Air Quality Desktop Report for Phaphama Project

Northern Cape, South Africa

Prepared for:

Kemu Holdings (PTY) LTD

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Report Name	**Air Quality Desktop Report for Phaphama Project**	
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1 Introduction

Mhlaba Hydro and Geotechnical (PTY) LTD (hereafter Mhlaba) has been appointed by Kemu Holdings (Pty) Ltd (hereafter Kemu Holdings) to conduct air quality desktop study report for the proposed Waterkloof iron ore project, "Waterkloof" and in support of the environmental authorisations application processes that are being conducted in accordance with the National Environment Air Quality Act (NEM:AQA) Act No. 39 of 2004 and the Minerals and Petroleum Resources Development Act (MPRDA).

Motjoli Iron Ore Company (Pty) Ltd (Motjoli) acquired the Blackridge prospecting right, NC 30/5/1/2/11434 PR, from Aquila Steel South Africa Pty (Ltd) (Aquila) in 2017. The principal prospecting right (NC 30/5/1/1/2/1023 PR) was renewed and ceded on granting to Motjoli.

The Blackridge prospecting right is located between Griquatown and Groblershoop in South Africa's Northern Cape Province and covers an area of 88 330 hectares. Access is by the Griquatown-Groblershoop main bitumen road and secondary gravel roads south to Prieska and north to Postmasburg. The Blackridge prospecting right is situated approximately 65km south of Kumba Iron Ore's Kolomela Iron Ore Mine.

This document detail only air quality desktop study of the proposed project area.

1.1 Scope of the investigation

Mhlaba Hydro and Geotechnical (PTY) LTD was requested to produce an air quality desktop study report for the proposed Waterkloof iron ore project.

1.2 Location of the study area

The Waterkloof project area forms part of the Blackridge Project and is located on farm Waterkloof 95 within the Siyancuma Local Municipality in the Pixley ka Seme District Municipality, Northern Cape Province in South Africa (Figure 1 1).

