species that occurred is classified as "Increaser I" species. Increaser I species tend to increase in underutilised veld and includes unpalatable climax/subclimax grasses such as *Hyperthelia dissoluta*.

**Table 10-9: Ecological description of grasses**

| Species | Grazing value | Plant succession | Grazing status |
|---|---|---|---|
| *Andropogon chinensis* | Average | Climax | Increaser II |
| *Elionurus muticus* | Low | Climax | Increaser III |
| *Eragrostis capensis* | Average | Subclimax | Increaser II |
| *Eragrostis chloromelas* | Average | Climax & subclimax | Increaser II |
| *Eragrostis curvula* | Average | Climax & subclimax | Increaser II |
| *Eragrostis gummiflua* | Low | Subclimax | Increaser II |
| *Eragrostis lehmanniana* | Average | Climax & subclimax | Increaser II |
| *Eragrostis racemosa* | Average | Subclimax | Increaser II |
| *Eragrostis tricophora* | Average | Subclimax | Increaser II |
| *Hyperthilia dissoluta* | Average | Climax | Increaser I |
| *Melinis nerviglumis* | Average | Climax | Increaser I |
| *Melinis repens* | Low | Pioneer & subclimax | Increaser II |
| *Paspalum scrobiculatum* | Average | Pioneer &subclimax | Increaser II |
| *Phragmites australis* | Low | - | Decreaser |
| *Setaria sphacelata var. sericea* | High | Climax | Decreaser |
| *Themada triandra* | High | Climax | Decreaser |

*10.1.6.2.4 Invasive species*

Invasive and exotic species tend to increase in disturbed environments. Therefore, the construction and operational phases of developments can increase the spread and growth of invasive species. Twelve species not indigenous to South Africa were recorded during the site survey of which all 12 species are listed as alien and invasive species in NEMBA (Act No. 10 of 2004) and are presented in the table below.

**Table 10-10: NEMBA Category AIP species recorded during site survey**

| Species | Common name | NEMBA AIP Category |
|---|---|---|
| *Acacia decurrens* | Green wattle | 2 |
| *Acacia mearnsii* | Blackwattle | 2 |
| *Acacia podalyriifolia* | Pearl acacia | 1b |
| *Circium vulgare* | Spear thistle | 1b |
| *Cortaderia jubata* | Purple pampas grass | 1b |
| *Datura stramonium* | Common thorn-apple | 1b |
| *Ligustrum japonicum* | Japanese wax-leaved privet | 3 |
| *Melia azedarach* | Syringa | 1b |
| *Pinus* sp. | Pine tree | 1b |
| *Pyracantha angustifolia* | Yellow fire-thorn | 1b |
| *Solanum sisymbriifolium* | Dense-thorned bitter apple | 1b |
| *Verbena bonariensis* | Tall verbena | 1b |

Ten of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants. Category 1 is the strictest category of species and none of these species are allowed to occur and/or become established on any land area except for the use of a biological control reserve. They

possess characteristics that are harmful to humans, animals or the environment. Category 1b is described in NEMBA (Act No. 10 of 2004) as invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove.

Two Category 2 plant species were recorded on the site. Category 2 AIP are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances. One Category 3 species occurs on site and these are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all category 3 plants become category 1b plants.

##### *10.1.6.2.5 Medicinal species*

Some of the species that were encountered during the field survey have cultural and/or medicinal use. Various medicinal books and peer-reviewed articles were used to verify whether the species have any medicinal uses. Seven species were found to occur on site that have medicinal uses.

**Table 10-11: Medicinal plant species recorded during site survey**

| Species | Common name |
|---|---|
| *Acacia mearnsii* | Blackwattle |
| *Datura stramonium* | Common thorn-apple |
| *Elephantorrhiza elephantina* | Elephants root |
| *Eucalyptus sp.* | Gum tree |
| *Gomphocarpus fruticosus* | Milkweed |
| *Hypoxis hemerocallidea* | African potato |
| *Pinus* sp. | Pine tree |

These plants are important from a cultural perspective and are used for traditional/cultural purposes. Traditional medicine in South Africa is an important practice on which seventy two percent of the Black African population relies, that accounts for 26.6 million consumers. Approximately 133 000 people are employed in the trade of traditional medicine, especially rural women.

The AIP species, Blackwattle, Common thorn-apple and Pine, found on site may be used for traditional medicine, but this does not exclude them from being invasive and the resultant obligation to eradicate them.

### 10.1.7 Fauna

#### *10.1.7.1 Desktop Assessment*

A desktop study was conducted to establish whether any potentially sensitive faunal species or species of conservation concern may possibly occur on site. The Virtual Museum and Animal Demography Unit (ADU) was used to compile species list based on the sightings and data gathering from the South African Biodiversity Institute for the 2627BC QDS. The avifaunal species list was obtained from SABAP2 for the 2627BC pentads.

It is important to note that a QDS covers a large area: ± 27 X 25 km (± 693 km²) and a pentad (SABAP2 Protocol) and area of ± 8 X 7.6 km (± 60.8 km²) and it is possible that suitable habitat will exist for a certain Red Data avifaunal species within this wider area surrounding the study site. However, the specific habitat(s) found on site may not suit the particular Red Data species, even though it has been recorded for the QDS or pentad.

Several species were identified as possibly sensitive species within the framework of this study. The sensitive species were determined according to their close relationship and dependence on the

vegetation type (Carletonville Dolomite Grassland) and the possible wetlands.

Table 10-12 lists all fauna species that are of conservation concern which were found during the desktop study.

**Table 10-12:Fauna species of conservation concern found in 2627BC QDS**

| Species | Common name | Conservation status |
|---|---|---|
| *Atelerix frontalis* | Southern African Hedgehog | Near Threatened: SANBI's Red List Species |
| *Anthropoides paradiseus* | Blue crane | Endangered: SANBI's Red List Species<br>Vulnerable: IUCN, CITES: Appendix II |
| *Balearica regulorum* | Crane, gray crown | Endangered: SANBI'S Red List species<br>Endangered: IUCN<br>CITES Appendix ll |
| *Polemaetus bellicosus* | Martial eagle | Vulnerable: SANBI's Red List Species |
| *Falco chicquera* | Falcon, Red- necked | Near threatened: IUCN |
| *Phoenicopterus minor* | Flamingo, Lesser | Near Threatened: SANBI's Red List<br>Near Threatened: IUCN |
| *Bucorvus leadbeateri* | Ground Hornbill | Vulnerable: SANBI's Red List<br>Vulnerable: IUCN |
| *Circus maurus* | Harrier, Black | Endangered: SANBI's Red List<br>Vulnerable: IUCN |
| *Geronticus calvus* | Ibis, Southern Bald | Vulnerable: Red List<br>Vulnerable: IUCN |
| *Eupodotis caerulescens* | Korhaan, Blue | Near Threatened: IUCN |
| *Sagittarius serpentarius* | Secretarybird, | Vulnerable: SANBI's Red List<br>Vulnerable: IUCN |
| *Gyps coprotheres* | Cape Vulture | Endangered: SANBI'S Red List species<br>Endangered: IUCN |

Each of the species contained in Table 10-12 are discussed under the appropriate heading in the sections to follow.

#### *10.1.7.1.1 Mammals*

Sixteen mammal species were found to possibly occur within the QDS, most of which have a Least Concern Red List Status and none of which are endemic to South Africa. One species is classified as Near Threatened according to the National Red Data List.

The Carletonville Grassland Biome is considered an adequate habitat source with several niches and microhabitats (especially near and within the riparian zones) to assume that mammals will be present on site. Large mammal species are not expected to occur on the site due to the disturbance caused by the proximity of anthropogenic activities.

*Atelerix frontalis* is listed as near threatened in the SANBI's Red Data List and is of conservational importance within the study area. The probability of the occurrence of the hedgehog within the area is very high considering that the Carletonville Dolomite Grassland is listed as a known area of inhabitance for the Southern African Hedgehog. Due to the omnivorous nature of the hedgehog, and the fact that it is not a picky eater, combined with its relatively small size, it is expected to at least use the study area and surrounds from time to time as foraging grounds. Sightings of hedgehogs have decreased in the last decade or two, the number given to the decline as stated by SANBI is an 8 % decrease in sightings since the 1980's. No evidence of hedgehog activity was recorded on site and that can be attributed to the fact that the animal is nocturnal.

*10.1.7.1.2 Avifaunal*

According to data collected during the Southern African Bird Atlas Project 2 (SABAP2) (http://UDP.adu.org.za/), a total of 42 bird species have been recorded in the 2627BC pentads (Appendix D of the Ecological specialist report).

Almost all of the bird species recorded for the pentad are of Least Concern Red List Status and none are endemic to South Africa. Five species are considered Vulnerable, three are considered Near Threatened and three are considered Endangered according to SANBI's Red Data List. The data indicates that a total of seven AEWA bird species could possibly occur within the area covered by the pentads.

It is important to note that the availability of water and amount of wetland habitat type within the proposed area, signal the additional protection granted by AEWA that may be described as an intergovernmental treaty dedicated to the conservation of migratory water birds and their habitat protection across Africa, Europe, Asia, Greenland and Canadian Archipelago. Six bird species listed by AEWA (Table 10-13) could possibly utilize the wetlands located near the study site. However, due to ecological and distributional parameters most of these birds are unlikely to occur on the study site.

Specific bird species may be classified as sensitive within the particular site because, if the wetland habitat and habitat integrity declines, they will most likely be the first to leave the area. The relation between wetlands and birds is shaped by many factors. These include the availability, depth, and quality of water, the availability of food and shelter and the presence or absence of predators.

Birds that use wetlands for breeding depend on the physical and biological attributes of the wetland. Birds have daily and seasonal dependencies on wetlands for food and other life-support systems. They are all dependent on a specific plant community to either construct their nests or as food and preferred habitat. Migratory birds will also be harshly affected if the wetland areas are impacted and destroyed during their absence.

***Anthropoides paradiseus* (Blue Crane)** is classified as Endangered in SANBI's Red List Species; Vulnerable in the IUCN listing, and falls in the CITES Appendix II. Endemic to southern Africa, mainly in South Africa while largely excluding the Northern Cape and Limpopo Province, with a small, isolated population at Etosha National Park in northern Namibia. It generally prefers open grassland, dwarf shrubland and cultivated land.

***Balearica regulorum* (Gray crowned crane)** is classified as Endangered in SANBI's Red List Species; Vulnerable in the IUCN listing, and falls in the CITES Appendix II. This species is not migratory although it may make variable local and seasonal movements depending on the abundance and distribution of food, nest-sites and rainfall. The species inhabits wetlands such as marshes, pans and dams with tall emergent vegetation, riverbanks, open riverine woodland, shallowly flooded plains and temporary pools with adjacent grasslands, open savannas, croplands, pastures, fallow fields and irrigated areas. It shows a preference for short to medium height open grasslands adjacent to wetlands for foraging, and breeds within or at the edges of wetlands. It roosts in water along rivers or in marshes, or perches on nearby trees.

***Circus maurus* (Black Harrier)** is classified as Endangered according to SANBI's Red List and listed as Vulnerable by the IUCN. The Black Harrier is restricted to southern Africa, where it is mainly found in the fynbos and Karoo of the Western and Eastern Cape. It is also found in the grasslands of Free State, Lesotho and KwaZulu-Natal. The northern limits of its distribution are in north-eastern South Africa. They are also found in Botswana and Lesotho (non-breeding birds), with a tiny population in northern Namibia. This species prefers coastal and mountain fynbos, highland grasslands, Karoo sub-

desert scrub and open plains with low shrubs and croplands. Harriers breed close to coastal and upland marshes, damp sites, near vleis or streams with tall shrubs or reeds. South-facing slopes are preferred in mountain areas where temperatures are cooler, and vegetation is taller. During the non-breeding season, they will also be found in dry grassland areas further north and they also visit coastal river floodplains in Namibia. The Black Harrier prefers hunting for small mammals in open grounds with low vegetation. Because of its small population and restricted range, the Black Harrier is classified as Near Threatened within its South African range and globally Vulnerable with an estimated total world population of 1000 to 2000 birds.

***Eupodotis caerulescens* (Blue Korhaan)** is classified as Near Threatened in the IUCN list. *Eupodotis caerulescens* is virtually endemic to South Africa, extending only marginally into western Lesotho. It is found on high grassveld, usually above 1500 m, where it inhabits open, fairly short grassland and a mixture of grassland and karoo dwarf-shrubland within 1 km of water, with termite mounds and few or no trees. It also inhabits old and fallow cropland, pastures and winter cultivation. It apparently benefits from small-scale agriculture, as it regularly forages in crop fields and planted pastures.

The following avifaunal species are also listed but are less expected to occur within the immediate study area or are not so much threatened by the loss of habitat, or loss of possible food due to loss of vegetation cover.

- ***Polemaetus bellicosus* (Martial eagle*):*** The martial eagle will most likely not be disrupted by the proposed kilns expansion, although some small mammals that it preys on might live within the grassland covering the area designated for the kiln. The martial eagle covers a wide range of habitat and would likely not be very reliant upon the area.
- ***Falco chicquera* (Red necked Falcon):** The Red Necked Falcon prefers more arid regions and have been spotted in the area very few times.
- ***Phoenicopterus minor* (Lesser Flamingo):** These birds have strict breeding areas, and are almost always moving between two pans, the one is the Etosha pan located in Namibia, and the other is the Sua pan in Botswana.
- ***Bucorvus leadbeateri* (Ground Hornbill):** These noisy large birds are under pressure and considered vulnerable on the SANBI's red data list but are not expected to be inhabitants to the study site. They were not recorded during the site survey.
- ***Geronticus calvus* (Southern Bald Ibis):** Southern Bald Ibises prefer mountainous grassland, which are not present in the immediate vicinity of the project site.
- ***Sagittarius serpentarius* (Secretarybird):** Classified as Vulnerable in the SANBI Red List Species as well as by the IUCN.

Due to the reasons mentioned above none of the bird species, except for *Eupodotis caerulescens* (Blue Korhaan), *Anthropoides paradiseus* (Blue Crane)**,** *Circus maurus* (Black Harrier) and *Balearica regulorum* (Gray crowned crane) which may occur on the study site need to be taken into consideration based solely on their conservation status.

**Table 10-13:AEWA listed bird species thought to occur in the 2627BC QDS**

| Species | Common name |
|---|---|
| *Anthropoides paradiseus* | Crane, Blue |
| *Balearica regulorum* | Crane, Grey Crowned |
| *Ciconia nigra* | Stork, Black |
| *Ciconia episcopus* | Stork, Woolly- necked |
| *Larus dominicanus* | Gull, Kelp |
| *Netta rufina* | Pochard, Red- crested |
| *Phoenicopterus minor* | Flamingo, Lesser |

*10.1.7.1.3 Butterflies*

Sixty-five butterfly species were found for the 2627QDS, all of which are categorized as Least Concern by SANBI.

*10.1.7.1.4 Reptiles*

Fifteen reptile species are recorded for the 2627BC QDS. All of the reptile species listed for the QDS are categorised as Least Concern on the SANBI's Red list.

*10.1.7.1.5 Amphibians*

The amphibian study conducted was mainly of a desktop nature, gathering information from the Frog Atlas of South Africa for the 2627BC Quarter Degree Squares. Four frog species were found to potentially occur on the study site and surrounding areas, all of the listed frog species are of Least Concern and none are endemic to South Africa.

### 10.1.8 Groundwater

#### *10.1.8.1 Hydrocensus*

No hydrocensus was conducted for the site, however a groundwater monitoring network is setup for the site and is discussed below using available reports.

#### *10.1.8.2 Percussion drilling and water Levels*

The drilling results of the percussion boreholes revealed that:

- No water level was recorded during the drilling process, but water was recorded at about 14.0 m depth, when the hole was backfilled, about three hours after drilling was abandoned. This water probably represents water that was used during the drilling process, and not the natural ground water level. The water level therefore appears to be below 47 m depth, in the dolomite bedrock (note dewatered compartment).
- Variable penetration rates were recorded as the percussion drill went through the overlaying shale. This may be ascribed to the variation in the degree of weathering and the hardness of the rock (soft- to medium hard).
- Medium air- loss but no sample loss occurred between 34.0 m and 36.0 m depth, probably due to a slightly higher concentration of wad. Medium air- loss and poor to medium sample recovery occurred from 47.0 m depth. The latter losses may be ascribed to a very soft, weathered dolomite layer between 47.0 m and 48.0 m depth. However, it is only the mangeniferous (wad) layer between the chert (breccia) and under lying dolomite bedrock, which is regarded as potential receptacles.
- No existing cavities were recorded.

#### *10.1.8.3 Water quality*

Water quality of the pits and treatment plant is recorded on a bi-annual basis with latest results of August 2017 discussed below for the parameters analysed.

*10.1.8.3.1 General groundwater quality*

From the tables and figures the following can be deduced:

- The major cations in the groundwater samples is potassium and calcium; and
- The major anions in the groundwater samples are chloride, sulphate and nitrate.

*10.1.8.3.2 Groundwater quality vs SANS Limits*

From the tables and figures the following can be deduced:

- Iron (Fe) is above the limits.

**Table 10-14: Groundwater Characteristics for Quarries**

| Parameter | | Unit | SANS 241: 2015 Recommended Limits | Risk | Results | | |
|---|---|---|---|---|---|---|---|
| | | | | | Quarry B | Quarry C | Quarry D |
| **Physical & Aesthetic Determinants** | | | | | | | |
| Electrical conductivity at 250C | EC | mS/m | ≤ 170 | Aesthetic | 11.6 | 3.1 | 13.6 |
| Total Dissolved Solids | TDS | mg/liter | ≤ 1200 | Aesthetic | 82 | 48 | 88 |
| pH at 250C | | pH units | ≥ 5 to ≤9.7 | Aesthetic | 7.38 | 6.5 | 7.43 |
| **Chemical Determinants - Macro Determinants** | | | | | | | |
| Nitrate as N | $NO_3$ | mg/liter | ≤ 11 | Acute Health | 0.8 | 0.99 | 0.86 |
| Sulphate | $SO_4$ | mg/liter | Acute Health ≤500; Aesthetic ≤250 | Acute Health/Aesthetic | 15.3 | 12.9 | 15.2 |
| Fluoride | F | µg/liter | ≤1500 | Chronic Health | 0 | 0 | 200 |
| Ammonia as N | $NH_3$ | mg/liter | ≤ 1.5 | Aesthetic | 0 | 0 | 0 |
| Chloride | Cl | mg/liter | ≤ 300 | Aesthetic | 9.02 | 5.34 | 10 |
| Sodium | Na | mg/liter | ≤ 200 | Aesthetic | 7.7 | 2.5 | 8.33 |
| Zinc | Zn | µg/liter | ≤5000 | Aesthetic | 200 | 10 | 240 |
| | | | | | | | |
| Copper | Cu | µg/liter | ≤ 2000 | Chronic Health | 3.81 | 3.5 | 6.62 |
| Total Iron | Fe | mg/liter | Acute Health ≤ 2.0; Aesthetic ≤0.3 | Acute/Aesthetic | 400 | 350 | 340 |
| **Concentration deemed to present an unacceptable health risk for lifetime consumption.** | | | | | | | |


**Figure 10-18: Monitoring points**

#### *10.1.8.4 Aquifer Sensitivity*

The term aquifer refers to a strata or group of interconnected strata comprising of saturated earth material capable of conducting groundwater and of yielding usable quantities of groundwater to boreholes and /or springs. In the light of South Africa's limited water resources, it is important to discuss the aquifer sensitivity in terms of the boundaries of the aquifer, its vulnerability, classification and finally protection classification, as this will help to provide a framework in the groundwater management process.

##### *10.1.8.4.1 Aquifer Classification*

The main aquifers underlying the area above the dolomitic aquifer were classified in accordance with the Aquifer System Management Classification document. The aquifer classification map of South Africa is shown in Figure 10-19. The aquifer is classified by using the following definitions:

- Sole Aquifer System: An aquifer which is used to supply 50% or more of domestic water for a given area, and for which there is no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial.
- Major Aquifer System: Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (Electrical Conductivity of less than 150 mS/m).
- Minor Aquifer System: These can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important for local supplies and in supplying base flow for rivers.
- Non-Aquifer System: These are formations with negligible permeability that are regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although imperceptible, does take place, and needs to be considered when assessing the risk associated with persistent pollutants.

According to the Aquifer classification map of South Africa and the information collected during the desktop study the site is underlain by a major aquifer system (dolomites), however the operations does not penetrate these dolomites and therefore is regarded as a minor aquifer system.

In order to achieve the Aquifer System Management and Second Variable Classifications, as well as the Groundwater Quality Management Index, a points-scoring system as presented in Table 10-15 and Table 10-16.

**Table 10-15: Ratings-Aquifer System Management and Second Variable Classifications**

| **Aquifer System Management Classification** | | |
|---|---|---|
| **Class** | **Points** | **Study area** |
| Sole Source Aquifer System: | 6 | |
| Major Aquifer System: | 4 | |
| Minor Aquifer System | 2 | 2 |
| Non-Aquifer System: | 0 | |
| Special Aquifer System: | 0 | 6 |
| **Second Variable Classification (Weathering/Fracturing)** | | |
| **Class** | **Points** | **Study area** |
| High: | 3 | |
| Medium: | 2 | 2 |
| Low: | 1 | |

**Table 10-16: Ratings - Groundwater Quality Management (GQM) Classification System**

| **Aquifer System Management Classification** | | |
|---|---|---|
| **Class** | **Points** | **Study area** |
| Sole Source Aquifer System: | 6 | |
| Major Aquifer System: | 4 | |
| Minor Aquifer System | 2 | 2 |
| Non-Aquifer System: | 0 | |
| Special Aquifer System: | 0 | 6 |
| **Second Variable Classification (Weathering/Fracturing)** | | |
| **Class** | **Points** | **Study area** |
| High: | 3 | |
| Medium: | 2 | 2 |
| Low: | 1 | |

As part of the aquifer classification, a Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required. The GQM Index is obtained by multiplying the rating of the aquifer system management and the aquifer vulnerability. The GQM index for the study area is presented in Table 10-6.

The vulnerability, or the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer, in terms of the above, is classified as medium.

The level of groundwater protection based on the Groundwater Quality Management Classification:

GQM Index = Aquifer System Management X Aquifer Vulnerability
= 2 x 2 = 4

**Table 10-17: GQM Index for the Study Area**

| **GQM Index** | **Level of Protection** | **Study Area** |
|---|---|---|
| <1 | Limited | |
| 1 – 3 | Low Level | |
| 3 – 6 | Medium Level | 4 |
| 6 – 10 | High Level | |
| >10 | Strictly Non-Degradation | |

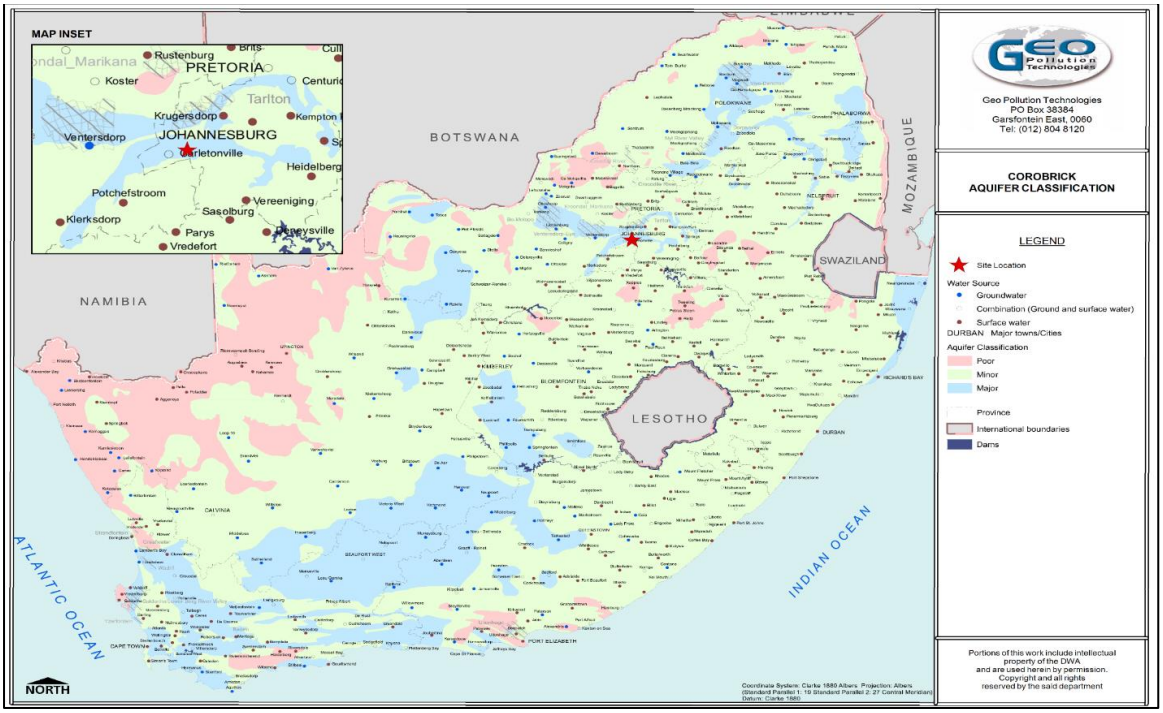



**Figure 10-19: Aquifer Classification**

### *10.1.8.5 Aquifer Vulnerability*

Aquifer vulnerability assessment indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Stated in another way, it is a measure of the degree of insulation that the natural and manmade factors provide to keep contamination away from groundwater.

- Vulnerability is high if natural factors provide little protection to shield groundwater from contaminating activities at the land surface.
- Vulnerability is low if natural factors provide relatively good protection and if there is little likelihood that contaminating activities will result in groundwater degradation.

The following factors have an effect on groundwater vulnerability:

- Depth to groundwater: Indicates the distance and time required for pollutants to move through the unsaturated zone to the aquifer.
- Recharge: The primary source of groundwater is precipitation, which aids the movement of a pollutant to the aquifer.
- Aquifer media: The rock matrices and fractures which serve as water bearing units.
- Soil media: The soil media (consisting of the upper portion of the vadose zone) affects the rate at which the pollutants migrate to groundwater.
- Topography: Indicates whether pollutants will run off or remain on the surface allowing for infiltration to groundwater to occur.
- Impact of the vadose zone: The part of the geological profile beneath the earth's surface and above the first principal water-bearing aquifer. The vadose zone can retard the progress of the contaminants.

The Groundwater Decision Tool (GDT) along with the aquifer vulnerability map of South Africa (Figure 10-19) was used to quantify the vulnerability of the aquifer underlying the site using the below assumptions.

- Depth to groundwater below the site was estimated from water levels measured during the hydrocensus inferred to be at mean of ~40 mbgl.
- Groundwater recharge of ~80 mm/a.
- Sandy loam sand and sandy clay soil vadose zone.
- Gradient of 1% were assumed and used in the estimation.

The aquifer vulnerability for a contaminant released from surface to a specified position in the groundwater system after introduction at some location above the uppermost aquifer was determined using the criteria described below and assuming a worst-case scenario:

- Highly vulnerable (> 60), the natural factors provide little protection to shield groundwater from contaminating activities at the land surface.
- Medium Vulnerable = 30% to 60%, the natural factors provide some protection to shield groundwater from contaminating activities at the land surface, however based on the contaminant toxicity mitigation measures will be required to prevent any surface contamination from reaching the groundwater table.
- Low Vulnerability (< 30 %), natural factors provide relatively good protection and if there is little likelihood that contaminating activities will result in groundwater degradation
- The GDT calculated a vulnerability value of 30%, which is low.

#### *10.1.8.6 Aquifer Protection Classification*

A Groundwater Quality Management Index of 4 was estimated for the study area from the ratings for the Aquifer System Management Classification. According to this estimate a medium level groundwater protection is required for the aquifer. Reasonable and sound groundwater protection measures based on the modelling will therefore be recommended to ensure that no cumulative pollution affects the aquifer, even in the long term.

DWS's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that measures must be taken to limit the risk to the following environments:

- The protection of the underlying aquifer.

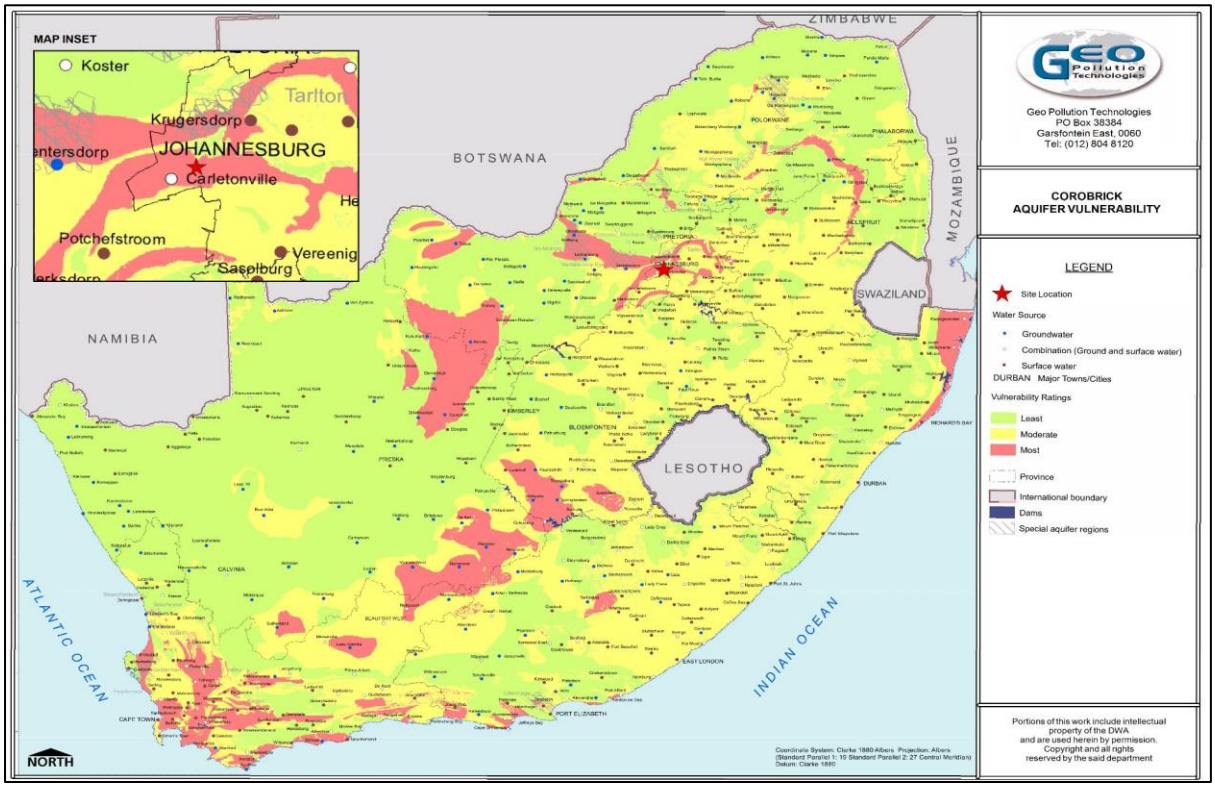



**Figure 10-20: Aquifer Vulnerability**

### *10.1.8.7 Source Pathway Receptor Model*

#### *10.1.8.7.1 Source*

The relevant potential contaminants but not limited related to the operations at the quarry are sulphate, potassium, chloride, magnesium and calcium as well as organic contaminants (hydrocarbons). The primary source of the above listed contaminants is:

- The quarry and associated product handling facilities.

