Report

WEST COAST RESOURCES MINING PROJECT

Soils and Agricultural Potential

By

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<u>Declaration of Independence</u>

I, D.G. Paterson, hereby state that I am a registered Practicing Natural Scientist (*Soil Science* – Registration No. 400463/04) and was responsible for supervising the compilation of this report in an impartial manner to acceptable scientific norms and standards.

Furthermore, I state that both I and ARC-Institute for Soil, Climate and Water are independent of any of the parties involved in this study.

July 2016

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Myezo Environmental Management Services (Pty) Ltd to undertake a soil investigation for the proposed West Coast Resources (Pty) Ltd diamond mining project located to the north and south of the settlement of Hondeklip Bay in the Northern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact Assessment (EIA) process for the project.

The objectives of the study are;

- To obtain all available information concerning the soils in the specified areas
- To assess broad agricultural potential as well as
- Determine the prevailing land capability and land use

With this information, potential impacts on the environment can be assessed and their significance determined.

2. SITE CHARACTERISTICS

2.1 Location

The West Coast resources mining project is located to the north and south of Hondeklip bay on the west coast of the Northern Cape Province (Figure 1). Two study areas are involved, namely an area to the north of Hondeklip bay, comprising the farms Samsons Bak 330, Elands Klip 333, Zwart Duinen 332, Schulpfontein 472, Noup 473, Somnaas 474, Koingnaas 475 and Zwart Lintjes Rivier 584, as well as various thin strips of land along the coast. The second, smaller area to the south of Hondeklip bay, comprises the farms Lang Klip 489, Mitchells Bay 495, Farm 497 and part of the farm Kanoep 496. approximately 25 km south of Kathu on Portions 1 and Remaining Extent of the farm Jenkins 562 as indicated on Figure 1 (shown in blue). The area lies between latitudes 29° 50′ and 30° 29′ S and between longitudes 17° 06′ and 17° 22′ E.

