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SPECIALIST REPORT

**Combined Screening Tool verification, soil, land capability,
land use and Agricultural Agro-ecosystem Specialist
Assessment of the proposed processing plant footprint,
situated on the remaining extents of the farms Van der Bijl
528MS, Dreyer 526MS, Antrobus 566MS and Steenbok
565MS, Limpopo Province**

Requested By

Gudani Consulting (Pty) Ltd

Compiled By

Rehab Green Monitoring Consultants CC
Environmental and Rehabilitation Monitoring Consultant cc
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1. INTRODUCTION

1.1 Terms of reference

Rehab Green Monitoring Consultants cc was appointed by Gudani Consulting (Pty) Ltd to conduct a baseline soil, land capability, land use and agricultural impact assessment of the proposed processing plant footprint, situated on the remaining extents of the farms Van der Bijl 528MS, Dreyer 526MS, Antrobus 566MS and Steenbok 565MS in Limpopo province. The project is undertaken by Kinetic Development Group and SA Energy Metallurgical Base (Pty) Ltd.

The report should address all requirements of applicable environmental legislation including the Agricultural Protocol, based on detailed soils, land capability, land use and agricultural production data, obtained via a detailed baseline investigation.

1.2 Report content clarification

This report is a combination of 2 reports required by the Agricultural Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Agricultural Resources (the Protocol). The Protocol is provided in Appendix G.

The 2 reports required by the Protocol are:

- An Agricultural Sensitivity Verification report that contains a verification of the correctness of the National web-based Screening Tool sensitivity ratings; and based on the outcome, one of the following;
- An Agricultural Compliance Statement Report; **or**
- An Agricultural Agro-ecosystem Assessment Report

The first report is a high-level verification of the sensitivity of the site and the second report is always based on the findings of the first report. Combining the 2 reports provides a clear understanding of the requirements that lead to the aspects being addressed and prevent uncertainties when either one of them is red without having the other one at hand.

1.3 Details and declaration of the author

1.3.1 Abbreviated Curriculum Vitae

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 Date of birth: 1968-02-11
 Email: piet@rehabgreen.co.za
 Qualification: N.Dip: Agricultural Resource Utilization, 1992
 Professional affiliations: Soil Science Society of South Africa
 South African Council for Natural Scientific Professions
 Professional career: 1991-2004 Institute for Soil Climate and Water
 2004-2025 Principal consultant of Rehab Green Monitoring Consultants cc
 Experience: 34 years experience in:

- pre-mining soil and land capability classification, mapping and impact assessments;
- Post-mining rehabilitated soil and land capability assessments;
- Pre-mining soil stripping plans and procedures for optimal rehabilitation and post-mining land capability achievements.
- Pre- and post-mining soil fertility assessments for re-vegetation and fertilizer application purposes.
- Agricultural Agro-ecosystem assessments

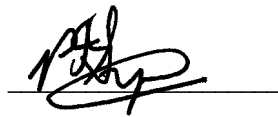
- GIS surface analyses and map compilations.

1.3.2 Declaration of Professional Registration

I, Piet Steenekamp, hereby declare that I am registered at The South African Council for Natural Scientific Professions (Reg. No. 200032/04) as a Certificated Natural Scientist in terms of section 20(3)(c) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003) in the following field of practice (Schedule 1 of the Act): Soil Science.

1.3.3 Declaration of Independence

I, Piet Steenekamp (ID 680211 5009 08 9), hereby declare that I have no conflict of interest related to the work of this report. Specially, I declare that I have no personal financial interests in the property and/or development being assessed in this report, and that I have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the development. I declare that the opinions expressed in this report are my own and a true reflection of my professional expertise.

A handwritten signature in black ink, appearing to be 'P.I. Steenekamp', is written over a horizontal line.

P.I. Steenekamp

2. LEGAL FRAMEWORK

The legal framework encompasses the following as published under the National Environmental Management Act (NEMA), Act 107 of 1998:

- Listed activities;
- EIA Regulation; and
- Gazetted protocols

2.1 Listed activities

Activity 28 of Listing Notice 1 as published under Notice No.327 in Government Gazette No. 40772, dated 4 April 2017 (subjected to corrections published under Notice No. 706 in Government Gazette No.41766, dated 13 July 2018) under sections 24(2), 24(5), 24D and 44 read with Section 47A (1) (b) of the National Environmental Management Act ,1998 (Act No.107 of 1998).

The activity includes all residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development:

- (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or
- (ii) (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;

excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.

(The competent authority for activity 28 is the authority of the province in which the activity is to be undertaken.)

2.2 EIA Regulations

- Environmental Impact Assessment Regulations 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and published on 29 May 2020 in Government Notice No 599.
 - Regulation 16(1)(b)(v) - when submitted in terms of regulation 19 or 21, be accompanied by the report generated by the **national web based environmental screening tool**, once this tool is operational.
 - Regulation 16(3)(a) - Any report, plan or document submitted as part of an application must comply with any **protocol** or minimum information requirements relevant to the application as identified and by the Minister in a government notice.
 - Regulation 17(c) - Upon receipt of an application, the competent authority must check whether the application — conforms to the requirements of these Regulations, any protocol or minimum information requirements relevant to the application as identified and *gazetted* by the Minister in a government notice or instructions or guidance provided by the competent authority to the submission of applications.
 - Regulation 19 - Submission of basic assessment report and environmental management programme, and where applicable closure plan, to competent authority.

2.3 Gazetted protocols

Agriculture: protocol for the specialist assessment and minimum report content requirements for environmental impacts on agricultural resources as Published in Government Notice No.320, Government Gazette 43110, 20 March 2020 (referred to as “the Protocol” further in the report).

3. METHODOLOGY

3.1 Screening Tool Report

As required by Regulation 16(1)(b)(v) of the Environmental Regulations an agricultural sensitivity report was generated with the **national web based environmental screening tool** and downloaded.

3.2 Agricultural Protocol

Regulation 16(3)(a) of the Environmental Regulations requires that any report, plan or document submitted as part of an application must comply with any **protocol** or minimum information requirements relevant to the application as identified by the Minister in a government notice. The protocol requires the following procedures:

3.2.1 Initial site sensitivity verification procedure

The Protocol requires an initial, high-level verification of the accuracy of the sensitivity categories as rated by the Screening Tool. The Protocol state that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the Screening Tool, must be confirmed by undertaking a site **sensitivity verification** as follows:

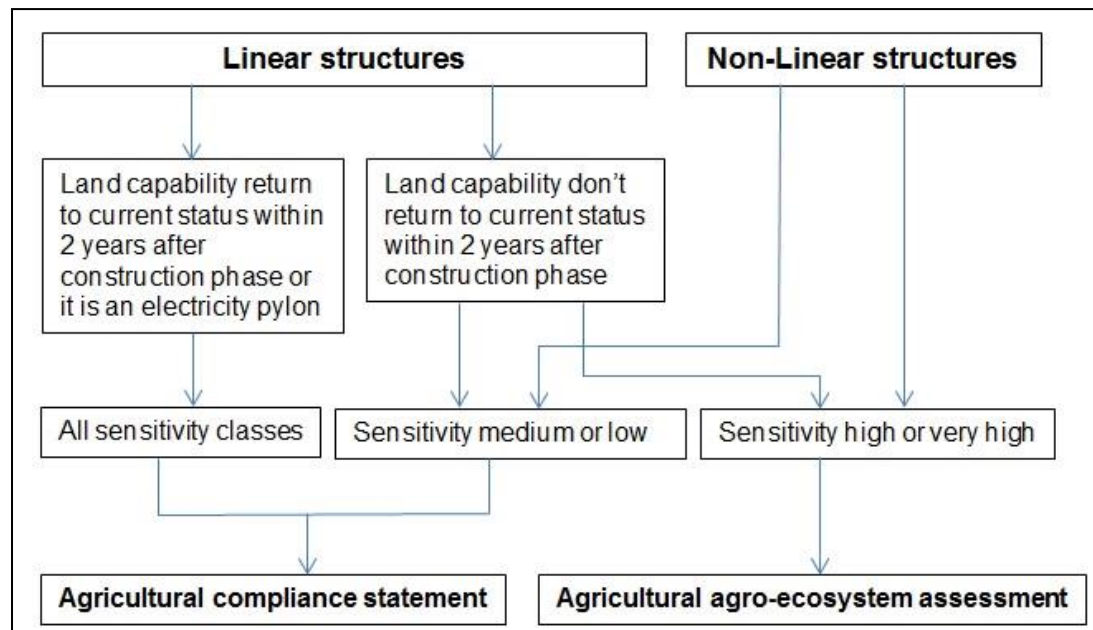
- The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist. The site sensitivity verification must be undertaken through the use of:
 - a desk top analysis, using satellite imagery;
 - a preliminary on-site inspection; and
 - any other available and relevant information.
- The outcome of the site sensitivity verification must be recorded in the form of a report that:
 - confirms or disputes the current use of the land and the environmental sensitivity as identified by the Screening Tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
 - contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and
 - is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

3.2.2 Specialist assessment level

Based on the sensitivity outcome and the type of structure, one of two levels of assessments needs to be undertaken, which is either an Agricultural Compliance Statement or an Agricultural

Agro-ecosystem Assessment.

The following flow diagram indicates, based on the type of structure and verified agricultural sensitivity, which of the 2 assessments need to be done:



The Protocol then provides criteria and minimum reporting requirements for each of the 2 levels of assessments that are to be done. The Protocol is provided in Appendix G.

3.3 Baseline assessment

The baseline assessment was done by means of the following procedures:

3.3.1 Soil assessment field procedures

Geographic Information System (GIS) software from Esri (Environmental Systems Research Institute) called ArcGIS-ArcMap was used to store and process field data and generate spatial data for map compilations.

Field observation points were generated at a density of 150 x 150 m across the proposed infrastructure footprints. The coordinates of the observation points were calculated and loaded on a Geographic Positioning System (GPS) to accurately locate the position of the observation points in the field. The study area and field observation points were superimposed on Google Earth satellite imagery for the compilation of large-scale field maps.

The soils within the development site were investigated by means of auger observations at a density of 150 x 150 m and randomly within homogeneous sections as deemed necessary. Auger holes were made to a maximum depth of 1.5m or to refusal. The soils were described and classified according to the South African Taxonomic Soil Classification System (Soil Classification Working Group, 2nd edition 1991). The system of soil classification is explained in Appendix A.

At each auger point the auger cores were placed on a sample board in 100 mm increments and photographed. The following procedure was followed to note soil properties and classify soils

forms accordingly:

- Identify applicable diagnostic horizons by noting the physical properties such as:
 - Effective depth (depth of soil suitable for root development);
 - Colour (in accordance with Munsell colour chart);
 - Texture (refers to the particle size distribution);
 - Structure (aggregation of soil particles into structural units);
 - Mottling (alterations due to continued exposure to wetness);
 - Concretions (cohesion of minerals into hard fragments);
 - Leaching (removal of soluble constituents by percolating water);
 - Gleying (reduction of ferric oxides under anaerobic conditions, resulting in grey, low chroma soil colours); and
 - Illuviation of colloidal matter from one horizon to another, resulting in the development of grey sandy E-horizons and grey clay G-horizons.
- Determine the appropriate soil Form and soil Family according to the above properties.

The soil properties that were used to map fairly homogeneous soil types are discussed in Appendix B.

3.3.2 Soil sampling and analyses

Samples of the A-horizons of the dominant soil types were taken and analysed for general fertility indicators.

3.3.3 Land capability assessment

Wetland and riparian zones were delineated according to the practical field procedure for the identification and delineation of wetlands and riparian areas (Department of Water Affair and Forestry, 2005). Four indicators were used in the study to delineate wetland and riparian zones, namely:

- Terrain unit;
- Soil form;
- Soil wetness; and
- Wetland and riparian vegetation.

Soil properties related to wetlands is further discussed in Appendix D1.

The initial Guidelines for the Rehabilitation of Mined Land was compiled in 1981 supported by the South African Chamber of Mines, now the Minerals Council of South Africa. The Guidelines were updated in 2007 and also largely adopted by the Land Rehabilitation Society of South Africa (LaRSSA), founded in 2012. LaRSSA compiled the Land Rehabilitation Guidelines for Surface Coal Mines during 2018, which was published in May 2019. It was undertaken as a project supported and endorsed by the Coaltech Research Association (Coaltech), a research subsidiary of the Minerals Council of South Africa. Land capability guidelines of this publication were used to map the following land capability categories (excluding the wetland category):

- Arable land;
- Grazing land; and
- Wilderness.

Criteria used for the above categories are given in Appendix D2.

3.3.4 Land use mapping

The extents of land use practices within the Agricultural Impact Footprint were surveyed during baseline assessment.

3.3.5 Agricultural Sensitivity (Soils, land use, surface slope, climate)

The detailed soil map, indicating dominant soil forms and associated properties, serves as basis of the derived agricultural sensitivity map. The soil forms are grouped in land capability classes based on soil properties, topography and climate. The land capability layer is then refined by incorporating current land use practices in order to produce a final agricultural sensitivity map. The following principles were followed in deriving the final agricultural sensitivity:

High agricultural sensitivity:

- All deep, well-drained, loamy sand to sandy clay loam soils on slopes less than 7.1%, irrespective of current agricultural use.
- All shallow, well-drained soils (<500mm) utilized for crop farming.
- All currently cultivated fields (crop farming), irrespective of soil potential and type.
- All deep, high potential soils occupied by semi-permanent agricultural structures (structures without roofs and concrete foundations e.g. cattle kraals, bale storage camps etc.)
- All abandoned/vacant sections that maybe occupied by partly demolished structures, situated on deep, high potential soils and surrounded by crop farming or cultivated pastures.

Medium agricultural sensitivity:

- All shallow, well-drained soils (<500 mm, without frequent rocky outcrops), not utilized for crop farming.
- All soils with impeded internal drainage, not suitable for crop farming but transformed to cultivated pastures.
- All soils with a pure sand texture but not subject to wetness.
- All soils on slopes between 7.1 and 14.3%.
- All deep, but highly dispersive soils.
- All soils occupied by permanent farming structures such as farmsteads and farming related buildings.

Low agricultural sensitivity:

- All shallow soils with frequent rocky outcrops or very shallow soils (>300mm) without rocky outcrops.
- All soils on slopes above 14.3%.
- All soils subjected to wetness to such a degree that crop farming is not possible and not previously transformed to cultivated pastures.
- All soils occupied by structures that prevent all agricultural related uses such as roads, railways, airstrips.
- All areas that are disturbed to such an extent that crop farming or pastures are not possible and only limited or no grazing potential remains.

3.4 Map compilations

The field data was captured in shapefile format (shp) and processed and stored in a Geographic Information System called ArcGIS. The maps are compiled in a map extendable document format (mxd) and exported to Jpeg format. The shapefiles can be exported to a dxf or dwg format for CAD users. The shapefiles, dxf and dwg formats are available on request.

The maps were generated in a projected coordinate system using the longitude of origin (LO) coordinate system based on the 29° East meridian, WG1984 Ellipsoid and Hartebeesthoek 1994 Datum.

3.5 Agricultural impact assessment

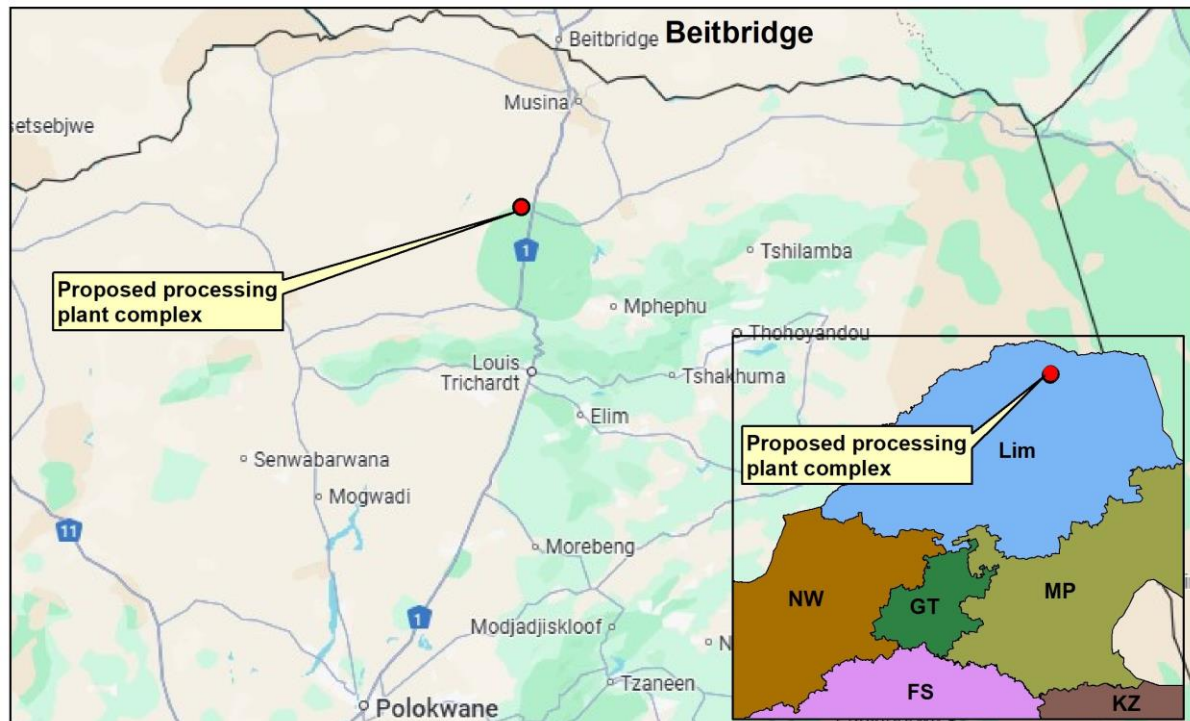
The method for rating environmental impacts is provided in Appendix E.

4. INTRODUCTION

4.1 Regional setting

The proposed processing plant complex is situated in-between the towns Louis Trichardt and Musina in the central northern part of Limpopo province (Figure 1a).