The hydraulic characteristics of the source and the geochemical properties of the subsurface will determine the behaviour of the contaminants emanating from the source. In addition, the location and extent of the pollution source will have an effect on the extent of the contaminant plume

#### *10.1.8.7.2 Pathways*

Pathways along which contaminants may be mobilized and migrate toward groundwater receptors include:

- The aquifer underlying and downstream of the site.

For an accurate prediction of the behaviour of a contaminant plume along its pathways, it is critical that the monitoring and field measurements are representative of the physical environment. It is also important to keep seasonal and annual trends in mind, as it affects the water quality.

#### *10.1.8.7.3 Receptors*

Any user of a groundwater or surface water resource that is affected by pollution from any of the above-mentioned sources is defined as a receptor. Furthermore, a borehole or river may also be a receptor. The following possible receptors may be found:

- The underlying dolomitic aquifer.

Based on the information collected during the desktop study it can be seen that a potential linkage between the sources, pathways and receptors does not exist for the site as the quarry does not intersect the dolomitic aquifer.

### 10.1.9 Air Quality

#### *10.1.9.1 Study of the Receiving Environment*

An understanding of the atmospheric dispersion potential of the area is essential to an air quality impact assessment. In the absence of measured on-site meteorological data required for atmospheric dispersion modelling, simulated meteorological data for the area was used.

On-site monitoring and sampling data was limited to dust fallout sampling as per the existing Corobrik atmospheric emission licence (AEL). Ambient air quality monitoring is monitored at the Randfontein station, approximately 25 km north-north-east of the Project site. The Randfontein station is located within a residential area and is unlikely to be representative of Corobrik's immediate surrounds; however, it may be representative of the baseline ambient pollutant concentrations in the residential areas (AQSR areas) near Corobrik. Graphs from 2015 to 2017 were accessed from the South African Air Quality Information System (www.saaqis.org.za) and used in the description of existing ambient air pollutant levels in the residential areas. The station records surrounding sources including: residential (domestic fuel burning) and traffic. Potential AQSR areas and individual AQSRs were identified from Google EarthTM imagery.

#### *10.1.9.2 Air Quality Receptors*

The expansion footprint will be located on the existing Corobrik property; approximately 2 km west of Bentley Park, 2 km south-east of AngloGold Ashanti's West Wits, approximately 4 km north-west of the Sibanye Stillwater mining villages, and approximately 3 km west of the future Sibanye Stillwater PV Plant. The Corobrik facility is located in the Merafong City Local Municipality, in the West Rand District of the Gauteng Province. The closest residential areas to the project area are Bentley Park, West Wits, and Phomolong and East Village. There is housing on the Corobrik property as well as five individual homesteads and Laerskool Oos-Driefontein in East Village within 5 km of the proposed expansion footprint area, and Sibanye Driefontein Health clinic in Phomolong located just beyond 5 km of the proposed expansion footprint area; these are categorised as individual AQSRs. The AQSRs were included as discrete receptors in the dispersion modelling simulations. The AQSRs are presented in Figure 10-21.

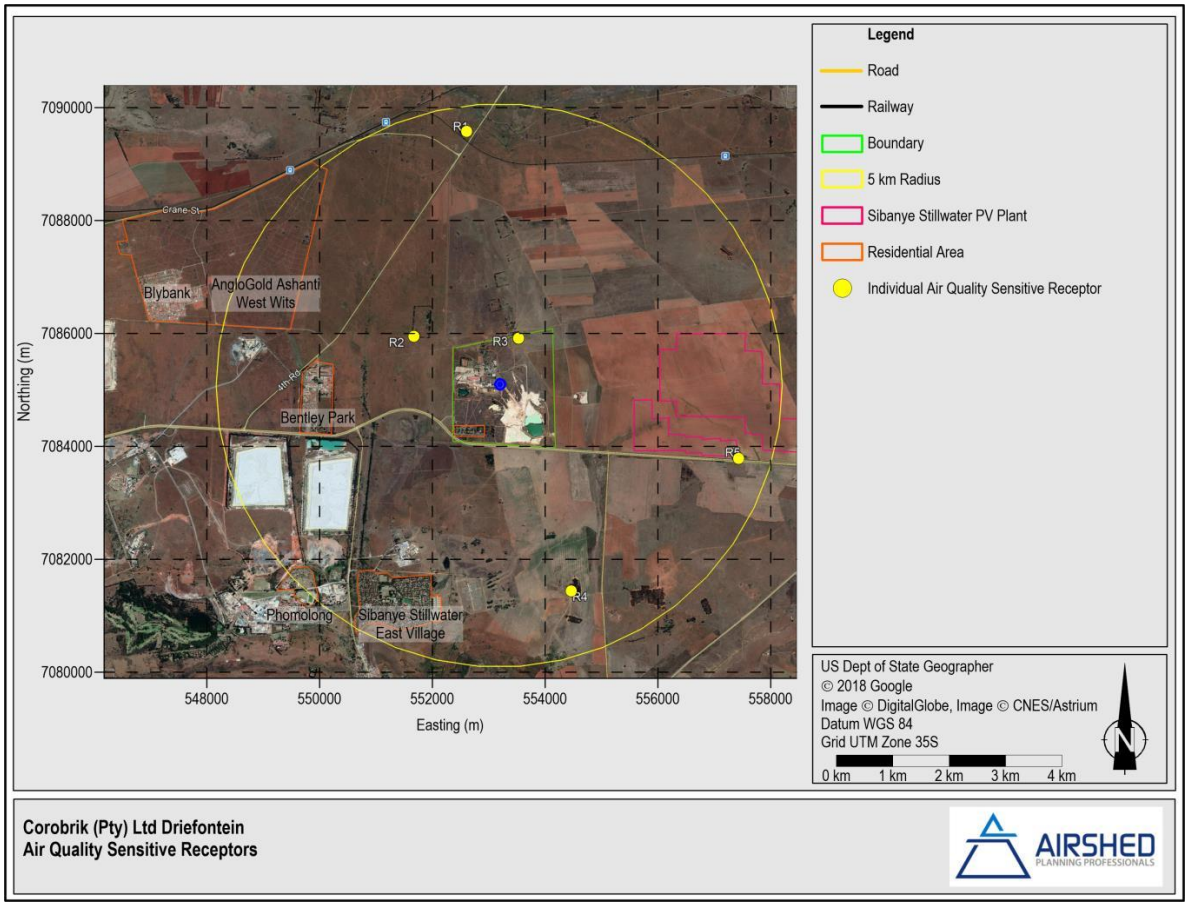



**Figure 10-21: Locality map showing Air quality receptors**

### *10.1.9.3 Atmospheric Dispersion Potential*

Meteorological mechanisms direct the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth's boundary layer. This dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume 'stretching'. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness. The wind direction, and variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading. The pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field (Tiwary & Colls, 2010).

The spatial variations, and diurnal and seasonal changes, in the wind field and stability regime are functions of atmospheric processes operating at various temporal and spatial scales. The atmospheric processes at macro- and meso-scales need therefore to be taken into account in order to accurately parameterise the atmospheric dispersion potential of a particular area. A qualitative description of the synoptic systems determining the macro-ventilation potential of the region may be provided based on a review of pertinent literature. These meso-scale systems may be investigated through the analysis of meteorological data observed for the region.

Since no weather measurements are available from the site, simulated MM5 meteorological data for the location for the 1 January 2014 to 31 December 2016 period was used to generate the following summaries.

#### *10.1.9.4 Surface Wind Field*

The vertical dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of wind speed, in combination with surface roughness (Tiwary & Colls, 2010).

The wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds between 5 m/s and 6 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated.

To avoid the overly conservative concentration estimates being made by AERMOD during calm conditions[3] the National Code of Practice for Air Dispersion Modelling suggests that all wind speeds greater than/equal to the anemometer starting threshold (AST) and less than 1 m/s be replaced with the value of 1 m/s. This approach has been adopted and 8% of the wind speeds replaced with 1 m/s.

A wind rose for the period January 2014 to December 2016 is shown in Figure 10-22. Day-time and night-time wind roses are included in Figure 10-23. The wind flow is dominated by north-north-easterly winds, followed by winds from the north. Calm conditions occurred 4.24% of the period summarised. During day-time conditions, the typical north-north-easterly winds decrease and are supplemented by winds from the north-north-west. Day-time conditions typically show higher wind speeds than night-time. The north-north-easterly component shows greater dominance during the night with fewer calm conditions after dark.

Seasonally, the wind flow pattern conforms to the period average wind flow pattern with north-north-easterly dominance; however, some seasonal variability exists in the wind fields (Figure 10-24). During summer north-north-easterly winds dominate in the range between 5m/s and 6 m/s with the fewest calm conditions, while winds from the north-north-west occur more frequently in autumn with the highest frequency of calm periods in winter, while winter and spring shows a north-north-easterly dominance with increased frequency of winds of speeds greater than 6 m/s.

[3] The Gaussian plume equation on which AERMOD algorithms are based is inverse proportional to wind speed resulting in over estimates of concentrations at wind speeds less than 1 m/s.

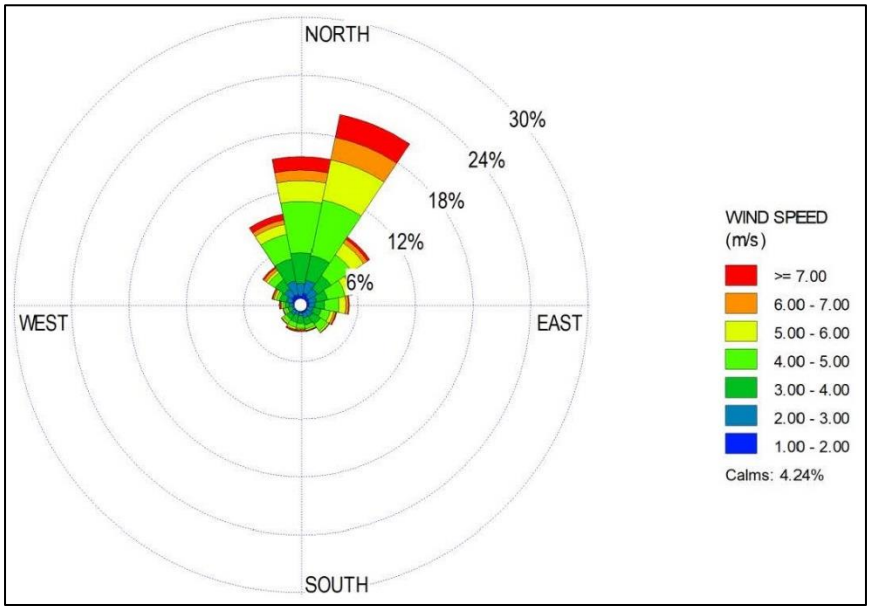



**Figure 10-22: Period average wind rose (MM5 data, January 2014 to December 2016)**

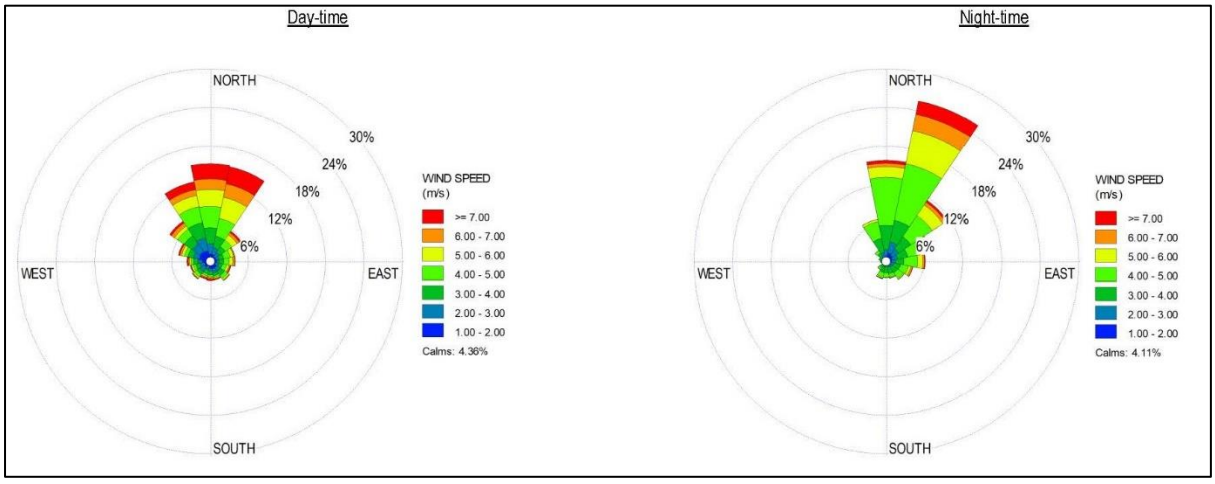



**Figure 10-23: Day-time and night-time wind roses (MM5 data, January 2014 – December 2016)**

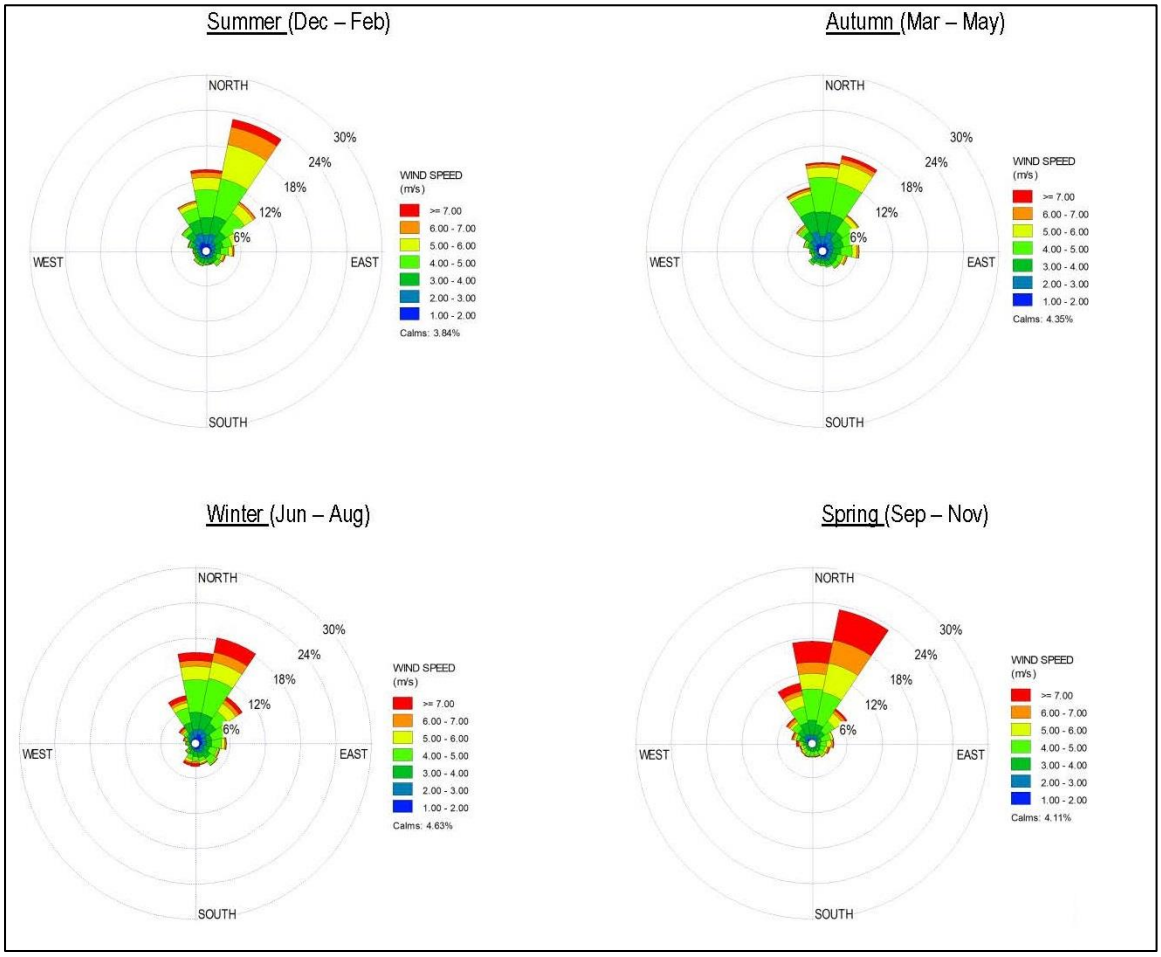



**Figure 10-24: Seasonal wind roses (MM% data, January 2014 – December 2016)**

### *10.1.9.5 Status Quo Ambient Air Quality*

#### *10.1.9.5.1 Existing Sources of Air Pollution in the Area*

***Mining Emission Sources***

The underground Sibanye Stillwater and AngloGold Ashanti Mines are located in close proximity to the expansion site. PM sources associated with mining activities include, underground mining operations (ventilation shaft emissions), surface materials handling activities, vehicle-entrainment by haul vehicles and wind-blown dust from waste and product stockpiles. Mining operations represent potentially the most significant sources of PM emissions ($PM_{2.5}$, $PM_{10}$ and TSP) with small amounts of CO, $NO_X$, $SO_2$, methane ($CH_4$), and carbon dioxide ($CO_2$) released during blasting operations, and from mine equipment exhaust emissions.

***Industrial Emission Sources***

The expansion area is located within approximately 50 km of the industrial operations. Activities are likely to include several continuous point sources of atmospheric pollutants. The industrial activities within 50 km are varied, resulting in a diversity of potential atmospheric pollutants from the sources, however $SO_2$, $NO_X$, CO, PM, and VOCs are likely to be common pollutants across most processes.

***Vehicle Tailpipe Emissions***

Emissions resulting from motor vehicles can be grouped into primary and secondary pollutants. While primary pollutants are emitted directly into the atmosphere, secondary pollutants form in the atmosphere as a result of chemical reactions. Significant primary pollutants emitted by internal combustion engines

include $CO_2$, CO, carbon (C), $SO_2$, $NO_X$ (mainly NO) and PM. Secondary pollutants include $NO_2$, photochemical oxidants such as ozone, sulphur acid, sulphates, nitric acid, and nitrate aerosols (particulate matter). Vehicle (i.e. model-year, fuel delivery system), fuel (i.e. type, oxygen content), operation (i.e. vehicle speed, load), and environmental parameters (i.e. altitude, humidity) influence vehicle emission rates (Onursal & Gautam, 1997). The release of VOCs via vehicle emissions is likely to have localised impacts and be within ambient air quality standards and are considered to be a minor contributor to an emissions inventory. The main roads in the region are regional secondary and unpaved minor routes. Traffic volumes within the 5 km radius of the facility are likely to carry heavy traffic.

***Domestic Fuel Combustion***

Domestic households are known to have the potential to be one of the most important sources contributing to poor air quality within residential areas. Individual households are low volume emitters, but their cumulative impact can be significant. It is likely that some households within the surrounding settlements utilise coal, paraffin and/or wood for cooking and/or space heating (mainly during winter) purposes. Pollutants arising from the combustion of these fuel sources include respirable particulates, CO and $SO_2$ with trace amounts of polycyclic aromatic hydrocarbons (PAHs), in particular benzo(a)pyrene and formaldehyde.

***Agricultural Sources***

Crop farming activities that may result in atmospheric emissions include fertiliser and pesticide applications, and harvesting. Vehicles driving on unpaved roads and exposed soil are typically used to apply fertiliser and pesticides. Both particulate matter (PM) and gaseous air emissions (mainly NO, $NO_2$, ammonia, $SO_2$ and VOC) are generated from the application of nutrients as fertilizers or manures. Particulate matter, composed of soil dust and plant tissue fragments (chaff), may be entrained by wind (US EPA., 2006a ).

Livestock farming is also a significant source of fugitive dust especially when the livestock trample on eroded/open areas. According to the US EPA, cattle emit methane through a digestive process that is unique to ruminant animals called enteric fermentation. The main impact from methane is on the dietary energy due to the reduction of carbon from the rumen. Dust and gasses levels are higher in winter or whenever animals are fed, handled or moved (http://www.cdc.gov/nasd/docs).

***Unpaved and paved roads***

Emissions from unpaved roads can constitute a substantial source of emissions to the atmosphere in the South African context. The force of the wheels of a vehicle traveling on an unpaved road, results in the pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads vary in relation to the vehicle traffic (including average vehicle speed, mean vehicle weight, average number of wheels per vehicle) and the silt loading on the roads.

Emissions from paved roads are significantly less than those originating from unpaved roads; however, they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the re-suspension of loose material on the road surface. Roads in the vicinity of the proposed project are mostly unpaved roads.

***Wind erosion of open areas***

Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Every time a surface is disturbed, its erosion potential is restored. Erodible surfaces may occur as a result of industrial processes (for example tailings storage facilities at the nearby Sibanye Stillwater and AngloGold Ashanti mines), agriculture, and/or grazing activities. The surrounding agricultural

properties could also be a source of wind-blown particulates after harvesting when fields are fallow.

***Biomass Burning***

Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, crop-residue burning and wild fires (locally known as veld fires) may represent significant sources of combustion-related emissions (Maenhaut, Salma, Cafmeyer, Annegarn, & Andreae, 1996)

Biomass burning is an incomplete combustion process (Cachier, 1992), with carbon monoxide, methane and nitrogen dioxide gases being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen gas, 10% remains in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds (Held, et al., 1996). The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content. In addition to the impact of biomass burning within the vicinity of the proposed project, long-range transported emissions from this source can be expected to impact on the air quality between the months August to October. It is impossible to control this source of atmospheric pollution loading; however, it should be noted as part of the background or baseline condition before considering the impacts of other local sources

***Fugitive Dust Sources***

These sources are termed fugitive because they are not discharged to the atmosphere in a confined flow stream. Sources of fugitive dust identified to potentially occur in the study area include paved and unpaved roads; agricultural tilling operations; and wind erosion of sparsely vegetated surfaces.

### *10.1.9.6 Measured Pre-Development Air Pollutant Concentrations and Dustfall Rates*

#### *10.1.9.6.1 Air Pollutant Concentrations*

The only near-site ambient air quality monitoring data that was available during the assessment was from the perimeter $SO_2$ sampler, at Corobrik, as per the previous AEL which showed baseline $SO_2$ concentrations to be negligible. For $NO_2$ and $PM_{10}$ there were no on-site or near-site sampling data available. Ambient air quality monitoring is monitored at the Randfontein station, approximately 25 km north-north-east of the Project site. The Randfontein station is located within a residential area and is unlikely to be representative of Corobrik's immediate surrounds; however, it may be representative of the baseline ambient pollutant concentrations in the residential areas (AQSR areas) near Corobrik. The ambient records for the period 2015 to 2017 were accessed from the South African Air Quality Information System (www.saaqis.org.za) for $NO_2$ (Figure 10-25), $SO_2$ (Figure 10-26) and $PM_{10}$ (Figure 10-27).

The measured $NO_2$ concentrations had one exceedance of the 1-hr NAAQS limit concentration in 2017 (Figure 10-25). $SO_2$ concentrations from January 2015 to December 2017 did not exceed the 1-hr and 24-hr NAAQS limit concentrations (Figure 10-26). $PM_{10}$ did not comply with the 24-hr NAAQS (i.e. there were more than 4 days with a concentration of 75 µg/m³ or more) in 2015 and 2016; however, the 24-hour NAAQS was complied with in 2017 as there was only one exceedance of the 24- hour NAAQS limit (Figure 10-27).

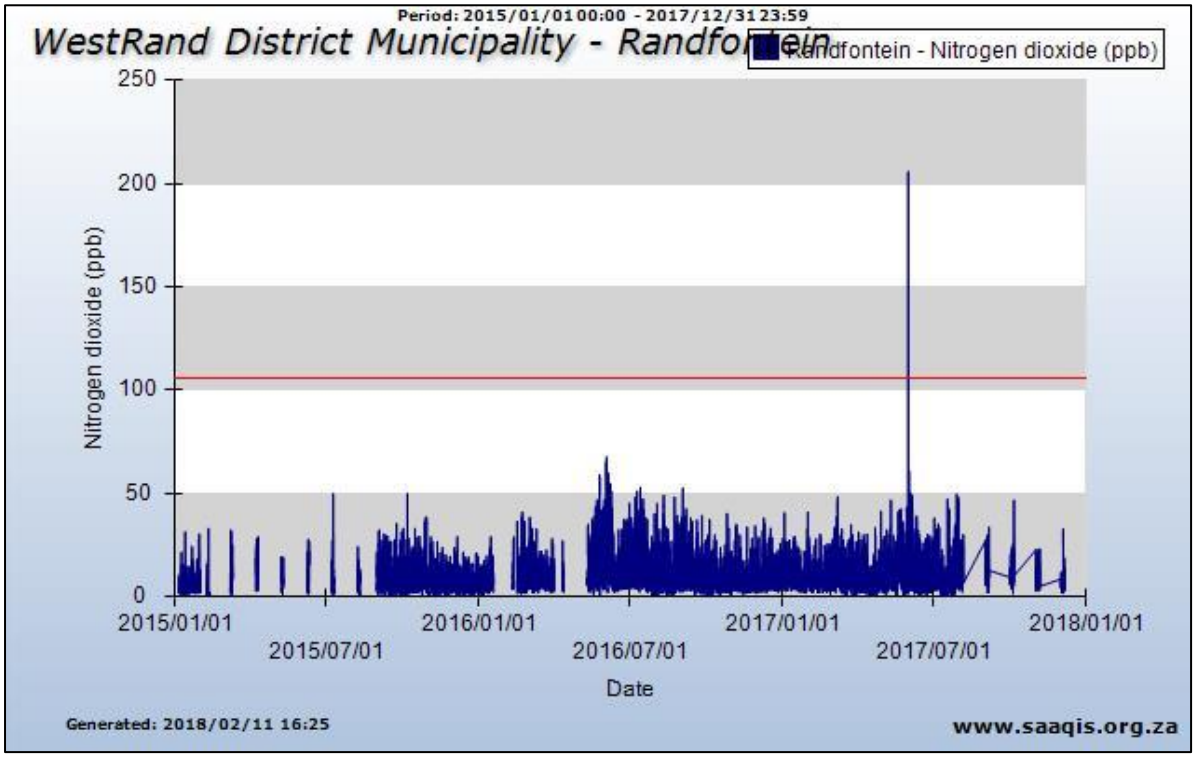



**Figure 10-25: Ambient $NO_2$ concentrations recorded at the Randfontein station between 1 January 2015 and 31 August 2017**

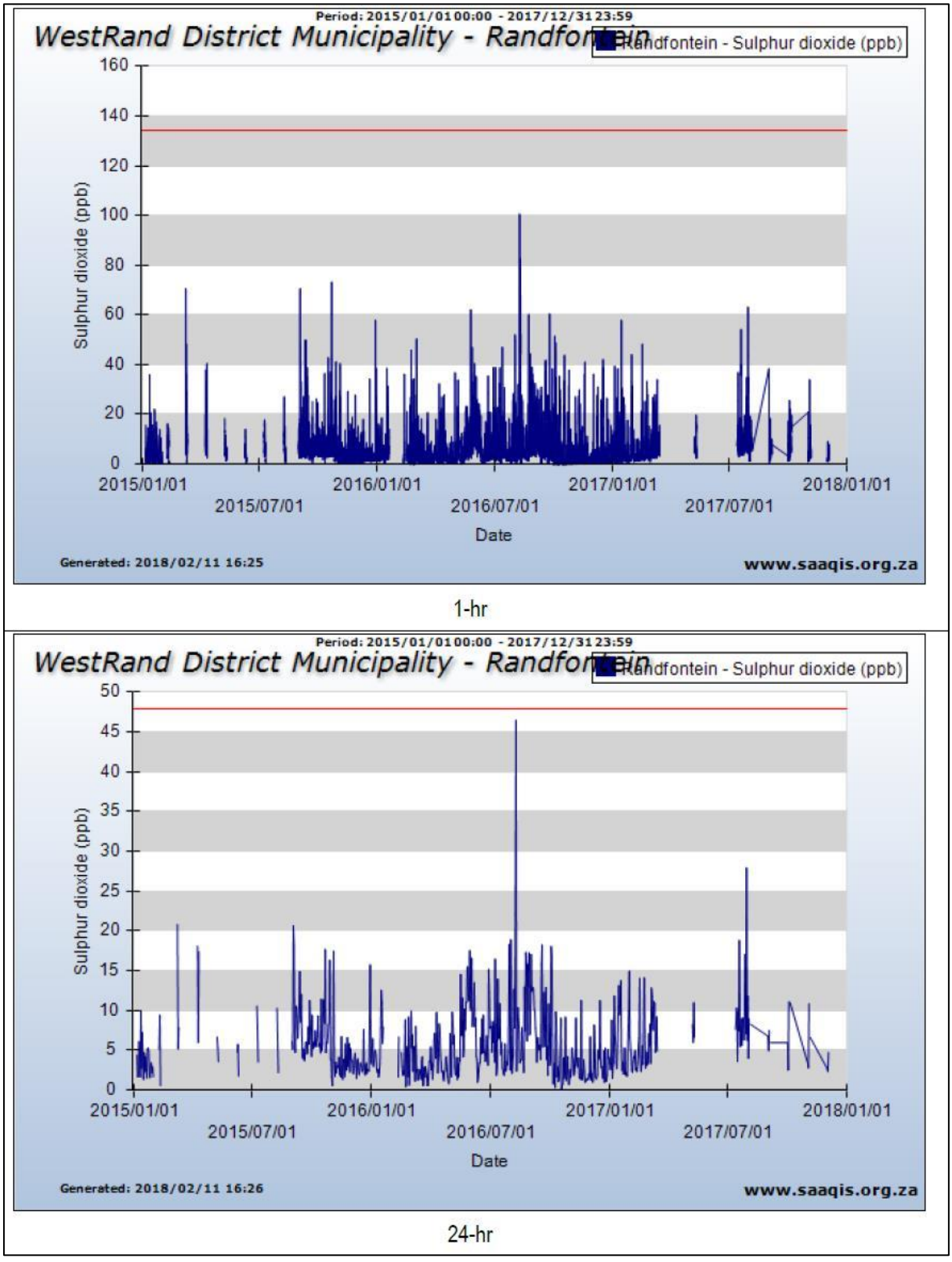



**Figure 10-26: Ambient $SO_2$ concentrations recorded at the Randfontein station between 1 January 2015 and 31 August 2017**

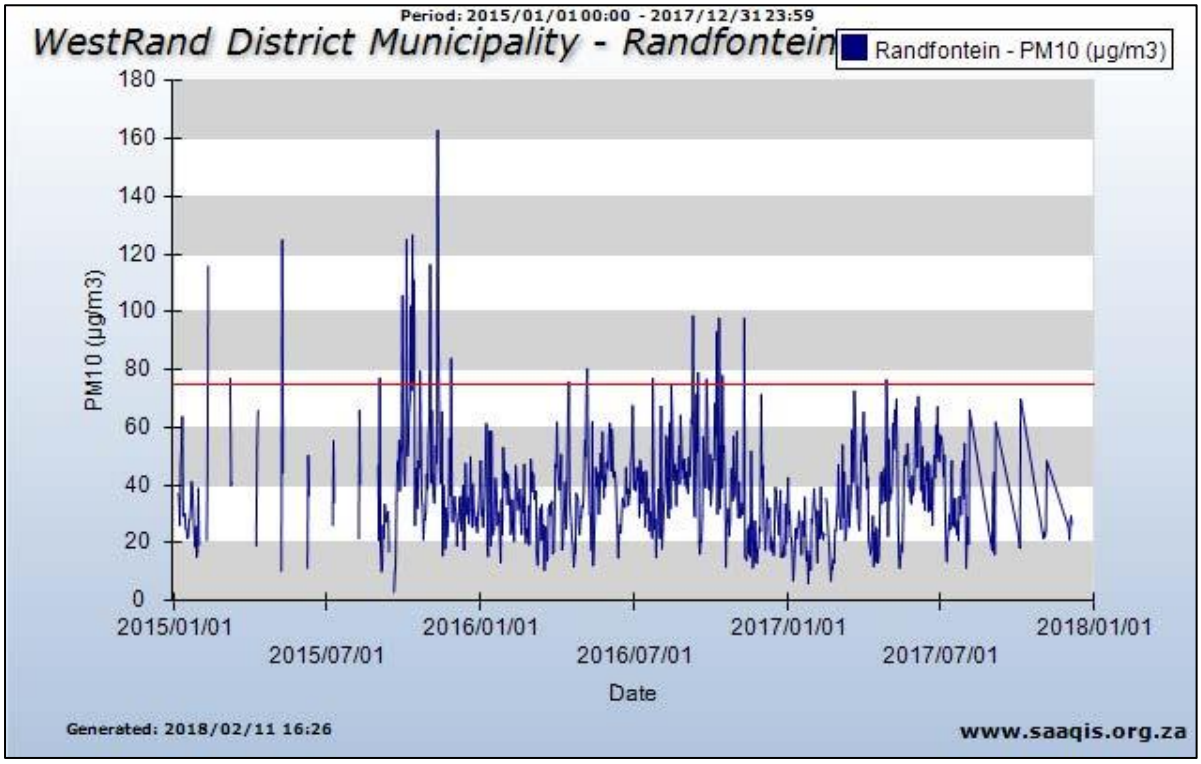



**Figure 10-27: Ambient $PM_{10}$ concentrations recorded at the Randfontein station between 1 January 2015 and 31 August 2017**

*10.1.9.6.2 Dustfall rates*

Dustfall is monitored at eight locations on-site and around the right boundary of Corobrik. According to the previous AEL, none of the dustfall units maximum daily dustfall rates exceed the non-residential dustfall standard for a 1-year period.

