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Agricultural Agro-Ecosystem Specialist Assessment for the Development of Lion Pride Extension Residential Township

Submitted by TerraAfrica Consult cc

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9 June 2022

DECLARATION OF INDEPENCE OF THE SPECIALIST

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Declaration of Independence

I, Mariné Pienaar, hereby declare that TerraAfrica Consult, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

I further declare that I was responsible for collecting data and compiling this report. All assumptions, assessments and recommendations are made in good faith and are considered to be correct to the best of my knowledge and the information available at this stage.

TerraAfrica Consult cc represented by M Pienaar
9 June 2022

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1. INTRODUCTION

Terra-Africa was assigned by Cosmopolitan Projects Johannesburg (Pty) Ltd to conduct an Agricultural Agro-Ecosystem Assessment on the proposed mixed land use township, “Lion Pride Extension”, on Portion 162, remainder of Portion 23 and remainder of Portion 196 of the farm Nooitgedacht 534-JQ within the jurisdiction of Mogale City Local Municipality, Gauteng Province. The proposed development involves the development of Residential 1 and Residential 3 land use township on approximately 41 hectares with the current land use zoned as “Agriculture”.

2. PURPOSE AND OBJECTIVES

The overarching purpose of the Agricultural Agro-Ecosystem Assessment that will be included in the Environmental Impact Assessment report, is to ensure that the sensitivity of the site to the proposed land use change (from agriculture to light industrial) is sufficiently considered. Also, that the information provided in this report, enables the Competent Authority to come to a sound conclusion on the impact of the proposed project on the food production potential of the site.

To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives:

- It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool.
- It must contain proof of the current land use and environmental sensitivity pertaining to the study field.
- All data and conclusions are submitted together with the Environmental Impact Assessment report for the proposed Lion Pride Extension.

According to GN320, the agricultural compliance statement that is submitted must meet the following requirements:

- It must identify the extent of the impact of the proposed development on the agricultural resources.
- It must indicate 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.

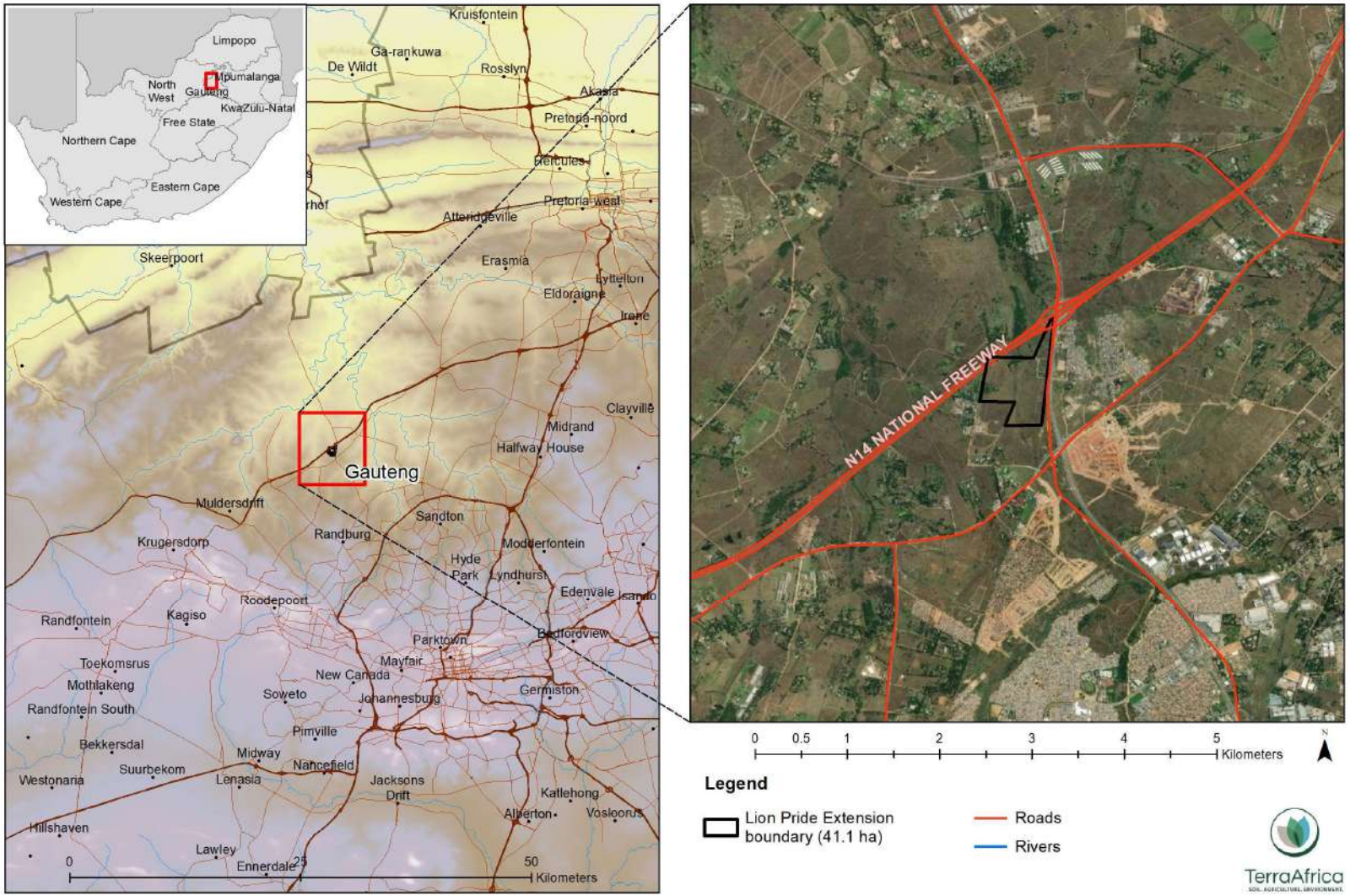


Figure 1: Locality map of the Lion Pride Extension Residential Township area

3. TERMS OF REFERENCE

In addition to the requirements stipulated in GN320, the following Terms of Reference as applies to the Agricultural Agro-Ecosystem Specialist Assessment:

- Consider all the baseline data that was gathered during the site survey together with all the relevant spatial data to understand the in-situ soil properties and agricultural production value of the site.
- Identify and assess potential impacts on both agricultural potential as well as soil, resulting from the proposed Lion Pride Extension Residential Township project.
- Identify and describe potential cumulative soil, agricultural potential and land capability impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area.
- Recommend mitigation, management, and monitoring measures to minimise impacts and/or optimise benefits associated with the proposed project.

4. LEGISLATIVE FRAMEWORK FOR THE ASSESSMENT

Since the development of a Lion Pride Extension, on Portion 162, remainder of Portion 23 and remainder of Portion 196 of the farm Nooitgedacht 534-JQ is on a site that partially has high sensitivity for agricultural resources, the report follows the protocols as stipulated for agricultural assessment in Government Notice 320 of 2020 (GN320). This Notice provides the procedures and minimum criteria for reporting in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (No. 107 of 1998) (from here onwards referred to as NEMA). It replaces the previous requirements of Appendix 6 of the Environmental Impact Assessment Regulations of NEMA.

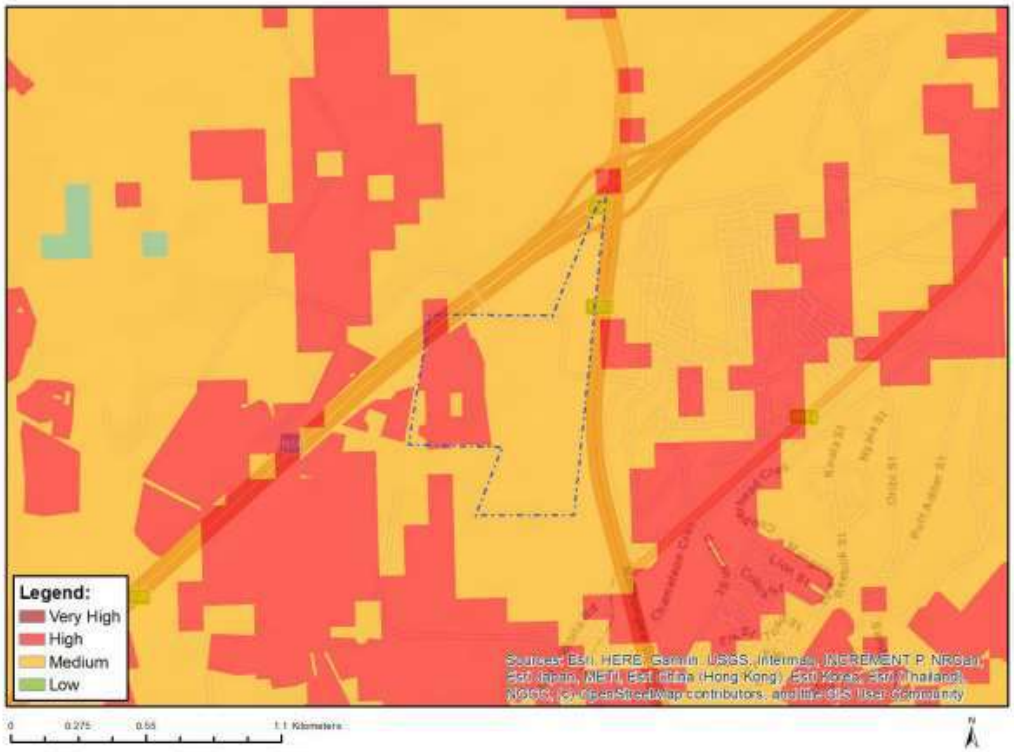
In addition to the specific requirements for this study, the following South African legislation is also considered applicable to the interpretation of the data and conclusions made with regards to environmental sensitivity:

- The Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. This Act requires the protection of land against soil erosion and the prevention of water logging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.
- Section 3 of the Subdivision of Agricultural Land Act 70 of 1970 may also relevant to the development.
- In addition to this, the National Water Act (Act 36 of 1998) deals with the protection of water resources, including wetlands. The soil assessment therefore also focused on the identification of any hydromorphic soil forms with wetland functionality that may be present in the study area.

5. SENSIVITY ANALYSIS OF THE SITE ACCORDING TO THE ENVIRONMENTAL SCREENING TOOL

The result of screening the proposed site with the Environmental Screening Tool of the Department of Environmental Affairs, showed that the area has a mixed sensitivity of Medium to High (**Figure 2**). The map from the screening report was provided by the Cosmopolitan Projects Johannesburg (Pty) Ltd. The area boundaries of the site are inclusive of the infrastructure layout that are proposed for the Extension area. All planned infrastructure will be situated within the boundaries as indicated in **Figure 2**.

MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

Figure 2: Agricultural Combined Sensitivity of the proposed light industrial development (source: Environmental Screening Tool)

6. METHODOLOGY

6.1 Desktop analysis of aerial imagery and other spatial data

Satellite imagery accessed on Google Earth, was analysed to determine areas of existing impact and land uses within the study area as well as the larger landscape. It was also scanned for any areas where crop production and farming infrastructure may be present. Prior to the site assessment, the study area boundary was superimposed on available spatial data layers. The following was analysed:

- The newly released National Land Capability Evaluation Raster Data Layer was obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) to determine the land capability classes of the development area according to this system (DAFF, 2017).
- The long-term grazing capacity for South Africa 2018 was also analysed for the area within which the Lion Pride Extension", on Portion 162, remainder of Portion 23 and remainder of Portion 196 of the farm Nooitgedacht 534-JQ area falls. This data set includes incorporation of the RSA grazing capacity map of 1993, the Vegetation type of SA 2006 (as published by Mucina L. & Rutherford M.C.), the Land Types of South Africa data set as well as the KZN Bioresource classification data. The values indicated for the different areas represent long term grazing capacity with the understanding that the veld is in a relatively good condition.
- The Gauteng Field Crop Boundaries (November 2019) was analysed to determine whether the proposed Lion Pride Extension Residential Township falls within the boundaries of any crop production areas. The crop production areas may include rainfed annual crops, non-pivot and pivot irrigated annual crops, horticulture, old fields, smallholdings, and subsistence farming.

6.2 Site assessment

The project site "Lion Pride Extension", on Portion 162, remainder of Portion 23 and remainder of Portion 196 of the farm Nooitgedacht 534-JQ within the jurisdiction of Mogale City Local Municipality, Gauteng Province was visited on 30 August 2022 (South African winter) for a site assessment that included a soil classification survey. The season has no effect on the outcome of the assessment.

The soil profiles were examined to a maximum depth of 1.5m or the point of refusal using a hand-held soil auger. Observations were made regarding soil texture, structure, colour and soil depth at each survey point. A cold 10% hydrochloric acid solution was used on site to test for the presence of carbonates in the soil. The soils are described using the S.A. Soil Classification: A Natural and Anthropogenic System for South Africa (Soil Classification Working Group, 2018). For soil mapping of the areas assessed in detail, the soils were grouped into classes with relatively similar soil characteristics. The locality of the survey points are indicated in **Figure 3** below. The data recorded for each survey point, is attached as Appendix 2.

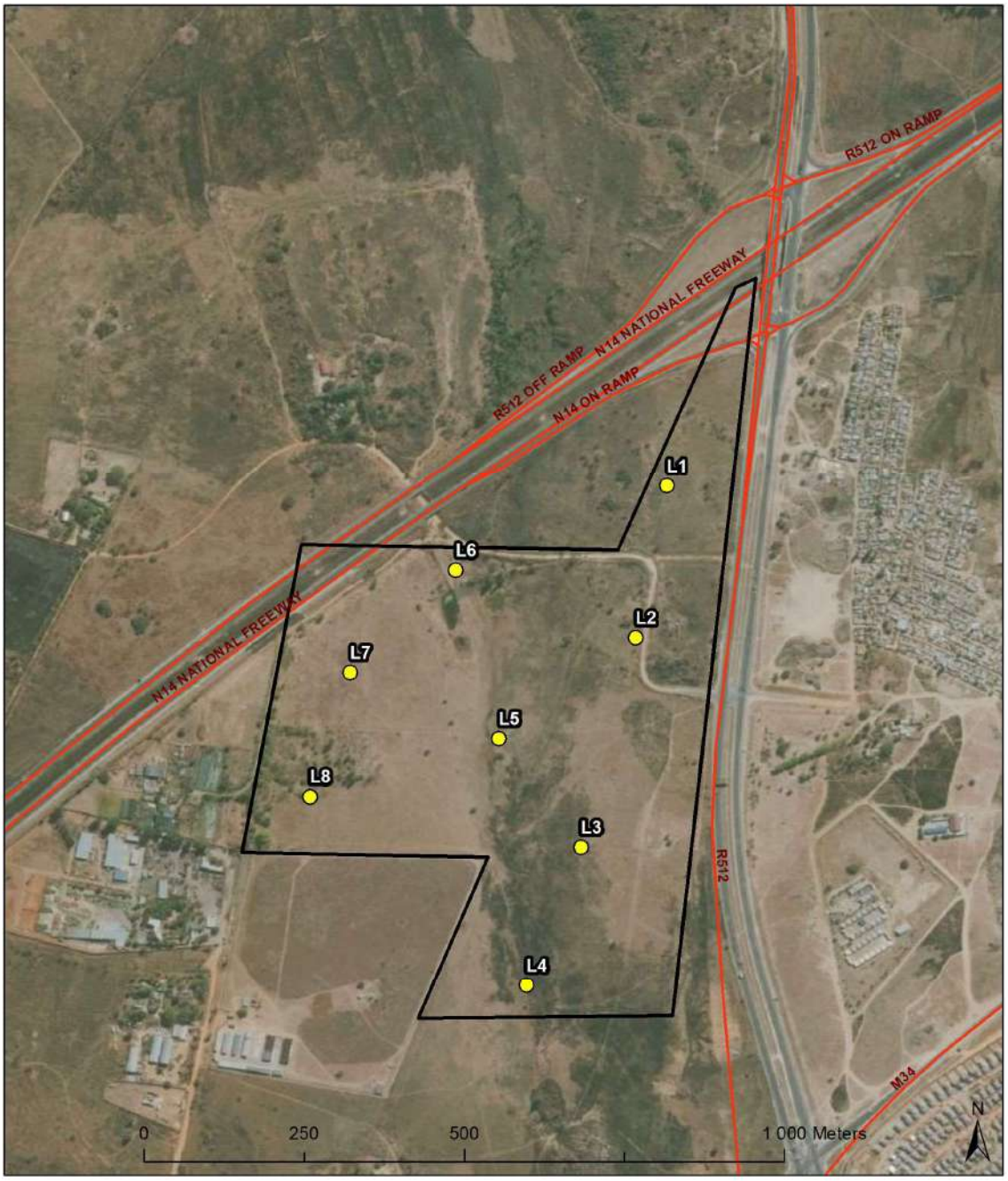


Figure 3: Locality of survey points within the proposed Lion Pride Extension Residential Township project site