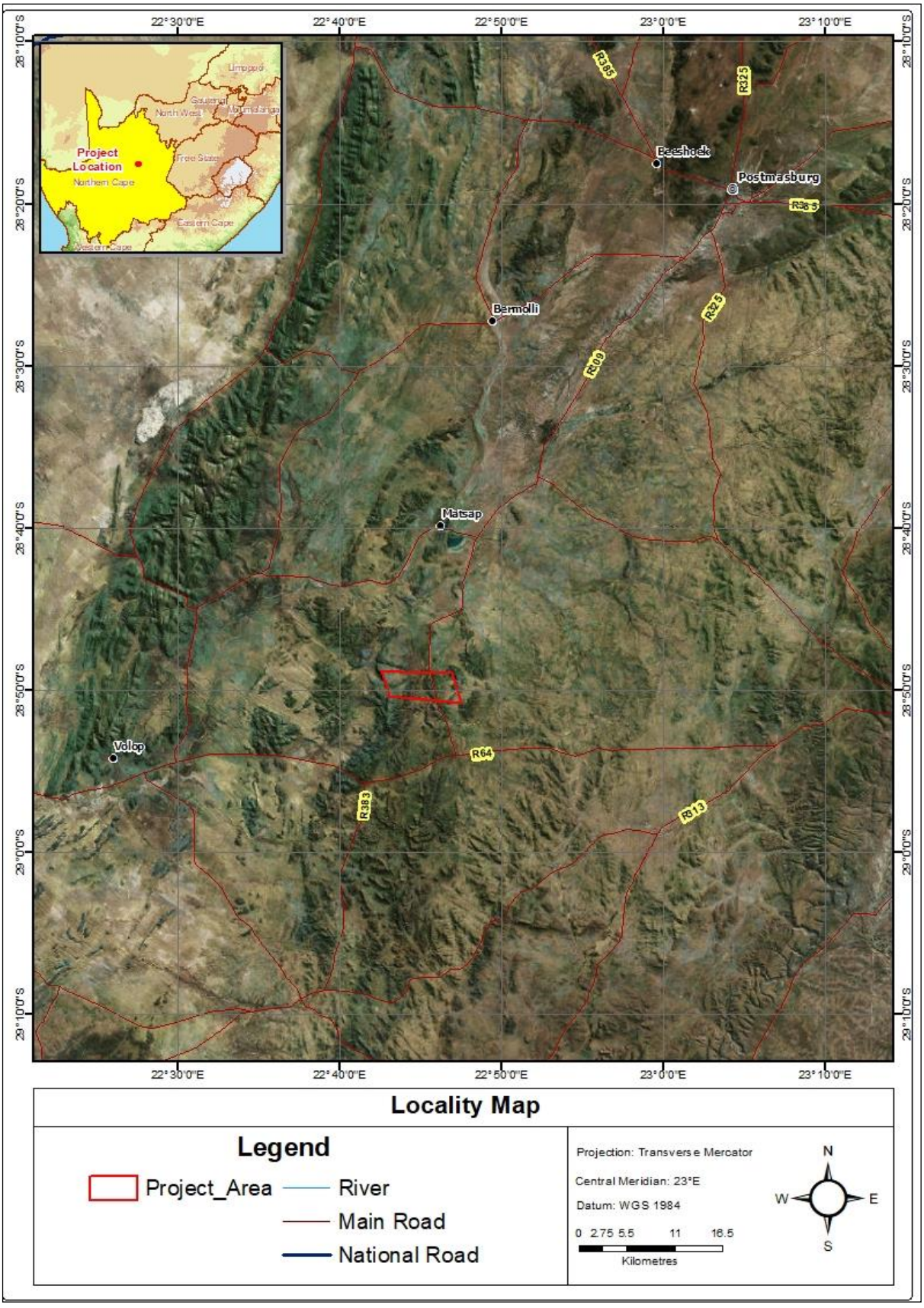

Figure 1-1: Locality of the Project Area

2 Baseline information

2.1 Climate and meteorological overview

In this region of South Africa, ambient air quality is strongly influenced by regional atmospheric movements, together with local climatic and meteorological conditions. The most important of these atmospheric movement routes are the direct transport towards the Indian Ocean and the recirculation over the sub-continents.

In the Northern Cape, the west experiences rainfall in winter, while the east receives most of its moisture from late summer thunderstorms. Rainfall aids in removing pollutants through wet deposition. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. In contrast, winter is characterised by atmospheric stability caused by a persistent high-pressure system over South Africa. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

Precipitation reduces erosion potential by increasing the moisture content of materials. This represents an effective mechanism for removal of atmospheric pollutants and is therefore considered during air pollution studies. Rain-days are defined as days experiencing 0.2 mm or more rainfall.

There are temperature variations throughout the year. These vary greatly within the daily cycle and according to location, vegetation cover, wind reach, and the presence of any large water bodies. The austral winter in southern Africa is characterised by the presence of pronounced atmospheric inversion layer, which, combined with a regional high-pressure system, can trap the pollutants in the lower atmosphere in a large anti-cyclonic vortex covering the interior of southern Africa. This usually results in reduced dispersion and a poorer ambient air quality during the winter period. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

2.1.1 Wind rose

Wind roses generally comprise of 16 spokes which represent the directions from which winds blew during the period. The colours reflect the different categories of wind speeds. Figure 2 shows the wind rose for the Karoo station which is located 250km south east of Waterkloof, the predominant wind direction is south south west.