### *10.1.9.7 Simulated Baseline Air Pollutant Concentrations and Dustfall Rates from Corobrik*

*10.1.9.7.1 Atmospheric Emissions*

The establishment of a comprehensive emission inventory formed the basis for determining the pollutant concentrations and dustfall rates from the Corobrik activities to represent the baseline air quality in the near vicinity of the Project. Sources of emission and associated pollutants considered in the Corobrik emissions inventory included:

- Fugitive dust emissions (TSP, $PM_{10}$ and $PM_{2.5}$):
  - excavation;
  - materials handling;
  - crushing; and,
  - vehicle entrained dust as a result of transport on the internal unpaved roads.
- Process emissions (HF, $NO_X$, $SO_2$ and PM):
  - Tunnel kiln and dryer operations.

A summary of sources quantified, emissions estimation techniques applied, and source input parameters are summarised in Table 10-18. Estimated annual average mitigated emissions, in tonnes per annum (t/a), per source group, are presented in Table 10-19. The operational phase modelling was based on the estimated mitigated emissions. Stack (kiln and dryer) emissions contribute most notably to the total annual mitigated TSP, $PM_{10}$ and $PM_{2.5}$ emissions, followed by vehicles travelling in the

quarry.

**Table 10-18: Emission estimation techniques and parameters for Corobrik (Pty) Ltd: Driefontein**

| Source Group | Emission Estimation Technique | Input Parameters/Notes |
|---|---|---|
| Excavation and Materials Handling | NPI emission factor equation for miscellaneous transfer and conveying (ADE, 2012)<br>$EF = k \cdot 0.0016 \cdot \left(\frac{U}{2.2}\right)^{1.3} \cdot \left(\frac{M}{2}\right)^{-1.4}$<br>Where<br>EF is the emission factor in kg/tonne material handled<br>k is the particle size multiplier ($k_{TSP}$ – 0.74, $k_{PM10}$ – 0.35, $k_{PM2.5}$ – 0.053)<br>U is the average wind speed in m/s<br>M is the material moisture content in % | The handlings steps include excavation, loading and offloading of trucks, as well as conveyor transfer points. The handling rate of 110 t/h was used in the estimation of emissions.<br>An average **wind speed** of **3.72 m/s** was determined from the MM5 data.<br>A **moisture content** of **10%** was used for clay.<br>**Hours of operation**: 365 days per year, 24-hours per day.<br>**Design Mitigation**: None. |
| Crushing | NPI single valued emission factors for high moisture ore (ADE, 2012)<br>TSP – 0.03 kg/tonne (primary)<br>$PM_{10}$ – 0.013 kg/tonne (primary)<br>$PM_{2.5}$ – *assumed* to be 0.001 kg/tonne (primary) | Crushing rates: 55 t/h per crusher (two crushers on site).<br>**Hours of operation**: 365 days per year, 24-hours per day<br>**Mitigation**: None. |
| Vehicle Entrained Dust from Unpaved Roads | US EPA emission factor equation (US EPA, 2006b)<br>$EF = k \cdot \left(\frac{s}{12}\right)^{a} \cdot \left(\frac{W}{3}\right)^{b} \cdot 281.9$<br>Where<br>EF is the emission factor in g/vehicle kilometre travelled (VKT)<br>k is the particle size multiplier ($k_{TSP}$ – 4.9, $k_{PM10}$ – 1.5, $k_{PM2.5}$ – 0.15)<br>a is a constant ($k_{TSP}$ – 0.7, $k_{PM10}$ – 0.9, $k_{PM2.5}$ – 0.9)<br>b is a constant ($k_{TSP}$ – 0.45, $k_{PM10}$ – 0.45, $k_{PM2.5}$ – 0.45)<br>s is the road surface material silt content in %<br>W is the average weight vehicles in tonnes | Transport activities include the transport of clay along the quarry and stockpile areas unpaved roads.<br>VKT were calculated from road lengths (limited to simulation areas), truck capacities and the number of trips required to transport materials.<br>Truck capacity 28 tonnes, average vehicle weight 39 tonnes, ~60 return trips/day, ~84 VKT/day.<br>The **road surface silt content of 16.8%** from similar operations was applied in the calculations.<br>**Hours of operation**: 365 days per year, 24-hours per day.<br>**Mitigation**: Watering. |
| **Source Group** | **Emission Estimation Technique** | **Input Parameters/Notes** |
| Stacks | US EPA emissions factors (US EPA, 1997) provided as kg/tonne per pollutant | Two tunnel kilns and dryers with the total number of bricks fired being approximatel 54.06 million bricks per annum, with a brick weight of 3.16 kg.<br>**No. of stacks**: 2<br>**Stack height**: 9 m<br>**Stack tip diameter**: 1.29 m<br>**Actual gas exit temperature stack 1**: 264.2°C<br>**Actual gas exit temperature stack 2**: 76.9°C<br>**Actual gas exit velocity stack 1**: 18.16 m/s<br>**Actual gas exit velocity stack 2**: 19.26 m/s |

**Table 10-19: Estimated annual mitigated emission rates in tonnes per annum per source group for Corobrik (Pty) Ltd: Driefontein**

| Current operations | TSP (t/a) | $PM_{10}$ (t/a) | $PM_{2.5}$ (t/a) | HF (t/a) | CO (t/a) | $CO_2$ (t/a) | $NO_2$ (t/a) | $SO_2$ (t/a) |
|---|---|---|---|---|---|---|---|---|
| Materials handling | 16.6 | 1.40 | 3.32 | - | - | - | - | - |
| Crushing | 2.96 | 6.63 | 0.21 | - | - | - | - | - |
| Unpaved roads | 68.8 | 39.3 | 3.93 | - | - | - | - | - |
| Stacks | 82.0 | 74.3 | 74.3 | 14.5 | 102 | 34 166 | 29.9 | 57.2 |
| **Total** | **170** | **122** | **82** | **15** | **102** | **34 166** | **30** | **57** |

### *10.1.9.8 Atmospheric Dispersion Modelling*

The assessment of the impact of the current operations on the environment is discussed in this section. To assess impact on human health and the environment the following important aspects need to be considered:

- the criteria against which impacts are assessed;
- the location of likely AQSRs;
- the potential of the atmosphere to disperse and dilute pollutants emitted by the project;
- existing ambient pollutant concentrations; and
- atmospheric emissions.

Dispersion models simulate ambient pollutant concentrations and dustfall rates as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources. Increasing reliance has been placed on concentration estimates from models as the primary basis for environmental and health impact assessments, risk assessments and emission control requirements. It is therefore important to carefully select a dispersion model for the purpose.

*10.1.9.8.1 Dispersion Model Setup*

- Grid resolutions of 50 m (grid of 11 km x 11 km) was used.
- MM5 meteorology data for the site was used.
- AQSRs were included as discrete receptors.
- One scenario was simulated – current operations at Corobrik.

*10.1.9.8.2 Presentation of Results*

Dispersion simulation was undertaken to determine highest hourly, highest daily and annual average ground level concentrations and daily average dustfall rates for each of the pollutants considered in the study as well as the frequency at which short-term criteria are exceeded. Averaging periods were selected to facilitate the comparison of simulated pollutant concentrations to relevant ambient air quality and inhalation health criteria as well as dustfall regulations.

Ambient air quality criteria apply to areas where the Occupational Health and Safety regulations do not apply; which is generally outside the property or lease area. Ambient air quality criteria are therefore not occupational health indicators but applicable to areas where the general public has access. In the case of this study the ambient criteria is seen to be applicable outside the boundary and at all AQSRs (inside or outside of the boundary).

Isopleth plots have been included if the assessment criteria were exceeded.

*10.1.9.8.3 Simulated Ambient HF Concentrations*

Simulated annual average HF concentrations are below the CAL EPA REL of 14 µg/m$^3$. The maximum simulated HF concentration is 2.56 µg/m$^3$ (on-site).

*10.1.9.8.4 Simulated Ambient NO2 Concentrations*

Simulated $NO_2$ is in compliance with the 1-hour and annual average NAAQS. The maximum simulated 1-hour $NO_2$ concentration is 59 µg/m$^3$ (on-site). The maximum simulated annual average $NO_2$ concentration is 5 µg/m$^3$ (on-site).

*10.1.9.8.5 Simulated Ambient SO2 Concentrations*

Simulated $SO_2$ is in compliance with the 1-hour, 24-hour average and annual average NAAQS. The maximum simulated 1- hour $SO_2$ concentration is 114 µg/m$^3$ (on-site). The maximum simulated 24-hour average $SO_2$ concentration is 51 µg/m$^3$ (on-site). The maximum simulated annual average $SO_2$ concentration is 10 µg/m$^3$ (on-site).

*10.1.9.8.6 Simulated Ambient $PM_{10}$ Concentrations*

Simulated annual average $PM_{10}$ concentrations exceed the NAAQS of 40 µg/m$^3$ but not beyond the boundary or at any AQSRs (Figure 10-28). The 24-hour NAAQS (4 days of exceedance of 75 µg/m$^3$) is exceeded beyond the boundary, up to 60 m from the quarry (30 m from the boundary) but not at any AQSRs (Figure 10-29).

*10.1.9.8.7 Simulated Ambient PM2.5 Concentrations*

Simulated annual average $PM_{2.5}$ concentrations exceed the NAAQS of 20 µg/m$^3$ but not beyond the boundary or at any AQSRs (Figure 10-30). The 24-hour NAAQS (4 days of exceedance of 40 µg/m$^3$) is exceeded but not beyond the boundary or at any AQSRs (Figure 10-31).

#### *10.1.9.8.8 Simulated Dustfall Rates*

Corobrik (Pty) Ltd: Driefontein's current activities were found to result in dustfall rates below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The maximum simulated dustfall rate is 296 mg/m$^2$-day (on-site).

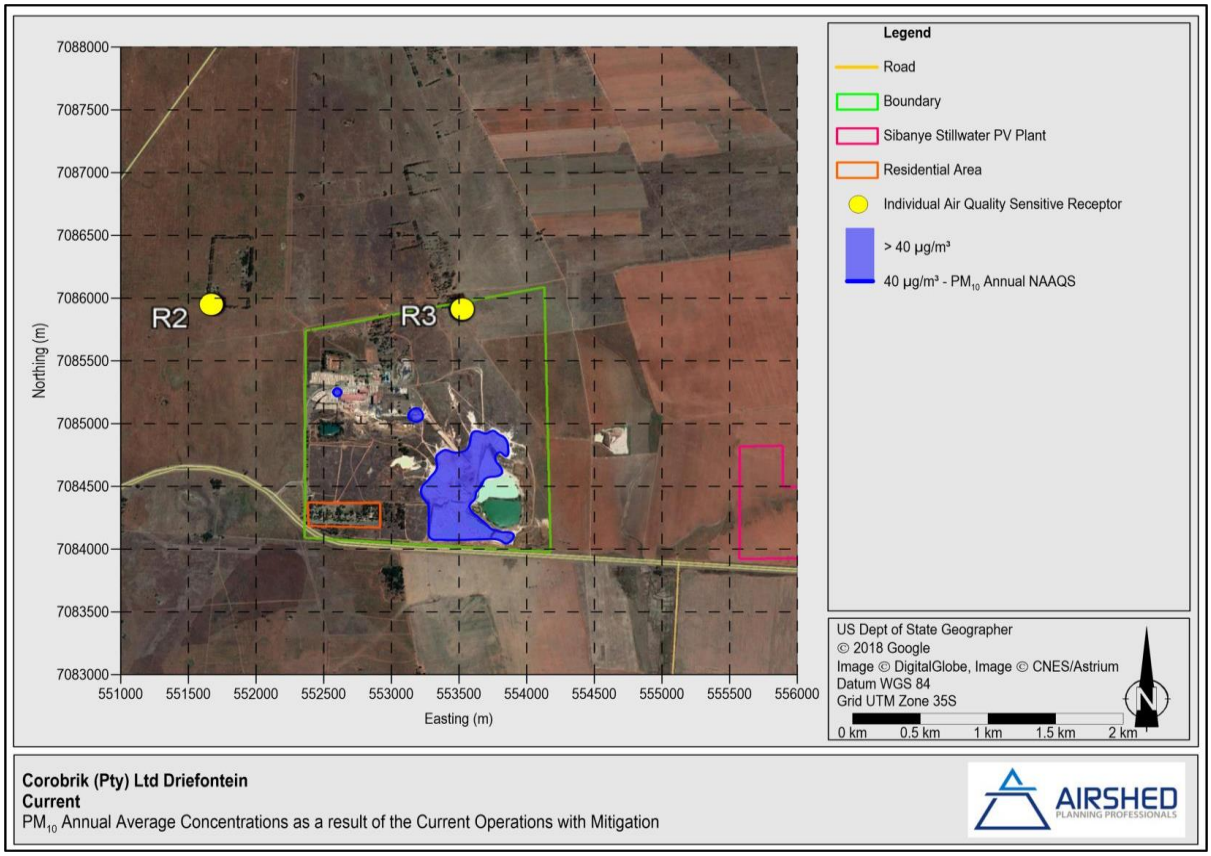



**Figure 10-28: Corobrik current operations – area of exceedance of the annual average $PM_{10}$ NAAQS**

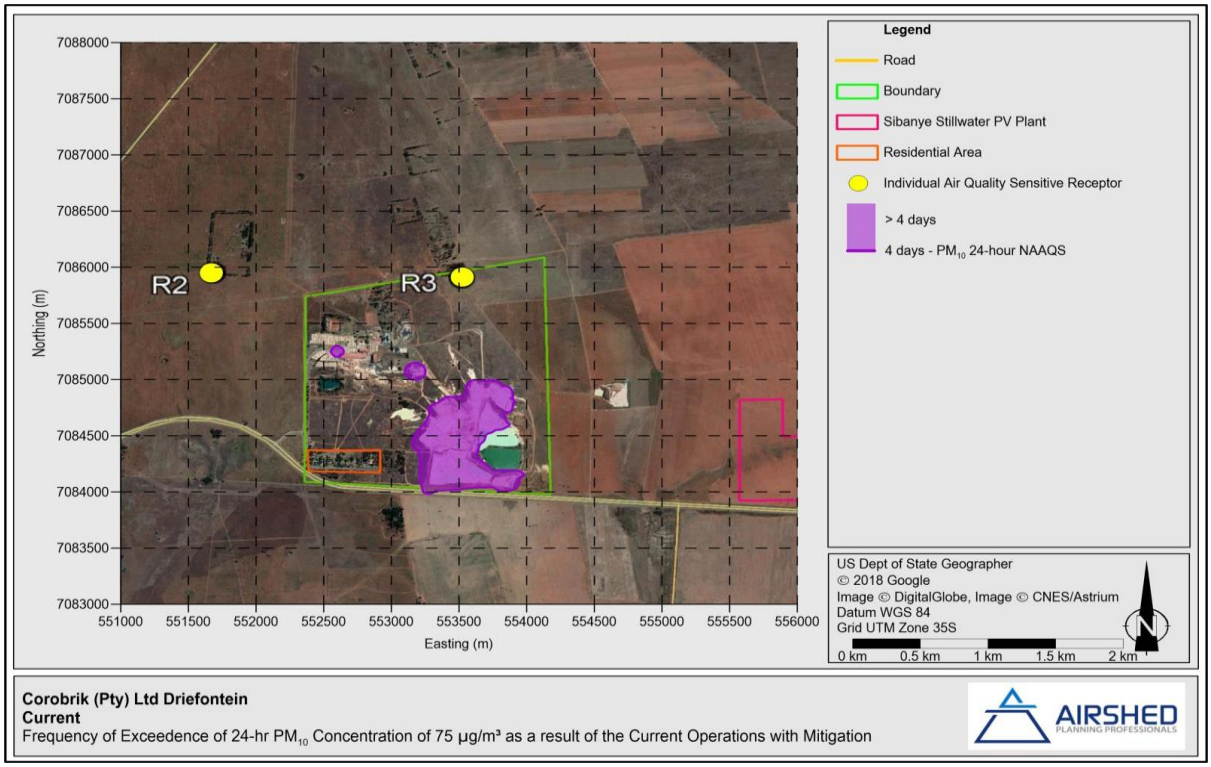



**Figure 10-29: Corobrik current operations - area of exceedance of the 24-hour average $PM_{10}$ NAAQS**

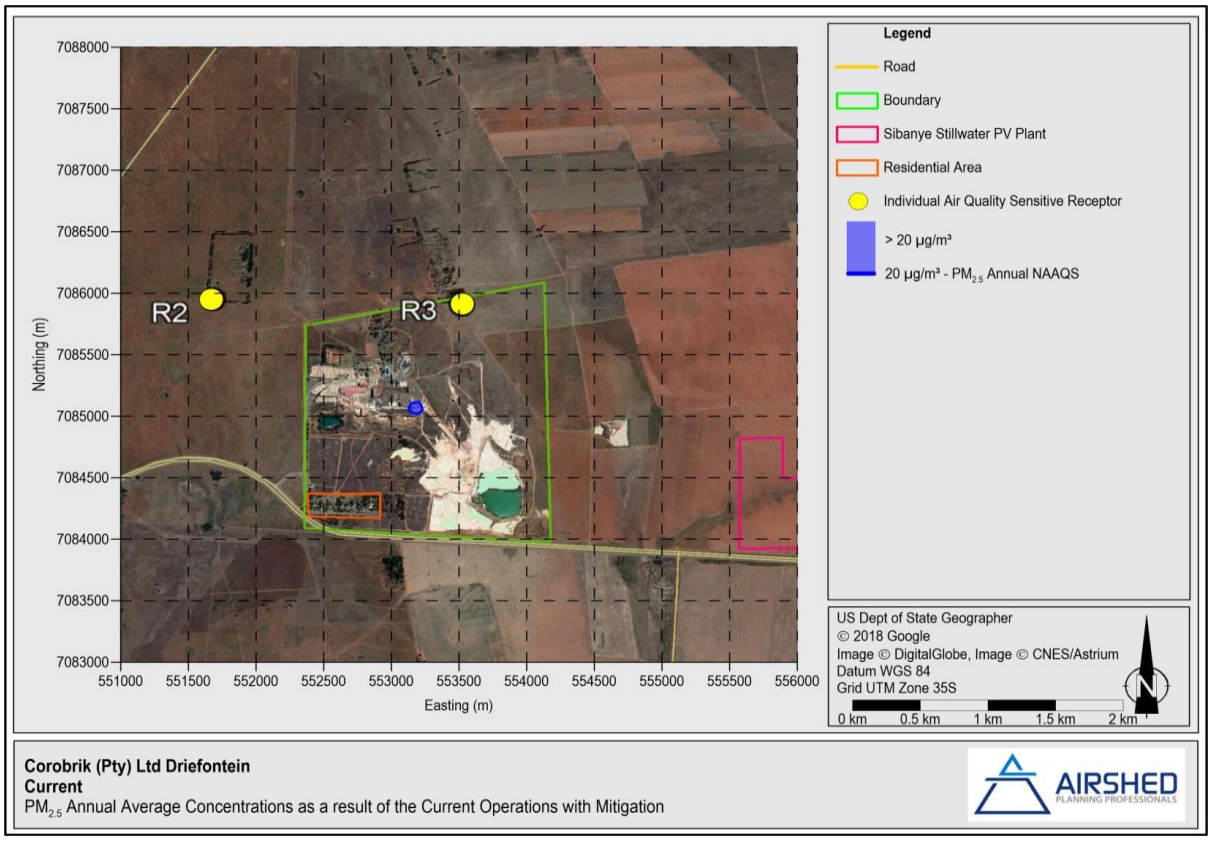



**Figure 10-30: Corobrik current operations – area of exceedance of the annual average $PM_{2.5}$ NAAQS**

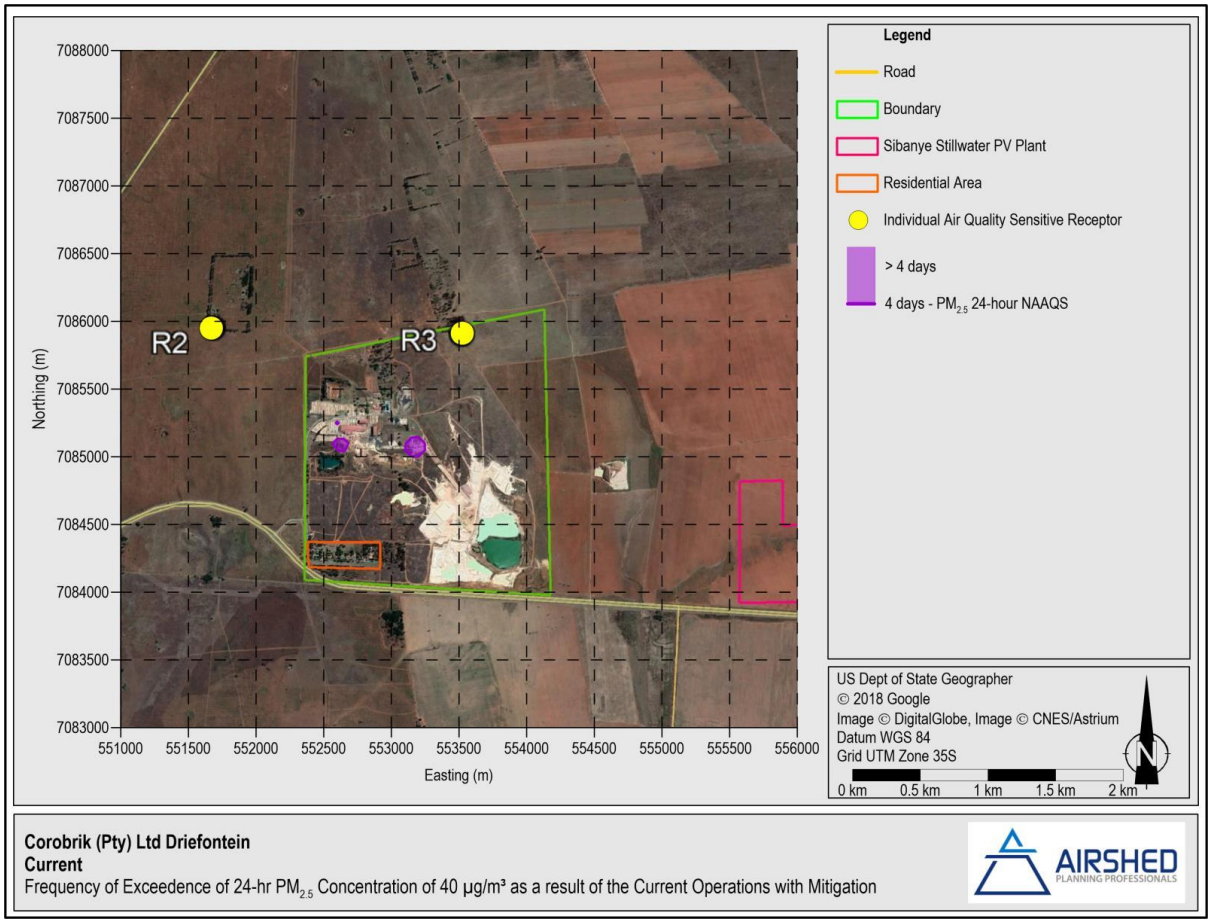



**Figure 10-31: Corobrik current operations - area of exceedance of the 24-hour average $PM_{2.5}$ NAAQS**

### 10.1.10 Noise

No noise study was conducted for the Corobrik (Pty) Ltd: Driefontein expansion project as the impact was not deemed to be significant. Noise will be noticeable during the construction phase; however, construction will be limited to working hours. It is also expected that the existing ambient sound levels as a result of the road and mining together with the construction sound levels will not result in elevated noise levels harmfull to life.

### 10.1.11 Sites of Archaeological, Historical and Cultural Interest

The study area is situated on Portions 23 and 27 (Portions of Portion 22) of the farm Driefontein 355 IQ and is located directly south of Corobrik's Driefontein Factory operations. The construction of two new kilns as part of their expansion is proposed on the study site.

The topography of the area is flat and open mostly, with little tree cover. Grass and shrub cover on the largest section was fairly dense but visibility during the survey was good. A portion of the study area (the Clay Stockpile Area) has recently been graded/cleared and soil heaps from this is also present in the area. These heaps were assessed for the presence of possible archaeological or historical artefacts and material. The study area was also used for agricultural purposes (ploughing/crop growing) in the recent past and as a result has been disturbed to a large degree. If there were any sites, features or material of archaeological and/or historical nature located here in the past it would have been disturbed or destroyed as a result (Pelser, 2018).


**Figure 10-32: Closer view of study area (Google Earth 2018)**

**Figure 10-33: Partial view of study area. Note the flat and open nature**

**Figure 10-34: A view of the Clay Stockpile area**

**Figure 10-35: Another view of the clay stockpile area with soil heaps**

**Figure 10-36: A view of a section of the area with the current Corobrik Driefontein Factory visible**

**Figure 10-37: A portion of the bordering land showing the ploughed nature of the area**

**Figure 10-38: Another view showing the clay stockpile area as well as the open nature of the area**

**Figure 10-39: Further view of the study area**

**Figure 10-40: View of old Quarry that is under rehabilitation**

The Stone Age is the period in human history when lithic (stone) material was mainly used to produce tools. In South Africa the Stone Age can be divided basically into three periods. It is however important to note that dates are relative and only provide a broad framework for interpretation. A basic sequence for the South African Stone Age (Lombard, et al., 2012) is as follows:

- Earlier Stone Age (ESA) up to 2 million – more than 200 000 years ago;
- Middle Stone Age (MSA) less than 300 000 – 20 000 years ago; and
- Later Stone Age (LSA) 40 000 years ago – 2000 years ago.

It should also be noted that these dates are not a neat fit because of variability and overlapping ages between sites (Lombard, et al., 2012).

No known Stone Age sites or artifacts are present in the area. The closest well-known Stone Age sites are those of Aasvoelkop, Melvillekoppies, Primrose and Linksfield (Bergh, 1999). Rock engraving sites are also known to occur north-east of Carletonville (Bergh, 1999).

***No Stone Age sites or material were identified in the study area during the January 2018 assessment.***

The Iron Age is the name given to the period of human history when metal was mainly used to produce artifacts. In South Africa it can be divided in two separate phases (Bergh, 1999), namely:

- Early Iron Age (EIA) 200 – 1000 A.D; and
- Late Iron Age (LIA) 1000 – 1850 A.D.

Huffman (Huffman, 2007) indicates that a Middle Iron Age should be included. His dates, which are widely accepted in archaeological circles, are:

- Early Iron Age (EIA) 250 – 900 A.D;
- Middle Iron Age (MIA) 900 – 1300 A.D; and
- Late Iron Age (LIA) 1300 – 1840 A.D.