Figure 1a: Regional setting of the proposed processing plant complex



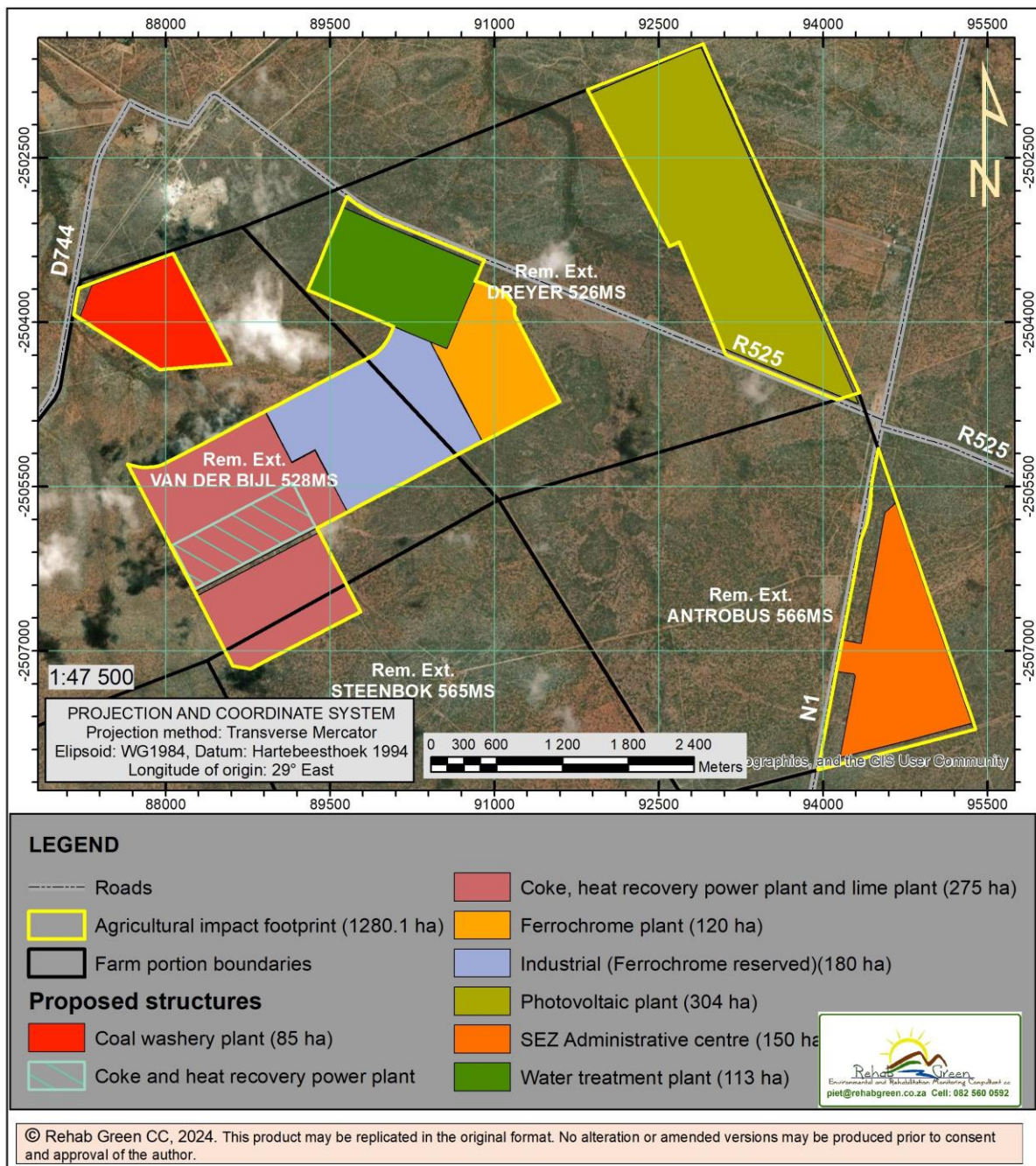
4.2 Brief project description and proposed structures

The proposed processing plant complex will be situated on the remaining extents of the farms Van der Bijl 528MS, Dreyer 526MS, Antrobus 566MS and Steenbok 565MS in Limpopo province, and will consist of the following facilities:

- A coal washery plant (85 ha),
- Integrated coke plant, heat recovery power plant and lime plant (275 ha)
- Overlapping ferrochrome plant and water treatment plant (203 ha)
- Photovoltaic (solar) power station (304 ha)
- SEZ administrative centre (offices and staff living facilities) (150 ha)
- Industrial (ferrochrome reserved) (180 ha)

The total processing complex footprint covers approximately 1196 ha and the extents and location of the planned facilities is shown in Figure 1b.

Figure 1b: Development site extent and planned structures of the proposed processing plant complex



4.3 Scope of work

The scope of work is:

- To conduct an agricultural sensitivity verification of the Screening Tool sensitivity ratings, following procedures as prescribed in the Protocol and confirm or dispute the Screening Tool sensitivity ratings with evidence presented in a report.
- To conduct a detailed baseline evaluation consisting of a soil, land capability and current land use assessment. Combine the baseline data and apply agricultural sensitivity criteria and generate a refined agricultural sensitivity map.
- To provide a report that contains all baseline information and addresses all requirements of relevant environmental legislation and applicable protocols, gazetted by a Minister in

order to assist with decision making in terms of the environmental authorization of the proposed development.

4.4 Study aims and objectives

Based on the scope of work and outcome of the verification of the Screening Tool sensitivity ratings an Agricultural Agro-eco-system Assessment or an Agricultural Compliance Statement will be compiled, which will include all or most of the following:

- Execute a site sensitivity verification by means of the national web-based screening tool;
- Conduct a baseline assessment to determine the status quo of the development site which entails:
 - A detailed soil assessment of the proposed development site, which includes soils forms, effective soil depth; top and subsoil clay percentage, internal drainage, terrain units and slope percentage;
 - Classify and map soil forms according to the South African Taxonomic Soil Classification System, 1991;
 - Derive and map the land capability based on soil properties, surface slope and climatic conditions;
 - Map all current land uses;
 - Derive potential agricultural yields based on soil properties and climatic conditions;
 - Map the current agricultural sensitivity of the development site based on gathered information and compare it to those of the Screening Tool;
 - Overlay the proposed development structures on the agricultural sensitivity map; and
 - Provide guidelines and procedures to minimize the impacts on agricultural resources and production;
- Determine the impact on agriculture in terms of:
 - The loss of agricultural land;
 - Change in agriculture productivity; and
 - Change in employment figures.
- Provide an opinion on the acceptability of the development in terms of agricultural resources and provide a recommendation on whether the development should be approved or not as specifically prescribed by minimum reporting requirements of the protocol.

5. EVALUATION OF THE SCREENING TOOL SENSITIVITY RATINGS

5.1 Extent of the Development Site and Agricultural Impact Footprint

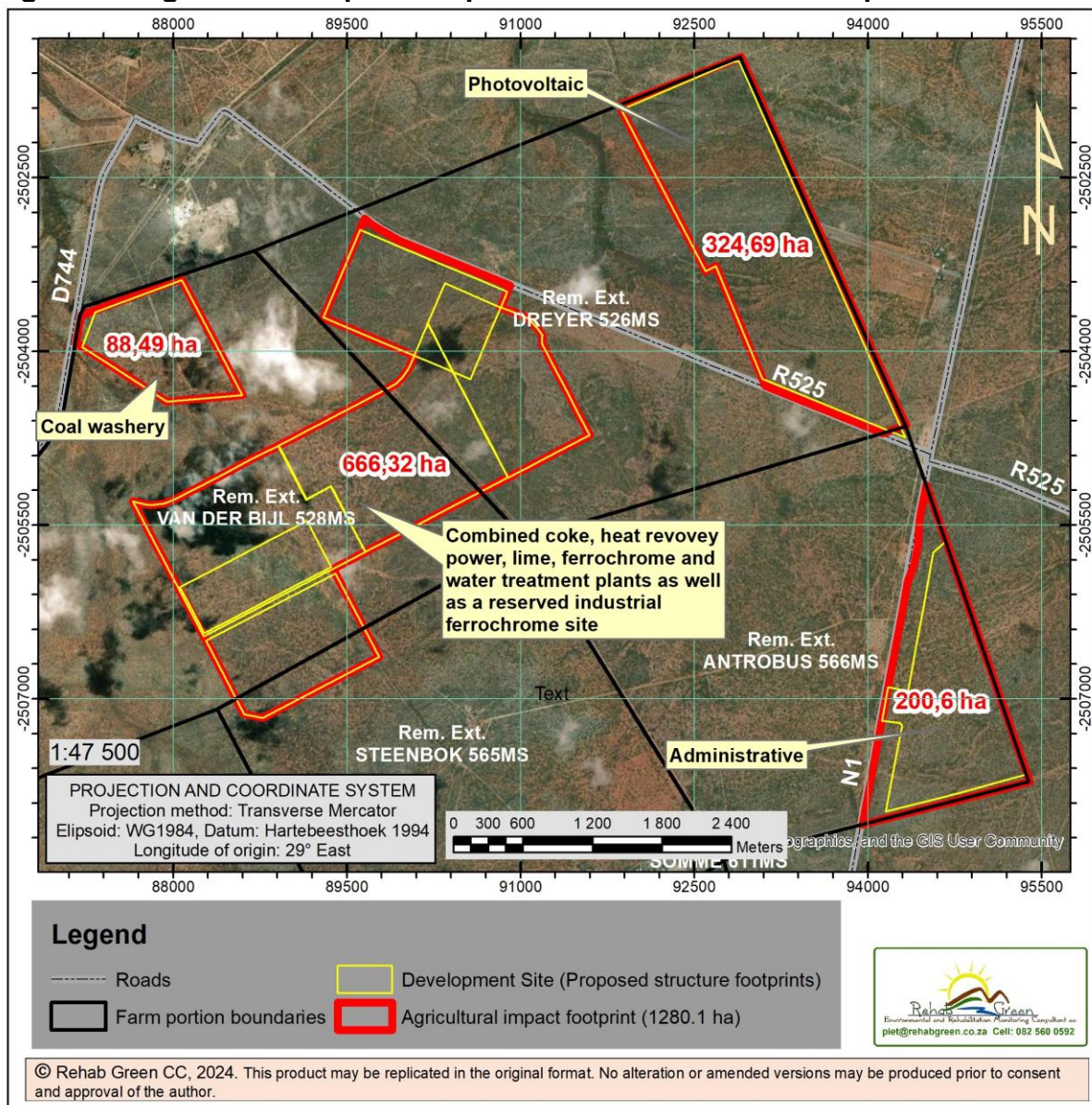
The applicable protocol i.e., Agriculture: Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Agricultural Resources, requires that the agricultural sensitivity ratings of the Screening Tool need to be verified by a method as described in Section 3.2.1. In order to verify the Screening Tool ratings, an agricultural impact extent need to be determined.

In order to demarcate the agricultural impact footprint, the proposed infrastructure footprints were overlain on Google Earth satellite imagery. The **Development Site** is regarded as all proposed infrastructure footprints as indicated on Figure 1b and 1c. However, the **agricultural impact footprint** is regarded as the Development Site (structure footprints) including all surrounding, or areas in between structures, where agricultural activities will be withdrawn or limited as a result of the planned development. It thus includes the narrow strip in between the administrative complex and N1 tar road, which will, most likely, become vacant or will at least not be utilized for agriculture during the lifespan of the project. It also includes narrow strips in-between the farm boundary and the footprints of the photovoltaic-, water treatment- and coal washery plants. It is assumed that the larger areas in-between the structure footprints will still be available for

agriculture. The agricultural impact footprint covers a total of 1280.1 ha and is indicated by red outlines on Figure 1c, consisting of 4 sections as follows:

- A coal washery plant (88.49 ha),
- Combined coke plant, heat recovery power plant and lime plant, ferrochrome plant, water treatment plant and reserved ferrochrome industrial area (666.32 ha)
- Photovoltaic (solar) power station (324.69 ha)
- SEZ administrative centre (offices and staff living facilities) (200.6 ha)

Figure 1c: Agricultural impact footprint in relation to the Development Site



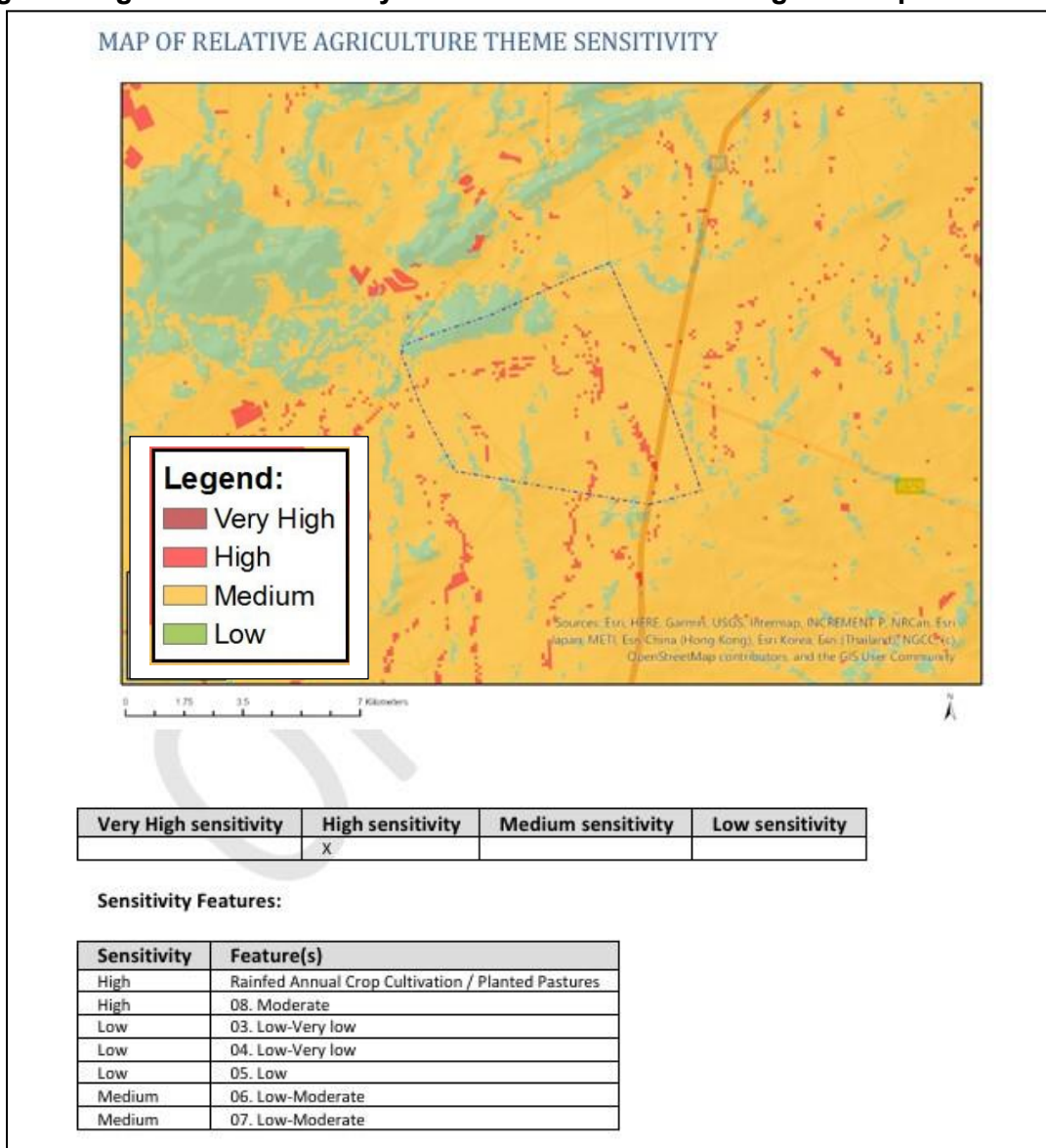
5.2 Agricultural sensitivity of the Agricultural Impact Footprint as rated by the Screening Tool

The agricultural sensitivity of the Agricultural Impact Footprint was rated in a report generated by means of the National web-based Screening Tool, dated 28/05/2025. The report was requested by P.I. Steenekamp of Rehab Green CC and the screening categories were: Transformation of land/From agriculture or afforestation. A signed copy of the Screening Tool report will accompany

the Agricultural Specialist Report for environmental authorization as required by the Protocol.

Figure 2 consists of a clip extracted from the Screening Tool report and shows the spatial extent of the 4 agricultural sensitivity classes within the Agricultural Impact Footprint, as rated by the Screening Tool. Figure 2 shows that according to the Screening Tool, approximately 3.5% of the Agricultural Impact Footprint is rated as high agricultural sensitivity, 89.7% as medium and 6.8% as low sensitivity. No areas were rated as very high.

Figure 2: Agricultural sensitivity extracted from the Screening Tool Report

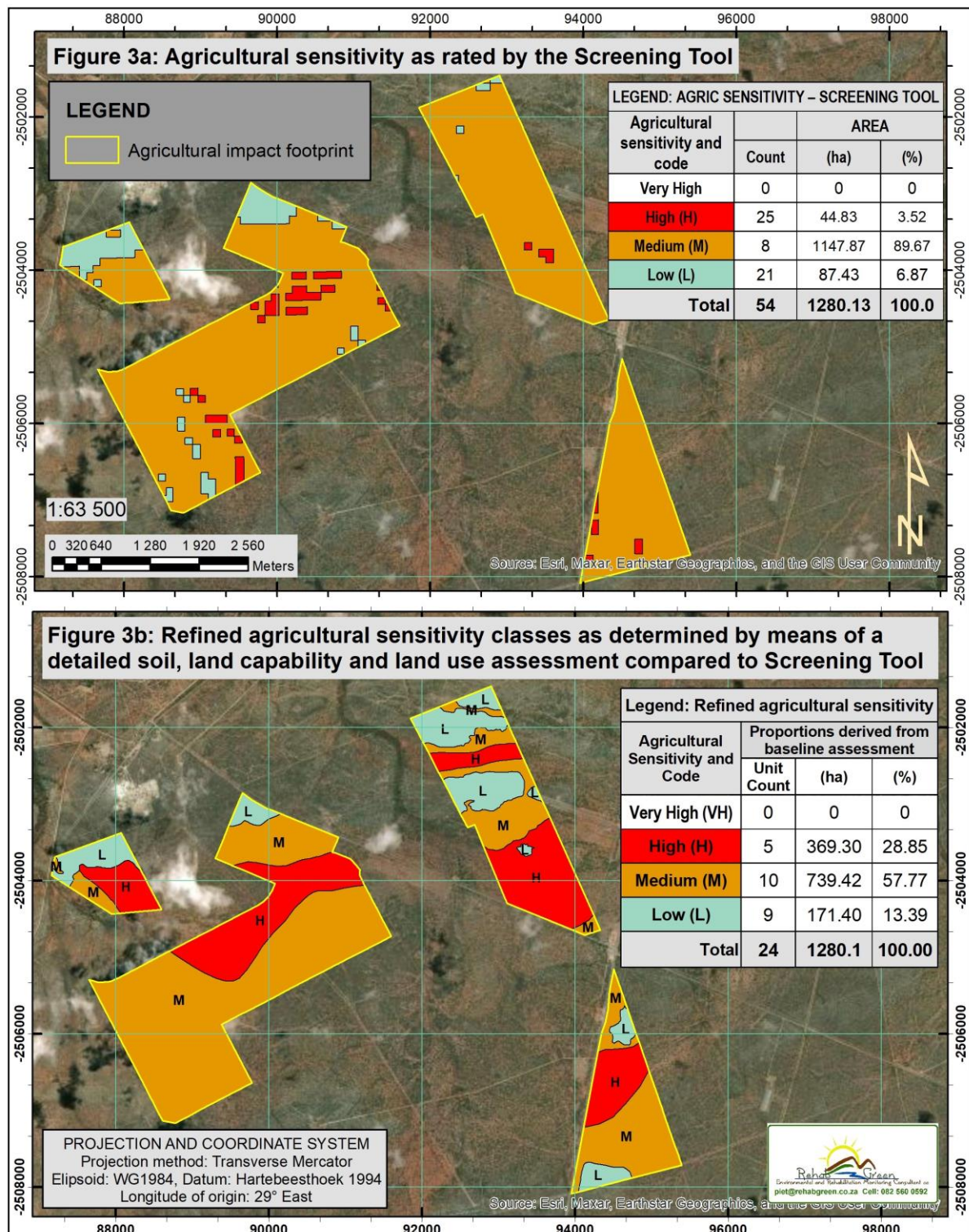


The Protocol further requires that the agricultural sensitivity ratings of the Screening Tool are to be verified.