6.3 Analysis of soil samples

Two soil samples were collected from two modal soil profiles in the study area. Soil samples were sealed in clean soil sampling plastic bags and sent to Van's lab in Bloemfontein. Samples taken to determine baseline soil fertility were analysed for electrical conductivity (EC), pH (KCl), phosphorus (Bray1), exchangeable cations (calcium, magnesium, potassium, sodium) and texture classes (relative fractions of sand, silt, and clay).

6.4 Impact assessment methodology

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (Table 1, Table 2 and Table 3).

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact.

The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when added up, can obtain a maximum value of 15. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary (even impacts considered to be of low significance may still require mitigation).

Table 1: Likelihood descriptors for impact assessment

Frequency of Activity	**RATING**
Annually or less / low	**1**
6 monthly / temporary	**2**
Monthly / infrequent	**3**
Weekly / life of operation / regularly / likely	**4**
Daily / permanent / high	**5**
Frequency of Impact	**RATING**
Almost never / almost impossible	**1**
Very seldom / highly unlikely	**2**
Infrequent / unlikely / seldom	**3**
Often / regularly / likely / possible	**4**
Daily / highly likely / definitely	**5**

Table 2: Consequence descriptors

Severity of impact	RATING
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful / ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	**RATING**
Activity specific / < 5 ha impacted / Linear features affected < 100m	1
Development specific / within the site boundary / < 100 ha impacted / Linear features > 100m	2
Local area / within 1 km of the site boundary / < 2000 ha impacted / Linear features < 1000m	3
Regional within 5 km of site boundary / < 5000 ha impacted / Linear features affected < 10 000m	4
Entire habitat unit / Entire system / > 5000 impacted / Linear features affected > 10 000m	5
Duration of impact	**RATING**
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5

Table 3: Significance rating matrix

	CONSEQUENCE (Severity + Spatial Scope + Duration)														
LIKELIHOOD (Frequency of activity + Frequency of Impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

The assessment of significance is undertaken twice. Initial significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment considers the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The Impact assessment model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information to be in line with international best practice guidelines in instances of uncertainty or lack of information by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table 4: Positive / Negative Mitigation Ratings

Significance Rating	Value	Negative impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Improve current management	Maintain current management
High	101-125	Improve current management	Maintain current management
Medium – high	76-100	Improve current management	Maintain current management
Medium – low	51-75	Maintain current management	Improve current management
Low	26-50	Maintain current management	Improve current management
Very low	1-25	Maintain current management	Improve current management

7. DATA LIMITATIONS, ASSUMPTIONS AND STUDY GAPS

- There is no data available on any historical production figures of the project area and it is assumed that there are no other farming activities on the site as no evidence of it could be found.
- It was also assumed that the desktop grazing capacity and field crop boundary data obtained from DAFF, has high correlation with the actual conditions on site.
- The applicant was not able to provide estimations of the anticipated employment figures that will be associated with the project. Similarly, the predicted gross income that the project will generate within the first five years from onset, could not be provided.
- No other uncertainties and gaps have been identified that may affect the conclusions made in this report.

8. RESPONSE TO CONCERNS RAISED BY INTERESTED AND AFFECTED PARTIES

Thus far, no concerns were raised by I & APs during the Public Participation Process pertaining to the continuation of existing land uses in the surrounding area. Should any comment be received, it will be addressed in this report.

9. RESULTS OF THE DESKTOP ASSESSMENT

9.1 Land capability

The proposed Lion Pride Extension Residential Township area includes four different land capability classes according to the land capability raster data layer (DAFF, 2017). **Figure 4** indicates the position of the different classes in the landscape. The area of development of the Lion Pride extension is a mixture of Class 06 (Low-Moderate), 07 (Low-Moderate), 08 (Moderate) and Class 09 (Moderate – High).