No Early Iron Age sites are known in the larger geographical area, while Later Iron Age sites do occur. This includes sites at Melvillekoppies & around the Carletonville area (Bergh, 1999) and Klipriviersberg (Huffman, 2007). De Jong mentions the occurrence of Late Iron Age stone-walled settlement sites close to Fochville and the Westonaria area (De Jong, 2010).

***No Iron Age occurrences were identified in the study area during the assessment.***

The historical age started with the first recorded oral histories in the area. It includes the moving into the area of people that were able to read and write. The first Europeans to move through and into the area was the group of Cornwallis Harris in 1836 (Bergh, 1999). These groups were closely followed by the Voortrekkers after 1840 (Bergh, 1999).

Merafong City Local Municipality, in which the study area is located, is a local municipality in the West Rand District Municipality, Gauteng, South Africa. Its boundaries enclose some of the richest gold mines in the world. It is situated about 65 km from Johannesburg and is serviced by a number of major roads, including the N12 from Johannesburg to Cape Town and the N14 (the main road between Gauteng and Mafikeng via Ventersdorp).

Formerly a cross-border municipality, the entire municipality was transferred to the North West Province following the abolition of cross-border municipalities by an amendment to the South African Constitution in 2005. The municipality was a part of the North West Province from 2005 to 2009, when it was reincorporated into the Gauteng Province by another amendment to the Constitution, following often violent protests in the township of Khutsong.

Merafong's historical development is closely knit with the discovery of rich gold deposits in the early 1930s. Fochville is the oldest town in the region, and was declared a town in 1951.

The town Carletonville was named after Guy Carleton Jones, an engineer from the Gold Fields Ltd mining company, who played a prominent role in the discovery of the West Wits gold field, of which Carletonville forms a part. The mining company decided in November 1946 to establish the town. Carletonville was proclaimed in 1948 and attained Town Council Status on 1 July 1959. Wedela is situated in between Western Deep Levels and Elandsrand mine. The town's name is derived from the prefixes of the two mines: the "Wed-" from Western Deep Levels and the "-ela" from Elandsrand. Wedela was established as a mining village in December 1978 by Harry Oppenheimer, and municipal status was granted to the town on 1 January 1990. Attached to Fochville and Carletonville are the towns of Khutsong, Kokosi, Greenspark, and Blybank.

The oldest map obtained from the Chief Surveyor General's database the farm Driefontein 355IQ, dates to 1903 (Document 100BTF01) (Chief Surveyor General Database, 2018).

It shows that the farm was then numbered as No.614 and was situated in the Potchefstroom (Oberholzer) District and Gatsrand Ward of the Zuid-Afrikaansche Republiek (ZAR). It was surveyed for J.C.Dreyer, J.G.Oosthuisen, T.F.Dreyer, C.L. van den Berg, J.J.J.Steyn & A.F.Meyer in July 1899.

No archaeological or historical sites or features could be identified on this map however.

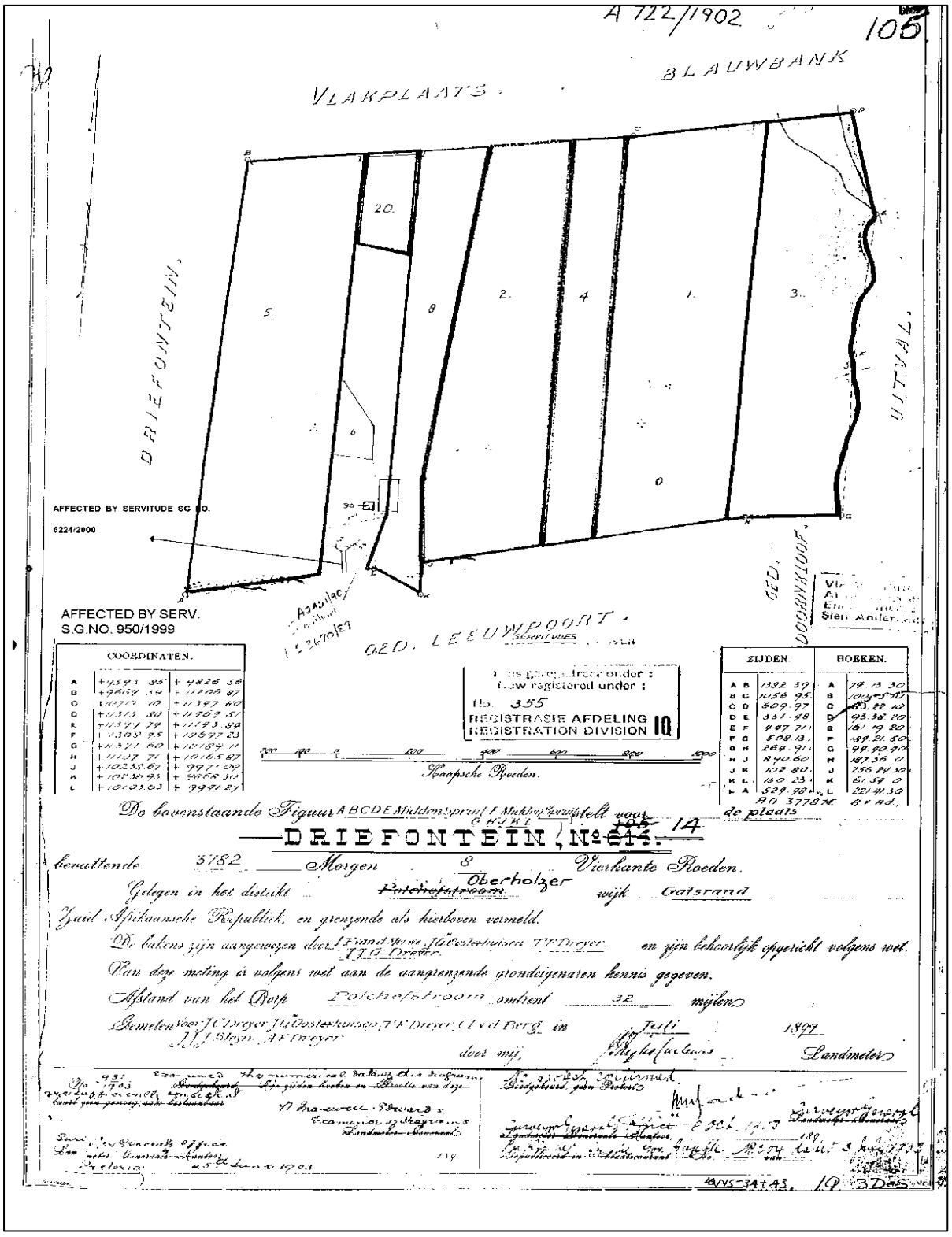



**Figure 10-41: 1903 Map of Driefontein 355IQ (www.csg.dla.gov.za)**

### 10.1.12 Visual Aspects

No Visual assessment was done for the expansion of the activities on Driefontein as it is an existing mining operation and the impact from the new kilns will be similar to the existing kilns on site.

#### *4.1.1.2 Landscape Integrity*

Landscape integrity is visual qualities represented by the following qualities, which enhance the visual and aesthetic experience of the area:

- Intactness of the natural and cultural landscape. The proposed Corobrik development is located within the existing Corobrik footprint and the area is already disturbed by the various activities on Corobrik.
- Lack of visual intrusions or incompatible structures. Various visual intrusions are already present; and
- Presence of a 'sense of place. The "sense of place" has already been much degraded as a result of all the mining activities and other developments within the Carletonville area and the farms surrounding the various developments are the only aspects keeping the natural veld characteristics that may be seen

Another factor which will influence the degree of visual impacts is the backdrop against which it is viewed. When viewed from close up, landscape elements are usually seen against the sky and are more visible. When the same elements are viewed from close up against a backdrop of similar colour, they tend to be more "hidden". Short range visual impacts of Corobrik will be limited to some extent by having the backdrop of the already existing Corobrik mining and activities.

Regionally, the visual character can be described as rurally agricultural, interspersed with mining land uses. Thus, although the Corobrik activities is more visible in this area than in areas with greater topographical ruggedness or a higher level of visual variation, it is not an uncommon sight and can be considered compatible with the regional visual character, even though the presence of mining infrastructure causes a negative visual intrusion on the landscape. The significance of this effect is, however, much less than for instance in an area characterised only by agriculture and rural settlements.

### *10.1.13* Regional Socio-Economic Structure

#### *10.1.13.1 Regional Description*

The West Rand District Municipality (Area: 4 087 km$^2$) is a Category C municipality located in the west of the Gauteng Province. The West Rand extends from Randfontein (the seat of the district) in the west to Roodepoort in the east, and includes the town of Krugersdorp. It is bordered by Bojanala Platinum to the north-west, City of Tshwane to the north-east, City of Johannesburg to the east, Sedibeng to the south-east, and Dr Kenneth Kaunda to the south-west. It comprises three local municipalities: Merafong, Mogale and Rand West Cities.

The municipality is situated relatively closely to the hub of economic activity in Gauteng, and is transversed by major national roads, namely the N12 and N14. Its main contribution lies primarily within the mining sector, however, areas such as Krugersdorp fulfil a residential function for many people working in Johannesburg. The West Rand remains the poorest region contributing to Gauteng's GDP.

The Cradle of Humankind falls under the jurisdiction of Mogale City and Merafong City, and forms part of the World Heritage Site.

Main Economic Sectors: Manufacturing (22%), mining (19%), community services (19%), finance (16%), trade (10%), transport (6%), construction (4%)

#### *10.1.13.2 Demographic Information*

**Table 10-20: Demographic information for Westrand municipality**

| Aspects | 2016 | 2011 |
|---|---|---|
| **Population** | 838 594 | 820 995 |
| **Age Structure** | | |
| Population under 15 | 23.1% | 24.1% |
| Population 15 to 64 | 71.7% | 71.9% |
| Population over 65 | 5.2% | 4.0% |
| **Dependency Ratio** | | |
| Per 100 (15-64) | 39.4 | 39.2 |
| **Sex Ratio** | | |
| Males per 100 females | 107.6 | 109.0 |
| **Population Growth** | | |
| Per annum | 0.48% | n/a |
| **Labour Market** | | |
| Unemployment rate (official) | n/a | 26.3% |
| Youth unemployment rate (official) 15-34 | n/a | 35.2% |
| **Education (aged 20 +)** | | |
| No schooling | 3.8% | 5.2% |
| Matric | 34.7% | 30.1% |
| Higher education | 10.1% | 10.8% |
| **Household Dynamics** | | |
| Households | 330 572 | 267 397 |
| Average household size | 2.5 | 2.8 |
| Female headed households | 31.7% | 31.1% |
| Formal dwellings | 76.3% | 72.7% |
| Housing owned | 43.0% | 36.0% |
| **Household Services** | | |
| Flush toilet connected to sewerage | 80.1% | 76.1% |
| Weekly refuse removal | 79.3% | 76.8% |
| Piped water inside dwelling | 55.5% | 53.6% |
| Electricity for lighting | 83.5% | 81.7% |

## 10.2 Description of the current land uses

The current land use on the Corobrik premises is that of mining for clay and making of bricks in their current kilns and these are fired by natural gas supplied by Sasol. Corobrik Driefontein proposes expand their current operations by implementing the New Kilns Project.

### 10.2.1 Sensitive Landscapes

The occurrence of possible sensitive landscapes at the project site is outlined in Table 10-21.

**Table 10-21: Sensitive Landscapes within the area and nearby proximity**

| Types of sensitive landscapes | Occurrence at the proposed development area |
|---|---|
| Nature conservation or ecologically sensitive areas indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species. | According to the specialist investigations conducting on both ecology and wetlands, the following findings was made: Possible wetlands are located toward the south-east of the project site, which has been indicated on the sensitivity map (Figure 10-12). According to the Gauteng |

| Types of sensitive landscapes | Occurrence at the proposed development area |
|---|---|
| | Conservation Plan the project site falls within Important Area and Ecological Support Areas.<br><br>The results of the Biodiversity Assessment indicated that the area was impacted by historical agricultural activities and the presence of Alien Invasive plant species. Limited floral and faunal diversity was found to occur on the site and assessment of the grass species occurring on site indicated that the area is disturbed. Connectivity with natural vegetation is fair to good, with the areas classified as VU2 (grassland) being largely unaffected by the current activities on site. |
| Sensitive physical environments - such as unstable soils and geo-technically unstable areas. | The topography is not expected to be affected as the new kilns and brickyard developments are all located within the operational area of the existing Corobrik development. |
| Important natural resources - river systems, groundwater systems, high potential agricultural land. | None known within the area earmarked for development as the new kilns and brickyard will be located within the existing operational area. |
| Sites of special scientific interest. | None known. |
| Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites. | A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel, and none were identified in the study area during the assessment. |
| Sites of outstanding natural beauty, panoramic views and scenic drives. | The area may be described as impacted and within the footprint of the existing Corobrik mining area |
| Green belts or public open space in municipal areas. | Not applicable. |

The current land uses in and surrounding the project site is mining, agriculture, access roads.

## 10.3 Description of specific environmental features and infrastructure on the site

During the field visit it was evident that the current land use is wilderness and grazing activities on the larger farm area and the land use on the Corobrik footprint is that of mining and industry (brick making). The larger surrounding areas towards the east, south and west are all earmarked as mining areas and the red dots within the map indicates active mines and mineral points within the immediate areas (Figure 10-42). The footprint is where the proposed kilns are designated, the brick yard is currently impacted terrain which has been cleared next to the main activities and has the characteristics of an old field (past agricultural usage).

## 10.4 Environmental and current land use map

*(Show all environmental and current land use features)*

Please refer to Figure 10-42 for the map indicating the current land use.

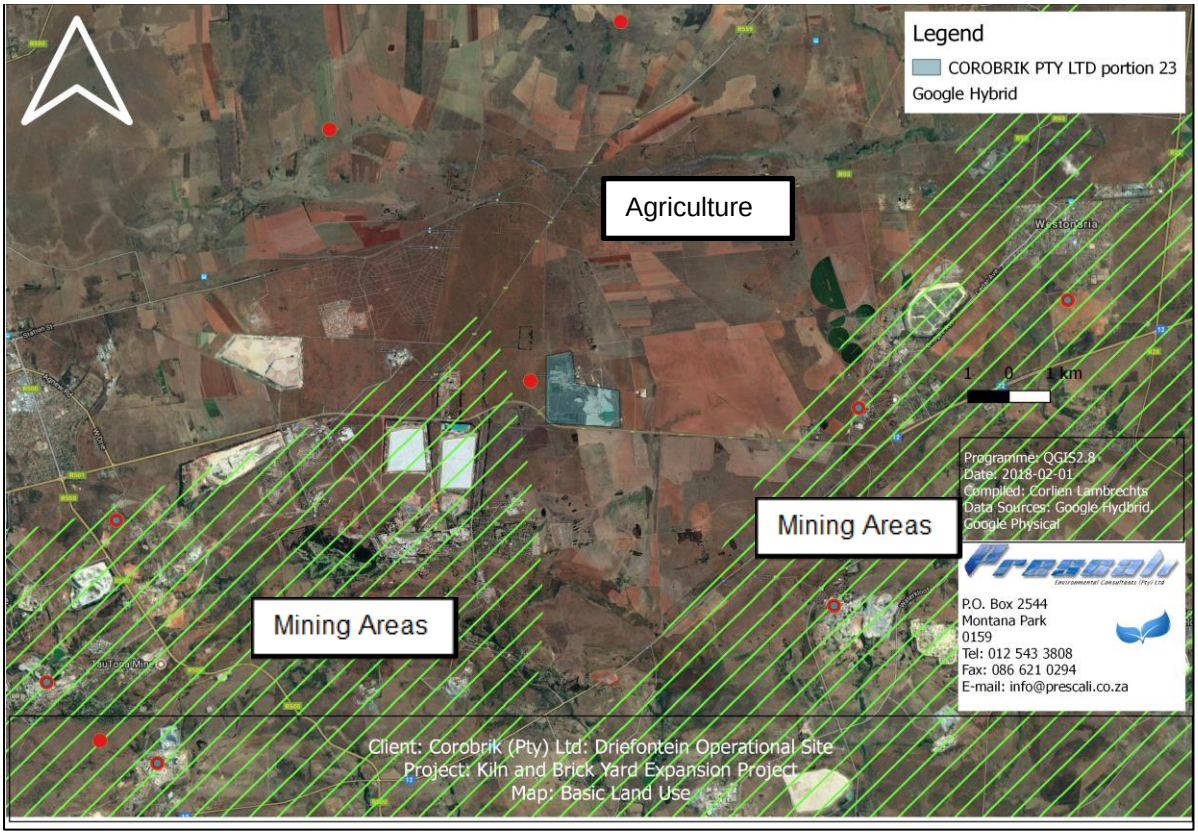



**Figure 10-42: Land use map (Yellow indicates Mining land, Red dots indicate Active Mines and Mineral spots**

# 11 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS CAN BE MANAGED

*(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).*

The following list of potential impacts has been identified as informed by typical known impacts of such activities. The impact and related significances are rated specifically with the assumption that no mitigation measures are applied.

Due to the proposed area being located within the operational footprint of the Corobrik operations, it will already have some of the features and the significance of some of the aspects will be of a much lower impact.

## 11.1 New Activities and potential impacts

**Table 11-1: Summary of potential impacts expected**

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE |
|---|---|---|---|
| Geology | Impact on Geology of area | The clearance of an area of 14 hectares or more of indigenous vegetation; Commercial on land previously used for mining; Expansion of existing facilities requiring amended permit or license; The expansion of commercial developments on land previously used for mining or heavy industrial purposes, where footprint will exceed 1 000 $m^3$, Phased activities; and 14 ha of Critical Biodiversity or Ecological support area will be cleared | Construction; Operational; Decommissioning |
| Topography | Hazardous excavations | All | Construction; Operational; Decommissioning |
| Soils | Loss of soil resource | All | Construction; Operational; Decommissioning |
| | Erosion | All | Construction; Operational; Decommissioning; Closure |
| | Soil contamination | All | Construction; Operational; Decommissioning |
| Land Capability | Loss of grazing land | All | Construction; Operational; Decommissioning; Closure |
| Land Use | Land use alterations | All | Construction; Operational |
| | Road disturbance and Project traffic increase due to production increase | All | Construction; Operational; Decommissioning |
| Natural Vegetation | Loss of Biodiversity and Ecological function | All | Construction; Operational; Decommissioning |
| Animal Life | Loss of Biodiversity and Ecological function | All | Construction; Operational; Decommissioning |
| Surface water | Alteration of drainage patterns | All | Construction; Operational; Decommissioning |
| | Water run-off as well as seepage from these sites are slightly contaminated with | All | Construction; Operational; Decommissioning |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE |
|---|---|---|---|
| | alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | | |
| | Deterioration in surface water quality | All | Construction |
| | Deterioration in surface water quality | All | Operational |
| | During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | All | Decommissioning |
| Groundwater | Lowering of groundwater levels | As above | Construction; Operational; Decommissioning; Closure |
| | Deterioration of water quality | As above | Operational |
| | Deterioration of water quality | As above | Decommissioning; Closure |
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | As above | Construction; Operational; Decommissioning; Closure |
| | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | As above | Construction; Operational; Decommissioning; Closure |
| | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | As above | Construction; Operational; Decommissioning; Closure |
| Noise | Disturbing noise (Day) | All | Construction, Decommissioning |
| | Disturbing noise (Night) | All | Operational |
| Sites of archaeological | Disturbance of heritage sites | All | Construction; Operational |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE |
|---|---|---|---|
| and cultural interests | | | |
| Visual aspects | Negative visual impact | All | Construction; Operational; Decommissioning; Closure |
| Socio-Economic | Positive Socio-economic impacts | All | Construction; Operational; Decommissioning; Closure |
| | Negative impact from closure | N/A | Decommissioning; Closure |
| | Negative cumulative impacts | N/A | Construction; Operational; Decommissioning; Closure |

## 11.2 Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

*(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process were determined in order to decide the extent to which the initial site layout needs revision).*

The methodology used to rank the impacts is discussed in Section 12.1.

## 11.3 The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected)

*(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)*

This is not applicable as Corobrik aims to develop on their proposed footprint and Corobrik is an existing operation. The space designated for development is best suited in terms of the natural environment and from a process point of view. Reasons as to why the existing site was decided upon are described in Section 7.1.1. Please also refer to Section 7.1.

## 11.4 The possible mitigation measures that could be applied and the level of risk

*(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).*

Measures to reduce impacts during construction and operation will mainly be required and implemented accordingly. Please refer to Table 27-1 and Table 27-2.

### 11.4.1 Motivation where no alternative sites were considered

Reasons as to why the existing site was decided upon are described in Section 7.1.1. Please also refer to Section 7.1.

### 11.4.2 Statement motivating the alternative development location within the overall site (Provide a statement motivating the final site layout that is proposed)

As per Sections 11.4.1 and 11.4.2 above, no other feasible/better suited site alternatives are applicable. The locations of the proposed new structures were determined by the existing activities on the Corobrik footprint and to avoid additional harm to the environment most of the infrastructure where designed on the existing footprint (clay stockpile area), except for the brickyard which will require vegetation clearance.

# 12 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

*(Including (i) a description of all environmental issues and risks that where identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)*

## 12.1 Methodology

The results of the desktop assessment were analysed and interpreted in order to assess the potential impacts, which the proposed development may inflict on bio-physical and social systems, devise potential alternatives with respect to selected activities and the development of necessary mitigation measures in order to minimise negative impacts and optimise positive impacts. The specialist recommendations were also incorporated into the Environmental Management Programme (**Part B of this report**). The activities were described in the project description were assessed in terms of direct, indirect as well as cumulative impacts, where possible.

### 12.1.1 Specialist Impact Identification and Assessment

The desktop assessment specifically differentiated between the environmental impacts associated with the construction, operation and decommissioning. As far as possible, the potential environmental impacts identified were quantified. Each impact was assessed and rated. The impacts considered of sufficient importance as to warrant mitigation measures and management during the construction and operational phases were included within this report.

The potential impacts and key issues which must be thoroughly investigated during the Basic Assessment were identified and included the following:

- Fauna and Flora (Red Kite Environmental Solutions (Pty) Ltd, 2018);
- Archaeological (Pelser, 2018);
- Surface water (Red Kite Environmental Solutions (Pty) Ltd, 2018);
- Air Quality (Airshed Planning Professionals, 2018); and
- Geohydrology assessment (Geo Pollution Technologies - Gauteng (Pty) Ltd, 2018).

During the assessment phase of the project all the potential impacts will be discussed in detail. Each specialist report as mentioned above will be used for the identification of the impacts and mitigation measures will be set up regarding those impacts. The assessment of the data was, where possible, based on accepted scientific techniques, failing which, the specialists made judgements based on their professional expertise and experience.

### 12.1.2 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) and as amended from time to time (DEAT, Impact Significance, Integrated Environmental Management, Information series 5.,

2002).

The level of detail as depicted in the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002)) was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

**Table 12-1: Impact assessment criteria**

| | |
|---|---|
| **EXTENT** | |
| **Classification of the physical and spatial scale of the impact** | |
| *Footprint* | The impacted area extends only as far as the activity, such as footprint occurring within the total site area. |
| *Site* | The impact could affect the whole, or a significant portion of the site. |
| *Regional* | The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns. |
| *National* | The impact could have an effect that expands throughout the country (South Africa). |
| *International* | Where the impact has international ramifications that extend beyond the boundaries of South Africa. |
| **DURATION** | |
| **The lifetime of the impact that is measured in relation to the lifetime of the proposed development.** | |
| *Short term* | The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase. |
| *Short to Medium term* | The impact will be relevant through to the end of a construction phase (1.5 years) |
| *Medium term* | The impact will last up to the end of the development phases, where after it will be entirely negated. |
| *Long term* | The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter. |
| *Permanent* | This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient. |
| **INTENSITY** | |
| **The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as** | |
| *Low* | The impact alters the affected environment in such a way that the natural processes or functions are not affected. |
| *Medium* | The affected environment is altered, but functions and processes continue, albeit in a modified way. |
| *High* | Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases. |
| **PROBABILITY** | |
| **This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:** | |
| *Improbable* | The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %). |
| *Possible* | The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %. |
| *Likely* | There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %. |
| *Highly Likely* | It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %. |
| *Definite* | The impact will take place regardless of any prevention plans, and only mitigation actions or |

| EXTENT | |
|---|---|
| **Classification of the physical and spatial scale of the impact** | |
| | contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %. |

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

- **Status of the impact** - A description as to whether the impact would be positive (a benefit), negative (a cost), or neutral.
- **Degree of confidence in predictions** - The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

Other aspects to take into consideration in the specialist studies are:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the full-lifecycle of the proposed development, including construction, operation and decommissioning.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region.
- The specialist studies must attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

### 12.1.3 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

#### *12.1.3.1 Determination of Significance – Without Mitigation*

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

| | |
|---|---|
| **NO SIGNIFICANCE** | The impact is not substantial and does not require any mitigation action. |
| **LOW** | The impact is of little importance, but may require limited mitigation. |
| **MEDIUM** | The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels. |
| **HIGH** | The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential. |

#### *12.1.3.2 Determination of Significance – With Mitigation*

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

| | |
|---|---|
| **NO SIGNIFICANCE** | The impact will be mitigated to the point where it is regarded as insubstantial. |
| **LOW** | The impact will be mitigated to the point where it is of limited importance. |
| **LOW TO MEDIUM** | The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels. |
| **MEDIUM** | Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw. |
| **MEDIUM TO HIGH** | The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels. |
| **HIGH** | The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable. |

### 12.1.4 Assessment Weighting

Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it was necessary to weigh and rank all the criteria.

#### *12.1.4.1 Ranking, Weighting and Scaling*

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer to Table 12-2). The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

**Table 12-2: Description of assessment parameters with its respective weighting**

| EXTENT | | DURATION | | INTENSITY | | PROBABILITY | | WEIGHTING FACTOR (WF) | | SIGNIFICANCE RATING (SR) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Footprint | 1 | Short term | 1 | Low | 1 | Probable | 1 | Low | 1 | Low | 0-19 |
| Site | 2 | Short to Medium | 2 | | | Possible | 2 | Low to Medium | 2 | Low to Medium | 20-39 |
| Regional | 3 | Medium term | 3 | Medium | 3 | Likely | 3 | Medium | 3 | Medium | 40-59 |
| National | 4 | Long term | 4 | | | Highly Likely | 4 | Medium to High | 4 | Medium to High | 60-79 |
| International | 5 | Permanent | 5 | High | 5 | Definite | 5 | High | 5 | High | 80-100 |

| MITIGATION EFFICIENCY (ME) | | SIGNIFICANCE FOLLOWING MITIGATION (SFM) | |
|---|---|---|---|
| High | 0,2 | Low | 0-19 |
| Medium to High | 0,4 | Low to Medium | 20-39 |
| Medium | 0,6 | Medium | 40-59 |
| Low to Medium | 0,8 | Medium to High | 60-79 |
| Low | 1,0 | High | 80-100 |

#### *12.1.4.2 Identifying the Potential Impacts Without Mitigation Measures (WOM)*

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

#### *12.1.4.3 Identifying the Potential Impacts With Mitigation Measures (WM)*

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

##### *12.1.4.3.1 Mitigation Efficiency (ME)*

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating (refer to Table 12-2). The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

or WM = WOM x ME

#### *12.1.4.4 Significance Following Mitigation (SFM)*

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

### 12.1.5 Description of environmental issues and risks without and with the implementation of mitigation measures

A summary of the key environmental aspects is provided in Table 12-3.