The agricultural sensitivity of the Agricultural Impact Footprint was evaluated by means of an intensive baseline field investigation, consisting of a detailed soil, land capability and land use assessment. The gathered field data was processed and detailed land use-, soil- and land capability maps were compiled (Figures 4, 5 and 6).

In order to compare the agricultural sensitivity ratings of the Screening Tool to the actual status

of the site, the land use-, soils- and land capability data layers were overlain on each other and the agricultural sensitivity criteria (Section 3.3.5) were applied in order to generate **refined** agricultural sensitivity ratings for the Agricultural Impact Footprint. In order to compare the 2 sets of ratings, a combined map was compiled, containing 2 figures (Figures 3a and 3b) with accompanying tables, representing the agricultural sensitivity ratings of both the Screening Tool, and the refined sensitivity ratings that was compiled from gathered detailed baseline information.



The agricultural sensitivity ratings of the Screening Tool are shown in Figure 3a with a Table indicating the areas and percentages occupied by each sensitivity class. Figure 3b shows the refined agricultural sensitivity rating of the detailed baseline assessment and contains a table with the ratings of the baseline assessment.

5.3 Dispute of the agricultural sensitivity rating of the Screening Tool

The Protocols requires in Section 2.3 (a) that, based on the findings of the site sensitivity verification, the Screening Tool sensitivity ratings must be confirmed or disputed. Figure 3a and 3b is a visual comparison of the areas and percentages of agricultural sensitivity ratings by the Screening Tool and those refined by means of the detailed baseline assessment. Table 1 provides a comparison of the areas and percentages comprised by each of the 4 sensitivity classes.

Table 1: Comparison of agricultural sensitivity ratings

Legend: Agricultural sensitivity comparison – Screening Tool vs Soil and land capability assessment						
Agricultural Sensitivity and Code	Screening Tool			Baseline assessment		
	Count	(ha)	(%)	Count	(ha)	(%)
Very High	0	0	0	0	0	0
High (H)	25	44.83	3.52	5	369.30	28.85
Medium (M)	8	1147.87	89.67	10	739.42	57.77
Low (L)	21	87.43	6.87	9	171.40	13.39
Total	54	1280.1	100.0	24	1280.1	100.00

The comparison in Table 1 as well as Figures 3a and 3b shows that the sensitivity ratings of the Screening Tool and those derived from the detailed baseline assessment differ to a fair degree, although both indicates that the Agricultural Impact Footprint is dominated by the medium sensitivity class. There are 2 crucial differences of which the first is that the high agricultural sensitivity class was found by the baseline assessment to be 28.85% and those of the Screening Tool 3.25%. This means that there are much larger areas with high agricultural sensitivity that need to be avoided as far as possible. The second difference is that the low agricultural sensitivity class was found by the baseline assessment to be 13.39% and those of the Screening Tool 6.87%. This means that there are much larger areas with low agricultural sensitivity that can be utilized for the project to lower the impact on agriculture.

When the Screening Tool ratings are overlain on satellite imagery, the following errors occurred in the Screening Tool ratings with examples shown in Figure 3c:

- Small, isolated, low sensitive patches within a large low sensitive area (instead of a large low sensitive patch);
- Senseless, scattered, highly sensitive patches within medium sensitive soils;
- Small, isolated, highly sensitive patches instead of a much larger, highly sensitive patch;
- Senseless, scattered, highly sensitive patches within medium sensitive soils;

- Numerous, small scattered, highly sensitive patches instead of a much larger, continues, highly sensitive patch; and
- Senseless, scattered, low sensitive patches within medium sensitive soils.

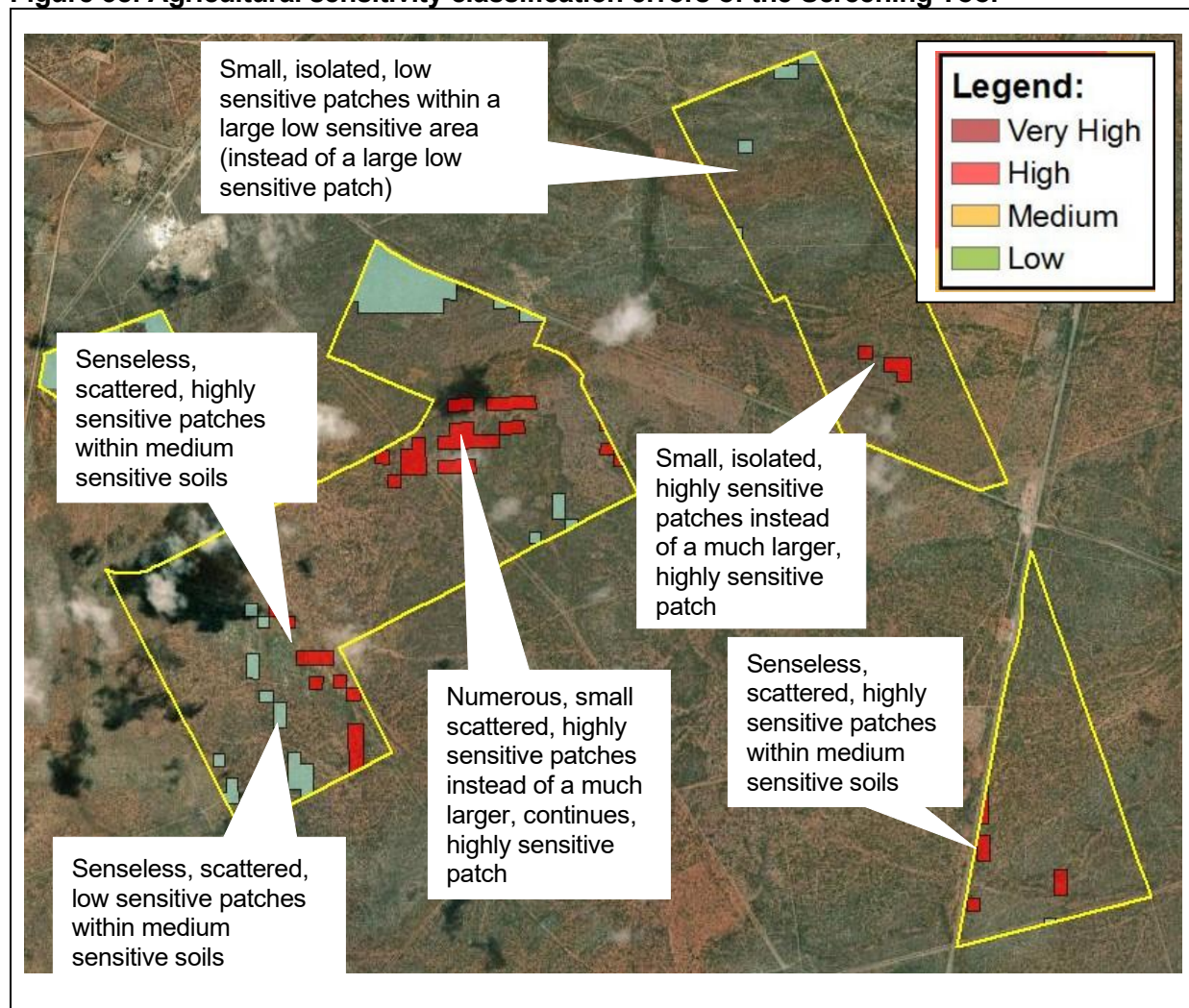
These errors were corrected in the refined agricultural sensitivity ratings by applying the criteria specified in Section 3.3.5. The ratings of the Screening Tool are therefore rejected and declared as incorrect and any further issues related to agricultural sensitivity, will be addressed and/or evaluated against the ratings of the refined agricultural sensitivity ratings, as derived from the detailed baseline assessment, and as displayed in Figure 3b and also in Figure 7 further in the report.

5.4 Evidence of the findings

The Protocols requires in Section 2.3 (b) that a motivation and evidence (e.g. photographs) of either the verified or different use of land and environmental sensitivity should be provided.

Figure 3c shows a clip of the agricultural sensitivity classes of the Screening Tool, overlain on a Google Earth satellite image. Labels on Figure 3c point out the location and provide a description of agricultural sensitivity classification errors of the Screening Tool that occurs throughout the Agricultural Impact Footprint (see bullets in Section 5.3).

Figure 3c: Agricultural sensitivity classification errors of the Screening Tool

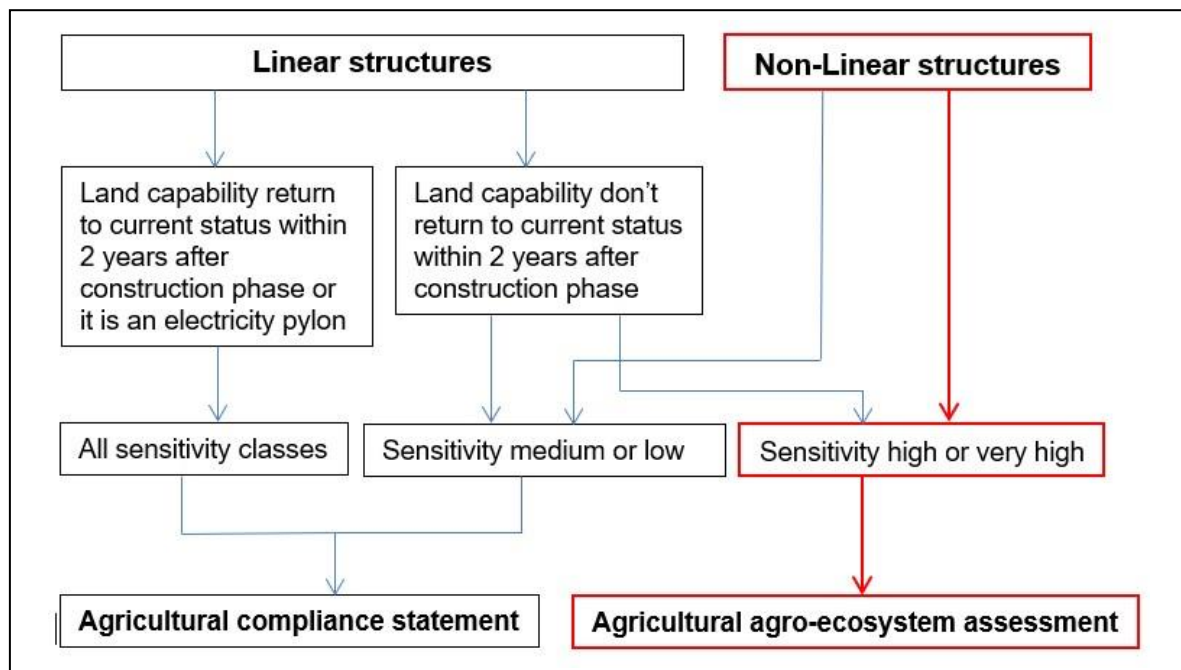


5.5 Level of specialist assessment

Section 3, Table 1, Paragraph 1.3.2 of the Protocol is quoted below:

“if any part of the proposed development footprint falls within an area of “very high” or “high” sensitivity, the assessment and reporting requirements prescribed for the “very high” or “high” sensitivity apply to the entire footprint, except in the case of 1.1.1 in which case an Agricultural Compliance Statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.”

Approximately 47.5% of the development site resides within high agricultural sensitive land, as indicated on the refined agricultural sensitivity map, Figure 3b, and as summarized in Table 1. A flow diagram was generated reflecting the criteria of the Protocol in terms of the level of specialist assessments. The criteria and path applicable to the proposed project is indicated by the red blocks and arrows below, which indicate that the required specialist assessment level is an Agricultural Agro-ecosystem Assessment.



6. AGRICULTURAL AGRO-ECOSYSTEM ASSESSMENT

Because the proposed Development Site occupies land with high agricultural sensitivity, the Protocol requires an Agricultural Agro-Ecosystem Assessment to be done based on the status quo of the site (See flow diagram in Section 5.5).

6.1 Baseline assessment / Status quo of the site

A baseline assessment was conducted on the Agricultural Impact Footprint, which consisted of a detailed soil, land capability, land used and agricultural production assessment.

6.1.1 Development site and agricultural impact footprint

The Agricultural Impact Footprint covers a total of 1280.1 ha and is indicated by red outlines on Figure 1c, consisting of 4 sections as follows:

- A coal washery plant (88.49 ha),
- Combined coke plant, heat recovery power plant and lime plant, ferrochrome plant, water treatment plant and reserved ferrochrome industrial area (666.32 ha)
- Photovoltaic (solar) power station (324.69 ha)
- SEZ administrative centre (offices and staff living facilities) (200.6 ha)

6.1.2 Existing impacts at the development site

(Protocol, Section 3, Table 1, Paragraph 2.4.5) ...existing impacts on the site, located on a map (e.g. erosion alien vegetation, non-agricultural infrastructure, waste, etc.).

There are no existing impacts on the Agricultural Impact Footprint.

6.1.3 Vegetation composition

(Protocol, Section 3, Table 1, Paragraph 2.4.2) where applicable, the vegetation composition, available water sources as well as agro-climatic information.

The Agricultural Impact Footprint is situated in the Savanna Biome and Mopani Bioregion. The vegetation type is classified as Musina Mopane Bushveld. The dominant grasses observed during the field assessment is *Aristida* and *Eragrostis* species, which is evident of severe former overgrazing.

6.1.4 Available water sources

There are no surface water sources within the Agricultural Impact Footprint.

6.1.5 Agro-climatic information

Agro-climate data is obtained from the Macuville (Musina-Agri) weather station calculated by software named CLIMWAT for CROPWAT, which is a joint publication of the Water Resources, Development and Management Service and the Environment and Natural Resources Service of the Food and Agriculture Organization (FAO) of the UN.

Table 2 provides climate data in terms of:

- Mean daily maximum temperature in °C
- Mean daily minimum temperature in °C
- Mean relative humidity in %
- Mean wind speed in km/day
- Mean sunshine hours per day

- Mean solar radiation in MJ/m²/day
- Monthly rainfall in mm/month
- Monthly effective rainfall in mm/month
- Reference evapotranspiration calculated with the Penman-Monteith method in mm/day.

Table 2: Climate

Monthly ETo Penman-Monteith - D:\My_CLIMWAT_Files\MACUVILLE-(MESSINA-AGRI_pen

Country Location 12 Station MACUVILLE-(MESSINA-A

Altitude 500 m. Latitude 22.26 °S Longitude 29.90 °E

Month	Min Temp °C	Max Temp °C	Humidity %	Wind km/day	Sun hours	Rad MJ/m ² /day	ETo mm/day
January	21.0	32.0	60	199	7.1	21.8	5.74
February	21.0	32.0	60	199	7.4	21.6	5.63
March	20.0	31.0	59	164	6.5	18.7	4.81
April	18.0	30.0	60	147	7.4	17.4	4.17
May	14.0	28.0	56	147	8.1	15.8	3.58
June	11.0	25.0	51	164	7.8	14.1	3.20
July	11.0	25.0	53	181	7.7	14.6	3.31
August	13.0	27.0	51	181	8.3	17.4	4.00
September	16.0	29.0	53	181	8.0	19.7	4.72
October	19.0	31.0	51	216	7.5	21.1	5.72
November	20.0	32.0	54	233	7.4	22.0	6.16
December	21.0	32.0	57	199	7.7	23.0	6.01
Average	17.1	29.5	55	184	7.6	18.9	4.76

Table 2 shows long term average minimum daily temperatures are 17.1°C with an average maximum of 29.5 °C. Long term average humidity is 55% and evapotranspiration calculated with the Penman-Monteith method is 4.76 mm/day.