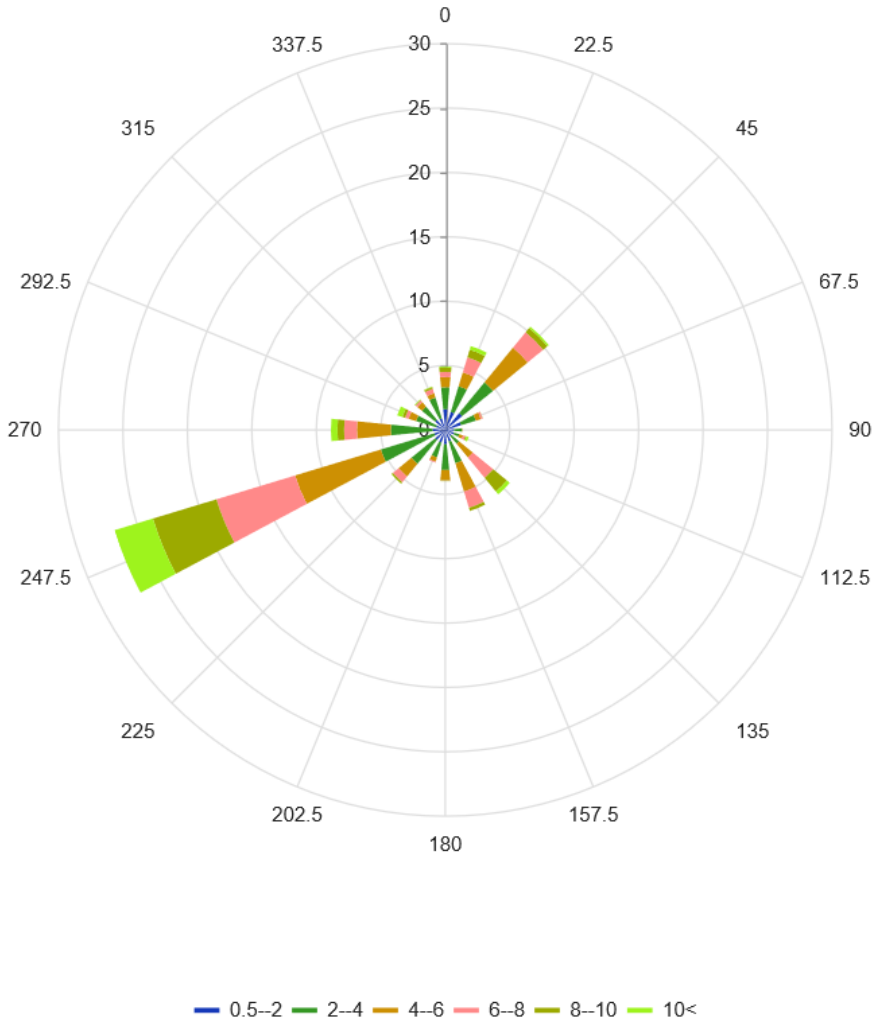

Figure 2: Karoo station annual wind rose(Source SAAQIS)

2.2 Provincial air quality

Within the 5 districts of the Northern Cape Province which is sub divided into 26 local municipalities there are mining and various industrial activities that generate pollutants which could affect air quality. These activities include abattoir, animal matter processing, bulk fuel storage, cement production, clamp kiln, crematorium, lime production, foundries, petroleum storage, sinter plants and biomass burning.

Mining activities generate emissions such as particulate matter measuring less than 10 µm in diameter (PM_{10}), particulate matter measuring less than 2.5 µm in diameter ($PM_{2.5}$) total suspended particulates (TSP), nitrogen oxides (NO_X) and sulphur dioxide (SO_2). Mines and quarries in the province include Black Rock mine, Hotazel, Mamatwane, Sishen and Kumani. Figure 3 shows the locations of the mines and quarries along the Gamagara mining corridor.