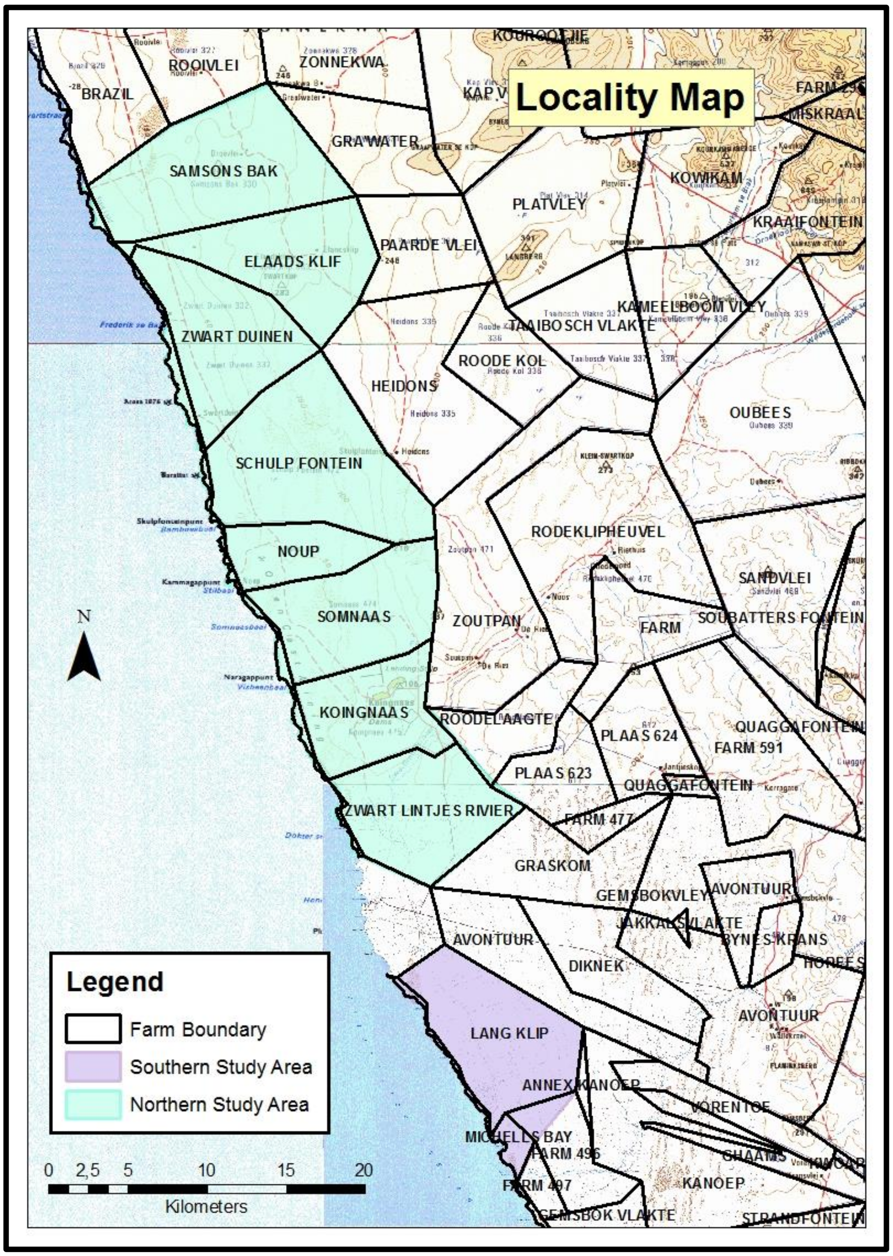

Figure 1 Locality map, West Coast resources mining project

2.2 Topography

Most of the area lies at an altitude of between sea level and around 180-200 metres, with the highest points in the north at 260-280 metres. The area has almost flat to gently undulating topography, with slopes of less than 5%.

No permanently wet surface drainage courses are present, with the only significant stream being the Swartlintjes River, which reaches the sea to the south of Koingnaas.

2.3 Climate

The climate of the study area (Koch *et al.,* 1987) can be regarded as warm to hot with very little rainfall. The little rain that does fall occurs mainly in winter. The long-term average annual rainfall in this region of the Northern Cape is around 100 mm, compared to the annual evaporation of around 912 mm. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices.

Temperatures vary greatly, due to the influence of coastal mists that often keep temperatures down, but when this is not a factor, summer temperatures especially can be hot, over 30^{o}C on most days.

2.4 Parent Material

Virtually the entire area is underlain by sandy Quaternary sediments, with isolated strips of gneiss and quartzite, mostly along the coast (Geological Survey, 1984). The distribution is shown in Figure 2.