Table 3: Annual rainfall

Monthly rain - D:\My_CLIMWAT_Files\MACUVILLE-(MESSINA-AGRI_cli

Station MACUVILLE-(MESSINA-A Eff. rain method USDA S.C. Mett

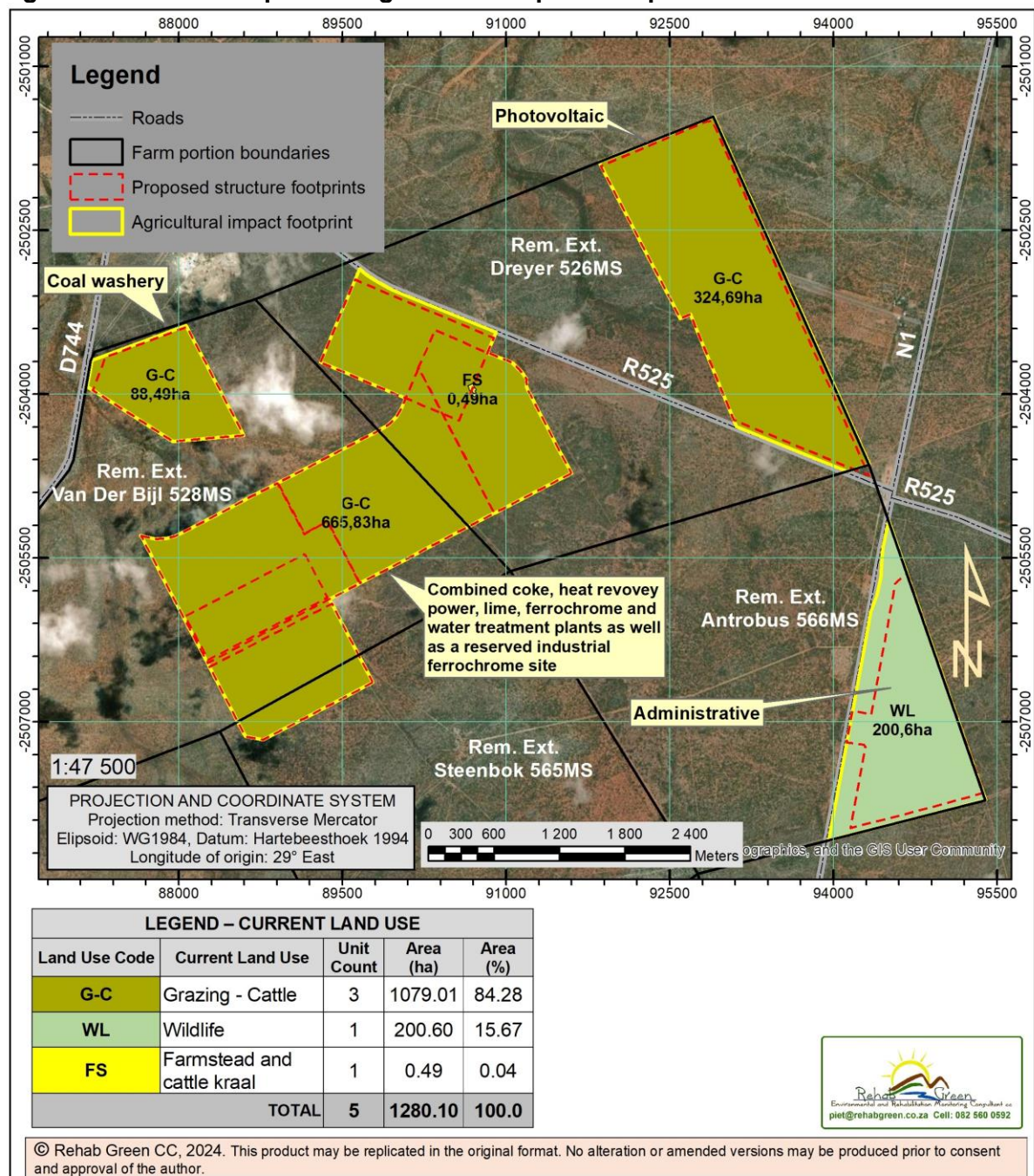
	Rain mm	Eff rain mm
January	74.0	65.2
February	55.0	50.2
March	37.0	34.8
April	24.0	23.1
May	5.0	5.0
June	4.0	4.0
July	1.0	1.0
August	1.0	1.0
September	8.0	7.9
October	21.0	20.3
November	41.0	38.3
December	64.0	57.4
Total	335.0	308.2

Table 3 shows average long-term monthly and annual rainfall data. The average effective rainfall of 308.2 mm per annum is concentrated in the summer months of October to April with November to February the wettest months.

6.2 Current land uses within the Agricultural Impact Footprint

The extents of current land use within the Agricultural Impact Footprint are shown in Figure 4.

Figure 4: Land use map of the Agricultural Impact Footprint



The current land uses are summarized in Table 4, which shows that grazing and subsistence cattle farming occupies 1079.01 ha, which translates to 84.28% of the Agricultural Impact Footprint. The section to the east of the N1 that is earmarked for administrative proposes are

utilized for game farming, which occupies 200.6 ha and translates to 15.67% of the Agricultural Impact Footprint. A farmstead and cattle kraal occupy 0.49 ha, which translates to 0.04% of the Agricultural Impact Footprint.

Table 4: Current land use within the Agricultural Impact Footprint

LEGEND – CURRENT LAND USE				
Land Use Code	Current Land Use	Unit Count	Area (ha)	Area (%)
G-C	Grazing - Cattle	3	1079.01	84.28
WL	Wildlife	1	200.60	15.67
FS	Farmstead and cattle kraal	1	0.49	0.04
TOTAL		5	1280.10	100.0

6.3 Dominant soil types

(Protocol, Section 3, Table 1, Paragraph 2.7.3) ...the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.

A detailed soil, land capability and land use survey were conducted by Rehab Green CC from March to May 2025. The soil data was gathered and the soil forms were mapped by means of 163 auger holes for soil classification and 11 soil sampling points for chemical analyses. Soil physical properties develop over thousands of years and the soil chemical status is subject to minor seasonal variation and follow-up surveys during more seasons are not required.

(Protocol, Section 3, Table 1, Paragraph 2.4) The status quo of the site must be described, including the following aspects which must be considered as the minimum in the baseline description of the agro-ecosystem:

2.4.1 ...the soil form/s, soil depth (effective and total depth), top and subsoil clay percentage terrain unit and slope.

Relevant soil properties were noted at each auger observation and the soils were classified in a soil Form and Family according to the Taxonomic Soil Classification System for South Africa, 1991. At auger points, the auger cores were placed in sequence in 100mm increments on a board to reconstruct the soil profile, which was then photographed as shown in Photos 1-5.



Photo 4: Surface – Coega soil form – Auger point AD3	Photo 5: Deeper Coega soil form – Auger point Y6	
		

The gathered soil information was processed and a total of 9 soil types, based on dominant soil form, effective soil depth and internal draining characteristics were identified during field observations and were symbolized as: Hu1, Hu2, Hu2/R, Cv, Py, Gs, Cg1, Cg2 and Cg3. The extent of the soil types is shown in Figure 5.

Figure 5 contains an abbreviated soil legend. The full soil legend is shown as Table 5, which described the soils in terms of the following aspects.

- Dominant soil form and family and subdominant forms;
- An average effective depth range in mm;
- Clay content per horizon;
- A description of the terrain unit and slope range;
- A broad description of the dominant soil form in terms of the effective soil depth, internal drainage, soil colour and soil texture class;
- The land capability classification;
- Agricultural sensitivity classification; and
- The area and percentage comprised by each soil form.

Figure 5: Detailed soil map of the Agricultural Impact Footprint

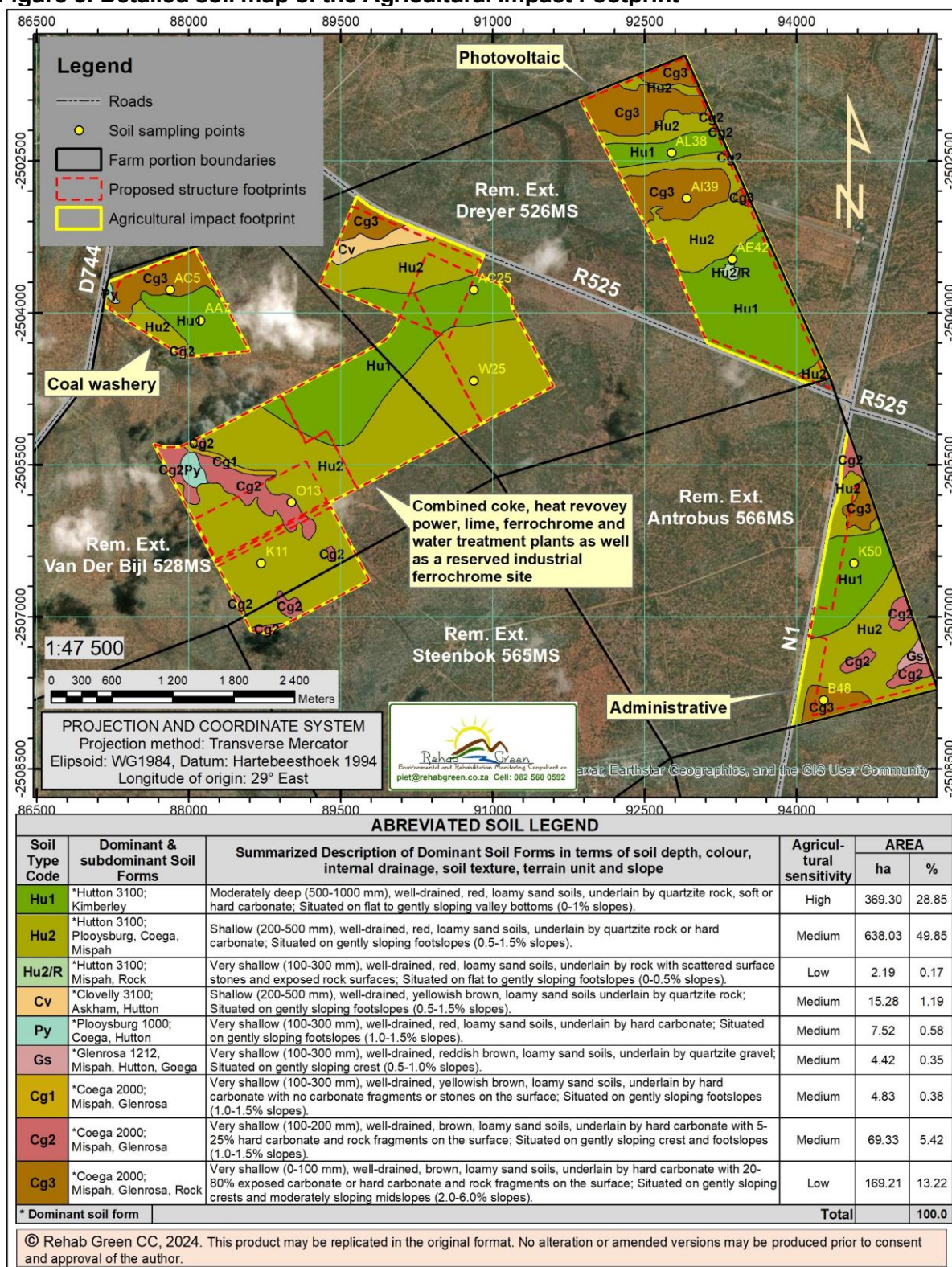


Table 5: Detailed soil legend of the Agricultural Impact Footprint

SOIL LEGEND									
Soil Type Code	Dominant soil form and family and other soil forms	Effective Soil Depth (mm)	Clay content per horizon	Terrain unit and slope percentage range	Summarized Description of Dominant Soil Form and associated terrain unit	Land Capability	Agricultural sensitivity	Area (ha)	Area (%)
Hu1	*Hutton 3100; Kimberley	500-1000	A: 9-12 B: 10-14	Wide stretched, weakly defined, flat to gently sloping valley bottoms (0-1% slopes).	Moderately deep (500-1000 mm), well-drained, red, loamy sand soils, underlain by quartzite rock, soft or hard carbonate.	Arable	High	369.30	28.85
Hu2	*Hutton 3100; Plooyburg, Coega, Mispah	200-500	A: 9-12 B: 10-14	Gently sloping footslopes (0.5-1.5% slopes).	Shallow (200-500 mm), well-drained, red, loamy sand soils, underlain by quartzite rock or hard carbonate.	Grazing	Medium	638.03	49.85
Hu2/R	*Hutton 3100; Mispah, Rock	100-300	A: 9-11 B: 9-11	Flat to gently sloping footslope (0-0.5% slopes).	Very shallow (100-300 mm), well-drained, red, loamy sand soils, underlain by rock with scattered surface stones and exposed rock surfaces.	Grazing	Low	2.19	0.17
Cv	*Clovelly 3100; Askham, Hutton	200-500	A: 9-11 B: 10-12	Gently sloping footslopes (0.5-1.5% slopes).	Shallow (200-500 mm), well-drained, yellowish brown, loamy sand soils underlain by quartzite rock.	Grazing	Medium	15.28	1.19
Py	*Plooyburg 1000; Coega, Hutton	100-300	A: 10-12 B: 10-12	Gently sloping footslopes (1.0-1.5% slopes).	Very shallow (100-300 mm), well-drained, red, loamy sand soils, underlain by hard carbonate.	Grazing	Medium	7.52	0.58
Gs	*Glenrosa 1212, Mispah, Hutton, Goega	100-300	A: 10-12	Gently sloping crest (0.5-1.0% slopes).	Very shallow (100-300 mm), well-drained, reddish brown, loamy sand soils, underlain by quartzite gravel.	Grazing	Medium	4.42	0.35
Cg1	*Coega 2000; Mispah, Glenrosa	100-300	A: 9-11	Gently sloping footslopes (1.0-1.5% slopes).	Very shallow (100-300 mm), well-drained, yellowish brown, loamy sand soils, underlain by hard carbonate with no carbonate fragments or stones on the surface.	Grazing	Medium	4.83	0.38
Cg2	*Coega 2000; Mispah, Glenrosa	100-200	A: 9-11	Gently sloping crest and footslopes (1.0-1.5% slopes).	Very shallow (100-200 mm), well-drained, brown, loamy sand soils, underlain by hard carbonate with 5-25% hard carbonate and rock fragments on the surface.	Grazing	Medium	69.33	5.42
Cg3	*Coega 2000; Mispah, Glenrosa, Rock	0-100	A: 9-11	Gently sloping crests and moderately sloping midslopes (2.0-6.0% slopes).	Very shallow (0-100 mm), well-drained, brown, loamy sand soils, underlain by hard carbonate with 20-80% exposed carbonate or hard carbonate and rock fragments on the surface.	Grazing	Low	169.21	13.22
*Dominant soil form							TOTAL	1280.1	100.0

6.3.1 Soil fertility status

The positions of the 11 soil sampling points are shown on the soils map; Figure 5 and the coordinates are included in Appendix C1. A sample of the A-horizon of the dominant soil types was taken and the soil chemical results are shown in Table 6. The original laboratory report is provided in Appendix C2.

The median values of the cations, potassium (K), calcium (Ca), magnesium (Mg) and sodium (Na) as well as phosphorus (P), sulphur (S) and pH were calculated and highlighted in orange at the bottom of Table 6.

Table 6: Soil chemical analyses

Samp Point	Soil form	Depth (mm)	Chemical properties													
			Extractable Cations								Acid. Sat. AmAc	S AmAc	Ca:Mg	R _s (resistance)	P Bray1	pH
			K	Ca	Mg	Na	K	Ca	Mg	Na						
			Ammonium acetate (mg/kg)				cmol(+)/kg									
B48	Cg	0-250	287	2482	86	10	0.7340	12.3852	0.7078	0.0435	-	2.84	17.71	-	11	7.8
K11	Hu	0-250	124	1138	243	17	0.3171	5.6786	2.0000	0.0739	-	2.42	2.86	-	5	6.2
K50	Hu	0-250	115	757	254	10	0.2941	3.7774	2.0905	0.0435	-	2.98	1.82	-	5	5.6
O13	Cg	0-250	269	1635	146	9	0.6880	8.1587	1.2016	0.0391	-	2.9	6.84	-	44	7.4
W25	Hu	0-250	433	936	310	9	1.1074	4.6707	2.5514	0.0391	-	3.12	1.84	-	3	6.5
AA7	Hu	0-250	232	547	145	9	0.5934	2.7295	1.1934	0.0391	-	3.02	2.3	-	5	5.7
AC5	Cg	0-250	266	2269	137	12	0.6803	11.3224	1.1276	0.0522	-	2.98	10.12	-	38	7.1
AC25	Hu	0-250	200	780	151	8	0.5115	3.8922	1.2428	0.0348	-	1.98	3.15	-	2	7
AE42	Hu	0-250	121	360	80	8	0.3095	1.7964	0.6584	0.0348	-	2.78	2.74	-	2	5.6
AI39	Cg	0-250	370	2904	143	8	0.9463	14.4910	1.1770	0.0348	-	3.21	12.36	-	19	7.9
AL38	Hu	0-250	259	706	247	8	0.6624	3.5230	2.0329	0.0348	-	3.15	1.74	-	4	6
Median			259	936	146	9	-	-	-	-	-	2.98	2.8	-	5	6.5
*Analvses done when pH is below 5.5																

*Analyses done when pH is below 5.5

6.3.2 Soil fertility evaluation

The median concentration values of cations (K, Ca, Mg and Na) as well as phosphorus and pH (highlighted in orange, Table 6) were compared to general fertility guidelines in Table 7.

The median K concentration of 259 mg/kg is rated as high and the median Ca and Mg concentrations (936 and 146 mg/kg) are rated as medium-high, which indicate a reasonably good fertility status in terms of cations. The median Na concentration of 9 mg/kg is low (which is positive) and indicates very little accumulation of sodium in the soil profile. The median ration of Ca to Mg is 2.8, which is ideal and reflect sufficient levels of Ca to buffer the destabilising effect of Mg on soil structure. The median P concentration of 5 mg/kg is low and indicates insufficient levels for pasture (10-20 mg/kg), as well as crop farming (30-50 mg/kg). The median soil acidity/alkalinity measured as pH(H₂O) is 6.5, which reflects slightly acid soil conditions, which is ideal for crop farming, pasture and grazing.