## 12.2 Assessment of each identified potentially significant impact and risk

*(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).*

**Table 12-3: Summary of the key environmental impacts SWOM: Significance without mitigation; SWM: Significance with mitigation)**

*The supporting impact assessment conducted by the EAP must be attached as an appendix,*

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
|---|---|---|---|---|---|---|---|---|---|
| | *(Including the potential impacts for cumulative impacts) (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.* | *(E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc. E.g. For mining, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)* | *In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)* | | | | | *(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc.) E.g. Modify through alternative method. Control through noise control. Control through management and monitoring through rehabilitation.* | |
| Geology | Impact on Geology of area | The clearance of an area of 14 hectares or more of indigenous vegetation; Commercial on land previously used for mining; Expansion of existing facilities requiring amended permit or license; The expansion of commercial developments on land previously used for mining or heavy industrial purposes, where footprint will exceed 1 000 $m^3$, Phased activities; and 14 ha of Critical | Construction; Operational; Decommissioning | Low to Medium | 36 | Low to Medium | 36 | None | None possible |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
|---|---|---|---|---|---|---|---|---|---|
| | | Biodiversity or Ecological support area will be cleared | | | | | | | |
| Topography | Hazardous excavations | All | Construction; Operational; Decommissioning | Low to Medium | 32 | Low | 6,4 | Management; Rehabilitation | Unsafe areas associated with the construction of the kilns, brick yard and associated buildings will be fenced. Other excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible. |
| Soils | Loss of soil resource | All | Construction; Operational; Decommissioning | Medium | 40 | Low-Medium | 24 | Management, Rehabilitation | The soil that has been removed within the area needs to be replaced and rehabilitated to its previous natural state as far as possible. Topsoil from the brickyard areas need to be removed before construction and used in rehabilitation afterwards. The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, prevention of erosion and loss, re-vegetation of disturbed areas and monitoring. |
| | Erosion | All | Construction; Operational; Decommissioning; Closure | Medium | 52 | Low | 10,4 | Management, Rehabilitation | Vegetate disturbed areas during the rainy season; Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils. |
| | Soil contamination | All | Construction; Operational; Decommissioning | Low-Medium | 24 | Low | 4,8 | Remedy through rehabilitation, infrastructure design and Management | Adequate sanitary facilities will be provided at construction sites and areas that is located away from the mine ablution blocks; Storage areas and vehicle maintenance areas will be surfaced and will have appropriate runoff containment measures, such as oil traps, bunds and canals, will be in place; Vehicles will be regularly serviced according to a pre-planned maintenance programme; All chemical, fuel and lubricant storage |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | areas will be underlain by impermeable substrates; Drums containing chemicals will be stored upright in a secure, bunded area with an impermeable surface; If necessary, the polluted soils will be classified as wastes and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. |
| Land Capability | Loss of grazing land | All | Construction; Operational; Decommissioning; Closure | Low-Medium | 30 | Low | 12 | Remedy through rehabilitation and management. | The new infrastructure will be developed as much as possible on the existing disturbed sites, or on the management areas with the lowest agricultural potential; the area where the brickyard is proposed has already been impacted. Corobrik will conserve soil and control erosion (as discussed above). Grazing and natural land along the Corobrik operation will need to remain as the main land activity to ensure land capability is kept to that of grazing and agriculture for the Driefontein larger farm. |
| Land Use | All | All | Construction; Operational | Medium | 42 | Low-Medium | 25,2 | Control through management and communication. Control through management and monitoring | Corobrik will inform the surrounding community of any unsafe conditions that may be planned on site. A community liaison forum will be established, if not already existing, and the programme will be made available through the forum as agreed with community representatives. |
| | Road disturbance and Project traffic increase due to production increase | All | Construction; Operational; Decommissioning | Medium | 56 | Low-Medium | 33,6 | Modify through management | Travel speeds on the mine roads will be limited to less than 40 km/h. Travel speeds on the access roads will be limited to remain within the current prescribed speed limits. |
| Natural Vegetation | Loss of Biodiversity and Ecological function | All | Construction; Operational; Decommissioning | Low - Medium | 33 | Low | 6,6 | Management, infrastructure design | Surface disturbance will be kept to a minimum. Activities will be concentrated in already disturbed areas as far as is possible. Human and vehicular activity will be |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | Significance with mitigation | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | restricted to construction and operational sites. |
| | | | | | | | • Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not damage flora.<br>• A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the operational area but also into surrounding area which may be impacted by the project. It is vital that the control of alien invasive species is ongoing. The reason for this is that an ongoing eradication of the invasive species will be more cost effective.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed. |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | • All activity should be avoided in restricted areas and riparian zones.<br>• Large undisturbed natural areas that should remain intact throughout the lifetime of the proposed development and must be designated in the planning phase.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific.<br>• Ensure linear structures, such as roads and pipelines, are well managed to reduce the degradation of vegetation due to edge effects. This will be facilitated by ensuring vehicles remain on roads and alien invasive species introduction is controlled along road verges.<br>• Continuous rehabilitation should be implemented during the operational phase. This includes using indigenous vegetation to re-vegetate land on an ongoing basis. |
| Animal Life | Loss of Biodiversity and Ecological function | All | Construction; Operational; Decommissioning | Low - Medium | 33 | Low | 6,6 | Protection, Management; Rehabilitation | • Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora.<br>• Allow animals to escape areas of activity freely and do not hinder their movement.<br>• All injured animals sighted during the development should be protected and moved to receive rehabilitation at the designated centre (identified within the EMP) and should not be handled by the |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | Significance with mitigation | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | employees under any circumstance. Clear protocol should be developed on the matter.<br>• Have a policy in place to prohibit hunting (rifles, snares, dogs) by the workers or employees of the site. These conditions should be written into contractors' agreements with strict penalty clauses. Employees engaging in any of these activities should be faced with disciplinary action. No hunting activities will be allowed on site.<br>• Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed.<br>• All activity should be avoided in restricted areas and identified riparian zones.<br>• All noisy equipment should be mitigated to lessen the sound levels as well as vibration levels should be controlled to limit impact on biodiversity and sensitive species by an accredited vibration specialist.<br>• Large undisturbed natural areas that should remain intact throughout the lifetime of the proposed development and must be designated in the planning phase.<br>• Special lighting should be used in the evenings to limit disturbance of animals and the attraction of insects to these lights. The current use of high-power security lighting |

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| | | | | | | | | | for public areas and arenas have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife on site. Sodium lamps require a third less energy.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific. |
| Surface water | Alteration of drainage patterns | All | Construction; Operational; Decommissioning | Medium | 42 | Low | 8,4 | Infrastructure design, Management, Monitoring, rehabilitation | Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. This will ensure appropriate separation of clean and dirty storm water and will maximise the return of clean water to the downstream drainage system. Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential re-use. Adherence to the Storm Water Management Plan as compiled by an accredited engineer is crucial. In compliance with the GN 704 Regulations, Corobrik will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. Corobrik will ensure that all storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event. New storm water channels will be implemented to limit the amount of drainage within the current storm water channels. |
| | Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | All | Construction; Operational; Decommissioning | Low-Medium | 36 | Low | 7,2 | Infrastructure design, Management, Monitoring, rehabilitation | • The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.<br>• Surface water quality monitoring should continue in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented |
| | Deterioration in surface water quality | All | Construction | Low-Medium | 36 | Low | 7,2 | Infrastructure design; Management; Licencing | Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised to minimise construction of new access roads, hence potential for erosion; If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances during site clearing; Dust suppression on the haul roads and cleared areas must regularly be undertaken; and An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | mitigation/management measures during construction, operational, and decommissioning of the project. The water balance for the project will be refined on an ongoing basis during the life of the project. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an ongoing basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. |
| | Deterioration in surface water quality | All | Operational | Medium | 48 | Low | 9,6 | | • All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills;<br>• Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath;<br>• Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste;<br>• The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it. |

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| | | | | | | | | | • The fuel, lubricant and other hazardous storage facilities must be located on a hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances.<br>• An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for reference to anytime in terms of handling, storage and disposal of materials.<br>• Surface water quality monitoring should continue 9in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented<br>• Regular maintenance and inspection of water infrastructure, specifically storm water channels, oil traps and silt traps. |
| | During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as | All | Operational | Low-Medium | 30 | Low | 6 | | • Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages;<br>• The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures;<br>• Ensure that the infrastructure (pipelines, fuel storage areas) are first emptied of all residual material before decommissioning; and<br>• Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be |

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| | these pollution sources have been removed and natural revegetation of the area may commence. | | | | | | | | continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site |
| Groundwater | Lowering of groundwater levels | As above | Construction; Operational; Decommissioning; Closure | Low-Medium | 30 | Low | 6 | As above | Do not exceed the licensed water uses as per WUL. The WUL may need to be amended to ensure all the water uses and quantities used in the new increased production remains accurate and managed. |
| | Deterioration of water quality | As above | Operational | Medium | 55 | Low | 11 | Infrastructure designs; Management; Monitoring | Identify and where possible, maximise areas of the quarry that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the quarry (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated.<br>• Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions.<br>• Ensure the minimisation of contaminated areas, reuse of dirty water wherever possible and planning to ensure that clean areas are not lost to the catchment unnecessarily.<br>• Ensure that seepage losses from storage facilities (such as settlement dam) are minimised and overflows are prevented.<br>• Ensure that all possible sources of dirty water have been identified and |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration.<br>• Ensure that less polluted water or that: moderately polluted water is not further polluted.<br>Where possible less and more polluted water should be separated. This will assist in the reuse water strategy and improve possibilities for reuse based on different water quality requirements by different quarry water uses.<br>• Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental spillages occur along the transport routes.<br>• Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff.<br>• Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the quarry operations.<br>• Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements.)<br>• Route all clean storm water directly to natural watercourses without increasing the risk of a |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow. Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of the quarry.<br>• Develop and implement proper environmental management and auditing systems to ensure that pollution prevention and impact minimisation plans and measures developed in the design and feasibility stages are fully implemented.<br>• The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised.<br>• Rehabilitation should be planned to promote free drainage and to minimise or eliminate ponding of storm water. On-going rehabilitation as mining operations progress is required.<br>• The clean and dirty water flow areas on a quarry should be identified.<br>• Every effort should be made to maximise the clean area and minimise the dirty area when locating the diversion berms, channels and dams.<br>• The quarry planning should consider concurrent rehabilitation of quarry workings and waste management facilities, to maximise the areas of clean runoff that can be discharged to the natural watercourses<br>• The capacity to rapidly pump water out of the pit into storage dams should be maintained. This will assist in minimising water quality deterioration due to long-term retention of storm water in |

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| | | | | | | | | | contact with materials that may cause water quality deterioration.<br>• Berms should be constructed around the quarry pit to minimise the flow of any surface water or floodwater into mine workings. These berms should be constructed to allow free drainage away from the pits.<br>• Water quantity and quality data should be collected on a regular, ongoing basis during quarry operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. See the Monitoring Network section.<br>• If excessive groundwater recharge and rainfall is encountered other than the predicted volumes the water could be managed as follows: Manage in-pit seepage and rainfall through a collection and storage system. Water stored in pit should be utilised locally for dust suppression, as far as possible. Excess pit water should be pumped to surface to be incorporated into the mine water balance,<br><br>Maximise the abstraction and discharge of clean groundwater ahead of the pit development, through installation of dewatering boreholes surrounding the pit. |
| | Deterioration of water quality | As above | Decommissioning; Closure | High | 48 | Low-Medium | 28,8 | As above | The following measures should be implemented during rehabilitation and closure<br>• After cessation of mining, there will be no material available for the backfilling of the pit. |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
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| | | | | | | | | | Therefore, the quarry pit should be managed as a pit lake. Depending on the water quality of the flooded pit, it could potentially be used as a water supply. However, if insufficient water of an acceptable quality can be extracted from the abandoned pit, caving of the pitwalls can be considered to ensure that steep and unsafe pit walls are eliminated. This will ensure a more gradual depression in the landscape. Acid rock drainage and water quality degradation are not expected post mining. |
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | As above | Construction; Operational; Decommissioning; Closure | Low-Medium | 39 | Low | 7,8 | Infrastructure design; Management | • Construction: Dispersion modelling was regarded not representative of the actual activities that will result in dust emissions during the construction phase. It is not anticipated that the various construction activities would result in higher off-site average daily dustfall rates than the operational activities. The temporary nature of the construction activities would likely reduce the significance of the potential impacts. Decommissioning is likely to be similar or less than the construction impacts.<br>• Operational Phase: The proposed operations related activities were found to result in dustfall rates below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The simulated future (current and proposed) operations' dustfall rates are below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The cumulative (proposed and measured) dustfall rates are not likely to exceed the NDCR limits and 400 mg/m$^2$-day off-site or at any AQSRs. Land |

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| | | | | | | | | | clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum. Road construction activities such as road grading:<br>• Water sprays at area to be graded – 50% CE.<br>• Freshly graded areas to be kept to a minimum. Wind erosion from exposed areas:<br>• Ensure exposed areas remain moist during dry, windy periods through regular water spraying. |
| | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | | Construction; Operational; Decommissioning; Closure | Low-Medium | 36 | Low | 7,2 | Infrastructure design; Management | Land clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content. For operational phase: Mining, handling, transport and storage of clay:<br>•Recommended additional mitigation measures of more regular application of water; and inspection and maintenance programs, including regular spill clean-up.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum. Road construction activities such as road grading:<br>-Water sprays at area to be graded – 50% CE. |

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| | | | | | | | | | • Freshly graded areas to be kept to a minimum.<br>Wind erosion from exposed areas:<br>• Ensure exposed areas remain moist through regular water spraying during dry, windy periods. |
| | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | | Construction; Operational; Decommissioning; Closure | Medium | 45 | Low | 9 | Infrastructure design; Management | Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.<br>• To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.<br>• In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds.<br>• Speed limits need to be observed and adhered to.<br>• Management should fit roads with speed humps to ensure adherence.<br>• Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.<br>• The drop heights should be minimised when depositing materials to the ground.<br>• Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily. |
| Noise | Disturbing noise | All | Construction, Decommissioning | Medium | 42 | Low | 8,4 | Infrastructure design; Management; Monitoring; Maintenance | • Communication between the receptors and the developer need to be implemented and maintained. The developer should consider co-ordinate the working time with periods when the receptors are likely not at home. An example would be to work within the 8 am to 2 pm time-slot to minimise the significance of the impact due to: |

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| | | | | | | | | | • Potentially receptors are most likely at school or at work, minimizing the probability of an impact happening; and<br>• Normal daily activities will generate other noises that would most likely mask construction noises, minimizing the probability of an impact happening. |
| Noise | Disturbing noise | All | Operational | Low-Medium | 39 | Low | 7,8 | Infrastructure design; Management; Monitoring; Maintenance | • Communication between the receptors and the developer need to be implemented and maintained |
| Sites of archaeological and cultural interests | Disturbance of heritage sites | All | Construction; Operational | None | | None | | Management; Conservation; Permitting | No impact on the identified heritage resource sites is expected, but the requirements apply in the event that the project layout changes in a way that will affect these sites or in the event that additional sites are discovered. |
| Visual aspects | Negative visual impact | All | Construction; Operational; Decommissioning; Closure | Medium | 52 | Low-Medium | 41,6 | Infrastructure design; Management; Rehabilitation | In considering measures to effect mitigation, there are three rules to consider. Mitigation measures will be: economically feasible; effective (time allowed for implementation and provision for management/maintenance); visually acceptable (within the context of the existing landscape). To address these measures the following principles will be implemented: Mitigation should be planned to fit into the existing landscape character. They should respect and build upon landscape distinctiveness.<br>Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility.<br>It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.<br><br>• Site preparation (The minimum amount of existing vegetation and |

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| | | | | | | | | | topsoil will be removed from construction areas. Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the site design. Eradication of vegetation should be done in 'natural manner', avoiding harsh straight lines. Dust suppression measures should be in place at all times.)<br>• Buildings and structures (Structures that are required to be built from steel or concrete will be painted a dark natural tone fitting with the surrounding environment. Olive greens and tans should be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Roofs of tall structures should be painted a 'dirty' grey. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided. To reduce the amount of glare, external surfaces of buildings and other structures will be articulated or textured to increase the interplay of light and shade. Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security flood lighting and operational lighting will only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, wherever possible lights will be directed downwards so as to avoid illuminating the sky.)<br>• Landscaping (Natural vegetation should be retained wherever possible and any removal of vegetation should be conducted |

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| | | | | | | | | | carefully to limit the visual lines of site to the project. An ecological approach to rehabilitation and vegetative screening measures, as opposed a horticultural approach to landscaping will be adopted. For example, communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A Vegetation berm to fence the view from the road towards the brickyard may be considered if economically feasible. |
| Socio-Economic | Positive Socio-economic impacts | All | Construction; Operational; Decommissioning; Closure | Positive impact | 0 | Positive impact | 0 | Management; Consultation | Non-core activities will be identified and prioritised for local service providers. Local service providers will be identified and requested to tender for the provision of the various services. |
| Socio-Economic | Negative impact from closure | N/A | Decommissioning; Closure | Medium | 52 | Low - Medium | 31,2 | Management; Communication; Strategy implementation | Adequate communication with the surrounding communities during all phases of the development to ensure that an open policy regarding timelines is enforced during all stages of the development.<br>• A clear policy will be developed that is transparent and well-advertised to local communities. The policy will be clear on the skills and qualifications necessary for employment at Corobrik |
| Socio-Economic | Negative cumulative impacts | N/A | Construction; Operational; Decommissioning; Closure | Medium | 52 | Low - Medium | 20,8 | Management; Communication; Strategy implementation | In regard to the protection of private property and quality of life:<br>• Discussions will be held with the South African Police Force regarding the policing of the area.<br>• A forum will be established whereby the Corobrik mine and surrounding land users communicate on a regular basis to ensure that the mine is in a position |

| ASPECTS AFFECTED | POTENTIAL IMPACT | ACTIVITY | PHASE | Significance without mitigation | | Significance with mitigation | | MITIGATION TYPE | Management and MITIGATION MEASURES |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | to attend to any concerns of farmers promptly.<br>A joint strategy will be developed with local authorities, the local police force and local landowners to deal with crime. In regard to recruitment: |

## 12.3 Summary of specialist reports

*(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-*

**Table 12-4: Summary of Specialist reports**

| List of Studies Undertaken | Recommendations of Specialist Reports | Specialist Recommendations That Have Been Included In The Report[4] | Reference to Applicable Section Of Report Where Specialist Recommendations Have Been Included. |
|---|---|---|---|
| Fauna and Flora | Possible wetlands are located toward the south-east of the project site, which has been indicated on the sensitivity map. According to the Gauteng Conservation Plan the project site falls within Important Area and Ecological Support Areas.<br><br>The impacts of the proposed project to the biodiversity of the affected area were rated as medium without the implementation of mitigation measure and low once mitigation measures have been taken into account. The largest impact on the fauna and flora of the area is expected to occur during the construction phase. The construction will result in the complete destruction of plant species and habitats located on the construction area. Other possible impacts that may occur is the spread of invasive exotic species, increased edge effects on road verges as a result of vehicles not staying within the demarcated roads. Staff members and/or contractors may also damage species if they move within unauthorised areas. | X | Please refer to Section 10.1.6 and Section 10.1.7 as well as all impact and management tables. |

[4] **(Mark With An X Where Applicable)**

| List of Studies Undertaken | Recommendations of Specialist Reports | Specialist Recommendations That Have Been Included In The Report[4] | Reference to Applicable Section Of Report Where Specialist Recommendations Have Been Included. |
|---|---|---|---|
| | Recommendations to avoid and mitigate these are given within the Management plan (which is included within the Management Tables within this BAR report) | | |
| Surface water | The impacts on the surface water are rated as moderate without the implementation of mitigation measures. With the implementation of mitigation management measures the impact of the development on the surface water environment is ranked as a low significance.<br><br>An Integrated Water and Waste Management Plan (IWWMP) needs to be compiled as a technical supporting document for the water use authorisation process. The Environmental Management Plan (EMP) for the proposed expansion should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to maintain its current basic ecosystem functions.<br><br>All mitigation measures that were provided within this report should be implemented and included in the relevant management plans. If all mitigation is adhered to, the combined impact could be rated as low. | X | Please refer to 10.1.5 as well as all impact and management tables. |
| Archaeology and Heritage | A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel, and none were identified in the study area during the assessment. | X | Please refer to Section 10.1.11 as well as all impact and management tables. |
| Ground water | <u>Groundwater pollution potential</u><br>It can be concluded that there is not linkage in the source, pathway receptor model. The quarry does not penetrate the dolomites and thus there is no linkage, therefore the groundwater pollution potential is low.<br><u>Recommendations</u><br>The following recommendations are put forward:<br>• Monitoring of groundwater upstream and downstream (entering and leaving the site) of the quarry is imperative. Depending on the water quality results consideration can be | X | Please refer to Section 10.1.8 as well as all impact and management tables. |

| List of Studies Undertaken | Recommendations of Specialist Reports | Specialist Recommendations That Have Been Included In The Report[4] | Reference to Applicable Section Of Report Where Specialist Recommendations Have Been Included. |
|---|---|---|---|
| | given to storm water trenches and leachate collection systems.<br>• Water levels and quality data should be collected on a bi annual basis during the quarry operations. This data should be used to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA.<br>• As a result of elevated contaminant concentrations with regards to the SANS drinking water limits the water from the quarry should not be used for drinking purposes | | |
| Air Quality | To ensure the lowest possible impact on AQSRs and environment it is recommended that the air quality management plan as set out in this report be adopted. This includes:<br>• the mitigation of sources of emission;<br>• the management of associated air quality impacts;<br>• ambient air quality monitoring; and,<br>• a complaints register must be kept.<br><br>Based on the above findings and provided the measures recommended are in place, it is the specialist opinion that the project may be authorised. | X | Please refer to Section 10.1.9 and Impact and Management Tables |

Attach copies of Specialist Reports as appendices.

# 13 ENVIRONMENTAL IMPACT STATEMENT

## 13.1 Summary of the key findings of the environmental impact assessment

Please also refer to the table provided above, which is a summary of the impacts assessed for the proposed development by the EAP (Please refer to Table 12-3 above). From the table it can be concluded that the proposed activities within the current Corobrik footprint area will not have a significant impact on the environment. A summary is also provided in Table 13-1.

### 13.1.1 Surface Water Assessment

In terms of findings related to the overall surface water environment relevant to the study site, the following conclusions are made:

- The study area, inclusive of existing and proposed activities, is situated within Quaternary Catchments C23E of the Upper Vaal Water Management Area.
- The nearest watercourse is 2.5 km from the project site and is a tributary of the Wonderfonteinspruit.
- Runoff from the project site feeds the Wonderfonteinspruit and from there the Mooirivierloop.
- The EIS set for the C23E Quaternary Catchment by DWS is Low, PES is a class E (largely modified) and the REC has been set as a class D.
- The main impacts currently on the Wonderfonteinspruit are:
    - Extensive underground mining in the region, which has reduced the local groundwater level, created numerous sinkholes, and likely caused a long-term reduction in the flow of systems.
    - Piping the system for 32 km which has completely changed the dynamics of the system.
    - Poor water quality within the system and polluted sediments.
    - Deterioration in Fish Health.
- The possible wetland area is situated within 100 m of the project site. However, it is important to note that the wetland was preliminarily delineated on the presence of obligate plant species and as an indication of further wetland delineation studies to be undertaken. It is recommended that a wetland delineation based on soil profiles be undertaken to verify the presence of a wetland system.

The identified water users in the C23E quaternary catchment includes towns and residential areas (Carletonville and surrounding towns) in upper reaches, mining in upper reaches, agriculture and pivot irrigation.

The impacts on the surface water are rated as moderate without the implementation of mitigation measures. With the implementation of mitigation management measures the impact of the development on the surface water environment is ranked as a low significance.

An Integrated Water and Waste Management Plan (IWWMP) needs to be compiled as a technical supporting document for the water use authorisation process. The Environmental Management Plan (EMP) for the proposed expansion should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to maintain its current basic ecosystem functions.

All mitigation measures that were provided within this report should be implemented and included in the relevant management plans. If all mitigation is adhered to, the combined impact could be rated as low.

### 13.1.2 Ecological Assessment

#### *13.1.2.1 General Conclusions*

Possible wetlands are located toward the south-east of the project site, which has been indicated on the sensitivity map. According to the Gauteng Conservation Plan the project site falls within Important Area and Ecological Support Areas.

The results of the Biodiversity Assessment indicated that the area was impacted by historical agricultural activities and the presence of Alien Invasive plant species. Limited floral and faunal diversity was found to occur on the site and assessment of the grass species occurring on site indicated that the area is disturbed. Connectivity with natural vegetation is fair to good, with the areas classified as VU2 (grassland) being largely unaffected by the current activities on site.

Almost all of the plant species listed for the four QDS are classified with a "LC" (Least Concern) Red Data status, however four species, namely Cape holly (Declining), River pumpkin (Declining), Khadi wortel (Vulnerable) and Cliff andromischus (Near Threatened), that may occur in the QDS were of conservation concern according to the SANBI Red List.

Ten of the Alien and Invasive Plants (AIP) found on the study site are classified as Category 1b invasive plants in terms of NEMBA (Act No. 10 of 2004). Two Category 2 plant species were recorded on the site and one Category 3 species occurs on site.

Seven plant species encountered during the field survey have cultural and/or medicinal use.

Based on a literature review for 2627BC faunal species distribution ranges in Southern Africa, it is estimated that approximately 42 bird, 16 mammal, 15 reptile, 65 butterfly and 4 amphibian species could occur within the study area. Twelve species were identified as possibly sensitive species within the framework of this study. The sensitive species were determined according to their close relationship and dependence on the vegetation type (Carletonville Dolomite Grassland) and the possible wetlands. Twelve of these species of conservation concern were avifaunal and the other one species mammalian.

From the twelve (12) faunal species of conservation concern that may could occur within the study site, five species were identified to have a moderate likelihood to be on site or use the site from time to time. These species are *Atelerix frontalis* (South African Hedgehog), *Circus maurus* (Black Harrier), *Balearica regulorum* (Gray crowned Crane), *Anthropoides paradiseus* (Blue Crane) and *Eupodotis caerulescens* (Blue Korhaan). However, none of these species were observed during the site survey.

The impacts of the proposed project to the biodiversity of the affected area were rated as medium without the implementation of mitigation measure and low once mitigation measures have been taken into account. The largest impact on the fauna and flora of the area is expected to occur during the construction phase. The construction will result in the complete destruction of plant species and habitats located on the construction area. Other possible impacts that may occur is the spread of invasive exotic species, increased edge effects on road verges as a result of vehicles not staying within the demarcated roads. Staff members and/or contractors may also damage species if they move within unauthorised areas.

Recommendations to avoid and mitigate these are given within the Management plan (which is included within the Management Tables within this BAR report).

#### *13.1.2.2 Impacts on the Natural Environment*

- The construction activities might result in impacts to the natural environment due to increased

traffic and construction personnel to the area. Constructing activities and heavy construction vehicles will result in compaction of the soil and removal of vegetation and topsoil and this could also impact on the fauna staying in the area. Storing of construction material, mixing of concrete or collection and delivering could result in pollution. Pristine areas will be severely impacted if not managed well.

- The operational activities might result in impacts to the natural environment due to increased traffic and personnel to the area. Activities and heavy vehicles might result in compaction of the soil, disturbances to the fauna environment as a result of noise, vegetation removal etc.
- The closure/decommissioning activities will result in the area being rehabilitated and returned to pre-determined state.

#### *13.1.2.3 Impacts on the Plant Communities*

- Most of the impacts on plant species will occur during the construction phase when removal of plant communities will take place on site.
- Invasive plant species may increase during the operational phase of the project. This will mostly take place in the remaining natural areas. Removal of these species is an ongoing process and if not managed regularly could result in severe changes and competition in plant communities.
- The topsoil that is removed may become spoilt and/or infertile making the replacement of the soil an ineffective process. The topsoil (A-zone) may also be stored together with the remainder of the soil removed making the replacement of topsoil unfeasible.
- Endemic and/or vulnerable species could possibly occur within the area of construction and would then be destroyed without proper knowledge and/or mitigation measures.
- Flora could be damaged by staff and contractors if they are allowed to access certain natural areas that should be indicated as no-go zones.
- Dust pollution could occur and could be severe if the necessary dust suppression mechanisms are not in place.
- Most of the impacts on plant species will occur during the construction- and operational phases. Once the operation has been decommissioned, final steps in the rehabilitation process will take place. It is however, possible that the rehabilitation plans are not feasible or only implemented and planned at a late stage hindering successful rehabilitation.

#### *13.1.2.4 Impacts on the Faunal Communities*

- The removal of vegetation areas will result in the destruction of microhabitats and burrows of animals. It might also result in the disturbance of sensitive animal species. This will lead to increases in inter- and intra-specific competition between species for the remaining habitats and food. The result is the out competing of individuals and certain species.
- The damage to plant communities will result in the destruction of microhabitats and burrows of animals. It might also result in the disturbance of sensitive animal species.
- Noises during the operational phase due to the operation of the kilns and associated activities will result in a less favourable habitat for species and several communities may seek other more favourable areas to inhabit.
- Fragmentation of habitat areas due to fencing and activity will fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds.
- Anthropogenic influence stemming from workers that infiltrate/penetrate the natural veld areas will damage and impact on species communities within certain areas.
- The completion of the decommissioning process might create microhabitats and burrows that had been destroyed in the construction/operational phase. The impact is therefore seen as minimal and animals will start to inhabit areas that have been previously deemed uninhabitable due to activity and noises.

### 13.1.3 Ground water Assessment

#### *13.1.3.1 Hydrogeology at site (structural geological features):*

The drilling results of the percussion boreholes revealed that (Avon Engineers, email 20 Feb 2017):

- No water level was recorded during the drilling process, but water was recorded at about 14.0 m depth, when the hole was backfilled, about three hours after drilling was abandoned. This water probably represents water that was used during the drilling process, and not the natural ground water level. The water level therefore appears to be below 47m depth, in the dolomite bedrock (note dewatered compartment).
- Variable penetration rates were recorded as the percussion drill went through the overlaying shale. This may be ascribed to the variation in the degree of weathering and the hardness of the rock (soft- to medium hard).
- Medium air- loss but no sample loss occurred between 34.0 m and 36.0 m depth, probably due to a slightly higher concentration of wad. Medium air- loss and poor to medium sample recovery occurred from 47.0 m depth. The latter losses may be ascribed to a very soft, weathered dolomite layer between 47.0 m and 48.0 m depth. However, it is only the mangeniferous (wad) layer between the chert (breccia) and under lying dolomite bedrock, which is regarded as potential receptacles.
- No existing cavities were recorded

#### *13.1.3.2 Status of groundwater quality*

The quarry monitors the three (3) pit on a bi-annual basis:

- The major cations in the groundwater samples is potassium and calcium;
- The major anions in the groundwater samples are chloride, sulphate and nitrate; and
- Only Fe is above the SANS drinking water limits.

#### *13.1.3.3 Groundwater pollution potential*

It can be concluded that there is not linkage in the source, pathway receptor model. The quarry does not penetrate the dolomites and thus there is no linkage, therefore the groundwater pollution potential is low. However, a hydrocensus should be conducted to confirm these findings.

### 13.1.4 Heritage

A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel, and none were identified in the study area during the assessment.

### 13.1.5 Air Quality

An air quality impact assessment was conducted for activities proposed as part of the Corobrik expansion. The main objective of this study was to establish baseline air quality in the study area and to quantify the extent to which ambient pollutant levels will change as a result of the proposed Project. The baseline and impact study then informed the air quality management and mitigation measures recommended as part of the Air Quality Management Plan (AQMP). This section summarises the main findings of the baseline and impact assessments.

The main findings of the baseline assessment are:

- The flow field is dominated by winds from the north-north-east, followed by winds from the north.
- The closest large residential areas to the project area are Bently Park approximately 2 km west, AngloGold Ashanti's West Wits approximately 2 km north-west and Sibanye Stillwater's mining villages approximately 4 km south-west of the project site. The Sibanye Stillwater proposed PV Plant is located 4 km east of the Corobrik facility. There are five individual homesteads within

5 km of the proposed location; and one school in Sibanye Stillwater's East Village located within 5 km of the proposed operations. There is one medical facility situated in Phomolong, a little more than 5 km from the proposed operations.

The main findings of the impact assessment are as follows:

- PM and gaseous emissions will be released during the construction, decommissioning, operational and closure phases of the Project. Only the operational phase air quality impacts were quantified since construction and decommissioning phases' impacts will likely be less significant than the operational phase impacts.
- Construction and decommissioning phases:
    - The significance of construction related inhalation health impacts are considered to have "Low" negative significance, completely reversible with no loss of resources. Since fugitive dust from construction activities is easily managed the impact area could be reduced if the management and additional mitigation measures recommended in this report are implemented effectively.
- Operational phase:
    - PM (TSP, $PM_{10}$ and $PM_{2.5}$) and gaseous (HF, $NO_x$ and $SO_2$) emissions and impacts were quantified.
    - Incremental inhalation health HF, $NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$ impacts were found to have no exceedances of assessment criteria. Incremental nuisance dustfall impacts were found to have no exceedances of assessment criteria. The significance of the incremental impacts on AQSRs considered "Low" without mitigation and "Low" with mitigation.
    - Simulated $PM_{10}$ and $PM_{2.5}$ concentrations as a result of future operations were found to exceed short-term NAAQS off-site. The significance of the future (cumulative) impacts on AQSRs considered "Medium" without mitigation and "Low to Medium" with mitigation.