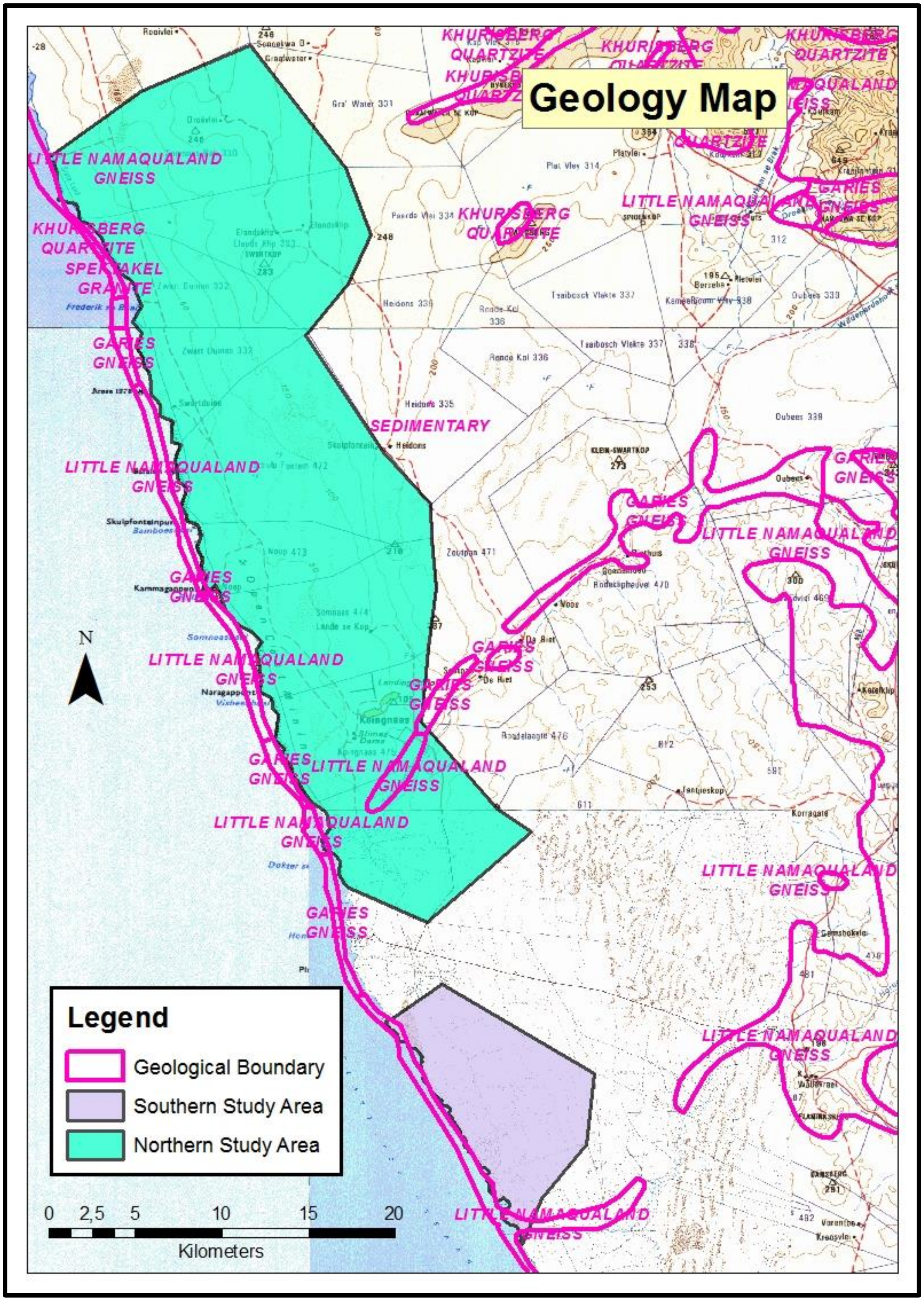

Figure 2 Geology map, West Coast resources mining project

3. METHODOLOGY

Existing information was obtained from the map sheet 3017 Garies (Fullstone & Oosthuizen, 1983) from the national Land Type Survey, published at a scale of 1:250 000. A ***land type*** is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al* (1977).

The broad study area is covered by the following seven land types, as shown on the map in the Appendix 1, namely:

- **Ah38, Ah48** (Red and yellow, freely-drained, structureless soils, high base status)
- **Ai13, Ai14, Ai19, Ai21** (Yellow, freely-drained, structureless soils, high base status)
- **Ha33** (Bleached, grey, structureless sandy soils)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type.

Also, other soils that were not identified due to the scale of the survey may also occur. **The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.**

A summary of the dominant soil characteristics of each land type is given in Table 2 below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown highlighted in **bold type**.

4. SOILS

A summary of the dominant soil characteristics is given in **Table 2** below.