Table 7: Soil fertility compared to broad fertility guidelines

Table 1: Soil fertility compared to broad fertility guidelines						
Element or measurement	Unit	Guidelines		Current status rating		Preferred minimum/ideal range
		Low	High	Median value	Rating	
Potassium (K)	mg/kg	<40	>250	259	High	80-150
Calcium (Ca)		<200	>3000	936	Medium-high	600-1000
Magnesium (Mg)		<50	>250	146	Medium-high	80-150
Ca:Mg	Ratio	<2	>4	2.8	Ideal	2-4
Acid saturation	%	<10	>30	-	-	<20
Sodium (Na)	mg/kg	<50	>200	9	Low (positive in terms of sodicity)	<50
ESP	%	<6	>15	-	-	0-6
Resistance	ohm	<200	>300	-	-	>300
Phosphorus (P)	mg/kg	<5	>35	5	Low	*10-20 **30-50
pH(H ₂ O)	Very acid <=4.0 Acid 4.0-4.9 Moderately acid 5.0-5.9 Slightly acid 6.0-6.8 Neutral 6.9-7.2 Moderately alkaline 7.3-8.1 Strongly alkaline >=8.2			6.5	Slightly acid (ideal)	5-5.8(KCl) 6-6.8(H ₂ O)
* pastures ** crop farming						

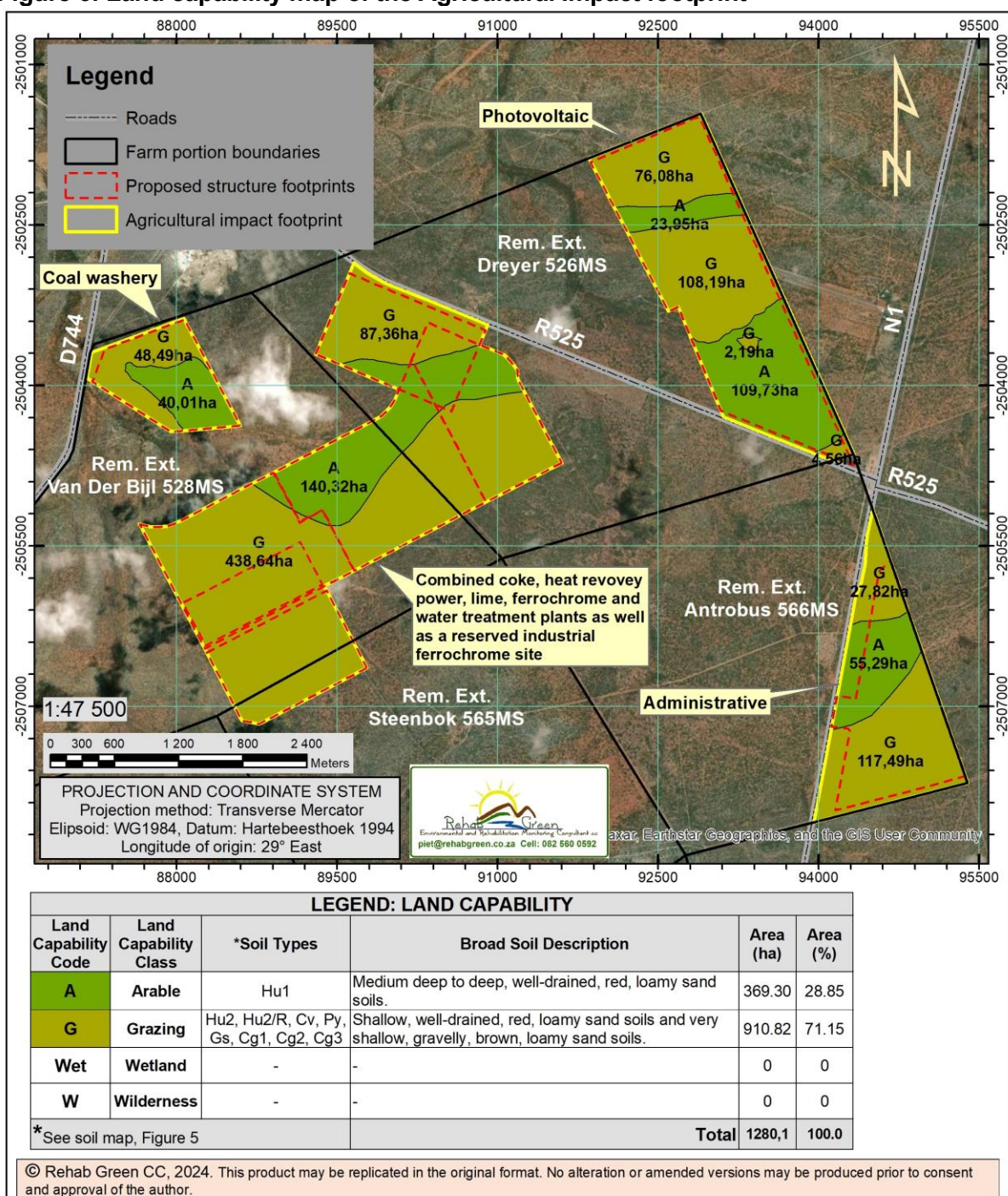
6.4 Pre-mining land capability

The land capability of the soils at the Agricultural Impact Footprint was rated by considering climate as described in section 6.1.5 and physical soil characteristics as described in the soils legend, Table 5. Criteria for land capability classes is provided in Appendix D2. The extents of derived land capability classes are shown in Figure 6 and are summarised in Table 8. Table 8 indicate that 28.85% of the Agricultural Impact Footprint were classified as arable land and the remaining 71.15% resides in the grazing land capability category.

Table 8: Land capability of the Development Site

LEGEND: LAND CAPABILITY					
Land Capability Code	Land Capability Class	*Soil Types	Broad Soil Description	Area (ha)	Area (%)
A	Arable	Hu1	Medium deep to deep, well-drained, red, loamy sand soils.	369.30	28.85
G	Grazing	Hu2, Hu2/R, Cv, Py, Gs, Cg1, Cg2, Cg3	Shallow, well-drained, red, loamy sand soils and very shallow, gravelly, brown, loamy sand soils.	910.82	71.15
Wet	Wetland	-	-	0	0
W	Wilderness	-	-	0	0
*See soil map, Figure 5			Total	1280,1	100.0

Figure 6: Land capability map of the Agricultural Impact footprint



6.5 Hydropedology

All soil types within the Agricultural Impact Footprint are grouped in the recharge hydropedology category, based on their internal drainage characteristics. All soil types consist of well-drained soil horizons that does not transport water lateral within a horizon or expel water in valley bottoms during peak season, and therefore, no soil types are grouped in the interflow or responsive hydrogeological categories. The hydrogeological behavior of the soil in the Agricultural Impact Footprint does not contribute to water quantities in any water sources in the surrounding area. There are thus also no wetlands within the Agricultural Impact Footprint.

The Agricultural Impact Footprint consists of sporadic somewhat higher lying crests and midslopes, occupied by very shallow, gravelly and stoney soils of the Coega form. Very low infiltration and high runoff volumes from these higher lying areas causes, during intense raining events, surface runoff to concentrate in shallow, narrow surface drainage paths, that drains away within several hours. These surface drainage paths are not streams or wetlands, although some sections can qualify as riparian zones.

7. FURTHER REQUIREMENTS OF THE AGRICULTURAL PROTOCOL

7.1 Development Site overlain on agricultural sensitivity

The Protocol requires a map of the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map as generated by the Screening Tool (Protocol: Section 3, Table 1, Paragraph 2.7.5).

The agricultural sensitivity ratings of the Screening Tool are shown in Figure 3a and the proportions is shown in Table 1. The Screening Tool ratings were found inaccurate as stated and proved in Section 5.2 to 5.4. The agricultural sensitivity of the Agricultural Impact Footprint was refined by means of a detailed baseline assessment. The refined agricultural sensitivity is derived from a combination of the soil's physical and chemical properties, the derived land capability, the current land uses and climatic conditions as presented in the previous sections. The agricultural sensitivity that resulted from a combination of the mentioned aspects was captured in a spatial format (shapefile) and a refined agricultural sensitivity map was compiled.

Because the agricultural sensitivity, as rated by the Screening Tool, were found inaccurate, it would be more sensible to overlain the proposed supporting infrastructure on the **refined** agricultural sensitivity classes as shown in Figure 7. Planned supporting infrastructure consists of the following as indicated on figure 7:

- A coal washery plant (88.49 ha),
- Combined coke plant, heat recovery power plant and lime plant, ferrochrome plant, water treatment plant and reserved ferrochrome industrial area (666.32 ha)
- Photovoltaic (solar) power station (324.69 ha)
- SEZ administrative centre (offices and staff living facilities) (200.6 ha)

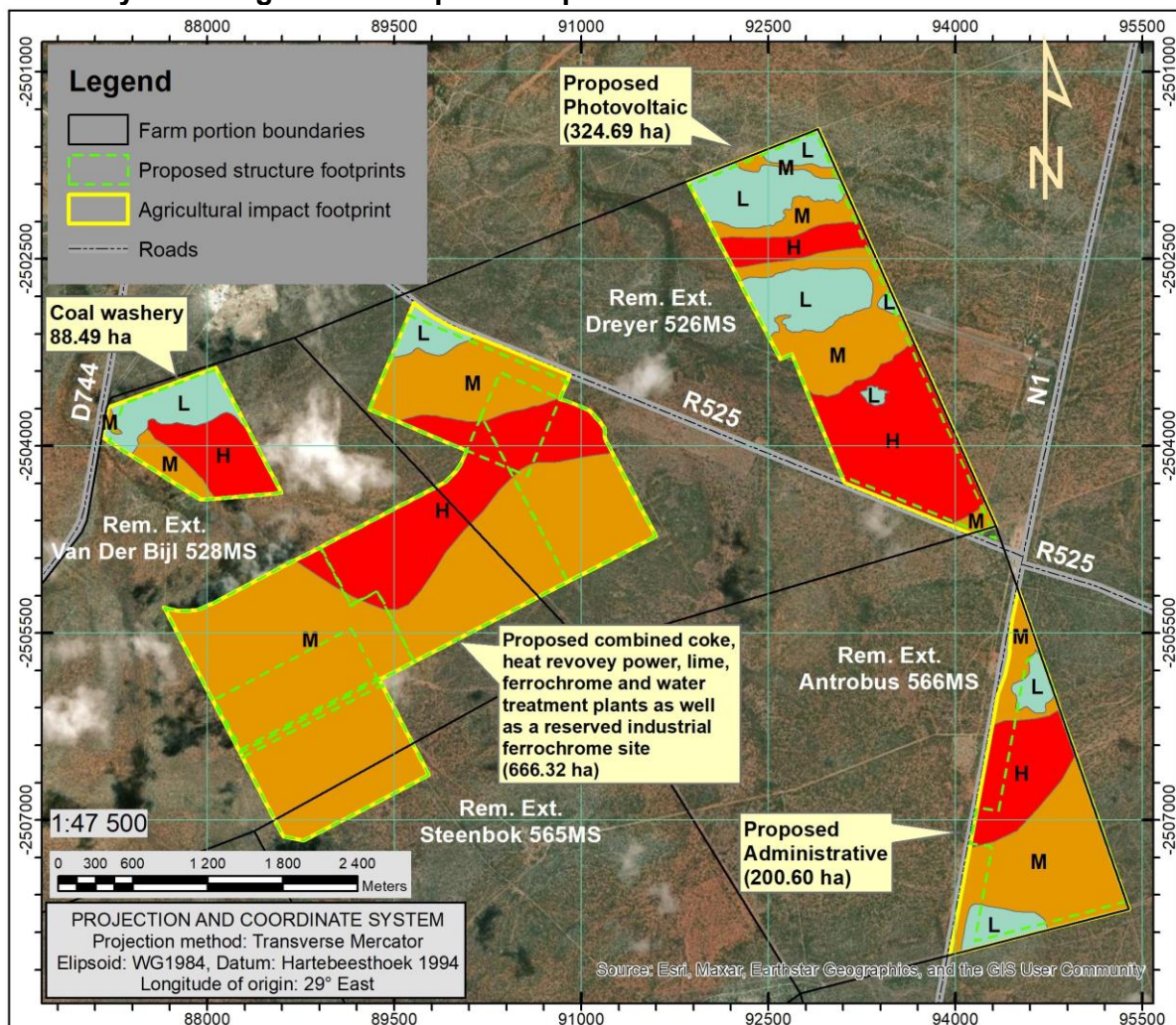
Table 9, which also serves as the legend for Figure 7, shows the proportions of the refined agricultural sensitivity classes of the Agricultural Impact Footprint. Table 9 shows that 28.85% of the Agricultural Impact Footprint is rated as high agricultural sensitivity, 57.77% as medium and 13.39% as low.

Table 9: Refined agricultural sensitivity classes derived from detailed baseline data

Legend: Refined agricultural sensitivity			
Agricultural Sensitivity and Code	Proportions derived from baseline assessment		
	Unit Count	(ha)	(%)
Very High (VH)	0	0	0
High (H)	5	369.30	28.85
Medium (M)	10	739.42	57.77
Low (L)	9	171.40	13.39
Total	24	1280.1	100.00

Figure 7 shows that the proposed infrastructure footprints intersect high agricultural sensitivity zones within all 4 infrastructure development sections. Refer to Sections 10.5-10.7.

Figure 7: Proposed supporting infrastructure overlain on the refined agricultural sensitivity of the Agricultural Impact Footprint



Legend: Refined agricultural sensitivity			
Agricultural Sensitivity and Code	Proportions derived from baseline assessment		
	Unit Count	(ha)	(%)
Very High (VH)	0	0	0
High (H)	5	369.30	28.85
Medium (M)	10	739.42	57.77
Low (L)	9	171.40	13.39
Total	24	1280.1	100.00



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7.2 Land uses on adjacent land parcels

The protocol requires information on the current agricultural activities on adjacent land parcels (Protocol: Section 3, Table 1, Paragraph 2.7.9).

The activities on adjacent land parcels were derived from Google Earth satellite imagery and are summarized in Table 10.

Table 10: Activities on farm portions surrounding the Development Site

Direction	Farm	Portion	Activities
Central North	Erasmus 529MS	Rem.Ext.	Mining, limited crop farming, livestock and or wildlife farming
	Erasmus 529MS	1, 3, 4	Appears to be a railway station, small town and partly livestock farming.
North-northeast	Jan van Rensburg 525MS	Rem.Ext.	Livestock and/or wildlife farming
North-northwest	Pretorius 531MS	Rem.Ext., 1	Livestock and/or wildlife farming
Northeast	Maseri Pan 520MS	Rem.Ext.	Livestock and/or wildlife farming
East	Scott 567MS	Rem.Ext.	Livestock and/or wildlife farming
South	Groot Endaba 581MS	Rem.Ext.	Livestock and/or wildlife farming
Southwest	Grootpraat 564MS	Rem.Ext.	Livestock and/or wildlife farming

7.3 Agricultural production

7.3.1 Average annual crop yields

The protocol requires a description of the current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down in production units (Protocol: Section 3, Table 1, Paragraph 2.4.3).

Average crop yields are estimated based on annual precipitation, soil properties and visual assessments of crops during the time of the soil assessment. The land use map, Figure 4, shows that no crop farming takes place within the Agricultural Impact Footprint and Table 11 indicate that the annual crop production on the 4 farms within the Agricultural Impact Footprint is zero.

Table 11: Medium term crop yields (5 years)

Farms	Portion	Production unit/crop	Area (ha)	Estimated Medium term yield range (t/ha/a)	Average medium-term yield (t/ha/a)	Total average yield per annum (t)
Van der Bijl 528MS	Rem.Ext.	None	0	-	-	0
Dreyer 526MS	Rem.Ext.	None	0	-	-	0
Antrobus 566MS	Rem.Ext.	None	0	-	-	0
Steenbok 565MS	Rem.Ext.	None	0	-	-	0

7.3.2 Average annual livestock yields

The approximate number of large stock units that are currently kept on the 4 farms that are impacted by the proposed development was obtained from the secretary of the Mulambwane CPA, Mr Aubrey Luvha, as shown in Table 12.

Table 12: Medium term livestock yields (5 years)

Farm	Portion	Production unit	Farm size (ha)	Current livestock units on farm	Current grazing load	Total offspring at 85% weaning rate per annum
Van der Bijl 528MS	Rem.Ext.	Cattle	1509.0	30	50 ha/lsu	25
Dreyer 526MS	Rem.Ext.	Cattle	1310.5	70	19 ha/lsu	59
Antrobus 566MS	Rem.Ext.	Cattle	979.7	60	16 ha/lsu	51
Steenbok 565MS	Rem.Ext.	Cattle	1089.2	40	27 ha/lsu	34
		Total	4888.4	200	12 ha/lsu (average)	169

Table 12 indicate that a total 200 cattle (large stock units - lsu) are kept on the 4 farms. The table shows that the current grazing load varies from 16-50 ha per lsu. The annual offspring was calculated on the assumption of a pregnancy rate of 90%, a calving rate of 88% and a weaning rate of 85%, which translates to a total of 169 weaner calves.

7.4 Change in productivity and potential losses in production as a result of the development

There are 2 sections in the Protocol that apply to the heading above namely:

(Section 3, Table 1, Paragraph 2.5.1) *change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down in to production units.*

The proposed development will withdraw 1280.1 ha of the 4 affected farms if the proposed structure footprints are fenced off and agriculture (cattle farming) can continue undisturbed on the surrounding areas. The productive land on the 4 farms will decrease with 1280.1 ha. If the structure footprints are not fenced off, it will result in additional areas that become unavailable for cattle farming and the area of land that become unproductive will increase further.

(Section 3, Table 1, Paragraph 2.7.6) *an indication of the potential losses in production and employment from the change of the agricultural use of land as a result of the proposed development;*

Table 13 shows the sizes of the structure footprints that will be withdrawn from cattle farming within each farm, which translates to a total of 1280.1 ha. Considering the current grazing load, the withdrawal of 1280.1 ha, translates to the loss in 53 large stock units, which calculates to a loss of 45 weaner calves.

Table 13: Loss in livestock yields due to the development

Farms	Portion	Production unit	Area withdrawn due to development (ha)	Current grazing load	Reduction in large stock units due to development	Reduction in offspring at 85% weaning rate per annum
Van der Bijl 528MS	Rem.Ext.	Cattle	459.4	50 ha/lisu	9	8
Dreyer 526MS	Rem.Ext.	Cattle	586.7	19 ha/lisu	31	26
Antrobus 566MS	Rem.Ext.	Cattle	200.6	16 ha/lisu	12	10
Steenbok 565MS	Rem.Ext.	Cattle	33.4	27 ha/lisu	1	1
			1280.1		53	45

7.5 Change in employment figures and potential losses of employment

There are 2 sections in the Protocol that apply to the heading above namely:

(Section 3, Table 1, Paragraph 2.5.2) *change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure, and*

(Section 3, Table 1, Paragraph 2.7.6) *an indication of the potential losses in production and employment from the change of the agricultural use of land as a result of the proposed development;*

Employment and labour impacts is not within the specialist field of the soil specialist and should be addressed by means of a socio-economic assessment, which are generally part of an EIA process and are executed by specialists in this field. Please refer to the socio-economic assessment.