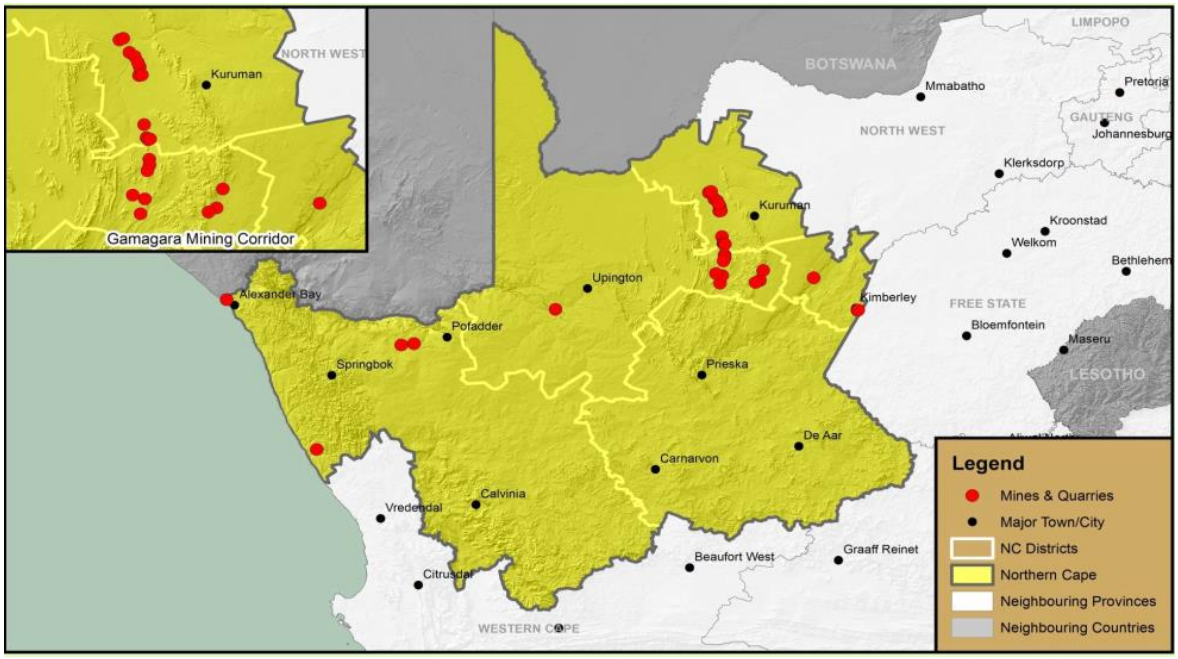

Figure 3:Mines and quarries in Northern Cape in 2017: Source DENC 2018

Table 1 presents the total emissions generated by activities undertaken in the province.

Table 1:Emissions in tonnes/annum Source[1]

	PM_{10}	$PM_{2.5}$	TSP	SO_2	NO_X	CO	VOC
Industrial sources	1 452		133	289	333	79	24
Mining	32 248	22 315	61 453				
Residential fuels	42			2	6	315	
Biomass burning			15 978	695	3 917	115 525	
Motor vehicles	517			253	6 574	15 433	3 067
Airports				3	11	9 988	157
Total	34 259	34 259	77 564	1 242	10 841	141 340	3 249

2.2.1 Continuous and passive monitoring

As shown in Figure 4, there is limited passive and continuous ambient monitoring undertaken in the province. There are two continuous ambient monitoring stations located at Nieuwoudtville approximately 450km south west and Kolomela Mine located approximately 60km north east of Waterkloof. Only passive monitoring is undertaken in the Pixley ka Seme District Municipality with no continuous ambient monitoring undertaken. Passive monitoring is undertaken at commercial areas and in the district municipality, monitoring is undertaken at Sunrise SAPS and Nonzwakazi located approximately 20km south east of Waterkloof.