Table 2 Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential (%)
Ah38	>1200 >1200 >1200	Hutton 31/41 Clovelly 31/41 Vilafontes 11/31	47% 20% 19%	Red, sandy soils, occasionally calcareous Yellow-brown, sandy soils, occasionally calcareous Grey to yellow, sandy soils, occasionally on hardpan calcrete	High: 0.0 **Mod: 77.1** Low: 22.9
Ah48	600-1200 >1200	Hutton 30/31 Clovelly 30/31	69% 22%	Red, sandy soils, on calcrete/weathering rock Yellow-brown, sandy **dune** soils	High: 0.0 **Mod: 69.7** Low: 30.3
Ai13	>1200 >1200	Clovelly 30/31 Fernwood 20/21	87% 10%	Yellow-brown, sandy soils Grey, sandy soils	High: 0.0 Mod: 1.7 **Low: 98.3**
Ai14	- 0-300	Rock Hutton 30/33	63% 29%	Exposed rock outcrops Red, sandy soils on rock	High: 0.0 Mod: 3.2 **Low: 96.8**
Ai19	>1200 150-1200 500-1200	Clovelly 30/31 Hutton 30/31 Clovelly 30/31	82% 7% 7%	Yellow-brown, sandy **dune** soils Red, sandy soils, on dorbank/calcrete Yellow-brown, sandy soils on weathering rock	High: 0.0 Mod: 14.0 **Low: 86.0**
Ai21	300-1200 >1200	Clovelly 31 Fernwood + Clovelly	45% 30%	Yellow-brown, sandy soils on weathering rock Grey & yellow, sandy **dune** soils	High: 0.0 Mod: 10.0 **Low: 90.0**
Ha33	>1200 >1200	Fernwood 20/21 Clovelly 40/41	81% 11%	Grey, sandy **dune** soils Yellow-brown, calcareous, sandy soils	High: 0.0 Mod: 10.8 **Low: 89.2**

Note: Agricultural Potential, as shown in the right-hand column, refers to ***soil characteristics only*** and no climatic or other restrictions are taken into account.

5. AGRICULTURAL POTENTIAL AND LAND CAPABILITY

5.1 Agricultural potential

The main limiting factor that influences the agricultural potential rating is the combination of sandy to very sandy soils (with dunes in many areas) along with the very low average annual rainfall.

Accordingly, the agricultural potential for the survey area is low. The only agricultural activities that would be expected to occur would be livestock and/or game farming. The average grazing capacity for this area is low, namely approximately 40 ha per animal unit and the long-term annual average NDVI (Normalized Difference Vegetation Index) is moderate to low (Schoeman & van der Walt, 2004).

5.2 Land Capability

The Land capability system for South Africa (Schoeman *et al.,* 2002, was used to obtain a general idea of the land capability and land use for this area.

The study area falls within ***land capability class VII***, with land use options largely restricted to grazing, woodland or wildlife.

> **Concept:** Land in class VII has very severe limitations that make it unsuited to cultivation and that restrict use largely to grazing, woodland or wildlife; restrictions are more severe than those for Class VI because of one or more continuing limitations that cannot be corrected, such as very steep slopes, erosion, **shallow soil, stones**, wet soils, salts or sodicity and **unfavourable climate**.

5.3 Land Cover

Using information from the latest version of the National Land Cover database (GeoTerraImage, 2015), the classes of land use within the study area can be seen (Figure 3).