8. ENVIRONMENTAL AND AGRICULTURAL IMPACT ASSESSMENT

8.1 Impact description and rating

One main activity will be responsible for the impact on soils, land use and agricultural production, namely: **Erection of various mine related structures**. The proposed structure footprints, as provided for the project, covers a total of 1196 ha. There are linear strips adjacent to proposed structure footprints that will become unavoidably vacant, which increase the agricultural impact footprint to 1280.1 ha, as indicated on Figure 1b and 1c. The agricultural impact footprint is indicated by red outlines on Figure 1c, and consist of 4 sections as follows:

- A coal washery plant (88.49 ha),
- Combined coke plant, heat recovery power plant and lime plant, ferrochrome plant, water treatment plant and reserved ferrochrome industrial area (666.32 ha)
- Photovoltaic (solar) power station (324.69 ha)
- SEZ administrative centre (offices and staff living facilities) (200.6 ha)

The structures will affect the soil productive ability and agricultural production in the following 2 ways:

- The footprints of roads, parking areas, buildings (workshops, offices, ablutions etc.) and processing plants will be covered completely with concrete, tar or pavers. The soil surface will thus be covered completely and it will cause the productive ability of the soils to cease completely and any agricultural production will thus also cease completely for the entire lifespan of the structure, until it is demolished and the footprint is rehabilitated.
- The soil surface in-between structures or buildings such as at the photovoltaic plant and administrative complex will not be covered and the productive ability of the soil will not cease, but agricultural production will cease because cattle farming will not be allowed or possible.

All structures will thus cause agricultural production to cease whether the soil's productive ability ceases or not. The impact ratings are provided in Tables 14 below.

Table 14: Impact assessment and rating

ACTIVITY: Erection of mine structures – haul roads (if applicable). The impact will occur during the construction and throughout the operational phase until all base materials are removed and the footprint rehabilitated, which is probably during the decommissioning phase.

Nature of the impact	Significance of potential impact <u>WITHOUT</u> mitigation						Mitigation Measures	Significance <u>WITH</u> mitigation	
	Extent	Duration	Intensity	Probability	Weight	Significance		Mitigation Efficiency	Significance
- The haul road will cover the soil surface and cause a complete cease of agricultural production and food supply. - The upper soil horizon will be disturbed. It will probably be removed and placed as a berm along the edges. - The remaining soil horizons will be compacted severely during construction and placement of base materials for the haul road.	2 Site	4 Long term	5 High	5 Definite	5 High	80 High	- The upper A-horizon should be removed to a depth of 200-400 mm and stored as a berm along the edges. The aim is to leave the B-horizon undisturbed and later replace the A-horizon in its original position, which implies a reconstruction of the original soil horizon sequences and subsequent less deterioration from pre-mining to post-mining land capability. - The footprint should then be covered with the required base materials as specified by the engineering design. - During the decommissioning phase the footprint should be thoroughly cleaned and all base materials should be removed to a suitable disposal facility. - The cleaned footprint (or exposed upper part of the B-horizon) should be ripped thoroughly prior to replacement of the stored A-horizon to alleviate all compaction caused by the structure. - The stored A-horizon should be graded evenly over the total structure footprint. - The soil should then be ameliorated as recommended by a soil specialist	0.6 Medium	48 Medium

							- according to soil chemical analysis of samples taken after replacement. - The footprint should be re-vegetated with a grass seed mixture. - A civil engineer should draw and provide a stormwater control plan and erosion control structures should be built during the construction phase to minimise soil erosion.		
ACTIVITY: Erection of mine structures – PCD (if applicable). The impact will occur during the construction and throughout the operational phase until all base materials are removed and the footprint rehabilitated, which is probably during the decommissioning phase.									
- The PCD footprint will cover the soil surface and cause a complete cease of agricultural production and food supply. - The topsoil will be disturbed and will probably be used to crated embankments. - The remaining soil horizons will be compacted severely prior to placement of the liner.	2 Site	4 Long term	5 High	5 Definite	5 High	80 High	- A liner to be constructed according to waste classification and engineer's design. - The A and B-horizons up to a depth of 1m can be used for the construction of embankments but should not be mixed with subsoil material. - During the decommissioning phase the footprint should be thoroughly cleaned and all sludge and other building material should be removed to a suitable disposal facility. - The soil material used for wall embankments should be graded evenly over the entire footprint. - The soil should be ameliorated as recommended by a soil specialist according to soil chemical analysis of samples taken after replacement. - The footprint should be re-vegetated with a grass seed mixture.	0.6 Medium	48 Medium

							A civil engineer should draw and provide a stormwater control plan and erosion control structures should be built during the construction phase to minimise soil erosion.		
ACTIVITY: Erection of mine structures – Topsoil and hard and soft overburden stockpiles (if applicable). The impact will occur during the operational phase until all topsoil are removed and the footprint rehabilitated, which is probably during the decommissioning phase.									
- The topsoil and overburden stockpiles will cover the soil surface and cause a complete cease of agricultural production and food supply. - The upper natural soil horizons will be compacted severely by the weight of the topsoil and overburden material. - All vegetation and animal life at the footprint will be destroyed. All natural soil processes and microbial activities will cease to a large extent or completely.	2 Site	4 Long term	5 High	5 Definite	5 High	80 High	- Topsoil or overburden material should be dumped directly on the natural surface without removal of any soil horizons. Any disturbance of the soil horizons will only cause a higher impact on the soil. - No maximum stockpile height is proposed from a soil's perspective. Stockpile height restrictions causes stockpile footprints sizes to increase and causes larger natural soil footprints to be compacted and simultaneously causes the natural soil processes within a larger footprint to cease to a large extent. - The dumped topsoil or overburden should all be removed precisely up to the original natural surface. The surface should be thoroughly cross-ripped to a minimum depth of 400mm to alleviate all compaction caused by the weight of the dumped material. The surface should then be smoothed with a disc-implement. - The soil's fertility status should then be ameliorated as recommended by a soil specialist according to soil chemical analysis. - The footprint should be re-vegetated with a grass seed mixture or re-introduced to the	0.4 Medium to high	32 Low to medium

							pre-mining land use such as crop farming or grazing.		
ACTIVITY: Erection of mine structures – ROM stockpile (if applicable). The impact will occur during the operational phase until the structure is removed and the footprint rehabilitated, which is probably during the decommissioning phase.									
- The base material that covers the soil surface will cause a complete cease of agricultural production and food supply. - The natural soil horizons underneath the base material will be compacted during construction of the base layer and during operation thereafter. - Spilled, low quality water or stormwater that leave the structure footprint may impact negatively on the surrounding soil chemical status.	2 Site	4 Long term	5 High	5 Definite	4 Medium to high	64 Medium to high	- The natural soil surface should be covered with 200-300mm of non-coaliferous overburden material and should be compacted to restrict contaminated water seeping into the underlying soils. A berm of overburden material should be constructed on the edges to contain contaminated water. - During the decommissioning phase the footprint should be cleaned thoroughly and all overburden material should be removed to a suitable disposal point. The cleaned footprint should be cross-ripped to alleviate compaction. - The soil's fertility status should be ameliorated as recommended by a soil specialist according to soil chemical analysis. - The footprint should be re-vegetated with a grass seed mixture.	0.4 Medium to high	26 Low to medium

ACTIVITY: Erection of mine structures – Workshops, hard parks, offices and other buildings. The impact will occur during the operational phase until the structure is removed and the footprint rehabilitated, which is probably during the decommissioning phase.									
- The structure footprint that covers the soil surface will cause a complete cease of agricultural production and food supply. - The natural soil horizons underneath the structure will be compacted during construction.	2 Site	4 Long term	5 High	5 Definite	4 Medium to high	64 Medium to high	- During the decommissioning phase the footprint should be cleaned thoroughly and all building material should be removed to a suitable disposal point. The cleaned footprint should be cross-ripped to alleviate compaction. - The soil's fertility status should be ameliorated as recommended by a soil specialist according to soil chemical analysis. - The footprint should be re-vegetated with a grass seed mixture. - A civil engineer should draw and provide a stormwater control plan and erosion control structures should be built during the construction phase to minimise soil erosion.	0.4 Medium to high	26 Low to medium
Cumulative impact Highly productive soils are occupied by mining or mining processes and then often poorly rehabilitated, which causes a permanent loss of high potential and highly productive soils. This is a serious, negative, accumulating impact on our national soil resource which reduces food production annually.							Mitigation Adequate rehabilitation procedures and controls to be included in EMPR'S to facilitate effective rehabilitation to a state as close to pre-mining land capability as possible, so that pre-mining land used can be reintroduced.		

9. IMPACT MITIGATION / REHABILITATION

9.1 Soil mitigation for structures on the mine infrastructure plan

9.1.1 Haul roads and roads (If applicable)

- The A-horizon should be removed to a depth of 200-400 mm and stored as a berm along the edges. The aim (on the long term) is to leave the B-horizon undisturbed and later replace the A-horizon in its original position, which implies a reconstruction of the original soil horizon sequences and subsequent less deterioration from pre-mining to post-mining land capability.
- The footprint should then be covered with the required base materials as specified by the engineering design.
- During the decommissioning phase the footprint should be thoroughly cleaned and all base material should be removed to a suitable disposal facility.
- The cleaned footprint (or exposed upper part of the B-horizon) should be ripped thoroughly prior to replacement of the stored A-horizon to alleviate all compaction caused by the structure and related activities.
- The stored A-horizon should be graded evenly over the total structure footprint.
- Soil samples should be taken after soil replacement and the soil should then be ameliorated according to soil chemical analysis as recommended by a registered soil specialist.
- The footprint should be re-vegetated with a grass seed mixture.

9.1.2 Coal washing plant, ROM pads, coal stockpiles, sidings and processing plants

- A liner, based on the waste type classification should be constructed according to engineer's specifications. These types of structures are often classified as Type 3 waste and require a Class C liner. No maximum stockpile height is proposed from a soil's perspective.
- The A-horizon should be removed to a depth of 200-400 mm and stored as a berm along linear structures or at a designated topsoil stockpile. This can be achieved by using graders or dozers. The aim (on the long term) is to leave the B-horizon undisturbed and later replace the A-horizon in its original position, which implies a reconstruction of the original soil horizon sequences and subsequent less deterioration from pre-mining to post-mining land capability. The natural seed source, which occurs mainly within the A-horizon is then replaced on the surface which will enhance succession to the natural state to some extent. In case of black clay soils with physical instabilities the structure engineer should decide whether it is necessary to remove the entire soil layer or only the upper part of the A-horizon.
- The structure footprint should then be covered with a base material (layer) suitable for the specific structure, which will probably be specified by the engineering design (roads, foundations, sidings, stockpiles etc).
- During the decommissioning phase the footprint should be thoroughly cleaned and all base material should be removed to a suitable disposal facility.
- The cleaned footprint (or exposed upper part of the B-horizon) should be ripped thoroughly to alleviate all compaction caused by the structure and related activities before replacement of the stored A-horizon.
- The stored A-horizon should be graded evenly over the total structure footprint.

- Soil samples should be taken after soil replacement and the soil should then be ameliorated according to soil chemical analysis as recommended by a registered soil specialist.
- The footprint should be re-vegetated with a grass seed mixture.

9.1.3 Hard parks, workshops, offices

- The engineering design of some of these structures may require removal of a thin soil layer and others not. All topsoil which might be removed for the foundations of these structures should be stored for later rehabilitation.
- During the decommissioning phase the footprint should be thoroughly cleaned.
- The footprint should be ripped to alleviate compaction
- Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface.
- Soil samples should be taken after soil replacement and the soil should then be ameliorated according to soil chemical analysis as recommended by a registered soil specialist.
- The footprint should be re-vegetated with a grass seed mixture.

9.1.4 PCD (if applicable)

- A liner to be constructed according to waste classification and engineer's design.
- The A and B-horizons up to a depth of 1m can be used for the construction of embankments but should not be mixed with subsoil material.
- During the decommissioning phase the footprint should be thoroughly cleaned and all sludge material should be removed to a suitable disposal facility.
- The soil material used for wall embankments should be graded evenly over the entire footprint.
- Soil samples should be taken after soil replacement and the soil should then be ameliorated according to soil chemical analysis as recommended by a registered soil specialist.
- The footprint should be re-vegetated with a grass seed mixture.

9.1.5 Topsoil and overburden stockpiles and dumps (if applicable)

- Topsoil or overburden should be dumped directly on the natural surface without removal of any soil horizons. Any disturbance of the soil horizons will only cause a higher impact on the soil.
- No maximum stockpile height is proposed from a soil's perspective. Stockpile height restrictions cause soil stockpiles footprints to increase and causes larger natural soil footprints to be compacted and simultaneously causes the natural soil processes within a larger footprint to cease to a large extent.
- The dumped topsoil should all be removed precisely up to the original natural surface. The surface should be thoroughly cross-ripped to alleviate all compaction caused by the weight of the dumped material. The surface should then be smoothed with a disc-implement.
- Soil samples should be taken after soil replacement and the soil should then be ameliorated according to soil chemical analysis as recommended by a registered soil specialist.
- The footprint should be re-vegetated with a grass seed mixture or re-introduced to the pre-mining land use such as crop farming or grazing.

10. CONFIRMATIONS AND MOTIVATIONS REQUIRED FROM THE SOIL SCIENTIST

This section addresses the remaining requirements in Section 3, Table 1 of the Protocol, which are not addressed yet. The reference to the section of the Protocol and the requirement is indicated by italic text.

10.1 Alternative footprints with medium or low agricultural sensitivity

(Table 1, Section 2.5.3) any alternative development footprints within the preferred site which would be of “medium” or “low” sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.

The agricultural sensitivity maps Figures 3b and 7, shows the refined agricultural sensitivity ratings based on newly gathered, detailed baseline information, that differs from the regional scale data of the Screening Tool. Figure 7 shows that the planned structure footprints intersect the high agricultural sensitive zones in all 4 of the planned development sections. It is further noted that very large footprints are allocated to the planned structures and hopefully the actual required footprints are much smaller and can be moved into medium and low sensitive zones. For example, it is doubtful that the coal washery plant can occupy the entire 88.49 ha, currently earmarked for it. Figure 7 indicate a number of low agricultural sensitive areas that can be utilized for infrastructure and it is recommended that the final structure footprints are located considering the agricultural sensitivity map, and avoid the highly sensitive areas. Refer to Section 10.5 where fragmentation of agricultural activities is discussed.

10.2 Motivation for not utilize sites with medium or low agricultural sensitivity

(Table 1, Sections 2.7.11) motivation must be provided if there were development footprints identified as per paragraph 2.5.3 above that were identified as having a “low” or “medium” agriculture sensitivity and that were not considered appropriate.

Refer to Section 10.5 where fragmentation of agricultural activities is discussed.

10.3 Long term benefits of the proposed project versus benefits of agriculture

(Table 1, Section 2.7.7) an indication of possible long term benefits that will be generated by the project in relation to the benefits of the agricultural activities on the affected land;

Food production is one of the main activities that contribute to the economy and there are no benefits that outweigh the value of food production. It is however essential that mining and processing also takes place, providing that the impact on agriculture are minimised as far as possible. It appears, however, that agricultural practices at the project area are not executed optimally, although it is not a reason for the planned development to occupy land in a way that will cause unnecessary fragmentation of agricultural production units. The agricultural production at the project area needs to be improved to an optimal state and the structures of the development should be located in a manner that impact the least on the existing agricultural production units. Refer to Section 10.5 where fragmentation of agricultural activities is discussed.

10.4 Additional environmental impacts expected from proposed development

(Table 1, Section 2.7.8) additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc.;

The sensitive groundwater system, which is the main water source for current agricultural production needs to be considered.

10.5 Fragmentation of agricultural activities

(Table 1, Section 2.7.12) confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro-siting of the proposed development to minimise fragmentation and disturbance of agricultural activities;

The proposed development will certainly cause unnecessary fragmentation of agricultural activities. The first major fragmentation from an agricultural and geographical point of view is the administrative complex, situated to the east of the N1 and the photovoltaic plant to the north of the R525. If these 2 structure footprints are both moved to the west of the N1 and south of the R525, it would drastically lessen the fragmentation impact.

The section of the coke, heat recovery and lime plant that intersect a small section of the farm Steenbok appears also unnecessary and may fit into the farm Van Der Bijl. The farm Van Der Bijl borders the Matopi mining activities to the north and it borders the railway line to the west. The farm Van Der Bijl can in fact, accommodate the total proposed structure complex, which will then affect only 1 farm instead of 4. There is also a frequent occurrence of shallow rocky soils on the remainder of farm Van Der Bijl, which can be utilized for structure footprints. It would cause less fragmentation and have a lower impact on agriculture to utilize the entire Van Der Bijl farm, even if high agricultural zones are utilized, than to cause fragmentation on 3 other farms as well.

Fragmentation mostly tends to accumulate once it took place and often expand bit by bit, because it can be argued that it is not a new impact, only a small expansion of an existing impact. It is therefore strongly recommended that all structures are moved to the farm Van Der Bijl in order to lessen the severe fragmentation of agricultural production units that the current layout will impose.

10.6 Acceptability of the impact on agricultural resources

(Table 1, Section 2.3.2) whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such an impact is outweighed by the positive impact of the proposed development on agricultural resources.

The current proposed development consists of 4 structure footprints, covering a total of 1280 ha, that spreads over 4 farms and each footprint occupies approximately 10-40% of the farm on which it occurs. This will cause significant fragmentation of the agricultural units. The fragmentation can easily limit or it can largely cease agricultural production in sections in-between the current planned structure footprints. The impact is therefore not acceptable unless it can be explained and substantiated why this layout is the only or best option.

10.7 Substantiated statement on acceptability or not and approval or not

*(Table 1, Section 2.7.13) substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the **acceptability or not** of the proposed development and a recommendation on the **approval or not** of the proposed development;*

The acceptability or not, of the impact is discussed in Section 10.6 above. In terms of approval or not, it should be clear that the development in principle is not opposed. However, the current layout that will significantly fragmentize agricultural units is not acceptable and approval thereof is therefore not recommended. It is recommended that the layout is refined to lessen the

fragmentation as far as possible or it should be substantiated why this layout is the only or best option.

10.8 Conditions subjected to the statement above

(Table 1, Section 2.7.14) any conditions to which this statement is subjected.

A refined layout should be provided for evaluation or a formal substantiation for the current layout should be provided.

10.9 Monitoring requirements and mitigation measures for inclusion in the EMPr

(Table 1, Section 2.7.15) where identified, proposed impact management outcomes or any monitoring requirements and/or mitigation measures for inclusion in the Environmental Management Programme (EMPr);

Soil erosion around all structures should be monitored and erosion prevention structures should be maintained and additional structures should be erected where existing one's proofs to be insufficient.