[1] DENC 2018: Northern Cape Air Quality Management

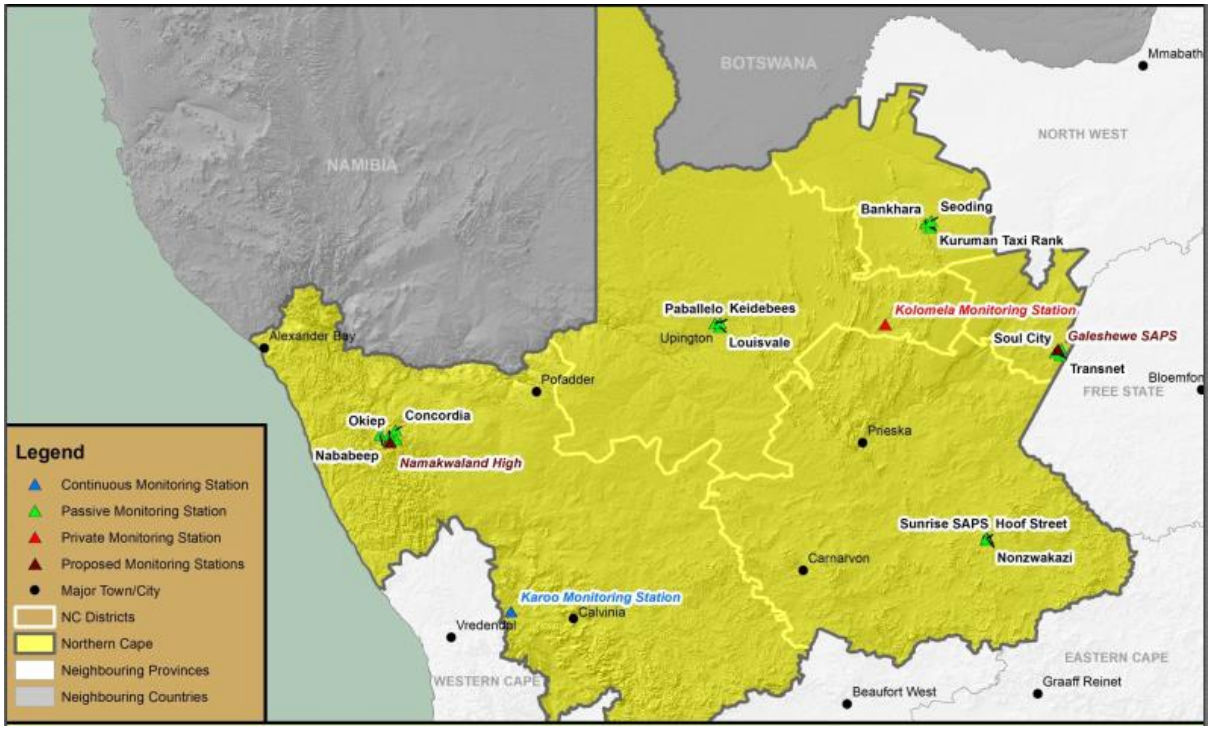

Figure 4: Continuous and passive monitoring in the Northern Cape Province

3 Applicable legislation

3.1.1 National Dust Control Regulations

The management of fugitive dust emissions is regulated under National Dust Control Regulations which were promulgated under NEM: AQA, in the Government Gazette No. 36974 on 1 November 2013. The dust fallout regulations defined the acceptable dust fall rates in terms of the presence of residential and non-residential areas (Table 2). In addition, the regulations prescribe the monitoring method to be in alignment with the American Society for Testing and Materials standard method for collection and analysis of windblown dust deposition, ASTM D1739.

The desktop study seeks to determine the baseline dust fallout levels prior to construction. The applicable legislation is presented in Table 2.

Table 2: National Dust Control (NDC) Regulations acceptable dust fallout rates

Restriction areas	Dust fall rate (mg/m^2/day over a 30 day average)	Permitted frequency of exceedance
Residential areas	Dust fall < 600	Two per annum (not in sequential months)
Non-residential areas	600 < Dust fall < 1200	Two per annum (not in sequential months)

Source: NEM: AQA National Dust Control Regulations, 2013

4 Waterkloof dust fallout monitoring

As discussed in 2.2.1, there is limited air quality data around the project area. Four dust buckets have been set up around the project area to monitor dust fallout prior to construction for a period of three months (June 2019 – August 2019). The initial dust buckets were set up on 29 June 2019 and are being changed every month in line with the NDC requirements and dust fallout methodology. At present no results are available for analysis, the dust fallout results will be available at the end of August 2019.

5 Conclusion

5.1 Recommendations

Based on the limited data currently available in the province and presented in the report, there is a need to monitor dust fallout with site specific ambient data over a longer period to take into account seasonal variation and present dust fallout levels in the seasons.

References

1. National Environmental Management: Air Quality Act, 2004 (Act.39 of 2004) (NEM: AQA)
2. Northern Cape Air Quality Management 13th Air Quality Governance Lekgotla
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4. Preston-Whyte, R.A and Tyson, PD, 1988. The Atmosphere and Weather of Southern Africa. Oxford University Press. 374 pp
5. SAAQIS Northen Cape wind rose accessed on 2 August 2019 from https://saaqis.environment.gov.za/Report/PollutantRose