## 13.2 Final Site Map

*Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as* ***Appendix***

Please refer to Figure 5-1 as well as Appendix 5.

## 13.3 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

Other alternatives were assessed and none are feasible or preferable due to the position of the existing activities on Corobrik, please refer to the following sections: Section 7.1, Section 7.2, specifically Section 7.2.3.

**Table 13-1: Summary of Key findings of the impact assessment**

| ASPECTS AFFECTED | POTENTIAL IMPACT | PHASE | Extend | | Duration | | Intensity | | Probability | | Weighing factor | | Significance without mitigation | | Mitigation Efficiently | | Significance with mitigation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Geology | Impact on Geology of area | Construction; Operational; Decommissioning | Site | 2 | Permanent | 5 | Low | 1 | Probable | 1 | Medium - High | 4 | Low to Medium | 36 | N/A | 1 | Low to Medium | 36 |
| Topography | Hazardous excavations | Construction; Operational; Decommissioning | Footprint | 1 | Permanent | 5 | Low | 1 | Probable | 1 | Medium - High | 4 | Low to Medium | 32 | High | 0.2 | Low | 6.4 |
| Soils | Loss of soil resource | Construction; Operational; Decommissioning | Site | 2 | Permanent | 5 | Low | 1 | Possible | 2 | Medium -High | 4 | Medium | 40 | Medium | 0.6 | Low-Medium | 24 |
| Soils | Erosion | Construction; Operational; Decommissioning; Closure | Regional | 3 | Long term | 4 | Medium | 3 | Likely | 3 | Medium -High | 4 | Medium | 52 | High | 0.2 | Low | 10.4 |
| Soils | Soil contamination | Construction; Operational; Decommissioning | Footprint | 1 | Medium term | 3 | Low | 1 | Likely | 3 | Medium | 3 | Low-Medium | 24 | High | 0.2 | Low | 4.8 |
| Land Capability | Loss of grazing land | Construction; Operational; Decommissioning; Closure | Site | 2 | Long term | 4 | Low | 1 | Likely | 3 | Medium | 3 | Low-Medium | 30 | Medium - High | 0.4 | Low | 12 |
| Land Use | Land use alterations | Construction; Operational | Regional | 3 | Medium term | 3 | High | 5 | Likely | 3 | Medium | 3 | Medium | 42 | Medium | 0.6 | Low-Medium | 25. |
| Land Use | Road disturbance and Project traffic increase due to production increase | Construction; Operational; Decommissioning | Regional | 3 | Medium term | 3 | High | 5 | Likely | 3 | Medium - High | 4 | Medium | 56 | Medium | 0.6 | Low-Medium | 33.6 |
| Natural Vegetation | Loss of Biodiversity and Ecological function | Construction; Operational; Decommissioning | Site | 2 | Medium term | 3 | Medium | 3 | Likely | 3 | Medium | 3 | Low - Medium | 33 | High | 0.2 | Low | 6.6 |
| Animal Life | Loss of Biodiversity and Ecological function | Construction; Operational; Decommissioning | Regional | 3 | Medium term | 3 | Medium | 3 | Possible | 2 | Medium | 3 | Low - Medium | 33 | High | 0.2 | Low | 6.6 |
| Surface water | Alteration of drainage patterns | Construction; Operational; Decommissioning | Regional | 3 | Long term | 4 | Medium | 3 | Highly likely | 4 | Medium | 3 | Medium | 42 | High | 0.2 | Low | 8.4 |
| Surface water | Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of | Construction; Operational; Decommissioning | Site | 2 | Long term | 4 | Medium | 3 | Likely | 3 | Medium | 3 | Low-Medium | 36 | High | 0.2 | Low | 7.2 |

| ASPECTS AFFECTED | POTENTIAL IMPACT | PHASE | Extend | | Duration | | Intensity | | Probability | | Weighing factor | | Significance without mitigation | | Mitigation Efficiently | | Significance with mitigation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | suspended solids (SS) and must be managed. | | | | | | | | | | | | | | | | | |
| Surface water | Deterioration in surface water quality | Construction | Regional | 3 | Long term | 4 | Medium | 3 | Possible | 2 | Medium | 3 | Low-Medium | 36 | High | 0.2 | Low | 7.2 |
| Surface water | Deterioration in surface water quality | Operational | Regional | 3 | Long term | 4 | Medium | 3 | Possible | 2 | Medium-High | 4 | Medium | 48 | High | 0.2 | Low | 9.6 |
| Surface water | During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | Operational | Regional | 3 | Long term | 4 | Low | 1 | Possible | 2 | Medium | 3 | Low-Medium | 30 | High | 0.2 | Low | 6 |
| Groundwater | Lowering of groundwater levels | Construction; Operational; Decommissioning; Closure | Site | 2 | Long term | 4 | Low | 1 | Likely | 3 | Medium | 3 | Low-Medium | 30 | High | 0.2 | Low | 6 |
| Groundwater | Deterioration of water quality | Operational | Site | 2 | Long term | 4 | Medium | 3 | Possible | 2 | High | 5 | Medium | 55 | High | 0.2 | Low | 11 |
| Groundwater | Deterioration of water quality | Decommissioning; Closure | Regional | 3 | Permanent | 5 | Medium | 3 | Definite | 5 | Medium | 3 | High | 48 | Medium | 0.6 | Low-Medium | 28.8 |

| ASPECTS AFFECTED | POTENTIAL IMPACT | PHASE | Extend | | Duration | | Intensity | | Probability | | Weighing factor | | Significance without mitigation | | Mitigation Efficiently | | Significance with mitigation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | Construction, Operation and Decommissioning | Regional | 3 | Short-Medium term | 2 | Medium | 3 | Definite | 5 | Medium | 3 | Low-Medium | 39 | High | 0.2 | Low | 7.8 |
| Air Quality | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | Construction, Operational, Decommissioning | Regional | 3 | Short term | 1 | Medium | 3 | Definite | 5 | Medium | 3 | Low-Medium | 36 | High | 0.2 | Low | 7.2 |
| Air Quality | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | Construction, Operational, Decommissioning | Regional | 3 | Long term | 4 | Medium | 3 | Definite | 5 | Medium | 3 | Medium | 45 | High | 0.2 | Low | 9 |
| .Noise | Disturbing noise | Construction, Decommissioning | Regional | 3 | Short-Medium term | 3 | High | 5 | Likely | 3 | Medium | 3 | Medium | 42 | High | 0.2 | Low | 8.4 |
| Noise | Disturbing noise | Operational | Regional | 3 | Long term | 4 | Medium | 3 | Likely | 3 | Medium | 3 | Low-Medium | 39 | High | 0.2 | Low | 7.8 |
| Sites of archaeological and | Disturbance of heritage sites | Construction; Operational | N/A | | N/A | | N/A | | N/A | | N/A | | None | | N/A | | None | |

| ASPECTS AFFECTED | POTENTIAL IMPACT | PHASE | Extend | | Duration | | Intensity | | Probability | | Weighing factor | | Significance without mitigation | | Mitigation Efficiently | | Significance with mitigation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cultural interests | | | | | | | | | | | | | | | | | | |
| Visual aspects | Negative visual impact | Construction; Operational; Decommissioning; Closure | Regional | 3 | Long term | 4 | Medium | 3 | Likely | 3 | Medium -High | 4 | Medium | 52 | Low - Medium | 0.8 | Low-Medium | 41.6 |
| Socio-Economic | Positive Socio-economic impacts | Construction; Operational; Decommissioning; Closure | N/A | | N/A | | N/A | | N/A | | N/A | | Positive impact | 0 | N/A | | Positive impact | 0 |
| Socio-Economic | Negative impact from closure | Decommissioning; Closure | Regional | 3 | Medium term | 3 | Medium | 3 | Highly likely | 4 | Medium - High | 4 | Medium | 52 | Medium | 0.6 | Low - Medium | 31.2 |
| Socio-Economic | Negative cumulative impacts | Construction; Operational; Decommissioning; Closure | Regional | 3 | Long term | 4 | Medium | 4 | Highly likely | 5 | Medium | 3 | Medium | 52 | Medium - High | 0.4 | Low - Medium | 20.8 |

# 14 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

*Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation*.

Please refer to Table 12-3 for mitigation measures prescribed to the Corobrik development. A summary of the table is provided here for convenience.

**Table 14-1: Proposed impact management objectives and impact management outcomes for inclusion in the EMP**

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | *(Including the potential impacts for cumulative impacts) (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc. etc)* | *(modify, remedy, control, or stop) Through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)* | |
| Geology | Impact on Geology of area | None | None possible |
| Topography | Hazardous excavations | Management; Rehabilitation | Unsafe areas associated with the construction of the kilns, brick yard and associated buildings will be fenced. Other excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible. |
| Soils | Loss of soil resource | Management, Rehabilitation | The soil that has been removed within the area needs to be replaced and rehabilitated to its previous natural state as far as possible. Topsoil from the brickyard areas need to be removed before construction and used in rehabilitation afterwards. The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, prevention of erosion and loss, re-vegetation of disturbed areas and monitoring. |
| | Erosion | Management, Rehabilitation | Vegetate disturbed areas during the rainy season; Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils. |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | Soil contamination | Remedy through rehabilitation, infrastructure design and Management | Adequate sanitary facilities will be provided at construction sites and areas that is located away from the mine ablution blocks; Storage areas and vehicle maintenance areas will be surfaced and will have appropriate runoff containment measures, such as oil traps, bunds and canals, will be in place; Vehicles will be regularly serviced according to a pre-planned maintenance programme; All chemical, fuel and lubricant storage areas will be underlain by impermeable substrates; Drums containing chemicals will be stored upright in a secure, bunded area with an impermeable surface; If necessary, the polluted soils will be classified as wastes and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. |
| Land Capability | Loss of grazing land | Remedy through rehabilitation and management. | The new infrastructure will be developed as much as possible on the existing disturbed sites, or on the management areas with the lowest agricultural potential; the area where the brickyard is proposed has already been impacted. Corobrik will conserve soil and control erosion (as discussed above). Grazing and natural land along the Corobrik operation will need to remain as the main land activity to ensure land capability is kept to that of grazing and agriculture for the Driefontein larger farm. |
| Land Use | Land use alterations | Control through management and communication Control through management and monitoring | Corobrik will inform the surrounding community of any unsafe conditions that may be planned on site. A community liaison forum will be established, if not already existing, and the programme will be made available through the forum as agreed with community representatives. |
| Land Use | Road disturbance and Project traffic increase due to production increase | Modify through management | Travel speeds on the mine roads will be limited to less than 40 km/h. Travel speeds on the access roads will be limited to remain within the current speed limits. |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| Natural Vegetation | Loss of Biodiversity and Ecological function | Management, infrastructure design | Surface disturbance will be kept to a minimum. Activities will be concentrated in already disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites.<br>• Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not damage flora.<br>• A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the operational area but also into surrounding area which may be impacted by the project. It is vital that the control of alien invasive species is ongoing. The reason for this is that an ongoing eradication of the invasive species will be more cost effective.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed.<br>• All activity should be avoided in restricted areas and riparian |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | zones.<br>• Large undisturbed natural areas that should remain intact throughout the lifetime of the proposed development and must be designated in the planning phase.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific.<br>• Ensure linear structures, such as roads and pipelines, are well managed to reduce the degradation of vegetation due to edge effects. This will be facilitated by ensuring vehicles remain on roads and alien invasive species introduction is controlled along road verges.<br>• Continuous rehabilitation should be implemented during the operational phase. This includes using indigenous vegetation to re-vegetate land on an ongoing basis. |
| Animal Life | Loss of Biodiversity and Ecological function | Protection, Management; Rehabilitation | • Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora.<br>• Allow animals to escape areas of activity freely and do not hinder their movement.<br>• All injured animals sighted during the development should be protected and moved to receive rehabilitation at the designated centre (identified within the EMP) and should not be handled by the employees under any circumstance. Clear protocol should be developed on the matter.<br>• Have a policy in place to prohibit hunting (rifles, snares, dogs) by the workers or employees of the site. These conditions should be |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | written into contractors' agreements with strict penalty clauses. Employees engaging in any of these activities should be faced with disciplinary action. No hunting activities will be allowed on site.<br>• Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed.<br>• All activity should be avoided in restricted areas and riparian zones.<br>• All noisy equipment should be mitigated to lessen the sound levels as well as vibration levels should be controlled to limit impact on biodiversity and sensitive species by an accredited vibration specialist.<br>• Large undisturbed natural areas that should remain intact throughout the lifetime of the proposed development and must be designated in the planning phase.<br>• Special lighting should be used in the evenings to limit disturbance of animals and the attraction of insects to these lights. The current use of high-power security lighting for public areas and arenas have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife on site. Sodium lamps require a third less energy.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific. |
| Surface water | Alteration of drainage patterns | Infrastructure design, Management, Monitoring, rehabilitation | Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. This will ensure appropriate separation of clean and dirty storm water and will maximise the return of clean water to the downstream drainage system. Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential re-use. Adherence to the Storm Water Management Plan as compiled by an accredited engineer is crucial. In compliance with the GN 704 Regulations, Corobrik will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. Corobrik will ensure that all storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event. New storm water channels will be implemented to limit the amount of drainage within the current storm water channels. |
| Surface water | Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | Infrastructure design, Management, Monitoring, rehabilitation | • The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.<br>• Surface water quality monitoring should continue in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented |
| Surface water | Deterioration in surface water quality | Infrastructure design; Management; Licencing | Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised to minimise construction of new access roads, hence potential for erosion; If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances during site clearing; Dust suppression on the haul roads and cleared areas must regularly be undertaken; and An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during construction, operational, and decommissioning of the project. The water balance for the project will be refined on an ongoing basis during the life of the project. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an ongoing basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. |
| Surface water | Deterioration in surface water quality | Infrastructure design; Management; Licencing | • All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills;<br>• Vehicles should regularly be |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath;<br>• Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste;<br>• The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.<br>• The fuel, lubricant and other hazardous storage facilities must be located on a hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances.<br>• An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for reference to anytime in terms of handling, storage and disposal of materials.<br>• Surface water quality monitoring should continue in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented<br>• Regular maintenance and inspection of water infrastructure, specifically storm water channels, oil traps and silt traps. |
| Surface water | During the decommissioning | Infrastructure design; | • Use of accredited contractors for removal or demolition of |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | Management; Licencing | infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages;<br>• The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures;<br>• Ensure that the infrastructure (pipelines, fuel storage areas) are first emptied of all residual material before decommissioning; and<br>• Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site. |
| Groundwater | Lowering of groundwater levels | As above | Do not exceed the licensed water uses as per WUL. The WUL may need to be amended to ensure all the water uses and quantities used in the new increased production remains accurate and managed. |
| Groundwater | Deterioration of water quality | Infrastructure designs; Management; Monitoring | Identify and where possible, maximise areas of the quarry that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the quarry (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated.<br>• Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions.<br>• Ensure the minimisation of contaminated areas, reuse of dirty water wherever possible and |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | planning to ensure that clean areas are not lost to the catchment unnecessarily.<br>• Ensure that seepage losses from storage facilities (such as settlement dam) are minimised and overflows are prevented.<br>• Ensure that all possible sources of dirty water have been identified and that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration.<br>• Ensure that less polluted water or that: moderately polluted water is not further polluted.<br>Where possible less and more polluted water should be separated. This will assist in the reuse water strategy and improve possibilities for reuse based on different water quality requirements by different quarry water uses.<br>• Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental spillages occur along the transport routes.<br>• Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff.<br>• Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the quarry operations.<br>• Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements.) |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | • Route all clean storm water directly to natural watercourses without increasing the risk of a negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow. Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of the quarry.<br>• Develop and implement proper environmental management and auditing systems to ensure that pollution prevention and impact minimisation plans and measures developed in the design and feasibility stages are fully implemented.<br>• The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised.<br>• Rehabilitation should be planned to promote free drainage and to minimise or eliminate ponding of storm water. On-going rehabilitation as mining operations progress is required.<br>• The clean and dirty water flow areas on a quarry should be identified.<br>• Every effort should be made to maximise the clean area and minimise the dirty area when locating the diversion berms, channels and dams.<br>• The quarry planning should consider concurrent rehabilitation of quarry workings and waste management facilities, to maximise the areas of clean runoff that can be discharged to the natural watercourses<br>• The capacity to rapidly pump water out of the pit into storage dams should be maintained. This will assist in minimising water quality deterioration due to long-term retention of storm water in contact with materials that may cause water quality deterioration.<br>• Berms should be constructed around the quarry pit to minimise the flow of any surface water or |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | floodwater into mine workings. These berms should be constructed to allow free drainage away from the pits.<br>• Water quantity and quality data should be collected on a regular, ongoing basis during quarry operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. See the Monitoring Network section.<br>• If excessive groundwater recharge and rainfall is encountered other than the predicted volumes the water could be managed as follows:<br>-Manage in-pit seepage and rainfall through a collection and storage system. Water stored in pit should be utilised locally for dust suppression, as far as possible. Excess pit water should be pumped to surface to be incorporated into the mine water balance,<br>- Maximise the abstraction and discharge of clean groundwater ahead of the pit development, through installation of dewatering boreholes surrounding the pit. |
| Groundwater | Deterioration of water quality | As above | The following measures should be implemented during rehabilitation and closure<br>• After cessation of mining, there will be no material available for the backfilling of the pit. Therefore, the quarry pit should be managed as a pit lake. Depending on the water quality of the flooded pit, it could potentially be used as a water supply. However, if insufficient water of an acceptable quality can be extracted from the abandoned pit, caving of the pitwalls can be considered to ensure that steep and unsafe pit walls are eliminated. This will ensure a |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | more gradual depression in the landscape. Acid rock drainage and water quality degradation are not expected post mining. |
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | Infrastructure design; Management | • Construction: Dispersion modelling was regarded not representative of the actual activities that will result in dust emissions during the construction phase. It is not anticipated that the various construction activities would result in higher off-site average daily dustfall rates than the operational activities. The temporary nature of the construction activities would likely reduce the significance of the potential impacts. Decommissioning is likely to be similar or less than the construction impacts.<br>• Operational Phase: The proposed operations related activities were found to result in dustfall rates below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The simulated future (current and proposed) operations' dustfall rates are below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The cumulative (proposed and measured) dustfall rates are not likely to exceed the NDCR limits and 400 mg/m$^2$-day off-site or at any AQSRs. Land clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum. Road construction activities such as road grading:<br>• Water sprays at area to be graded – 50% CE.<br>• Freshly graded areas to be kept to a minimum. Wind erosion from |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | exposed areas:<br>• Ensure exposed areas remain moist during dry, windy periods through regular water spraying. |
| Air Quality | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | Infrastructure design; Management | Land clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content. For operational phase: Mining, handling, transport and storage of clay:<br>•Recommended additional mitigation measures of more regular application of water; and inspection and maintenance programs, including regular spill clean-up.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum. Road construction activities such as road grading:<br>-Water sprays at area to be graded – 50% CE.<br>• Freshly graded areas to be kept to a minimum.<br>Wind erosion from exposed areas:<br>• Ensure exposed areas remain moist through regular water spraying during dry, windy periods. |
| Air Quality | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | Infrastructure design; Management | Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.<br>• To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.<br>• In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds.<br>• Speed limits need to be observed and adhered to.<br>• Management should fit roads |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | with speed humps to ensure adherence.<br>• Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.<br>• The drop heights should be minimised when depositing materials to the ground.<br>• Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily. |
| Noise | Disturbing noise | Infrastructure design; Management; Monitoring; Maintenance | Communication between the receptors and the developer need to be implemented and maintained. |
| Noise | Disturbing noise | Infrastructure design; Management; Monitoring; Maintenance | The developer should consider co-ordinate the working time with periods when the receptors are likely not at home. An example would be to work within the 8 am to 2 pm time-slot to minimise the significance of the impact. This will ensure that potentially receptors are most likely at school or at work, minimizing the probability of an impact happening; and normal and other daily activities will generate other noises that would most likely mask construction noises, minimizing the probability of an impact happening. |
| Sites of archaeological and cultural interests | Disturbance of heritage sites | Management; Conservation; Permitting | No impact on the identified heritage resource sites is expected, but the requirements apply in the event that the project layout changes in a way that will affect these sites or in the event that additional sites are discovered. |
| Visual aspects | Negative visual impact | Infrastructure design; Management; Rehabilitation | In considering measures to effect mitigation, there are three rules to consider. Mitigation measures will be: economically feasible; effective (time allowed for implementation and provision for management/maintenance); visually acceptable (within the context of the existing landscape). To address these measures the following principles will be implemented: Mitigation should be planned to fit into the existing landscape character. They |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | should respect and build upon landscape distinctiveness. Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility. It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.<br>Site preparation (The minimum amount of existing vegetation and topsoil will be removed from construction areas. Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the site design. Eradication of vegetation should be done in 'natural manner', avoiding harsh straight lines. Dust suppression measures should be in place at all times.)<br>Buildings and structures (Structures that are required to be built from steel or concrete will be painted a dark natural tone fitting with the surrounding environment. Olive greens and tans should be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Roofs of tall structures should be painted a 'dirty' grey. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided. To reduce the amount of glare, external surfaces of buildings and other structures will be articulated or textured to increase the interplay of light and shade. Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security flood lighting and operational lighting will only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, wherever possible lights will be directed downwards so as to avoid illuminating the sky.) |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | Landscaping (Natural vegetation should be retained wherever possible and any removal of vegetation should be conducted carefully to limit the visual lines of site to the project. An ecological approach to rehabilitation and vegetative screening measures, as opposed a horticultural approach to landscaping will be adopted. For example, communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A Vegetation berm to fence the view from the road towards the brickyard may be considered if economically feasible. |
| Socio-Economic | Positive Socio-economic impacts | Management; Consultation | Non-core activities will be identified and prioritised for local service providers. Local service providers will be identified and requested to tender for the provision of the various services. |
| Socio-Economic | Negative impact from closure | Management; Communication; Strategy implementation | Adequate communication with the surrounding communities during all phases of the development to ensure that an open policy regarding timelines is enforced during all stages of the development.<br>A clear policy will be developed that is transparent and well-advertised to local communities;<br>The policy will be clear on the skills and qualifications necessary for employment. |
| Socio-Economic | Negative cumulative impacts | Management; Communication; Strategy implementation | In regard to the protection of private property and quality of life: Discussions will be held with the South African Police Force regarding the policing of the area.<br>A forum will be established whereby the mine and surrounding land users communicate on a regular basis to ensure that the mine is in a position to attend to any concerns of farmers promptly.<br>A joint strategy will be developed with local authorities, the local police force and local landowners |

| Aspects Affected | Potential Impact | Mitigation Type | Management and Mitigation Measures |
|---|---|---|---|
| | | | to deal with crime. In regard to recruitment: |

# 15 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

*Any aspects which must be made conditions of the Environmental Authorisation*

It is recommended that before the operational phase begins,

- The Emergency readiness plan should include ways to remedy and prevent environmental damage if spillage has occurred and minimise and prevent negative impacts as a result.
- If any heritage associated objects or archaeological items are uncovered during any phase of the development, procedure as set out within the specialist study is to be taken and a specialist is to be contacted immediately before any activity continues.
- All other mitigation measures as prescribed within this report should be included as conditions to mitigate the possible impacts of the Corobrik Driefontein development.
- The Air Emissions License will require amendment to include the new Kilns and related emissions.

# 16 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

*(Which relate to the assessment and mitigation measures proposed)*

Thorough investigations have been done in terms of designs, suitable design reports, layouts and specialist areas assessed. Assumptions with regards to noise and visual impacts were made. A wetland study was recommended by the surface water specialist.

# 17 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

## 17.1 Reasons why the activity should be authorized or not

Thorough investigations have been done in terms of designs, suitable design reports and layouts and the specialist studies done along the road, seem to be satisfactory and impacts expected is to be mitigated to an acceptable level of risk.

## 17.2 Period for which the Environmental Authorisation is required

For the new expansion activities, the environmental authorisation should match that of the current Corobrik activities as specified within their Mining Right.

# 18 UNDERTAKING

*Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.*

The signed undertaking is included in the EMP (Part B of this report).

# 19 FINANCIAL PROVISION

*State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.*

A preliminary financial provision was calculated by Bacundi for the mining related activities at Corobrik Driefontein (Bacundi Environmental Solutions, 2017).

The financial closure liability for the unplanned closure of Driefontein Quarry (as at October 2017) has been calculated to be approximately **R 3 149 744.11 (Excluding VAT)** as per the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision provided by a Mine as published by the Department of Mineral Resources (DMR).

***The Bucandi Environmental Solutions report did not include any of the existing infrastructure on the Driefontein mine, only the clay quarry itself as Corobrik maintains that the factory life is independent of the life of mine as resources can brought to the factory from other sources.***

*The 2 new Kilns and Brickyard expansion preliminary financial liability was calculated, which consist of the following infrastructure:*

- Kilns;
- Brick / Stockyard;
- Sewer line;
- Overland conveyer;
- Gate house;
- Stromwater channel;
- Admin building;
- Office parking;
- Truckers ablution blocks;
- Truck stop area;
- Unpaved stock yard;
- Earth works platform; and
- Vegetation clearance.

The value calculated below for the new activities, including the factory areas, the new brickyard areas, the paved areas and re-vegetation, was calculated as **R1 486 947,65 (Excluding VAT)** for the new activities.

This comes to a total of **R 4 636 691.76 (Excluding VAT)** for the existing quantum (Bucandi Report) and new proposed infrastructures.

**Table 19-1: Financial Provisioning calculated for Corobrik Driefontein Activities**

| No | Description | Unit | A | B | C | D | E=A*B*C*D | Calculated by Bucandi (2017) |
|---|---|---|---|---|---|---|---|---|
| | | | Quantity | Master rate | Multiplication factor | Weighting factor 1 | Amount (rands) | Amount (rands) |
| 1 | Dismantling of processing plant and related structures (including overland conveyors and powerlines) | $m^3$ | | 14,45 | 1 | 1 | R0,00 | |
| 2 (A) | Demolition of steel buildings and structures (including floor slabs) (Kilns) | $m^2$ | 18214 | 201,24 | 1 | 1 | R3 665 385,36 | |
| 2 (B) | Demolition of reinforced concrete buildings and structures (gate house, admin office, truckers ablution, clinic) | $m^2$ | 481.3 | 296,57 | 1 | 1 | R142 739,14 | |
| 3 | Rehabilitation of access roads | $m^2$ | | 36,01 | 1 | 1 | R0,00 | R64 840,00 |
| 4 (A) | Demolition and rehabilitation of electrified railway lines | m | | 314,69 | 1 | 1 | R0,00 | |
| 4(B) | Demolition and rehabilitation of non-electrified railway lines | m | | 171,65 | 1 | 1 | R0,00 | |
| 5 | Demolition of housing/and or administration facilities | $m^2$ | | 362,37 | 1 | 1 | R0,00 | |
| 6 | Opencast rehabilitation including final voids and ramps | Ha | | 184 428,97 | 1 | 0,04 | R0,00 | R110 657,00 |
| 7 | Sealing of shafts adits and inclines | $m^3$ | | 97,27 | 1 | 1 | R0,00 | |
| 8 (A) | Rehabilitation of overburden and spoils | ha | | 126639,96 | 1 | 1 | R0,00 | R316 600,00 |
| 8(B) | processing waste deposits and evaporation ponds (non-polluting potential) | ha | | 157727,78 | 1 | 1 | R0,00 | |
| 8© | Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential) | ha | | 458116,22 | 1 | 1 | R0,00 | |
| 9 | Rehabilitation of subsided areas | ha | | 106041,89 | 1 | 1 | R0,00 | |
| 10 | General surface rehabilitation, including grassing of all denuded areas | ha | 14 | 111425,41 | 1 | 1 | R1 559 955,74 | R601 921,00 |
| 11 | River diversions | ha | | 100320,21 | 1 | 1 | R0,00 | |
| 12 | Fencing | ha | 8 | 114,43 | 1 | 1 | R915,44 | |
| 13 | Water management | | | 38144,56 | 1 | 1 | R0,00 | |
| 14 | 2 to 3 years of maintenance and aftercare | ha | | 14828,48 | 1 | 1 | R0,00 | R66 753,00 |
| 15 (A) | Specialist study | | | 22886,74 | | | R0,00 | R0,00 |
| 15 (B) | Specialist study | | | 22887,74 | | | R0,00 | R0,00 |
| **Sub Total 1 (Sum of items 1 to 15)** | | | | | | | R5 368 995,68 | R1 160 771,00 |
| | | | | | | | R5 637 445,47 | R1 218 809,55 |
| | | | | **Add 6% if Sub Total 1 is ≥ R 1000** | | | | |
| | | | | **Add 12% if Sub Total 1 is ≤ R 1000** | | | R676 493,46 | R146 257,15 |
| 1 | Preliminary and General | 6% of Subtotal 1 | | | **Weighting factor 2 (Step 4.4)** | | | |
| | | 12% of Subtotal 1 | | | 1,05 | | | |
| 2 | Contingency | 10.0% of Subtotal 1 | | | | | R563 744,55 | R121 880,96 |
| **Sub Total 2 (Subtotal 1 plus sum of management and contingency)** | | | | | | | R6 877 683,47 | R1 486 947,65 |
| **VAT (14%)** | | | | | | | R962 875,69 | R208 172,67 |
| **GRAND TOTAL (Subtotal 3 plus VAT)** | | | | | | | R7 840 559,15 | R1 695 120,32 |

### 19.1 Explain how the aforesaid amount was derived.

The methodology used is the method prescribed in the guideline document "Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine" (Department of Minerals and Energy, 2005).

The steps followed to calculate the quantum is outlined below:

- Step 1: Determine mineral mined and saleable by-products;
- Step 2A: Determine primary risk class: Class A (High risk), Class 8 (Medium risk), or Class C (Low risk);
- Step 2B: Revise primary risk class (if applicable) based on saleable by-products;
- Step 3: Determine environmental sensitivity of mine area: Low sensitivity, Medium sensitivity, High sensitivity;
- Step 4: For Class A or 8 mining operations:
    - Step 4.1: Determine level of information available: Extensive, or Limited. For extensive information, either: Option 1: Accept the quantum determined, Option 2: Commission an independent review by a competent person, or Option 3: Follow a "rules- based" approach and proceed to step No. 4.2 For limited information, follow a "rules-based" approach and proceed to step No. 4.2;
    - Step 4.2: Identify closure components;
    - Step 4.3: Identify unit rates for closure components;
    - Step 4.4: Identify and apply weighting factors;
    - Step 4.5: Identify areas of disturbance;
    - Step 4.6: Identify closure costs from specialist studies;
    - Step 4.7: Calculate closure costs;
- Step 5: For Class C Mining operations:
    - Step 5.1: Identify minimum rates per hectare for closure;
    - Step 5.2: Determine overall size of the mine (in hectares);
    - Step 5.3: Calculate closure cost. Alternatively, follow "rules- based" approach: Step 4.1 to 4.6; and
- Step 6: Independent review by competent person. Commission independent review should there be non- agreement on the quantum for financial provision deter- mined from steps 4 or 5 above.