10.10 Assumptions and uncertainties or gaps in knowledge or data

(Table 1, Section 2.7.16) a description of the assumptions made and any uncertainties or gaps in knowledge or data;

It is uncertain whether the proposed infrastructure will occupy the total footprints as currently indicated or whether it may occupy only a portion of the currently indicated footprints.

11. CONCLUSION

The overall conclusion is summarized in Section 10.

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APPENDIX A

SOIL CLASSIFICATION SYSTEM

The classification system categorizes soil types in an upper soil Form level which is subdivided into a number of lower Family levels. Each soil Form (higher level) is defined by a unique vertical sequence of soil horizons with specific defined properties. The soil Families (lower level) are a subdivision of the soil Form (higher level), differentiated on the basis of specific characteristics such as leaching status, calcareousness, structure types and sizes etc.

In this way, standardised soil identification and communication is allowed by use of soil Form names and family numbers or names e.g. Hutton 2100 or Hutton Hayfield. The soil Form and soil Family together are referred to as soil types.

The soil Forms are indicated by the name and the Family by its appropriate number e.g. Hutton 2100. The soil Form and Family are then symbolized e.g. Hu and referred to as soil type Hu. The soil Form and Family are often further categorized based on effective soil depth, terrain unit and slope and a numerical number is added to the symbol e.g. Hu1. For example, where the Hutton 2100 soil Form and Family occurs at an effective depth of 900-1200 mm, it is symbolized and referred to as soil type Hu1, and where this soil Form and Family occurs at an effective depth of 600-900 mm it is symbolized and referred to as soil type Hu2.

APPENDIX B

PHYSICAL SOIL PROPERTIES AND CHARACTERISTICS

Various terms in the soil legend are used to describe a series of soil properties and characteristics such as the dominant soil Form and Family, effective soil depth, internal drainage, and clay content per soil horizon and texture class.

1. Effective soil depth

Effective soil depth can be considered as the depth freely permeable to plant roots and water. Effective soil depth categories used in the soil legend are as follows:

Very shallow	< 300 mm
Shallow	300-600 mm
Moderately deep	600-900 mm
Deep	900-1500 mm
Very deep	> 1500 mm

2. Internal drainage

Internal drainage is the flow of water (annual precipitation) through the soil profile. Soils with the ability to drain annual precipitation through the profile without waterlogged periods within certain parts of the profile are called **well-drained** soils. Soils which lack this ability will display properties indicating temporary to permanent water logged conditions in parts of the soil profile in the form of mottling, leaching or gleying.

Moderately well-drained soils mostly display impeded internal drainage in the lower profile e.g. soft plinthic horizons, which is the result of periodically fluctuating water tables which are characterized by mottling and accumulation of iron and manganese oxides.

Imperfectly drained soils mostly display impeded internal drainage in the upper and lower parts of the profile e.g. E and plinthic horizons, which is the result of periodic lateral flow of water in the profile and fluctuating water tables. Such soils are characterized by grey, leached, sandy horizons and mottled plinthic horizons.

Poorly drained soils mostly display impeded internal drainage in the upper and lower parts of the soil profile e.g. E, plinthic and G-horizons and are the result of long term to permanent wetness in the soil profile, which is characterized by grey, leached, sandy horizons, mottled plinthic horizons and gleyed clay horizons.

3. Texture class

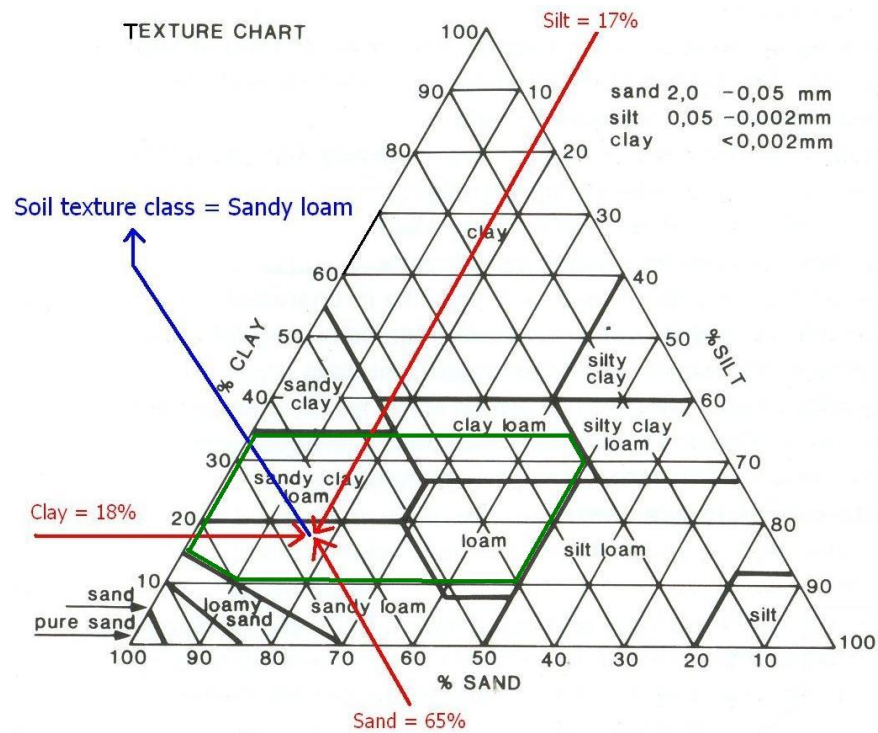
Soil texture refers to the relative proportions of the various particle size separates in the soil. Particle sizes are defined in the following **fractions**.

Sand – (2.0 – 0.05 mm)
Silt – (0.05 – 0.002 mm)
Clay – (< 0.002 mm)

The relative proportions of these 3 fractions (as illustrated by the red arrows in Figure B1) determines 1 of 12 soil texture classes e.g. sandy loam, loam, sandy clay loam etc. The different texture class zones are demarcated by the thick black lines in the diagram. The green zone can be used as a guideline for moderate to high agricultural potential, but needs to be evaluated

together with other soil properties.

Figure B1: Soil texture chart



APPENDIX C1

COORDINATES OF SOIL SAMPLING POINTS

Coordinates of Soil Sampling Points				
Soil sampling point	Projected Coordinate System LO 29, Wgs 1984, Hartebeesthoek 1994		Geographic Coordinate System Wgs 1984, Hartebeesthoek 1994	
	X (m)	Y (m)	X/Lat (dd)	Y/Long (dd)
B48	94262.64	-2507821.04	-22.665823	29.917163
K11	88712.64	-2506471.04	-22.653934	29.863091
K50	94562.64	-2506471.04	-22.653617	29.920001
O13	89012.64	-2505871.04	-22.648501	29.865976
W25	90812.64	-2504671.04	-22.637570	29.883416
AA7	88112.64	-2504071.04	-22.632295	29.857120
AC5	87812.64	-2503771.04	-22.629602	29.854185
AC25	90812.64	-2503771.04	-22.629444	29.883364
AE42	93362.64	-2503471.04	-22.626597	29.908149
AI39	92912.64	-2502871.04	-22.621204	29.903737
AL38	92762.64	-2502421.04	-22.617149	29.902251

APPENDIX C2

Original laboratory report

Verslag goedgekeur deur / Report approved by:

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Data Administrator



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TS: WIN 014, 031 & ICP-OES



Test Report

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BELANGRIK / IMPORTANT

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Test	Method	Test	Method
pH(H ₂ O)	WIN 014	Ca(Mehlich III)	WIN 074
pH(KCl)*	WIN 031	Mg(Mehlich III)	WIN 074
P(Bray1)	WIN 073	K(Mehlich III)	WIN 074
P(Bray2)	WIN 080	Na(Mehlich III)	WIN 074
K(AmAc)	WIN 072	Fe(Mehlich III)	WIN 074
Na(AmAc)	WIN 072	Mn(Mehlich III)	WIN 074
Ca(AmAc)	WIN 072	Cu(Mehlich III)	WIN 074
Mg(AmAc)	WIN 072	Zn(Mehlich III)	WIN 074
EXCH ACID KCl	WIN 031	B(Mehlich III)	WIN 074
Ca%(AmAc)	WIN 072	S(Mehlich III)	WIN 074
Mg%(AmAc)	WIN 072	P(Mehlich III)	WIN 074
K%(AmAc)	WIN 072	Al(Mehlich III)	WIN 074
Na%(AmAc)	WIN 072	C - Carbon(ASHING)	WIN 125
ACID SATURATION(AmAc)	WIN 072	TEC(Mehl III-American)	Calculation
Ca:Mg(AmAc)	WIN 072	SOM - Soil Organic Matter	WIN 082
(Ca+Mg)/K (AmAc)	WIN 072	Estimated Released Nitrogen (Mehlich III - American)*	WIN 074
Mg:K(AmAc)	WIN 072	Ca%(Mehlich III) Base Saturation	Calculation
S-VALUE(AmAc)	WIN 072	Mg%(Mehlich III-American) Base Saturation	Calculation
Na:K	WIN 072	K%(Mehlich III - American) Base Saturation	Calculation
T-VALUE(AmAc)*	Calculation	Na%(Mehlich III-American) Base Saturation	Calculation
Dens. - Density*	WIN 076	H(Mehlich III - American) Base Saturation	Calculation
S (AmAc)	WIN 072	OTHER(Mehlich III-American) Base Saturation	Calculation

APPENDIX D1

WETLAND DELINEATION

1. Legal framework

In order to determine the existence and extent of a wetland in the proposed mining area the legal framework on what classifies as a wetland should be applied. The National Water Act, 1998 (Act 36 of 1998), (NWA), includes a wetland in the definition of a watercourse. A watercourse is:

- *“a river or spring;*
- *a natural channel in which water flows regularly or intermittently;*
- *a wetland, lake or dam into which, or from which, water flows, and*
- *any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.”*

A wetland is then further defined by the NWA as *“land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”*.

Based on the above definition, the Department of Water Affairs and Forestry (DWAF), now the Department of Water Affairs (DWA), published a set of guidelines describing field indicators and methods for determining whether an area is a wetland or riparian area, and for finding its boundaries (DWAF, 2005). These guidelines state that wetlands must have one or more of the following attributes:

- *Wetland (Hydromorphic) soils* that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of *water loving plants (hydrophytes)*; and
- *A high water table* that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil.

Based on the NWA definition of a wetland, four indicators were identified within the DWAF (2005) guidelines to assist in identifying wetland areas:

- *Terrain Unit Indicator.* The topography of the area is usually used to determine where in the landscape the wetland is likely to occur.
- *Soil Form Indicator.* Certain soil forms, as defined by the Soil Classification Working Group (1991), are associated with prolonged and frequent saturation.
- *Soil Wetness Indicator.* The soil wetness indicator identifies the morphological “signatures” developed in the soil profile as a result of prolonged and frequent saturation.
- *Vegetation Indicator.* The vegetation indicator identifies hydrophilic vegetation associated with frequently saturated soils.

2. Processes in wetland soils and associated properties

The following processes normally take place under anaerobic/saturated or so-called wetland conditions:

- Mottling (localized colouring and alterations due to continued exposure to wetness);

- Concretions (accumulation and cohesion of minerals into hard fragments).
- Leaching (removal of soluble constituents by percolating water);
- Gleying (reduction of ferric oxides under anaerobic conditions resulting in grey, low chroma soil colours); and
- Illuviation of colloidal matter from one horizon to another, resulting in the development of grey sandy E-horizons and grey clay G-horizons.

These processes usually result in soil properties which provide undisputable evidence of temporary to permanent wetness such as:

Dark grey coloured A-horizons

The A-horizon is the upper 200-300 mm of the soil profile and is usually defined by a slightly darker colour due to a greater or lesser amount of humified organic matter. The dark grey A-horizon is common to almost all the soils found in permanent and seasonal zones. The dark grey colour usually appears only in the moist state and rapidly fades in to a plain grey colour when it dries out. The dark appearance is due to higher organic carbon content which builds up under the long term moist conditions in a wetland system. The carbon and also fine organic matter loses its dark colour in the dry state and the grey colour of the soil particles becomes prominent. The grey soil colour is the result of the removal of soluble constituents (iron oxides, silicate clay) by percolating water. The dark grey A-horizon is common in permanent, seasonal and temporary wetland zones.

Grey to pale grey E-horizons

The E-horizon underlies the A-horizon, having a lower content of colloidal matter (clay, sesquioxides, organic matter) usually reflected by a pale colour and a relative accumulation of quartz and/or other resistant minerals of sand or silt sizes. The E-horizon develops under high lateral flow (permanent or periodic) of water in the soil profile, which removes some colloidal matter to the lower soil profile and some further down the wetland system. The E-horizon is thus the flow path for shallow groundwater in the wetland zone. The grey and pale grey E-horizon is common in permanent and seasonal wetland zones and less common in temporary zones.

Yellowish grey E-horizons

The colour of the E-horizon reflects the intensity of removal of colloidal matter from the horizon. This results in the phenomenon that some E-horizons have a yellowish colour in the moist state but become grey in the dry state. The yellowish colour in the moist state is due to an incomplete covering of the mineral soil particle by ferric oxides and indicates a less leached state and less anaerobic (saturated conditions) conditions. The yellowish E-horizons are therefore strongly related to temporary wetland zones and occur less in seasonal or permanent wetland zones.

Plinthic horizons

Plinthic horizons are characterised by localization and accumulation of iron and manganese oxides under conditions of a fluctuating water table, resulting in distinct reddish brown, yellowish brown and/or black mottles, with or without hardening to form sesquioxide concretions. Plinthic horizons are the result of fluctuating water tables which implies wetter and dryer phases and are therefore found commonly in seasonal and temporary wetland zones and less in permanent wetland zones.

G-horizons

Gleying is the process of reduction of ferric oxides and hydrated oxides under anaerobic

conditions, resulting in grey, low chroma matrix colours. This usually goes along with clay illuviation from the upper horizon which results in a grey clay horizon and is called a G-horizon. G-horizons are commonly found in permanent wetland zones, occasionally in seasonal zones and rarely in temporary wetland zones.

APPENDIX D2

CRITERIA USED FOR ARABLE, GRAZING AND WILDERNESS LAND CAPABILITY CATEGORIES

The land capability classes are defined as follows:

Class I: Wetland

Wetland and riparian zones were delineated according to the practical field procedure for the identification and delineation of wetlands and riparian areas (Department of Water Affair and Forestry, 2005).

Class II: Arable land

Land which conforms to all of the following requirements is designated as Class II: Arable:

- does not qualify as wetland
- has soil that is readily permeable⁴ to the roots of common cultivated plants throughout a depth of 0.75 m from the surface
- has a soil pH value between 4,0 and 8,4
- has electrical conductivity of the saturation extract less than 400mS/m at 25°C and an exchangeable sodium percentage less than 15 through the upper 0,75 m of soil
- has a permeability of at least 1,5 mm per hour in the upper 0.5 m of soil
- has less than 10 percent by volume of rocks or pedocrete fragments larger than 100 mm in diameter in the upper 0,75 m of soil
- has a slope (in percent) and erodibility factor⁵ (K) such that their product is less than 2,0
- occurs under a climate regime which permits, from soils of similar texture and adequate effective depth (0,75 m), the economic attainment of yields of adapted agronomic or horticultural crops that are at least equal to the current national average for those crops, or
- is either currently being irrigated successfully or has been scheduled for irrigation by the Department of Water Affairs.

Class III: Grazing land

Grazing land conforms to all of the following requirements:

- does not qualify as wetland or as arable land
- has soil or soil-like material, permeable to the roots of native plants, that is more than 0.25 m thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm diameter
- supports or is capable of supporting a stand of native or introduced grass species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.

Class IV: Wilderness land

This is land which has little or no agricultural capability by virtue of being too arid, too saline, too steep or too stony to support plants of economic value. Its uses lie in the fields of recreation and wildlife conservation. It does, however, also include watercourses, submerged land, built-up land and excavations. Wilderness land is defined by exclusion, namely:

- land which does not qualify as wetland, arable land or grazing land.

APPENDIX E

1. METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

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

1.1 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, 1998) and as amended from time to time (DEAT, 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 0-1: 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 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.

1.1.1 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.

1.1.1.1 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:

Table 0-2: Significance-Without Mitigation

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.

1.1.1.2 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:

Table 0-3: Significance- With Mitigation

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.

1.1.2. 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.

1.1.2.1. Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 0-4). 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 0-4: 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	Improbable	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		

1.1.2.2 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:

$$\text{Significance Rating (WOM)} = (\text{Extent} + \text{Intensity} + \text{Duration} + \text{Probability}) \times \text{Weighting Factor}$$

1.1.2.3 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.

1.1.2.3.1 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 efficiency (ME) rating (refer to *Table 0-4*). 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:

$$\begin{aligned} \text{Significance Rating (WM)} &= \text{Significance Rating (WOM)} \times \text{Mitigation Efficiency} \\ \text{or WM} &= \text{WOM} \times \text{ME} \end{aligned}$$

1.1.2.4 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.

(DEAT, 2002)

Finally, the impact assessment must refer to the residual and latent impact after successful implementation of the management measures.

APPENDIX F1

SOIL HORIZON PROPERTIES INFLUENCING STRIPPING AND STOCKPILING PROCEDURES

The stripping procedures aim, with consideration of practical limitations, to reconstruct the original horizon sequences. This is the only way to re-establish 70% or more of the pre-mining land capability. It is important to bear in mind that the natural soil horizons developed over thousands of years in a specific sequence and is the result of soil genesis (weathering) of the parent rock driven by climatic conditions (temperature and moisture) within a specific topography. Stripping and replacing of soil will always result in a moderate to severe disturbance of the natural balances in the soil's physical and chemical properties. This implies that, even with precise execution of well-defined rehabilitation procedures, a degradation from pre-mining to post-mining land capability is unavoidable. This implies that, without precise stripping and replacing of topsoil, substantial degradation from pre-mining to post-mining land capability will probably take place.

The term topsoil in these guidelines refers to the A, B, E and G-horizons of the soil profile as defined in the Taxonomic Soil Classification system for South Africa. The A-horizon comprises the upper part (0-300 mm) of the soil profile and the B1 and B2-horizon from 300 mm up to the stripping depth specified per soil type as shown on Figure 6 and Table 10.

The A-horizon is characterised by a darker colour due to a higher organic carbon content, caused by decomposition of organic matter and roots of crops or natural vegetation. The organic carbon provides higher fertility and water holding capacity. It also improves infiltration and provides a natural buffer against compaction and hard setting. It also serves as a seed source of natural species which can re-establish after rehabilitation. It is therefore crucial to strip the A-horizon separately and replace it in the same position.