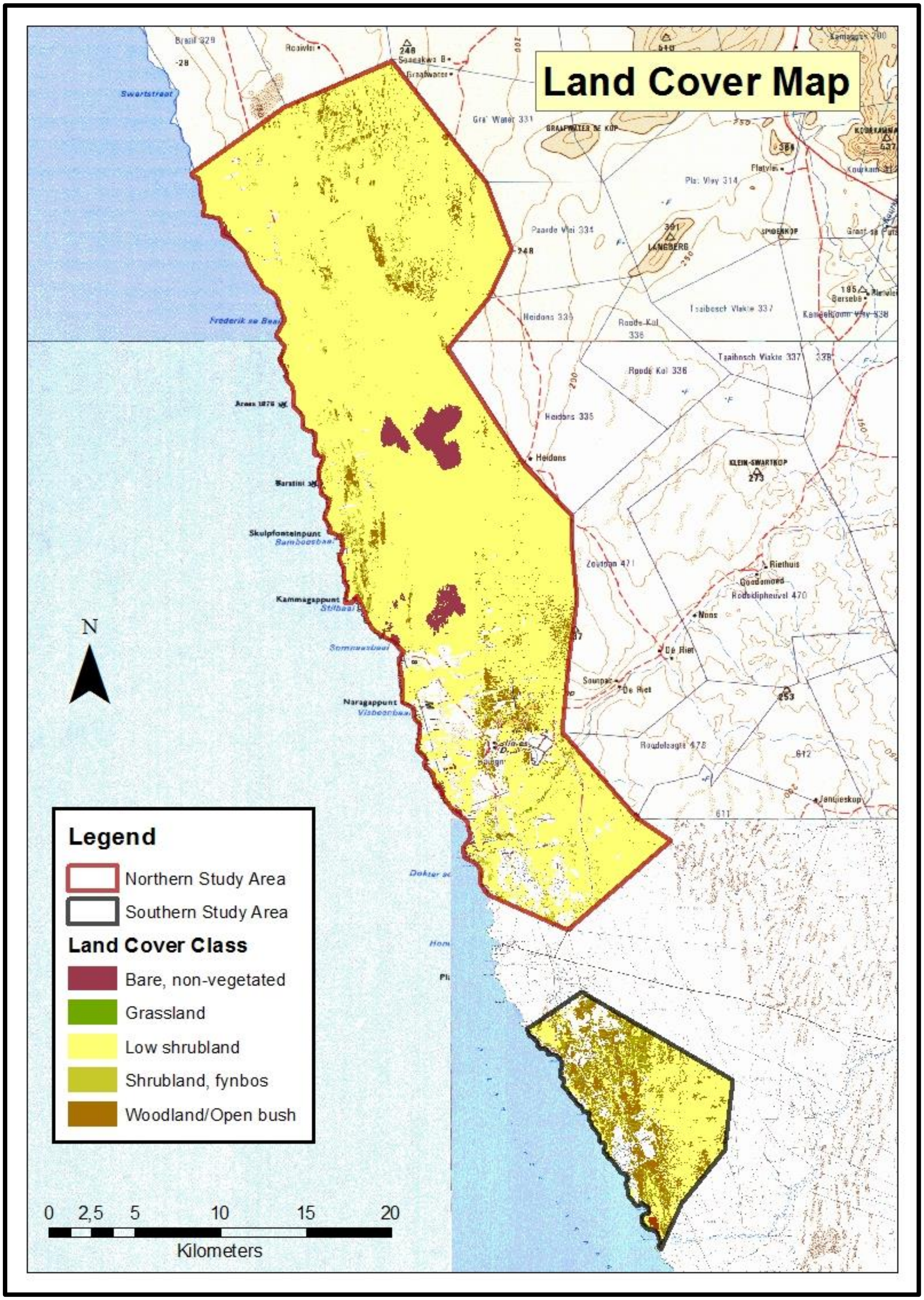

Figure 3 Land Cover map of West Coast resources mining project

The overwhelmingly dominant land use is either “low shrubland” or “shrubland, fynbos”, which will be more or less all that the prevailing climate can support (see Figure 4). No evidence of any agricultural activities is reflected in either the land cover information or on Google Earth imagery.

Figure 4 Natural vegetation near Koingnaas, West Coast

6 IMPACTS AND SENSITIVITIES

6.1 Assumptions and limitations

The main limitation is that the soil information provided is at 1:250 000 scale, and has not been ground-truthed. However, the existing reconnaissance information, supported by the climatic characteristics of the area, indicates that this is a very low potential area for agriculture.

6.2 Impacts

The main potential impact will not be the ***loss of agricultural land***, mainly due to the low prevailing agricultural potential. However, whenever any excavation or other surface disturbance is involved, the possibility of increased erosion exists. In the case of the West Coast Resources mining project, due to the sandy nature of the topsoils, coupled with the dry climate, the erosion hazard will be in the form of increased ***susceptibility to wind erosion***, whereby any activity that removes the vegetation cover (no matter how sparse) will expose the topsoil to the possibility of removal and re-deposition at a distance, by wind action.