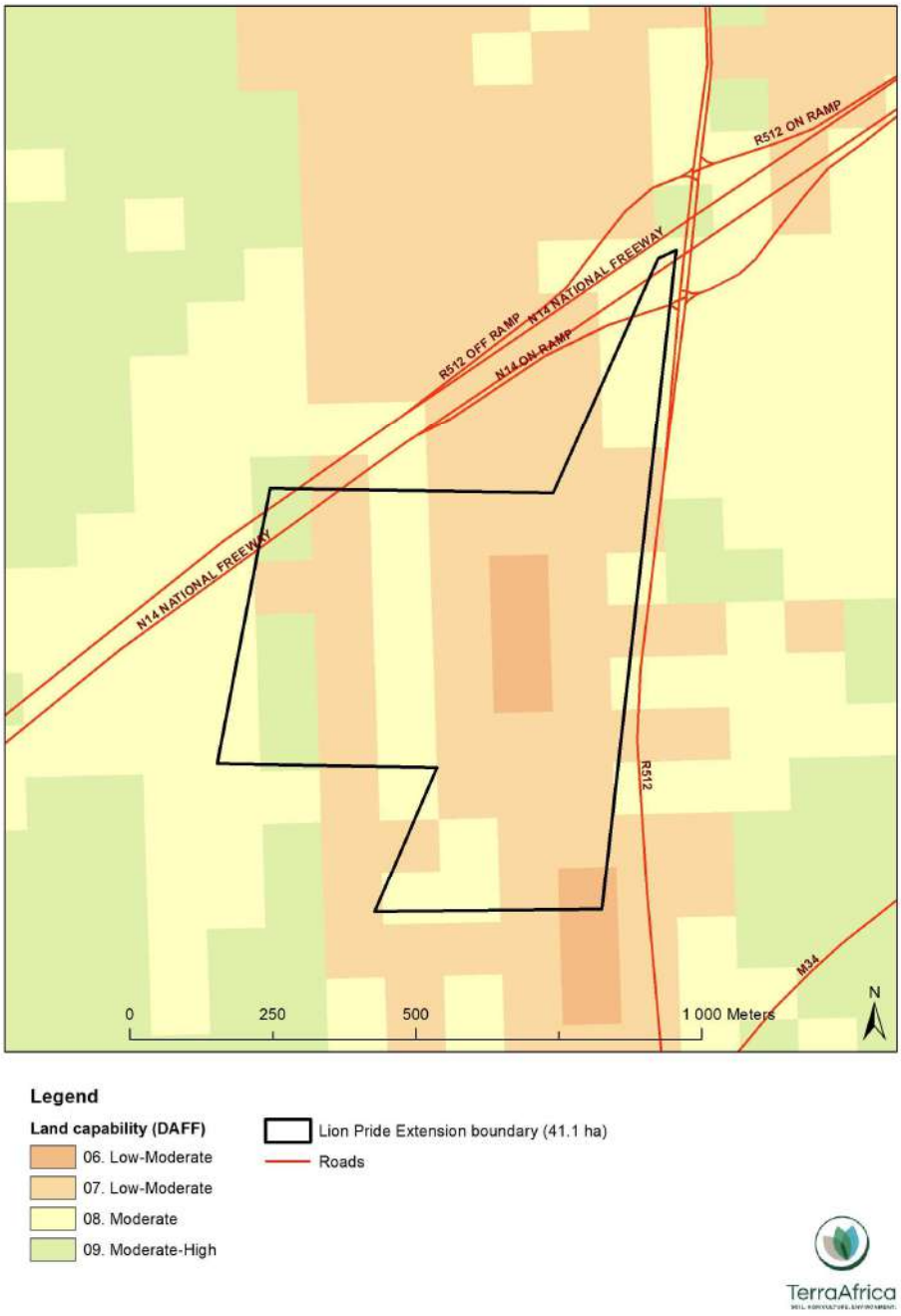


Figure 4: Land capability classification of the Lion Pride Extension Residential Township area and surrounding area (data source: DAFF, 2017)

9.2 Field crop boundaries

The position of field crops around the proposed Lion Pride Extension Residential Township area is illustrated in **Figure 5**. According to this data, the development area includes rainfed annual crop cultivation and/or planted pastures (DAFF, 2019). This area is situated in the western part of the study area. Directly west, small holdings are found outside the site boundaries.