Well-drained, red and yellow brown B-horizons usually contain significantly lower organic carbon and have a higher clay content which gradually increases lower in the soil profile. The increasing clay content plays a significant role in soil potential and the soil's ability to sustain crops and plants, because it provides higher water storage capacity and prevents groundwater from rapidly leaching out of the rooting zones of plants. Red and yellow brown B-horizon materials which are placed on the surface (in the natural A-horizon position) tend to seal and compact severely, which leads to lower germination rates of seeds, restricted root development and higher runoff which triggers soil erosion.

Imperfectly to poorly drained plinthic B-horizons commonly have significantly higher clay contents than the well-drained horizons above them. They are characterised by prominent mottling and sesquioxide concretions which indicate impeded internal drainage. These materials are prone to severe compaction and sealing which result in low infiltration, higher runoff and consequent erosion when placed on the surface (in the natural A-horizon position).

Poorly drained G-horizons are clayey, very slowly permeable horizons. Placing this horizon on the surface will result in high runoff, very low infiltration and poor plant growth.

APPENDIX F2

Principles for stripping and stockpiling of topsoil

Stripping and stockpiling has **an impact** on soil, land capability and land use, but it is important to realize that the way this action is performed is also the first and one of the most important **mitigation measures**. The impact on soil, land capability and land use are mitigated by means of the rehabilitation process which commences with **stripping and stockpiling of topsoil during the entire mining process** and is **not** a process that **starts with replacing of topsoil** after or during the mining operation. Rehabilitation and subsequent mitigation of the impacts on soil, land capability and land use consists therefore of the following phases:

- Stripping and stockpiling of topsoil
- Backfill of open pits and leveling of spoil material to a free draining surface
- Replacing and leveling of topsoil and preparation of the surface
- Soil amelioration and re-vegetation

If the first phase of rehabilitation, namely stripping and stockpiling of topsoil, is not done with the aim of reinstating post-mining land capability similar to pre-mining land capability, then high quality rehabilitation will probably not be achieved and it will probably result in any degree from moderate to serious deterioration from pre-mining to post-mining land capability.

In practice, even with optimal rehabilitation procedures applied, some deterioration from pre-mining to post-mining land capability is unavoidable. It is therefore crucial to follow the proposed rehabilitation procedures as far as possible in order to minimise degradation of soil characteristics and to re-establish the highest possible post-mining land capability.

The term topsoil refers to the A and B-horizons of the soil profile as defined in the Taxonomic Soil Classification system for South Africa. The A-horizon comprises the upper part (0-300 mm) of the soil profile and the B-horizon from 300 mm up to the stripping depth specified per soil type indicated in the soil stripping guide. The characteristics of soil horizons (A- and B-horizons) are further described in Appendix E in terms of soil stripping, stockpiling and replacing.

Stripping, stockpiling and replacing of topsoil has a very high impact on soil, land capability and land use and the procedures followed during execution of these actions directly influence the post-mining land capability and consequently determine the degree of deterioration from pre-mining to post-mining land capability. They also directly determine the possible post-mining land uses.

During stripping and stockpiling the following principles should be aimed for:

- ***Prevent mixing of high quality topsoil (A and B-horizons) with low quality underlying material to ensure sufficient volumes of high quality soil for rehabilitation.*** The quality of soil earmarked for rehabilitation purposes significantly deteriorates when the high quality topsoil is mixed with the underlying poorer quality material (clay layers, calcrete, plinthite, weathered rock etc.). This results in significant deterioration in the quality of the soil's physical and chemical properties and a decline in the soil fertility necessary for re-vegetation. The deterioration in soil quality also significantly increases the susceptibility of rehabilitated soils for erosion and seal and crust formation.
- ***Separate stockpiling of different soil type groups to obtain the highest post-mining land capability.*** Topsoil quality or potential is not just limited to the grade of soil generally referred to as topsoil but can vary from very high to low due to various

properties. Soil properties of different soil types can vary substantially e.g. high quality red and yellow well-drained soils and low quality grey poorly drained wetland soils can occur over very short distances in the same field. Mixing of different soil types results in rapid changes in soil properties and characteristics such as texture, infiltration rates and water holding capacity over short distances after replacement, which will definitely adversely affect the post-mining land capability. Contrary to the general perception, separate stockpiling of different soil types does not have significant cost implications for the mine and only requires planning and continuing management.

- ***Separate stripping, stockpiling and replacing of soil horizons (A and B-horizon) in the original natural sequence to combat hardsetting and compaction, maintain soil fertility and conserve the natural seed source.*** The higher soil fertility of the A-horizon, especially phosphorus and carbon contents, declines significantly when it is mixed with the B-horizon, resulting in poorer re-vegetation success. It also increases the susceptibility to compaction and hard setting. The A-horizon also serves as a seed source which will enhance the re-establishing of natural species. The A and B-horizons should be stripped and stockpiled separately and replaced with the A-horizon overlying the B-horizon. However, separate stripping, stockpiling and replacing of the A and B horizons in the same sequence is the ideal procedure but goes along with practical, mechanical and cost implications and is mostly not achievable without proper management. Replacing the A and B horizons in the original sequence is recommended by the Chamber of Mines but is a practice not generally implemented in South Africa yet.

Mitigation procedures for soil and land capability for specific structures

6.2.2 Structures

Guidelines for handling of topsoil for various structure footprints are provided below. **Should any** of these structures be erected these guidelines should be followed. However, some deviation of the guidelines may take place in order to accommodate the engineering design and requirements for each specific structure.

6.2.2.1 Structures to be demolished during the decommissioning phase

Procedures to follow for structures with a flat basis such as inter-burden, coal stockpiles, haul roads, sidings and plants:

- A liner based on the waste type classification should be constructed according to engineer's specifications. These types of structures are often classified as Type 3 waste and require a Class C liner. No maximum stockpile height is proposed from a soils perspective.
- The A-horizon should be removed to a depth of 200-400 mm and stored as a berm along linear structures or at a designated topsoil stockpile. This can be achieved by using graders or dozers. The aim (on the long term) is to leave the B-horizon undisturbed and later replace the A-horizon in its original position, which implies a reconstruction of the original soil horizon sequences and subsequent less deterioration from pre-mining to post-mining land capability. The natural seed source, which occurs mainly within the A-horizon is then replaced on the surface which will enhance succession to the natural state to some extent. In case of black clay soils with physical instabilities the structure engineer should decide whether it is necessary to remove the entire soil layer or only the upper part of the A-horizon.
- The structure footprint should then be covered with a base material (layer) suitable for the specific structure which will probably be specified by the engineering design (roads,

foundations, sidings, stockpiles etc).

- During the decommissioning phase the footprint should be thoroughly cleaned and all base material should be removed to a suitable disposal facility.
- The cleaned footprint (or exposed upper part of the B-horizon) should be ripped thoroughly to alleviate all compaction caused by the structure and related activities before replacement of the stored A-horizon.
- The stored A-horizon should be graded evenly over the total structure footprint.
- The soil should then be ameliorated according to soil chemical analysis of samples taken after replacement.
- The footprint should be re-vegetated with a grass seed mixture.

Procedures to follow for structures such as hard and soft overburden stockpiles and topsoil stockpiles:

- If topsoil needs to be removed for a Class D liner it should be stored at a designated stockpile. If a liner is not a requirement for the specific material no removal/stripping of topsoil should be done. Any disturbance of the soil horizons will only cause a higher impact on the soil. Such material can be placed directly on the soil surface and the footprint of the stockpile should be contained as far as possible.
- No maximum stockpile height is proposed from a soils perspective.
- After removal of the stockpiled material the surface should be thoroughly cleaned (all small rock fragments should be removed) and cross-ripped to alleviate compaction caused by the weight of the dumped material. The necessary equipment and actions should be applied in order to prepare the surface for seeding.
- The soil should then be ameliorated according to soil chemical analysis.
- The footprint should be re-vegetated with a grass seed mixture or re-introduced to the pre-mining land use such as crop farming or grazing.

Procedures to follow for structures with a deeper concave basis such as pollution control dams:

- A liner to be constructed according to waste classification and engineers design.
- The A-horizon should be removed to a depth of 200-300 mm and stored close by at any suitable position. This can be achieved by using graders or dozers. The aim (on the long term) is to replace the A-horizon in its original position, which implies some reconstruction of the original soil horizon sequences and subsequent less deterioration of land capability.
- The B-horizon (300 mm up to subsoil material) can be used for the construction or elevation of wall embankments but may not be mixed with subsoil material.
- The entire footprint should be lined with concrete or a polyethylene membrane or similar to prevent soil and groundwater pollution during the operational phase of the structure.
- During the decommissioning phase the footprint should be thoroughly cleaned and all sludge material should be removed to a suitable disposal facility.
- Material used for wall embankments should be replaced at the bottom.
- The stored A-horizon should then be graded evenly over the entire footprint.
- The soil should be ameliorated according to soil chemical analysis of samples taken after replacement.
- The footprint should be re-vegetated with a grass seed mixture.

Procedures for structures not involving coaliferous or discard ore material such as roads, explosives magazines, buildings, parking areas:

- The engineering design of some of these structure may require removal of a thin soil layer

and others not. All topsoil which might be removed for the foundations of these structures should be stored for later rehabilitation.

- During the decommissioning phase the footprint should be thoroughly cleaned.
- The footprint should be ripped to alleviate compaction
- Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface.
- The topsoil should be ameliorated according to soil chemical analysis.
- The footprint should be re-vegetated with a grass seed mixture.

6.2.2.2 Structures that will remain after the decommissioning phase

Procedures for structures involving coalliferous material such as discard dumps:

The engineering design of structures such as a discard dump will largely dictate how topsoil will be used to reduce the impact of the dump in terms of soil and groundwater pollution. It is however assumed that the topsoil at the dump footprint will be stripped and stored in order to rehabilitate the dump afterwards. The following procedures are therefore recommended for handling of the topsoil. **However, some deviation of the procedures may take place in order to accommodate the engineering design and requirements.**

- Structures such as discard dumps mostly remain after the decommissioning phase and are usually responsible for serious salt pollution to soil and water resources on a continuing bases. It is therefore critical to ensure that sufficient soil material is removed and stored during the construction phase in order to properly rehabilitate (cap) the structure to prevent pollution as far as possible.
- Shortages of topsoil are a common problem when large discard dumps needs to be capped and often leads to the creation of borrow pits which is an additional impact on soil, land capability and land use. It is recommended that soils are stripped at depth as indicated by the soil stripping guide provided in the soil report. Sticking strictly to these depths will ensure that only high quality topsoil is stripped and stored, which will dramatically influence the effective and successful re-vegetation of the capping layer. It is important to incorporate the stripping depths and available high quality soil volumes in the engineering design.
- After removal of the topsoil the entire footprint should be compacted and lined as specified by the engineering design to prevent soil pollution due to leachates.
- Leachates should be channeled to a pollution control dam via concrete or lined drains.
- The gradients of the dump edges should be designed to facilitate effective capping of the dump with topsoil.
- During the operational and decommissioning phase the edges of the dump should be shaped to suitable gradients.
- The soil on the edges should be ameliorated according to soil analysis and re-vegetated with a grass seed mixture dominated by a strong grower and stabilizing specie such as *Cynodon dactylon*.

APPENDIX G**PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON AGRICULTURAL RESOURCES****1. SCOPE**

This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on agricultural resources for activities requiring environmental authorisation. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations¹.

The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool) for agricultural resources, which is based on the land capability evaluation values provided by the department responsible for agriculture².

The screening tool can be accessed at: <https://screening.environment.gov.za/screeningtool>.

2. SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a **site sensitivity verification**.

2.1. The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.

2.2. The site sensitivity verification must be undertaken through the use of:

- (a) a desk top analysis, using satellite imagery;
- (b) a preliminary on-site inspection; and
- (c) any other available and relevant information.

2.3. The outcome of the site sensitivity verification must be recorded in the form of a report that:

- (a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
- (b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and
- (c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

3. SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS**TABLE 1: ASSESSMENT AND REPORTING OF IMPACTS ON AGRICULTURAL RESOURCES****1. General information**

1.1. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of "very high" or "high" sensitivity for agricultural resources must submit an **Agricultural Agro-Ecosystem Specialist Assessment** unless:

¹ The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

² Refer to the land capability metadata sheet available on the national web based environmental screening tool.

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- 1.1.1 the application is for a linear activity for which impacts on the agricultural resource are temporary and the land in the opinion of the soil scientist or agricultural specialist, based on the mitigation and remedial measures, can be returned to the current land capability within two years of the completion of the construction phase;
- 1.1.2. the impact on agricultural resources is from an electricity pylon; or
- 1.1.3. information gathered from the site sensitivity verification differs from the designation of “very high” or “high” agricultural sensitivity, and it is found to be of a “medium” or “low” sensitivity.
- 1.2. Should paragraphs 1.1.1; 1.1.2; or 1.1.3 apply, an **Agricultural Compliance Statement** must be submitted.
- 1.3. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of “medium” or “low” sensitivity for agricultural resources must submit an **Agricultural Compliance Statement**, unless:
- 1.3.1. the information gathered from the site sensitivity verification differs from that identified as having a “medium” or “low” agricultural sensitivity and it is found to be of a “very high” or “high” sensitivity; or
- 1.3.2. if any part of the proposed development footprint falls within an area of “very high” or “high” sensitivity, the assessment and reporting requirements prescribed for the “very high” or “high” sensitivity apply to the entire footprint, except in the case of 1.1.1 in which case an Agricultural Compliance Statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

VERY HIGH SENSITIVITY RATING - Land capability evaluation values of 11 – 15; all irrigated land; horticulture and viticulture; demarcated high value agricultural areas with a priority rating of A and/or B.

These areas are potentially unsuitable for development owing to:

- high agricultural value and preservation importance;
- high production capability;
- high capital investment made; or
- unique agricultural land attributes.

HIGH SENSITIVITY RATING - Land capability evaluation values of 8 - 10 including all cultivated areas³ including sugar cane areas and demarcated high value agricultural areas with a priority rating of C and/or D.

2. Agricultural Agro-Ecosystem Specialist Assessment

- 2.1. The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professionals (SACNASP).
- 2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.
- 2.3. The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within the past 5 years, and must identify:
- 2.3.1. the extent of the impact of the proposed development on the agricultural resources; and
- 2.3.2. whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.
- 2.4. The status quo of the site must be described, including the following aspects which must be considered as a minimum in the baseline description of the agro-ecosystem:
- 2.4.1. the soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit and slope;
- 2.4.2. where applicable, the vegetation composition, available water sources as well as agro-climatic information;

³ The Field Crop boundary and Land Capability dataset has been provided by the DAFF. For details of the datasets, click on the options button to the right of the Field Crop Boundary layer and Land Capability layer respectively, in the Agricultural Theme to view the metadata.

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High sensitivity areas are still preservation worthy since they include land with an agricultural production potential and suitability for specific crops.

- 2.4.3. the current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units;
 - 2.4.4. the current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure; and
 - 2.4.5. existing impacts on the site, located on a map (e.g. erosion, alien vegetation, non-agricultural infrastructure, waste, etc.).
- 2.5. Assessment of impacts, including the following aspects which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:
- 2.5.1. change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down into production units;
 - 2.5.2. change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure; and
 - 2.5.3. any alternative development footprints within the preferred site which would be of "medium" or "low" sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.
- 2.6. The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be written up in an **Agricultural Agro-Ecosystem Specialist Report**.
- 2.7. This report must contain the findings of the agro-ecosystem specialist assessment and the following information, as a minimum:
- 2.7.1. details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;
 - 2.7.2. a signed statement of independence by the specialist;
 - 2.7.3. the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
 - 2.7.4. a description of the methodology used to undertake the on-site assessment inclusive of the equipment and models used, as relevant;
 - 2.7.5. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;
 - 2.7.6. an indication of the potential losses in production and employment from the change of the agricultural use of the land as a result of the proposed development;
 - 2.7.7. an indication of possible long term benefits that will be generated by the project in relation to the benefits of the agricultural activities on the affected land;
 - 2.7.8. additional environmental impacts expected from the proposed development based on the current status quo of the land including erosion, alien vegetation, waste, etc.;
 - 2.7.9. information on the current agricultural activities being undertaken on adjacent land parcels;
 - 2.7.10. an identification of any areas to be avoided, including any buffers;
 - 2.7.11. a motivation must be provided if there were development footprints identified as per paragraph 2.5.3 above that were identified as having a "medium" or "low" agriculture sensitivity and that were not considered appropriate;

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	2.7.12. confirmation from the soil scientist or agricultural specialist that all reasonable measures have been considered in the micro-siting of the proposed development to minimise fragmentation and disturbance of agricultural activities; 2.7.13. a substantiated statement from the soil scientist or agricultural specialist with regards to agricultural resources on the acceptability or not of the proposed development and a recommendation on the approval or not of the proposed development; 2.7.14. any conditions to which this statement is subjected; 2.7.15. where identified, proposed impact management outcomes or any monitoring requirements for inclusion in the Environmental Management Programme (EMPr); and 2.7.16. a description of the assumptions made and any uncertainties or gaps in knowledge or data. 2.8. The findings of the Agricultural Agro-Ecosystem Specialist Assessment must be incorporated into the Basic Assessment Report or Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which are to be contained in the EMPr. 2.9. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.
MEDIUM SENSITIVITY RATING - Land capability evaluation values of 6 – 7. Medium sensitivity areas are likely to be very marginal arable land. LOW SENSITIVITY RATING - Land capability evaluation values of 1 – 5. Low sensitivity areas are likely to be non-arable land, and is therefore land onto which most development should be steered.	3. Agricultural Compliance Statement 3.1. The compliance statement must be prepared by a soil scientist or agricultural specialist registered with the SACNASP. 3.2. The compliance statement must: 3.2.1. be applicable to the preferred site and proposed development footprint; 3.2.2. confirm that the site is of “low” or “medium” sensitivity for agriculture; and 3.2.3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site. 3.3. The compliance statement must contain, as a minimum, the following information: 3.3.1. contact details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae; 3.3.2. a signed statement of independence; 3.3.3. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool; 3.3.4. confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities; 3.3.5. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development; 3.3.6. any conditions to which the statement is subjected; 3.3.7. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;

	3.3.8. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMP; and 3.3.9. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data. 3.4. A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.
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