The impact tables addressing these two impacts, as well as proposed mitigation measures, are shown below.

Table 3 Impact concerning agricultural potential

Loss of agricultural potential due to mining activities		
	Without Mitigation	Assuming Mitigation
Severity	Low	Low
Duration	Short-term	Short-term
Extent	Localised	Localised
Consequence	Low	Low
Probability	Possible	Unlikely
Significance	Medium	Low
Status	Negative	Negative
Confidence	High	High
Nature of Cumulative impact	Little or no cumulative impact expected, mainly due to lack of high potential land and any agricultural production in the vicinity	
Degree to which impact can be reversed	The impact is partially reversible as normal rehabilitation actions should enable land to be returned to some sort of grazing capacity	
Degree to which impact may cause irreplaceable loss of resources	Low – agricultural resources in the area are not irreplaceable	
Degree to which impact can be mitigated	Low	

Mitigation

Mitigation measures will involve:

- Restricted footprint: as little surface disturbance as possible so that there is minimum disturbance
- Removal and storage of cover soil (>0.5 m, if possible). Soil should be stored for the shortest possible time (<2-3 yrs, if possible) and stored to a height of less than 2-3 metres, if possible before being replaced for rehabilitation.
- Effective re-establishment of natural vegetation (in consultation with vegetation specialists), with appropriate soil conservation n measures during this phase.
- Regular monitoring (at least every 6 months) to check on progress of rehabilitation.

Table 3 Impact concerning wind erosion

Increased wind erosion susceptibility		
	Without Mitigation	Assuming Mitigation
Severity	High	Low
Duration	Permanent	Short-term
Extent	Fairly widespread	Localised
Consequence	High	Low
Probability	Highly probable	Unlikely
Significance	Medium	Low
Status	Negative	Negative
Confidence	High	High
Nature of Cumulative impact	Significant cumulative impact expected, mainly due to the potential removal of bare, often fine sand-textured topsoil by wind action, leading to the deposition of the soil particles at a considerable distance.	
Degree to which impact can be reversed	The impact is partially reversible with mitigation as normal rehabilitation actions should enable the minimum amount of soil to be lost	

Degree to which impact may cause irreplaceable loss of resources	Medium – significant soil loss due to wind action will be difficult to remedy, unless mitigation is carried out
Degree to which impact can be mitigated	Low

Mitigation

Mitigation measures will include:

- The requirement that any removal of surface vegetation be restricted to as small a footprint as possible.
- In addition, due to the wind erosion hazard in this area (sandy topsoils – see Table 2), wind protection measures should be taken wherever possible. Such measures will potentially include windbreaks (either natural vegetation or constructed (fencing, netting etc.) perpendicular to the direction of the prevailing wind, and may need to be undertaken with the cooperation of an engineering specialist.
- Regular monitoring (approximately every 6 months) should be carried out across all areas of mining activity. This can be done visually, but any signs of soil loss by wind or water, should be reported in order that preventative measures can be taken before any problem becomes worse.

Within the broader study area, there are ***no specific sensitive areas*** that need to be avoided, in terms of the soils or agricultural potential.

7 CONCLUSIONS

Taking the above-mentioned factors into account, the general agricultural potential rating is low, which agrees with the land capability rating of Class VII.

The overall impacts on the soils of the area are expected to be moderate to low due to the current land use as well as the fact that the survey area does not constitute an area of high agricultural potential. The impacts of previous mining activities on the soil will, however, require that adequate mitigation and management measures to be put in place.

It is the opinion of the author that there is no reason why the proposed activity should not be authorized, in terms of the soils occurring or their associated agricultural potential.