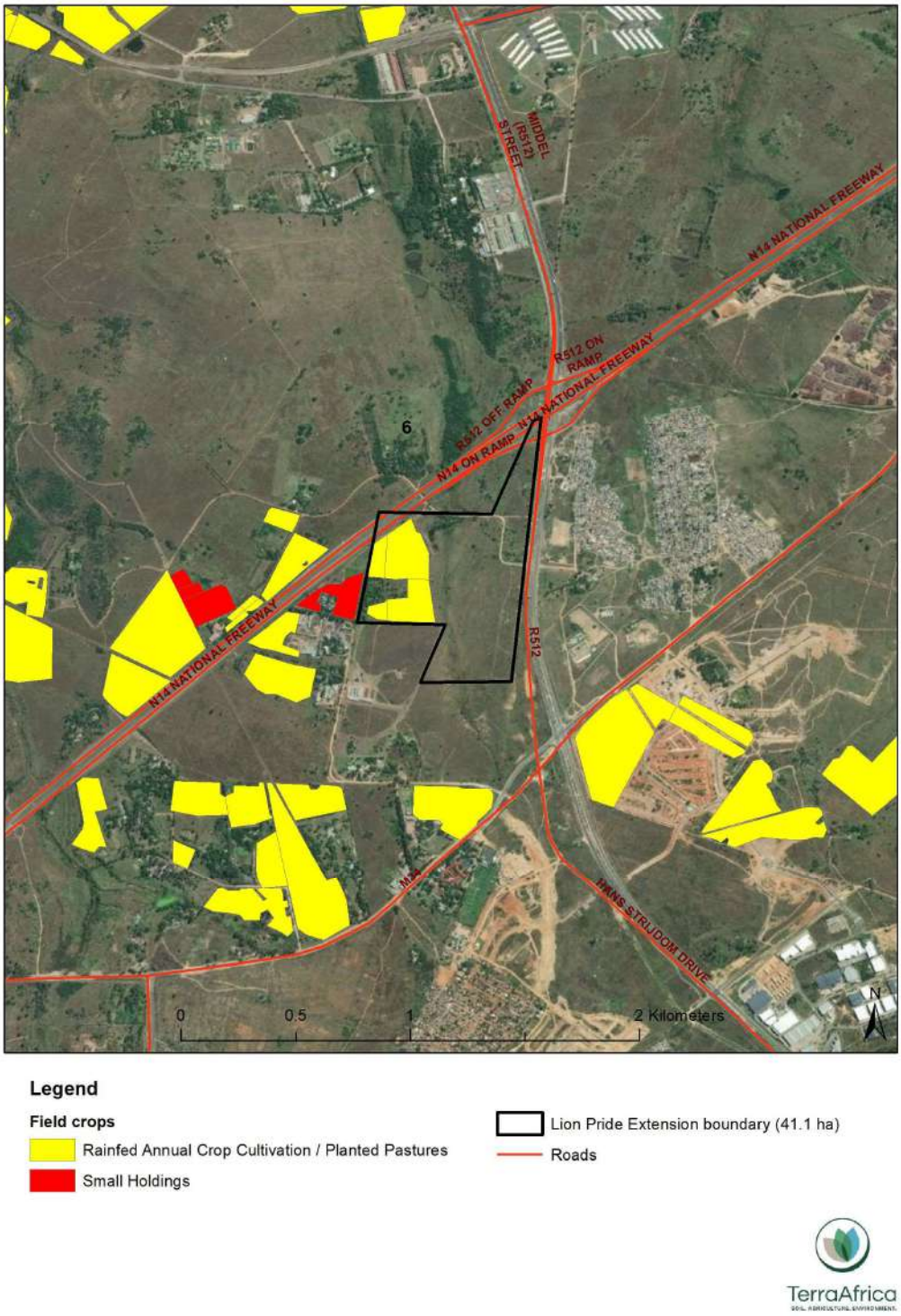


Figure 5: Location of field crop boundaries within and around proposed project area (data source: DAFF, 2019)

9.3 Grazing capacity

Following the metadata layer obtained from DAFF, the grazing capacity of the entire area within which the Lion Pride Extension Residential Township area falls, has grazing capacity of 6 ha/LSU (see **Figure 6**).

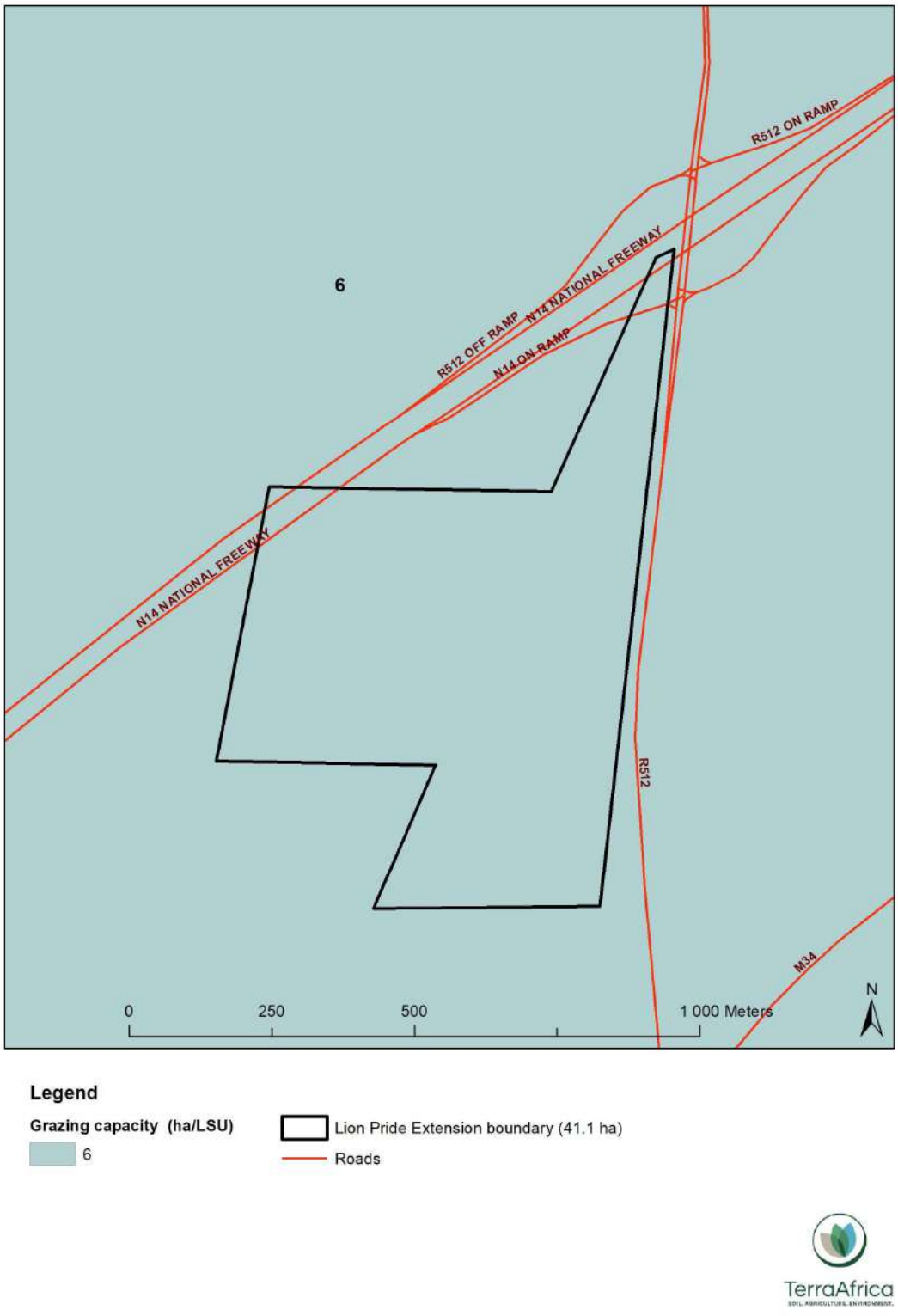


Figure 6: Grazing capacity of the proposed project area and surrounding area (DALRRD, 2018)