The quantum for the infrastructure and impact estimates was calculated as per the DMR 2005 closure cost rates schedule as well as the CPIX 2017 quantum calculation.

### 19.2 Confirm that this amount can be provided for from operating expenditure.

*(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).*

Corobrik (Pty) Ltd: Driefontein will ensure that costs are provided for financial provisioning.

## 20 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

### 20.1 Impact on the socio-economic conditions of any directly affected person.

*(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an Appendix).*

***Please note that no specific socio-economic specialist investigation was conducted for the activities associated with the Corobrik expansion.***
The following general socio-economic impacts may be expected to a low degree:

***Health and Social Well-Being***
The health and social wellbeing impacts related to the project include.

- Annoyance, dust and noise during construction phase;
- Crime and security;
- Fire risk; and
- Reduced actual personal safety, increased hazard exposure.

***Quality of the Living Environment Impacts***

- None expected except in the case of an accident or large spillage that was not mitigated or prevented.

***Economic and Material Well-Being Impacts***
The economic and material well-being impacts include:

- Increase in employment opportunities;
- Increase in employment stability;
- Economic stimulation of the area; and
- Impact of water availability to the maintenance of current activities and income.

***Family and Community Impacts***

- None expected except in the case of an accident or large spillage that was not mitigated or prevented.

***Institutional, Legal, Political and Equity Impacts***
The institutional, legal, political and equity impacts include:

- Increased demand on existing infrastructure facilities and social services;
- Attitude formation towards project; and
- Disaster management.

## 20.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

*(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).*

A number of known cultural heritage (archaeological and historical) sites exist in the larger geographical area within which the study area falls. No sites of any cultural heritage (archaeological and/or historical) origin or significance were identified in the impact areas that had to be surveyed by APAC (Pelser, 2018).

# 21 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

*(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as Appendix).*

Specifications as to what would be the best suited scenario were investigated during the planning and proposal stage of the Corobrik (Pty) Ltd: Driefontein expansion. The best suited alternative was developed in terms of both environmental and financial means.

Therefore, no other site alternatives were found to be applicable. The chosen location within the existing operations on Corobrik is the best suited placement to avoid excessive ecological damage. However, the brickyard will require vegetation clearance, but is already an impacted area due to historical agricultural activities and therefore is still the best suited.

# PART B ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

**Draft Environmental Management Programme**

## 22 DETAILS OF THE EAP:

*(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).*

The information can be found in Section 2.1.

### 22.1.1 Details of the EAP

| | |
|---|---|
| Name of the Practitioner: | Dr. P. Erasmus and Ms C. Lambrechts |
| Tel No: | 012 543 3808 |
| Fax No: | 086 621 0294 |
| E-mail address: | info@prescali.co.za |
| Postal Address | P.O. Box 2544<br>Montana Park<br>0159 |

### 22.1.2 Expertise of the EAP

#### *22.1.2.1 The qualifications of the EAP (with evidence)*

- Dr. P. Erasmus has qualifications in Zoology and Biochemistry and further studied in Zoology and Marine pollution. She is registered as a Pri Sci Nat. (SACNASP), Natural Professional Scientist, for Ecological Sciences, Registration number 116207. Her qualifications are provided in Appendix 1.
- Ms. Lambrechts has qualifications in Zoology and Environmental Management. She is registered as a Cand.Sci.Nat. (SACNASP), Candidate Natural Scientist, Registration number 100003/17. Her qualifications are provided in Appendix 1.

#### *22.1.2.2 Summary of the EAP's past experience (In carrying out the Environmental Impact Assessment Procedure)*

- Dr. P. Erasmus has 9 years of applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
  - Department: Water Affairs and Forestry (DWAF);
  - M2 Environmental Connections (Pty) Ltd;
  - Prescali Environmental Consultants (Pty) Ltd.
- Ms. Lambrechts has 4 years of applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
  - Geo Pollutions Technology cc;
  - M2 Environmental Connections cc;
  - Prescali Environmental Consultants (Pty) Ltd.

## 23 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

*(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).*

Please refer to Section 5.

# 24 COMPOSITE MAP

*(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)*

Please refer to Appendix 5 and Figure 5-1.

# 25 DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

## 25.1 Determination of closure objectives

*(Ensure that the closure objectives are informed by the type of environment described in 2.4 herein)*

- To leave site in a safe state for humans and animals.
- To ensure that the water resource (surface and ground) is not affected by rehabilitation activities.
- To promote indigenous vegetation growth suitable for animals that graze over the disturbed areas on the site.
- Removal of most/all surface infrastructure from the site and to rehabilitate the brickyard area.
- Cleaning and upgrading of all areas to fit the current land use.
- Vegetation of rehabilitated disturbed surfaces around the project area.
- Ensure blending with the surrounding environment.

## 25.2 Volumes and rate of water use required for the operation

Little water will be required for the construction of the proposed activities; the operation may make use of water that will be covered in the existing Water use license.

## 25.3 Has a water use licence been applied for?

No WUL amendment is required. The Corobrik (Pty) Ltd: Driefontein operations already has a Water Use License (WUL).

# 26 IMPACT MANAGEMENT OUTCOMES

*(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph);*

Please refer to Table 26-1.

## 26.1 Impacts to be mitigated in their respective phases

**Table 26-1: Measures to rehabilitate the environment affected by the undertaking of any listed activity**

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | *(as listed in 2.11.1)* | *of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure* | *(volumes, tonnages and hectares or $m^2$)* | *(describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)* | *(A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities* | *Describe the time period when the measures in the environmental management programme must be implemented. Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. With regard to Rehabilitation, therefore state either: - Upon cessation of the individual activity or Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.* |
| Impact on Geology of area | The clearance of an area of 14 hectares or more of indigenous vegetation; Commercial on land previously used for mining; | Construction; Operational; Decommissioning | 14 ha | None possible | N/A | N/A |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | Expansion of existing facilities requiring amended permit or license; The expansion of commercial developments on land previously used for mining or heavy industrial purposes, where footprint will exceed 1 000 $m^3$, Phased activities; and 14 ha of Critical Biodiversity or Ecological support area will be cleared | | | | | |
| Hazardous excavations | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Unsafe areas associated with the construction of the kilns, brick yard and associated buildings will be fenced. Other excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible. | Health and Safety Requirements | Continuous |
| Loss of soil resource | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | The soil that has been removed within the area needs to be replaced and rehabilitated to its previous natural state as far as possible. Topsoil from the brickyard areas need to be removed before construction and used in rehabilitation afterwards. The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, prevention | N/A | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | of erosion and loss, re-vegetation of disturbed areas and monitoring. | | |
| Erosion | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | Vegetate disturbed areas during the rainy season; Where disturbed areas cannot be re-vegetated during the life of operations, appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils. | N/A | As needed |
| Soil contamination | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Adequate sanitary facilities will be provided at construction sites and areas that is located away from the mine ablution blocks; Storage areas and vehicle maintenance areas will be surfaced and will have appropriate runoff containment measures, such as oil traps, bunds and canals, will be in place; Vehicles will be regularly serviced according to a pre-planned maintenance programme; All chemical, fuel and lubricant storage areas will be underlain by impermeable substrates; Drums containing chemicals will be stored upright in a secure, bunded area with an impermeable surface; If necessary, the polluted soils will be classified as wastes and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated. | N/A | As needed |
| Loss of grazing land | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | The new infrastructure will be developed as much as possible on the existing disturbed sites, or on the management areas with the lowest agricultural potential; the area where | N/A | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | the brickyard is proposed has already been impacted. Corobrik will conserve soil and control erosion (as discussed above). Grazing and natural land along the Corobrik operation will need to remain as the main land activity to ensure land capability is kept to that of grazing and agriculture for the Driefontein larger farm. | | |
| Land use alterations | All new activities (as above) | Construction; Operational | 14 Ha | Corobrik will inform the surrounding community of any unsafe conditions that may be planned on site. A community liaison forum will be established, if not already existing, and the programme will be made available through the forum as agreed with community representatives. | N/A | Continuous |
| Road disturbance and Project traffic increase due to production increase | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Travel speeds on the mine roads will be limited to less than 40 km/h. Travel speeds on the access roads will be limited to remain within the current speed limits. | N/A | Already implemented |
| Animal Life: Loss of Biodiversity and Ecological function | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Surface disturbance will be kept to a minimum. Activities will be concentrated in already disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites. | Yes | Continuous |
| | | | | • Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, | | Immediately, before construction of expansion infrastructure begins. Alien and |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not damage flora.<br>• A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the operational area but also into surrounding area which may be impacted by the project. It is vital that the control of alien invasive species is ongoing. The reason for this is that an ongoing eradication of the invasive species will be more cost effective.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed.<br>• All activity should be avoided in restricted areas and riparian zones.<br>• Large undisturbed natural areas that | | Invasive Management is Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | should remain intact throughout the lifetime of the proposed development and must be designated in the planning phase.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific.<br>• Ensure linear structures, such as roads and pipelines, are well managed to reduce the degradation of vegetation due to edge effects. This will be facilitated by ensuring vehicles remain on roads and alien invasive species introduction is controlled along road verges.<br>• Continuous rehabilitation should be implemented during the operational phase. This includes using indigenous vegetation to re-vegetate land on an ongoing basis. | | |
| Vegetation: Loss of Biodiversity and Ecological function | All new activities (as above) | Construction; Operational; Decommissioning | All | • Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and workers to comply with these mitigation measures.<br>• Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora.<br>• Allow animals to escape areas of activity freely and do not hinder their movement.<br>• All injured animals sighted during the development should be protected and moved to receive rehabilitation at the | Yes | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | designated centre (identified within the EMP) and should not be handled by the employees under any circumstance. Clear protocol should be developed on the matter.<br>• Have a policy in place to prohibit hunting (rifles, snares, dogs) by the workers or employees of the site. These conditions should be written into contractors' agreements with strict penalty clauses. Employees engaging in any of these activities should be faced with disciplinary action. No hunting activities will be allowed on site.<br>• Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.<br>• All activities should be restricted to one area and activity and access into larger intact areas should be avoided. Strict measures should be implemented. No foraging, food and wood collecting within the veld should be allowed.<br>• All activity should be avoided in restricted areas and riparian zones.<br>• All noisy equipment should be mitigated to lessen the sound levels as well as vibration levels should be controlled to limit impact on biodiversity and sensitive species by an accredited vibration specialist.<br>• Large undisturbed natural areas that should remain intact throughout the lifetime | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | of the proposed development and must be designated in the planning phase.<br>• Special lighting should be used in the evenings to limit disturbance of animals and the attraction of insects to these lights. The current use of high-power security lighting for public areas and arenas have a devastating effect on the nocturnal animals and insects by attracting them away from their natural environment, leading to certain death. A Mercury arc and halogen lamps emit light in the white spectrum, disorientating nocturnal insects and animals and in turn prevents mating and depletes the natural environment of many species as they die circling the lights. Yellow Sodium lights are prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife on site. Sodium lamps require a third less energy.<br>• The vegetation removal (and associated fauna) should be controlled and should be very specific. | | |
| Surface water: Alteration of drainage patterns | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. This will ensure appropriate separation of clean and dirty storm water and will maximise the return of clean water to the downstream drainage system. Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential re-use. Adherence to the Storm Water Management Plan as compiled by an | Yes, WUL | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | accredited engineer is crucial. In compliance with the GN 704 Regulations, Corobrik will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. Corobrik will ensure that all storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event. New storm water channels will be implemented to limit the amount of drainage within the current storm water channels. | | |
| Surface water: Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | | Construction; Operational; Decommissioning | | • The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.<br>• Surface water quality monitoring should continue in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented | | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| Surface water: Deterioration in surface water quality | | Construction; Operational | | Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised to minimise construction of new access roads, hence potential for erosion; If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances during site clearing; Dust suppression on the haul roads and cleared areas must regularly be undertaken; and An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during construction, operational, and decommissioning of the project. The water balance for the project will be refined on an ongoing basis during the life of the project. Flow meters will be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an ongoing basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account.<br>• All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills;<br>• Vehicles should regularly be maintained as per the developed maintenance program. | | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | This should also be inspected on a daily basis before use to ensure there are no leakages underneath;<br>• Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste;<br>• The storm water management to ensure separation of clean and dirty and water runoff, the surface water channels are to be constructed on the upstream boundary of the operation which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the operational. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.<br>• The fuel, lubricant and other hazardous storage facilities must be located on a hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances.<br>• An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for reference to anytime in terms of handling, storage and disposal of materials.<br>• Surface water quality monitoring should | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | continue in order to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented<br>• Regular maintenance and inspection of water infrastructure, specifically storm water channels, oil traps and silt traps. | | |
| During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution | | Decommissioning | | • Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages;<br>• The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures;<br>• Ensure that the infrastructure (pipelines, fuel storage areas) are first emptied of all residual material before decommissioning; and<br>• Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site. | | Annual |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| sources have been removed and natural revegetation of the area may commence. | | | | | | |
| Lowering of groundwater levels | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | As above | Do not exceed the licensed water uses as per WUL. The WUL may need to be amended to ensure all the water uses and quantities used in the new increased production remains accurate and managed. | Yes, WUL | Bi-annually, unless WUL states Quarterly |
| Groundwater: Deterioration of water quality | | Operational; Decommissioning ; Closure | 14 Ha | Identify and where possible, maximise areas of the quarry that will result in clean storm water runoff (for example open veld areas) as well as infrastructure associated with the quarry (for example office areas) and ensure that runoff from these areas is routed directly to natural watercourses and not contained or contaminated.<br>• Ensure that clean storm water is only contained if the volume of the runoff poses a risk, if the water cannot be discharged to watercourses by gravitation, for attenuation purposes, or when the clean area is small and located within a large dirty area. This contained clean water should then be released into natural watercourses under controlled conditions.<br>• Ensure the minimisation of contaminated areas, reuse of dirty water wherever possible and planning to ensure that clean areas are not lost to the catchment unnecessarily. | Yes, WUL | Bi-annually, unless WUL states Quarterly |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | • Ensure that seepage losses from storage facilities (such as settlement dam) are minimised and overflows are prevented.<br>• Ensure that all possible sources of dirty water have been identified and that appropriate collection and containment systems have been implemented and that these do not result in further unnecessary water quality deterioration.<br>• Ensure that less polluted water or that: moderately polluted water is not further polluted.<br>Where possible less and more polluted water should be separated. This will assist in the reuse water strategy and improve possibilities for reuse based on different water quality requirements by different quarry water uses.<br>• Where contaminants are transported along construction roads, emergency containment and mitigation measures must be developed to minimize impacts should accidental spillages occur along the transport routes.<br>• Store all potential sources of contamination in secure facilities with appropriate Storm Water management systems in place to ensure that contaminants are not released to the water resource through Storm Water runoff.<br>• Separate and collect all storm water that has a quality potentially poorer than the water quality specified and negotiated for the specific catchment into dirty water storage facilities for reuse within the quarry | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | operations.<br>• Ensure that all storm water structures that are designed to keep dirty and clean water separate can accommodate a defined precipitation event. (The magnitude of the precipitation event used in such an objective statement must, as a minimum, adhere to the relevant legal requirements).<br>• Route all clean storm water directly to natural watercourses without increasing the risk of a negative impact on safety and infrastructure, e.g. loss of life or damage to property due to an increase in the peak runoff flow. Ensure that the maximum volume of clean water runoff is diverted directly to watercourses and the minimum amount of storm water reports to the pit floor of the quarry.<br>• Develop and implement proper environmental management and auditing systems to ensure that pollution prevention and impact minimisation plans and measures developed in the design and feasibility stages are fully implemented.<br>• The size of unrehabilitated areas (pit, spoils, unvegetated areas) that produce contaminated runoff should be minimised.<br>• Rehabilitation should be planned to promote free drainage and to minimise or eliminate ponding of storm water. On-going rehabilitation as mining operations progress is required.<br>• The clean and dirty water flow areas on a quarry should be identified. | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | • Every effort should be made to maximise the clean area and minimise the dirty area when locating the diversion berms, channels and dams.<br>• The quarry planning should consider concurrent rehabilitation of quarry workings and waste management facilities, to maximise the areas of clean runoff that can be discharged to the natural watercourses<br>• The capacity to rapidly pump water out of the pit into storage dams should be maintained. This will assist in minimising water quality deterioration due to long-term retention of storm water in contact with materials that may cause water quality deterioration.<br>• Berms should be constructed around the quarry pit to minimise the flow of any surface water or floodwater into mine workings. These berms should be constructed to allow free drainage away from the pits.<br>• Water quantity and quality data should be collected on a regular, ongoing basis during quarry operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. See the Monitoring Network section.<br>• If excessive groundwater recharge and rainfall is encountered other than the | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | predicted volumes the water could be managed as follows:<br>-Manage in-pit seepage and rainfall through a collection and storage system. Water stored in pit should be utilised locally for dust suppression, as far as possible. Excess pit water should be pumped to surface to be incorporated into the mine water balance,<br>- Maximise the abstraction and discharge of clean groundwater ahead of the pit development, through installation of dewatering boreholes surrounding the pit.<br><br>The following measures should be implemented during rehabilitation and closure<br>• After cessation of mining, there will be no material available for the backfilling of the pit.<br>Therefore, the quarry pit should be managed as a pit lake. Depending on the water quality of the flooded pit, it could potentially be used as a water supply. However, if insufficient water of an acceptable quality can be extracted from the abandoned pit, caving of the pitwalls can be considered to ensure that steep and unsafe pit walls are eliminated. This will ensure a more gradual depression in the landscape. Acid rock drainage and water quality degradation are not expected post mining. | | |
| Dust fall: Individual AQSRs occur | All new activities (as above) | Construction; Operational; | 14 Ha | • Construction: Dispersion modelling was regarded not representative of the actual activities that will result in dust emissions | Yes, Air Emissions License | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | | Decommissioning ; Closure | | during the construction phase. It is not anticipated that the various construction activities would result in higher off-site average daily dustfall rates than the operational activities. The temporary nature of the construction activities would likely reduce the significance of the potential impacts. Decommissioning is likely to be similar or less than the construction impacts.<br>• Operational Phase: The proposed operations related activities were found to result in dustfall rates below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$-day. The simulated future (current and proposed) operations' dustfall rates are below the NDCR limit for non-residential and residential areas and 400 mg/m$^2$day. The cumulative (proposed and measured) dustfall rates are not likely to exceed the NDCR limits and 400 mg/m$^2$-day off-site or at any AQSRs. Land clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum.<br>Road construction activities such as road grading:<br>• Water sprays at area to be graded – 50% | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | CE.<br>• Freshly graded areas to be kept to a minimum. Wind erosion from exposed areas:<br>• Ensure exposed areas remain moist during dry, windy periods through regular water spraying. | | |
| Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | Land clearing activities such as bulldozing and scraping of roads:<br>• Water sprays at area to be cleared – 50% control efficiency (CE) can be achieved.<br>• Moist topsoil will reduce the potential for dust generation when tipped onto stockpiles – US EPA indicated a 62% reduction in dust generation by doubling the moisture content.<br>For operational phase: Mining, handling, transport and storage of clay:<br>•Recommended additional mitigation measures of more regular application of water; and inspection and maintenance programs, including regular spill clean-up.<br>• Ensure travel distance between clearing area and topsoil piles to be at a minimum.<br>Road construction activities such as road grading:<br>-Water sprays at area to be graded – 50% CE.<br>• Freshly graded areas to be kept to a minimum.<br>Wind erosion from exposed areas:<br>• Ensure exposed areas remain moist through regular water spraying during dry, windy periods. | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.<br>• To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.<br>• In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds.<br>• Speed limits need to be observed and adhered to.<br>• Management should fit roads with speed humps to ensure adherence.<br>• Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.<br>• The drop heights should be minimised when depositing materials to the ground.<br>• Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily. | | |
| Disturbing noise (day) | All new activities (as above) | Construction; Operational; Decommissioning | 14 Ha | Communication between the receptors and the developer need to be implemented and maintained. | N/A | Continuous |
| Disturbing noise (night) | | | | The developer should consider co-ordinate the working time with periods when the receptors are likely not at home. An example would be to work within the 8 am to 2 pm time-slot to minimise the significance of the impact. This will ensure that potentially | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | receptors are most likely at school or at work, minimizing the probability of an impact happening; and normal and other daily activities will generate other noises that would most likely mask construction noises, minimizing the probability of an impact happening. | | |
| Disturbance of heritage sites | All new activities (as above) | Construction; Operational | 14 Ha | No impact on the identified heritage resource sites is expected, but the requirements apply in the event that the project layout changes in a way that will affect these sites or in the event that additional sites are discovered. | Yes, SAHRA | Continuous |
| Negative visual impact | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | In considering measures to effect mitigation, there are three rules to consider. Mitigation measures will be: economically feasible; effective (time allowed for implementation and provision for management/maintenance); visually acceptable (within the context of the existing landscape). To address these measures the following principles will be implemented:<br>Mitigation should be planned to fit into the existing landscape character. They should respect and build upon landscape distinctiveness.<br>Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility. It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.<br>Site preparation (The minimum amount of existing vegetation and topsoil will be | Yes | Continuous |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | removed from construction areas. Ensure, wherever possible, all existing natural vegetation is retained and incorporated into the site design. Eradication of vegetation should be done in 'natural manner', avoiding harsh straight lines. Dust suppression measures should be in place at all times.) Buildings and structures (Structures that are required to be built from steel or concrete will be painted a dark natural tone fitting with the surrounding environment. Olive greens and tans should be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Roofs of tall structures should be painted a 'dirty' grey. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided. To reduce the amount of glare, external surfaces of buildings and other structures will be articulated or textured to increase the interplay of light and shade. Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security flood lighting and operational lighting will only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas, wherever possible lights will be directed downwards so as to avoid illuminating the sky.) | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| | | | | Landscaping (Natural vegetation should be retained wherever possible and any removal of vegetation should be conducted carefully to limit the visual lines of site to the project. An ecological approach to rehabilitation and vegetative screening measures, as opposed a horticultural approach to landscaping will be adopted. For example, communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A Vegetation berm to fence the view from the road towards the brickyard may be considered if economically feasible. | | |
| Positive Socio-economic impacts | All new activities (as above) | Construction; Operational; Decommissioning ; Closure | 14 Ha | Non-core activities will be identified and prioritised for local service providers. Local service providers will be identified and requested to tender for the provision of the various services. | Integrated Development Plan of Westrand Municipality | Continuous |
| Negative impact from closure | | Decommissioning ; Closure | | Adequate communication with the surrounding communities during all phases of the development to ensure that an open policy regarding timelines is enforced during all stages of the development.<br>A clear policy will be developed that is transparent and well-advertised to local communities;<br>The policy will be clear on the skills and qualifications necessary for employment. | | |

| POTENTIAL IMPACT | ACTIVITY | PHASE | Size and Scale | Management and Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|---|
| Negative cumulative impacts | | Construction; Operational; Decommissioning ; Closure | | In regard to the protection of private property and quality of life:<br>Discussions will be held with the South African Police Force regarding the policing of the area.<br>A forum will be established whereby the mine and surrounding land users communicate on a regular basis to ensure that the mine is in a position to attend to any concerns of farmers promptly.<br>A joint strategy will be developed with local authorities, the local police force and local landowners to deal with crime. In regard to recruitment: | | |

# 27 IMPACT MANAGEMENT OUTCOMES

**Table 27-1: Impact Management Outcomes**

*(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph;*

| Aspects Affected | Potential Impact | Phase | Mitigation Type | Standard To Be Achieved |
|---|---|---|---|---|
| | *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.* | *In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)* | *(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc.) E.g. Modify through alternative method. Control through noise control, Control through management and monitoring through rehabilitation* | *(Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives) etc.* |
| Geology | Impact on Geology of area | Construction; Operational; Decommissioning | None | N/A, NEMA (avoid harm to environment) |
| Topography | Hazardous excavations | Construction; Operational; Decommissioning | Management; Rehabilitation | Health and Safety Regulations |
| Soils | Loss of soil resource | Construction; Operational; Decommissioning | Management, Rehabilitation | N/A, NEMA (avoid harm to environment) |
| | Erosion | Construction; Operational; Decommissioning; Closure | Management, Rehabilitation | |
| | Soil contamination | Construction; Operational; Decommissioning | Remedy through rehabilitation, infrastructure design and Management | |
| Land Capability | Loss of grazing land | Construction; Operational; Decommissioning; Closure | Remedy through rehabilitation and management. | N/A, NEMA (avoid harm to environment) |
| Land Use | Land use alterations | Construction; Operational | Control through management and communication<br>Control through management and monitoring | N/A, NEMA (avoid harm to environment) |
| | Road disturbance and Project traffic increase due to production increase | Construction; Operational; Decommissioning | Modify through management | |
| Natural Vegetation | Loss of Biodiversity and Ecological function | Construction; Operational; Decommissioning | Management, infrastructure design | NEMBA |

| Aspects Affected | Potential Impact | Phase | Mitigation Type | Standard To Be Achieved |
|---|---|---|---|---|
| Animal Life | Loss of Biodiversity and Ecological function | Construction; Operational; Decommissioning | Protection, Management; Rehabilitation | NEMBA |
| Surface water | Alteration of drainage patterns | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, rehabilitation | WUL, GN 704, Waste Management (IWWMP) |
| | Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | Construction; Operational; Decommissioning | Infrastructure design, Management, Monitoring, rehabilitation | |
| | Deterioration in surface water quality | Construction | Infrastructure design; Management; Licencing | |
| | Deterioration in surface water quality | Operational | Infrastructure design; Management; Licencing | |
| | During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | Operational | Infrastructure design; Management; Licencing | |
| Groundwater | Lowering of groundwater levels | Construction; Operational; Decommissioning; Closure | As above | WUL |
| | Deterioration of water quality | Operational | Infrastructure designs; Management; Monitoring | |
| | Deterioration of water quality | Decommissioning; Closure | As above | |

| Aspects Affected | Potential Impact | Phase | Mitigation Type | Standard To Be Achieved |
|---|---|---|---|---|
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | Construction; Operation, Decommissioning | Infrastructure design; Management | Air Emissions License and Air Quality Regulations |
| | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | Construction, Operation and Decommissioning | Infrastructure design; Management | |
| | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | Construction, Operational, Decommissioning | Infrastructure design; Management | |
| Noise | Disturbing noise (Day) | Construction, Decommissioning | Infrastructure design; Management; Monitoring; Maintenance | N/A, NEMA (Right to non-harmful environment) |
| | Disturbing noise (Night) | Operational | Infrastructure design; Management; Monitoring; Maintenance | |
| Sites of archaeological and cultural interests | Disturbance of heritage sites | Construction; Operational | Management; Conservation; Permitting | SAHRA |
| Visual aspects | Negative visual impact | Construction; Operational; Decommissioning; Closure | Infrastructure design; Management; Rehabilitation | N/A, NEMA (Right to non-harmful environment) |
| Socio-Economic | Positive Socio-economic impacts | Construction; Operational; Decommissioning; Closure | Management; Consultation | Integrated Development Plan of |

| Aspects Affected | Potential Impact | Phase | Mitigation Type | Standard To Be Achieved |
|---|---|---|---|---|
| | Negative impact from closure | Decommissioning; Closure | Management; Communication; Strategy implementation | the Westrand Municipality |
| | Negative cumulative impacts | Construction; Operational; Decommissioning; Closure | Management; Communication; Strategy implementation | |

## 27.1 Impact Management Actions

*(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).*

**Table 27-2: Impact Management Actions**

| **Potential Impact** | **Activity** | **Mitigation Type** | **Compliance with Standards** | **Time Period for Implementation** |
|---|---|---|---|---|
| *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc…. etc…)* | | *(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control* | *(A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities* | *Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore stat e either:-..Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.* |
| Impact on Geology of area | Geology | None | N/A | N/A |
| Hazardous excavations | Topography | Management; Rehabilitation | Health and Safety Requirements | Continuous |
| Loss of soil resource | Soils | Remedy through rehabilitation, infrastructure design and Management | N/A | Continuous; and As needed |
| Erosion | | | | |
| Soil contamination | | | | |
| Loss of grazing land | Land Capability | Remedy through rehabilitation and management. | N/A | Continuous |
| Land use alterations | Land Use | Control through management, monitoring and communication | N/A | Continuous |
| Road disturbance and Project traffic increase due to production increase | | Modify through management, adherence to speed limits on site | | Already implemented |
| Loss of Biodiversity and Ecological function | Natural Vegetation | Management, infrastructure design | N/A | Immediately, before construction of expansion infrastructure begins. Alien and Invasive Management is Continuous |

| Potential Impact | Activity | Mitigation Type | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|
| | | Preventative measures and Alien Invasive Management Plan Drafting | N/A | Continuous |
| Loss of Biodiversity and Ecological function | Animal Life | Protection, Management; Rehabilitation | N/A | Continuous |
| Alteration of drainage patterns | Surface water | Infrastructure design, Management, Monitoring, rehabilitation. Appropriate Licensing | Yes, WUL | Continuous;<br>Quarterly monitoring; and<br>Annual reporting |
| Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | | | | |
| Deterioration in surface water quality | | | | |
| Deterioration in surface water quality | | | | |
| During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to | | | | |

| Potential Impact | Activity | Mitigation Type | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|
| siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | | | | |
| Lowering of groundwater levels | Groundwater | Infrastructure design; Management; Licencing | Yes, WUL | Bi-annually, unless WUL states Quarterly |
| Deterioration of water quality | | Infrastructure designs; Management; Monitoring | | Bi-annually, unless WUL states Quarterly |
| Deterioration of water quality | | As above | | Bi-annually, unless WUL states Quarterly |
| Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant | Air Quality | Infrastructure design; Management and thereby Prevention | Yes, Air Emissions License | Continuous |

| Potential Impact | Activity | Mitigation Type | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|
| winds. | | | | |
| Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | | | | |
| The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | | | | |
| Disturbing noise (Day) | Noise | Infrastructure design; Management; Monitoring; Maintenance | N/A | Continuous |
| Disturbing noise (Night) | | Infrastructure design; Management; Monitoring; Maintenance | | Continuous |
| Disturbance of heritage sites | Sites of archaeological and cultural interests | Management; Conservation; Permitting | Yes, SAHRA | Continuous |
| Negative visual impact | Visual aspects | Infrastructure design; Management; Rehabilitation | N/A | Continuous |
| Positive Socio-economic impacts | Socio-Economic | Management; Consultation | | Continuous |

| Potential Impact | Activity | Mitigation Type | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|
| Negative impact from closure | | Management; Communication; Strategy implementation | Integrated Development Plan of Westrand Municipality | |
| Negative cumulative impacts | | Management; Communication; Strategy implementation | | |

# 28 FINANCIAL PROVISION

## 28.1 Determination of the amount of Financial Provision

Please refer to Section 19.