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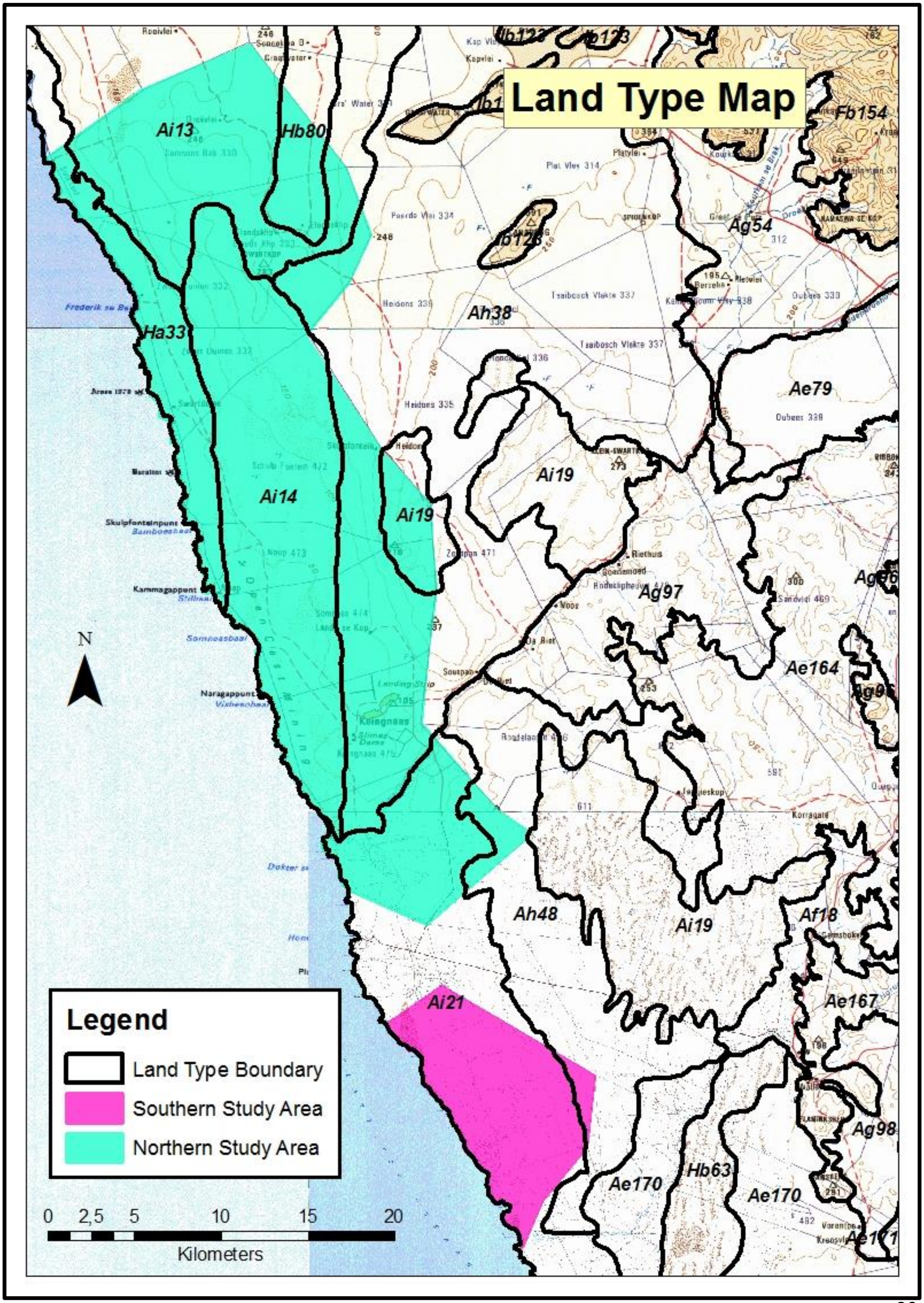
APPENDIX 1

LAND TYPE MAP



Land Type Map
Ai13
Hb80
Fb154
Ag54
Ah38
Ha33
Ae79
Ai19
Ai14
Ai19
Ag97
Ae164
Ah48
Ai19
Af18
Ai21
Ae167
Ag98
Hb63
Ae170
Ae170
Legend
Land Type Boundary
Southern Study Area
Northern Study Area
N
0 2,5 5 10 15 20
Kilometers