10. SITE ASSESSMENT RESULTS

10.1 Soil forms

Four different soil forms have been identified within the proposed development site. The Glenrosa soil forms is the dominant soil form covering 37.2 ha. The Katspruit soil is found near the stream which is situated in the centre of the study area. A Technosol is also found in the north western part of the study area. Below follows a description of each of the soil map units of which the positions are indicated in **Figure 10**.

Technosol:

The Technosol was classified as an Urban Technosol. An Urban Technosol is defined as soil where and other material present is in an urban environment where significant areas are disturbed or covered by means of construction including, but not limited to roads, buildings, sport fields and waste dumps. Within the study area, the Techonosol represents the R28/N14 highway that runs through site in a north-south direction (see **Figure 7**).

Figure 7: Photographic evidence of the 0.47 ha of Technosol located in the middle of the proposed project site

Glenrosa and Mispah group:

This soil group is present in most of the site and covers 37.2 ha (**Figure 8**). These two soil forms have been grouped together as the main characteristics of the original soil profile (lithic horizon with 200 mm depth) are still evident. Th Lithic horizon had saprolithic characteristics. The Mispah soils were allocated to the hills of the area.

Figure 8: Figure A shows the Mispah soil form, while Figure B shows the Glenrosa with saprolithic characteristics.

Katspruit:

The Katspruit was found near the stream which was situated in the center of the study area. The Katspruit only covered 1.5 ha of the total area and had a Munsell colour of 2.5Y 4/1. The Katspruit soil consists of an orthic horizon overlying a gley horizon (see **Figure 9**). The depth of the Katspruit reached 1.5 m.

Figure 9: Example of the Katspruit soil form

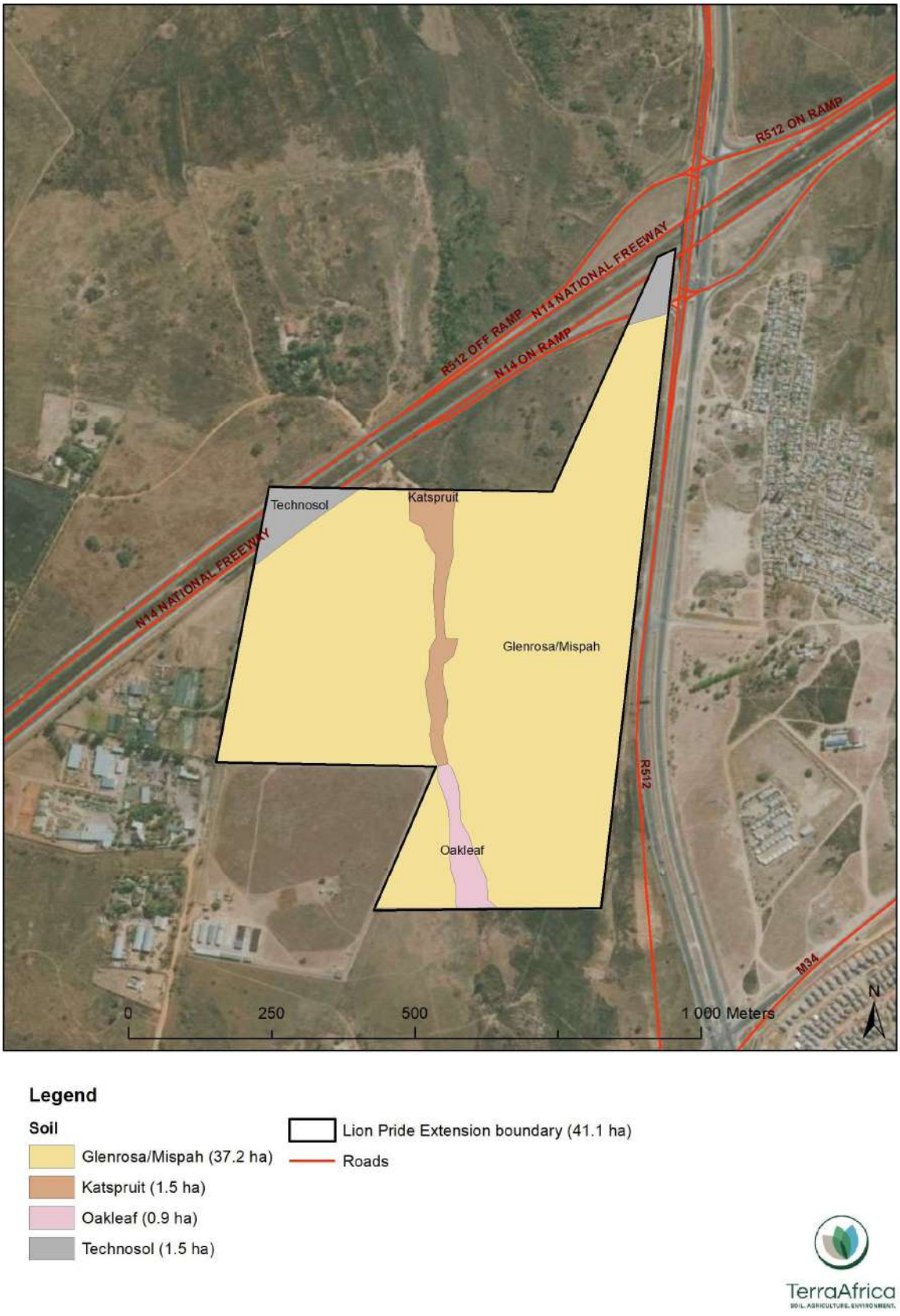


Figure 10: Soil classification map of the proposed Lion Pride Extension Residential Township area