### 28.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation

The closure objectives are outlined in Section 23.1 (Part B) and were determined to be the best environmental option taking into consideration the fact that the trenches are already existing.

### 28.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

Yes, this will be done as part of the public participation process when this report is made available for comment. Comments from the public are incorporated within this report.

### 28.1.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

At this stage, no formal rehabilitation plan is available, but rehabilitation will be of the following infrastructure:

| | |
|---|---|
| **New footprint and all associated activities that fall within** | 14 Ha |

### 28.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The rehabilitation plan, once finalised will be compatible with the closure objectives as it is the applicant's responsibility to restore the site to its original condition as far as possible and to make sure that the environment is left in the desired state as before the infrastructure was installed/implemented.

### 28.1.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

Please refer to Section 28 for preliminary financial provisioning calculated for the applicant.

### 28.1.6 Confirm that the financial provision will be provided as determined.

The financial provision will be provided by Corobrik (Pty) Ltd: Driefontein.

# 29 MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

Including:
*g) Monitoring of Impact Management Actions*
*h) Monitoring and reporting frequency*
*i) Responsible persons*
*j) Time period for implementing impact management action*
*k) Mechanism for monitoring compliance*
*The supporting impact assessment conducted by the EAP must be attached as an appendix, marked Appendix*

**Table 27-3: Mechanism for Monitoring Compliance and Reporting**

| Aspects Affected | Potential Impact | Impacts requiring monitoring programmes | Functional requirements for monitoring | Roles and responsibilities | Monitoring and reporting frequency | Time period for implementation impact management options |
|---|---|---|---|---|---|---|
| Geology | Impact on Geology of area | Yes | Impacts to Geology does not form part of these activities applied for. Geology impacts may result due to the Clay mining on Corobrik, but is not related to the Brickyard or the Kilns (expansion) | Mine Manager | As per current EMP/Mining right conditions | Continuous |
| Topography | Hazardous excavations | Yes | Confirm berms in place / fencing in place. Identify areas to be rehabilitated and rehabilitate. | SHEQ | Quarterly | Continuous |
| Soils | Loss of soil resource | Yes | Confirm vegetation establishment; Confirm that soil is conserved and removed before construction to preserve topsoil. | SHEQ | Annually | Continuous |
| | Erosion | Yes | Confirm vegetation establishment; Conduct inspections to determine | SHEQ | Annually | Continuous |

| Aspects Affected | Potential Impact | Impacts requiring monitoring programmes | Functional requirements for monitoring | Roles and responsibilities | Monitoring and reporting frequency | Time period for implementation impact management options |
|---|---|---|---|---|---|---|
| | | | sites prone to erosion. Implement management measures to reduce potential for erosion. | | | |
| | Soil contamination | Yes | Ensure availability of adequate sanitary facilities to cater for construction workers; Confirm areas, storage and equipment are constructed correctly and maintained. Set up service plan and record services of vehicles. Confirm areas are constructed correctly and maintained. Confirm clean up done correctly, soil disposed of correctly and inspect rehabilitated area. | SHEQ, Contractors, Workshop Manager | Throughout construction | Continuous, Annual reporting |
| Land Capability | Loss of grazing land | Yes | Demarcate areas and Design appropriately | ECO / Contractor/ Civil Engineer | As needed | Continuous |
| Land Use | Land use alterations | N/A | Landscape management | SHEQ | Annually | Continuous |
| | Road disturbance and Project traffic increase due to production increase | N/A | Ensure speed limit signage are maintained | SHEQ | Annually | Continuous |
| Natural Vegetation | Loss of Biodiversity and Ecological function | Yes | Demarcate area | ECO / Contractor | As needed | Continuous |
| | | Yes | Biodiversity monitoring | ECO / Contractor | As per current EMP/Mining right conditions | During Construction; Continuous |

| Aspects Affected | Potential Impact | Impacts requiring monitoring programmes | Functional requirements for monitoring | Roles and responsibilities | Monitoring and reporting frequency | Time period for implementation impact management options |
|---|---|---|---|---|---|---|
| Animal Life | Loss of Biodiversity and Ecological function | Yes | Biodiversity monitoring | ECO / Contractor | As per current EMP/Mining right conditions | During Construction; Continuous |
| Surface water | Alteration of drainage patterns | Yes, per WUL | NWA / WUL / IWWMP | SHEQ | As per WUL conditions | Continuous |
| | Water run-off as well as seepage from these sites are slightly contaminated with alleviated levels of suspended solids (SS) and must be managed. Same issues as identified above | | N/A | SHEQ | N/A | Continuous |
| | Deterioration in surface water quality | | WUL monitoring related to surface water and groundwater samples (Water quality) | SHEQ, Contractor | As per WUL; and Continuous | Continuous, Water Balance Annually |
| | Deterioration in surface water quantity | | Measure and record water meter readings. Update water balance | Metallurgical engineers, water controllers, SHEQ | | Continuous |
| | During the decommissioning activities, there could still be impacts to the surface water environment. Exposed surfaces will be prone to erosion, leading to siltation of surface water resources. However, the complete removal of infrastructure will have a positive impact on the | Yes | As per WUL | SHEQ | Annually unless otherwise specified in WUL | Continuous |

| Aspects Affected | Potential Impact | Impacts requiring monitoring programmes | Functional requirements for monitoring | Roles and responsibilities | Monitoring and reporting frequency | Time period for implementation impact management options |
|---|---|---|---|---|---|---|
| | surrounding natural water resources as these pollution sources have been removed and natural revegetation of the area may commence. | | | | | |
| Groundwater | Lowering of groundwater levels | Yes | Monitor boreholes for quality and water levels, as per WUL | SHEQ | Bi-annually, unless WUL states Quarterly | Continuous |
| | Deterioration of water quality | | | | | |
| | Deterioration of water quality | | | | | |
| Air Quality | Dust fall: Individual AQSRs occur within 5 km of the proposed construction operations. Areas to the south-south-west of the project site are more likely to be affected, especially in the short-term, due to the predominant winds. | Yes | Conduct air quality monitoring. | SHEQ | Monthly Air monitoring, Annual Reporting | Continuous |
| | Cumulatively there is likely to be a negative impact as a result of the increase in ambient concentrations of criteria air pollutant ($NO_2$, $SO_2$, $PM_{10}$ and $PM_{2.5}$) as a result of the current operations and construction related activities. | | | | | |
| | The project is likely to have a negative impact by increasing ambient concentrations of criteria air pollutants (HF, $NO_2$, $SO_2$ and PM). | | | | | |
| Noise | Disturbing noise (day) | Yes | Conduct noise monitoring | SHEQ | As per current | Continuous |
| | Disturbing noise (night) | | | | | |

| Aspects Affected | Potential Impact | Impacts requiring monitoring programmes | Functional requirements for monitoring | Roles and responsibilities | Monitoring and reporting frequency | Time period for implementation impact management options |
|---|---|---|---|---|---|---|
| | | | | | EMP/Mining right conditions | |
| Sites of archaeological and cultural interests | Disturbance of heritage sites | Yes | Record occurrences of sites and artefacts if found | SHEQ | As needed | Continuous |
| Visual aspects | Negative visual impact | Yes | SHEQ. Mine Manager | SHEQ | Annually | Continuous |
| Socio-Economic | Positive Socio-economic impacts | Yes | Keep records of service providers and where they are from | Procurement | Annually | Continuous |
| | Negative impact from closure | | Compliance with programme principles / vision | Human Resources | Annually | Continuous |
| | Negative cumulative impacts | | Ensure regular communication and good relationship with SAPS of the region | Human Resources | Annually | Continuous |

### 29.1.1 Functional requirements for monitoring programmes

Please refer to Table 27-1 and Table 27-2 for monitoring information prescribed to the operation.

#### *29.1.1.1 Surface water Monitoring*

The nearest watercourse to the project site is situated approximately 2.5 km away and the Wonderfonteinspruit is more than 5 km from the site. It is not anticipated that the operations will have a significant impact on surface water resources as long as the recommended mitigation measures are implemented.

Corobrik Driefontein has an ongoing surface water monitoring programme for the three quarries which are currently used for the retention of storm water generated on site as well as the effluent from the existing waste water treatment plant. The existing monitoring programme with the inclusion of monitoring of any polluted water containment structures and effluent is deemed sufficient for the monitoring and management of any potential impacts to the surface water environment that may arise from the proposed project.

Surface water quality should be monitored on a quarterly basis at the sampling points described in the table below. Variables to be analysed to determine surface water quality are those currently being analysed as part of the monitoring programme on Corobrik.

**Table 27-4: Surface water sampling points**

| No | Sampling point name | Location |
|---|---|---|
| 1 | Treatment plant effluent | S 26°21’00.79’’, E 27°31’52.75’’ |
| 2 | Quarry B | S 26º21’15.62’’, E 27º31’38.54’’ |
| 3 | Quarry C | S 26º21’24.36’’, E 27º31’58.69’’ |
| 4 | Quarry D | S 26º21’29.31’’, E 27º32’25.01’’ |

#### *29.1.1.2 Groundwater Monitoring*

##### *29.1.1.2.1 Groundwater Monitoring Network*

A groundwater monitoring system has to adhere to the criteria mentioned below. As a result the system should be developed accordingly. The objectives of water quality monitoring are:

- To enable the Permit Holder to comply with the relevant Permit conditions and legislation.
- To indicate any escape of leachate into the water environment.
- To serve as an early warning system, so that any pollution problems that arise can be identified and rectified.
- To quantify any effect that the quarry has on the water regime.

##### *29.1.1.2.2 Source, plume, impact and background monitoring*

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped classification according to the following purposes:

- Source monitoring: Monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry.
- Plume monitoring: Monitoring boreholes are placed in the primary groundwater plume’s
- migration path to evaluate the migration rates and chemical changes along the pathway.
- Impact monitoring: Monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern.

- Background monitoring: Background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry.

#### *29.1.1.2.3 System Response Monitoring Network*

Groundwater levels: Static water levels are used to determine the flow direction and hydraulic gradient within an aquifer. Where possible all of the above-mentioned borehole's water levels need to be recorded during each monitoring event.

#### *29.1.1.2.4 Monitoring Frequency*

In the operational phase and closure phase, bi-annual abbreviated analyses monitoring of groundwater quality and groundwater levels is recommended, as listed below. Quality monitoring should take place before after and during the wet season, i.e. during September and March. It is important to note that a groundwater-monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

Since a quarry can continue to pollute the ground and surface water regime long after the site has been closed, post-closure water quality monitoring must be ongoing or the site has been proven to have limited risk in the long term.

#### *29.1.1.2.5 Monitoring Parameters*

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sample position. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH is lowered.

#### *29.1.1.2.6 Analysis (pollution indicators)*

Physical Parameters:

- Groundwater levels.

Suggested Parameters for Background and Investigative Monitoring:

- Field measurements:
  - pH, EC, TDS.
- Laboratory analyses:
  - Ca, Mg, Na, K, $NO_3$, $SO_4$, Cl, $HCO_3$, Fe, Mn, Al; and
  - oHydrocarbon compounds by GC-MS.

Suggested Parameters for Detection Monitoring:

- Field measurements:
  - pH, EC, TDS.
- Laboratory analyses:
  - Ca, Mg, Na, K, $NO_3$, $SO_4$, Cl, $HCO_3$, Fe, Mn, Al; and
  - Hydrocarbon compounds by GC-MS.

#### *29.1.1.3 Ecology Monitoring*

Monitoring of the flora should be done on a continual basis to assess whether there are any concerns regarding the flora and to assess whether the rehabilitation is successful. Monitoring of the flora should start as soon as the construction phase of the development commences. Monitoring should be undertaken annually.

The monitoring of biodiversity should include the following:

- Seasonal visual assessment of areas to determine if vegetation in undisturbed areas is being impacted.
- A biodiversity baseline assessment should be conducted. Once this data is available, annual biodiversity monitoring of areas both affected and unaffected by activities should be initiated to determine the annual fluctuation in species numbers and, if necessary, relate this to activities on site.
- Continue with alien invasive monitoring, eradication and control programme.
- Implement an Observe and Report approach which will enable employees to report any disturbance of fauna or degradation that they encounter during the operational phase.

#### *29.1.1.4 Air quality Monitoring*

##### *29.1.1.4.1 Source Monitoring*

It is compulsory to measure and report annually on emissions from the kiln/dryer stacks associated with the current and proposed operations. It should, however, be noted that on-site dustfall monitoring can be an effective mechanism in determining the main emission sources. It is recommended that exhaust emissions testing be done on all mobile diesel combustion sources as part of equipment maintenance schedules.

##### *29.1.1.4.2 Ambient Air Quality Monitoring*

Ambient air quality monitoring can serve to meet various objectives, such as:

- compliance monitoring;
- validate dispersion model results;
- use as input for health risk assessment;
- assist in source apportionment;
- temporal trend analysis;
- spatial trend analysis;
- source quantification; and,
- tracking progress made by control measures.

It is recommended that, as a minimum continuous dust fallout sampling be conducted as part of the project's air quality management plan. Current sampling locations are sufficient. The following methods for sampling are recommended:

- For dustfall, the NDCR specifies that the method to be used for measuring dustfall rates and the guideline for locating sampling points shall be ASTM D1739 (1970), or equivalent method approved by any internationally recognized body.

##### *29.1.1.4.3 Dustfall Sampling*

The ASTM method covers the procedure of collection of dustfall and its measurement and employs a simple device consisting of a cylindrical container (not less than 150 mm in diameter) exposed for one calendar month (30 ±2 days). Even though the method provides for a dry bucket, de-ionised (distilled) water can be added to ensure the dust remains trapped in the bucket. The bucket stand includes wind

shield at the level of the rim of the bucket to provide an aerodynamic shield. The bucket holder is connected to a 2 m galvanized steel pole, which is either planted and cemented or directly attached to a fence post. This allows for a variety of placement options for the fallout samplers. Two buckets are usually provided for each dust bucket stand. Thus, after the first month, the buckets get exchanged with the second set.

Collected samples are sent to an accredited laboratory for gravimetric analysis. At the laboratory, each sample will be rinsed with clean water to remove residue from the sides, and the contents filtered through a coarse (>1 mm) filter to remove insects and other course organic detritus. The sample is then filtered through a pre-weighed paper filter to remove the insoluble fraction. This residue and filter are dried, and gravimetrically analysed to determine total dustfall.

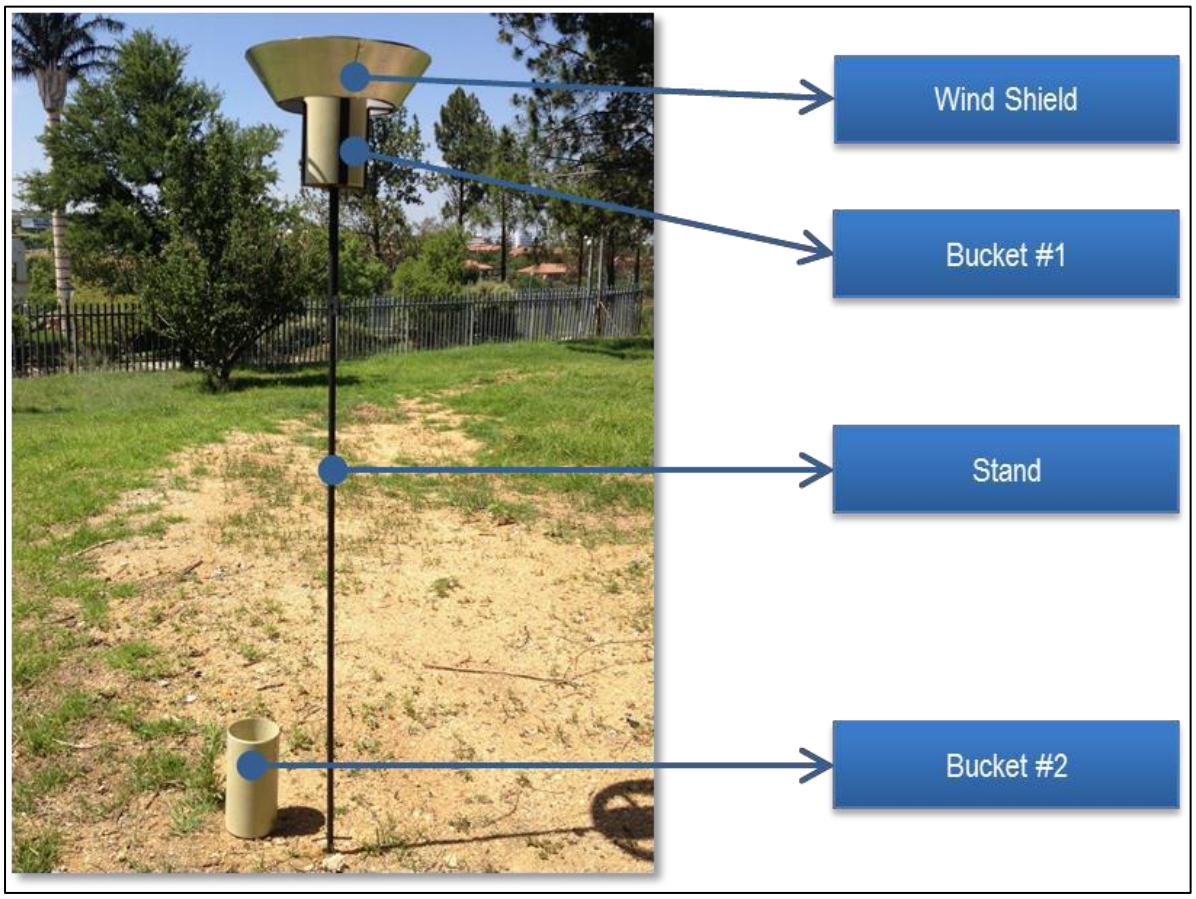


**Figure 27-1: Dustfall collection unit example**

### 29.1.2 Roles and responsibilities for the execution of monitoring programmes

*The contractor will be responsible to ensure that all rehabilitation takes place.*

It remains the responsibility of the developer, which is Corobrik (Pty) Ltd: Driefontein to hire a suitably qualified contractor, SHEQ or ECO to execute the EMP monitoring requirements as specified.

# 30 ENVIRONMENTAL AWARENESS PLAN

## 30.1 Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

The applicant will inform his or her employees of any risk on a daily basis should any such a risk be identified. This will include Health and Safety as well as Environmental Risks.

## 30.2 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Any activity that results in damage or pollution to the environment will be rated and signed a value to determine the risk. An environmental emergency is defined as an unplanned situation or event resulting in potential pollution of the environment. A pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur.

## 30.3 Roles and responsibilities

All employees of Corobrik (Pty) Ltd: Driefontein and its contractors involved in the development section are responsible for reporting any accident/emergency to their supervisor immediately, and if required notifying the emergency response teams. Personnel must be nominated as response team members and must receive appropriate training to manage emergencies. All other personnel must be made aware of potential emergencies and trained in emergency response. Management must be aware of their responsibilities in case of emergency.

## 30.4 Responses to environmental emergencies

### 30.4.1 Emergency Plan

An emergency plan must be developed for each potential environmental emergency situation. The emergency plan must give information on:

- Description of the emergency;
- Reference to relevant material safety data sheets;
- Responsibilities for management of emergencies;
- Contact telephone numbers (on-site & off-site);
- Equipment required (including locations); and
- Site plan where applicable.

### 30.4.2 Classification of Emergencies

The following incidents will be classified as an emergency:

- Natural Disasters;
- Damage to radiological/nuclear sources equipment;
- Strikes, protest or unrest;
- Information Management System Failure (plc systems)
- Health and Disease Outbreaks;
- Serous Incident or Fatality;
- High Potential Risk Incidents (Fatality, serious environmental pollution); and
- Other emergencies.

The most applicable emergency situation as part of this new development may be due to the malfunctioning of the Kilns and related safety or environmental risks.

### 30.4.3 Reporting emergencies

Corobrik (Pty) Ltd: Driefontein and its contractors involved in the new development section will establish

procedures to identify the potential for, and response to, incidents and emergency situations and for preventing and mitigating the illness, injury or environmental hazard that may be associated with them. Corobrik (Pty) Ltd: Driefontein and its contractors involved in the development section will review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations. Corobrik (Pty) Ltd: Driefontein shall also periodically test such procedures where and when practicable.

In the event of a serious incident or fatality occurring it is of the utmost importance to not only ensure the Health and Safety of every person involved but also to ensure that certain evidence is protected and gathered for use Corobrik (Pty) Ltd: Driefontein, with the aim of the prevention of a similar incident/accident occurring in the future.

A "No Blame Fixing" approach to incident investigation will be implemented and it must be stressed that the gathering of information must be seen as preventative action and not as blame fixing.

In light of the above, and in addition to the emergency procedure that is relevant to the specific area where the incident/accident occurred, and in relation to the notifying of person and first aid treatment/safety of any person involved, the following steps must be taken immediately after an incident/accident classified above has occurred.

In the event of a reportable/major environmental incident that could lead to danger to the public or the environment (death or sustaining impact on the environment) the appointee of that specific section, in consultation with SHEQ Manager, is responsible for communicating with and drafting an external report (in terms of Section 30 of National Environmental Management Act, 1998 (Act No. 108 of 1998) and Sections 19 and 20 of the National Water Act, 1998 (Act No. 36 of 1998) to the national and provincial department and the municipality containing the:

- Nature of the incident;
- Substances and quantities and accurate effect on persons and environment;
- Initial measures to minimise impacts;
- Causes of the incident;
- Accordance measures;
- When an environmental incident occurs, the following should be adhered to:
    - Report incident as per Incident Reporting Flow Diagram;
    - Measures to clean up any spillage/pollution must be taken as per Emergency Procedure. It is important to ensure that no secondary pollution is caused by incorrect handling of an environmental incident, e.g. incorrect disposal of absorbent material use to clean up a spill; and
    - For high potential risk incident (HPRI) / reportable environmental incidents, the SHEQ Manager will conduct a closeout investigation prior to closure of the incident. This will be done one month after all actions has been completed to verify the effectiveness of the actions.

| **Formalise policies** | |
|---|---|
| **OBJECTIVES**<br>To formalise and sign off on company policies | |
| **ACTIONS** | **WHEN** |
| Compile Health and safety policy | Before construction and operation starts (if one is not existing or if amendment is required to include new issues related to the proposed new infrastructure) |
| Compile Environmental policy | Before construction and operation starts (or amendment of current environmental policy to include new operations) |

The notification process has six main steps in managing an emergency, from the identification of the situation to final close off. These are as follows:

- Find and identify;
- Ensure human safety;
- Reporting;
- Containment and clean-up;
- Corrective action; and
- Monitoring.

## 30.5 Environmental Emergency Incidents

The SHEQ Manager must, within 14 days of the incident, report information on the incident to enable initial evaluation to the following

- Director-General of DEA;
- Provincial Head of Department; and
- Local Municipality.

The report must include:

- Nature of the incident;
- Substance involved and an estimation of quantity released and their possible acute effects on persons and the environment;
- Initial measures taken to minimise impacts;
- Cause of incident, whether direct or indirect; and
- Measures taken to avoid recurrence of such incident.

### 30.5.1 Water Pollution Emergency Incident

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource.

The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred.

The information with regard to the incident is communicated to the Business Manager, SHEQ Manager and Security Personnel immediately by the superior of the area.

The SHEQ Manager and the General Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DWS (Regional Manager);
- South African Police Services or relevant fire department; and
- The Catchment Management Agency.

The SHEQ Manager and crisis management team must

- Take all reasonable measures to contain and minimise the effects of the incident;
- Undertake clean-up procedures;
- Remedy the effects of the incidents; and
- Sample the water together with the responsible person of the area.

### 30.5.2 Air Pollution Emergency Incidents

- Non-compliance with the air quality registration certificate condition and requirements.

- Record of any non-compliance is kept;
- The non-compliance with the certificate conditions will be reported telephonically, by fax or by e-mail to the Chief Air Pollution Control Officer as soon as possible but not later than 24 hours after violation will start to occur. The particulars of such violation, including details of measure is put in place to prevent it happening in the future, will be included respective or in the weekly or monthly report;
- If the utilization and/or efficiency of air pollution control fail to meet requirements as specified in the certificate then the process is managed under emergency procedures until such time as it will be possible to operate in compliance with the conditions of this certificate; and
- Record is kept of periods of upset and abnormal emissions, e.g. off-gas vented directly to the atmosphere or excess thereof due to the faults or limited capacity of air pollution control equipment or limits for process parameters being exceeded, etc. as per requirements of Annexure II and Chief Air Pollution Control Officer is notified immediately should it occur.

### 30.5.3 Environmental Impact Register

All non-conformances pertaining to safety, health, environmental, quality of project activities and employees shall be documented as identified by BCM according to documented procedures.

Corobrik (Pty) Ltd: Driefontein will make provision for recording and reviewing the nature and extent of any non-conformance that may be encountered during the Project Execution phase.

The Project Steering Committee in conjunction with the identifier shall decide on the impact of poor performance and the actions that would be necessary to prevent further deterioration or occurrence.

### 30.5.4 Records

Records must be kept of all environmental emergencies and non-conformances

## 31 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

*(Among others, confirm that the financial provision will be reviewed annually).*

- The financial provisioning will be revised on a yearly basis;
- The AEL documentation is handed to the municipality as these activities will require an amendment to the Air Emissions License.

## 32 UNDERTAKINGS

The EAP, ……Corlien Lambrechts ……., herewith confirms

a) The correctness of the information provided in the reports;

b) The inclusion of comments and inputs from stakeholders and I&AP's;

c) The inclusion of inputs and recommendations from the specialist reports where relevant; and

d) The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

Signed at.....on this..... day .....

Signature of applicant .....

Designation .....

**COMMITMENT/UNDERTAKING BY THE APPLICANT**

I, ……, the undersigned and duly authorised thereto by Corobrik (Pty) Ltd: Driefontein undertake to adhere to the requirements and to the conditions as set out in the Basic Assessment Report submitted to the Gauteng Department of Agriculture and Rural Development (Gauteng) and approved on.....

.....

Signed at.....on this..... day .....

Signature of applicant .....

Designation .....

END-

# 33 REFERENCES

Airshed Planning Professionals. (2018). Air Quality Specialist Report for the Corobrik (Pty) Ltd Driefontein Facility in West Rand District Municipality, Gauteng.

Bacundi Environmental Solutions. (2017). Financial Liability Report.

Bergh, J. (1999). *Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies.* Pretoria: J.L. van Schaik.

Cachier, H. (1992). Biomass burning sources. In W. Nierenberg, Encyclopedia of Earth System Science (pp. 377-385).

Chief Surveyor General Database. (2018). Document No: 100BTF01. *www.csg.dla.gov.za.*

De Jong, R. (2010). Final Heritage Impact Assessment Report: Proposed New Tailings Storage Facility in the Westonaria Area, Gauteng Province. Unpublished Report of Cultmatrix Heritage on behalf of EnviroServ Waste Management (Pty) Ltd: Reference number: 2008169.

DEAT. (1998). *Environmental Impact Assessment Guidelines.* Pretoria: DEAT.

DEAT. (2002). *Impact Significance, Integrated Environmental Management, Information series 5.* Pretoria: DEAT.

Department of Minerals and Energy. (2005). Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine.

Geo Pollution Technologies - Gauteng (Pty) Ltd. (2018). Groundwater Assessment for Corobrik (Pty) Ltd Driefontein - Expansion.

Held, G., Gore, B., Surridge, A., Tosen, G., Turner, C., & Walmsley, R. (1996). Air Pollution and its impacts on the South.

Huffman, T. (2007). Handbook to the Iron Age: The Archaeology of Pre-colonial Farming Societies in Southern Africa.

Lombard, M. L., Wadley, J., Deacon, S., Wurz, I., Parsons, M., Mohapi, J., . . . Mitchell., P. (2012). South African and Lesotho Stone Age Sequence Updated (I) South African Archaeological Bulletin 67 (195): 120-144; 2012 .

Maenhaut, W., Salma, I., Cafmeyer, J., Annegarn, H., & Andreae, M. (1996). Regional atmospheric aerosol composition and sources in the eastern Transvaal, South Africa, and impact of biomass burning. Journal of Geophysical Research.

Mucina, L., & Rutherford, M. (2006). *The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.* Pretoria: South African National Biodiversity Institute.

Musina, L., & Rutherford, M. (2011). *The Vegetation of South Africa, Lesotho and Swaziland.* Strelitzia.

Onursal, B., & Gautam, S. (1997). Vehicular Air Pollution: Experiences from Seven Latin American Urban Centers, World.

Pelser, A. (2018). Report on a Phase 1 Archaeological impact Assessment for the proposed development of 2 new Kils as part of the Corobrik Driefontein Expansion on Portions 23 & 27 (Portions of Portion 22) of the farm Driefontein 355IQ, Near Carletonville, Gauteng.

Red Kite Environmental Solutions (Pty) Ltd. (2018). Fauna and Flora Assessment for Corobrik (Pty) Ltd: Driefontein New Kilns Project on Portion 23 of the farm Driefontein 355 IQ, Gauteng Province, February 2018.

Red Kite Environmental Solutions (Pty) Ltd. (2018). Surface water assessment for the Corobrik expansion project.

Tiwary, A., & Colls, J. (2010). Air Pollution: Measurement, Modelling and Mitigation.

US EPA. ( 2006a ). AP42, 5th Edition, Volume I, Chapter 13: Miscellaneous Sources, 13.2.5 Introduction to Fugitive Dust.

Van Oudsthoorn, F. (1999). Guide to grasses of southern Africa. 1st Edition. Briza Publications, Pretoria.

# 34 APPENDICES

**Appendix 1: Qualifications and Resume of EAP**

**Appendix 2: Resume of EAP**

**Appendix 3: Summary of impact assessment**

**Appendix 4: Site locality**

**Appendix 4: A3 Maps**

**Appendix 5: Public participation documents**

**Appendix 6: Specialist reports**

**Appendix 7: Acceptance Letter from GDARD**