Oakleaf:

The Oakleaf soil form consists of an orthic horizon overlying a thick neocutanic horizon. The Oakleaf was found in the southern parts of the study area and only covered 0.9 ha. The oakleaf has a high agricultural a land capability.

10.2 Soil fertility

Topsoil samples of the Glenrosa and Katspruit soil forms were samples. The pH (KCL) of the Glenrosa was more acidic (pH of 4.72) than the Katspruit soil form (pH of 5.28).The plant-available phosphorus levels are 2.92 mg/kg for the Glenrosa and 5.20 mg/kg for the Katspruit soil form. From the perspective of soil fertility for crop production, phosphorus will have to be supplemented as an essential plant nutrient. However, the levels are sufficient for the growth of veld grass.

The cation exchange capacity of both the Glenrosa and Katspruit is low, reaching only 3.9 and 6.7 cmol(+)/kg respectively. Sodium is not an essential plant nutrient, but high concentrations may cause soil sodicity. Currently, there is no risk of soil sodicity on site as the total plant-available sodium levels are 28.47 mg/kg and 35.11 mg/kg, respectively.

The electrical conductivity (EC) of the samples were measured in milliSiemens per metre (mS/m) by the laboratory and was converted to deciSiemens per metre (dS/m) for interpretation of the values. The EC of Glenrosa is 0.40 dS/m and Katspruit is 0.52 dS/m. According to Sparks (2003), EC limits below 2 dS/m indicate that soil salinity is absent and that plant roots will not be harmed by salt levels in the soil. The EC values of all four samples are well below this value and there is currently no risk of existing soil salinity on site.

10.3 Soil texture

The soil texture of the soil forms present within the proposed development area, was calculated by using the results of the particle size analysis for the soil texture triangle formulas as provided on the website of the United States Department of Agriculture's under Natural Resource Conservation Services (Soil) (www.nrcs.usda.gov). The soil texture triangle is illustrated in **Figure 11**. The results of the particle size analysis of the soil samples as well as the soil texture class into which results translate, are presented in **Table 5** below.

Table 5: Soil texture (calculated from particle size analysis)

Soil form	Soil horizon	Sand	Silt	Clay	Soil texture
		(% smaller than 2mm)			
Glenrosa	Topsoil (Orthic)	53	17	30	Sandy Clay Loam
Katspruit	Topsoil (Orthic)	75	8	18	Sandy Loam

Following the results in **Table 5**, the soil textures in the area are sand Clay Loam to Sandy Loam. The sandy soil texture will be prone to compaction when earthworks of the proposed project are conducted during wet soil conditions (such as after a rainfall event).

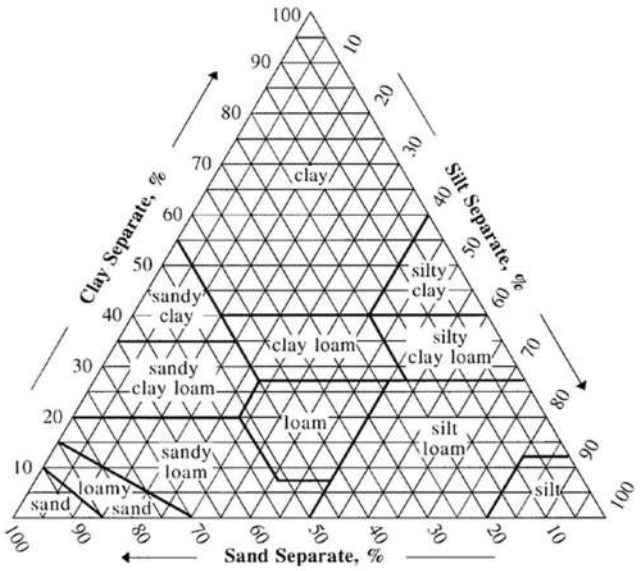


Figure 11: Soil texture triangle

10.4 Land capability classification

Using the soil classification data, the project site can be divided into four different land capability classes based on its suitability for rainfed crop production. The position of the different land capability classes as well as the proposed layout of the project infrastructure of the Lion Pride Extension, are indicated in **Error! Reference source not found.**.

Approximately 1.5 ha of land has Very Low (Class 01) land capability and consist of the Urban Technosol. Furthermore, most of the site has Low (Class 05) land capability and consists of the Glenrosa and Mispah soil forms. According to the project infrastructure layout, this entire area will be used for the development of the infrastructure associated with the proposed project.

The Katspruit soil situated in the center of the study area have Moderate-Low (06) land capability and covered 1.5 ha of the study area. The Oakleaf was the only soil form to have a Moderate-High (09) land capability and occurred in the southern parts of the study area. The Oakleaf soils only cover 0.9 ha of Moderate-High land capability.

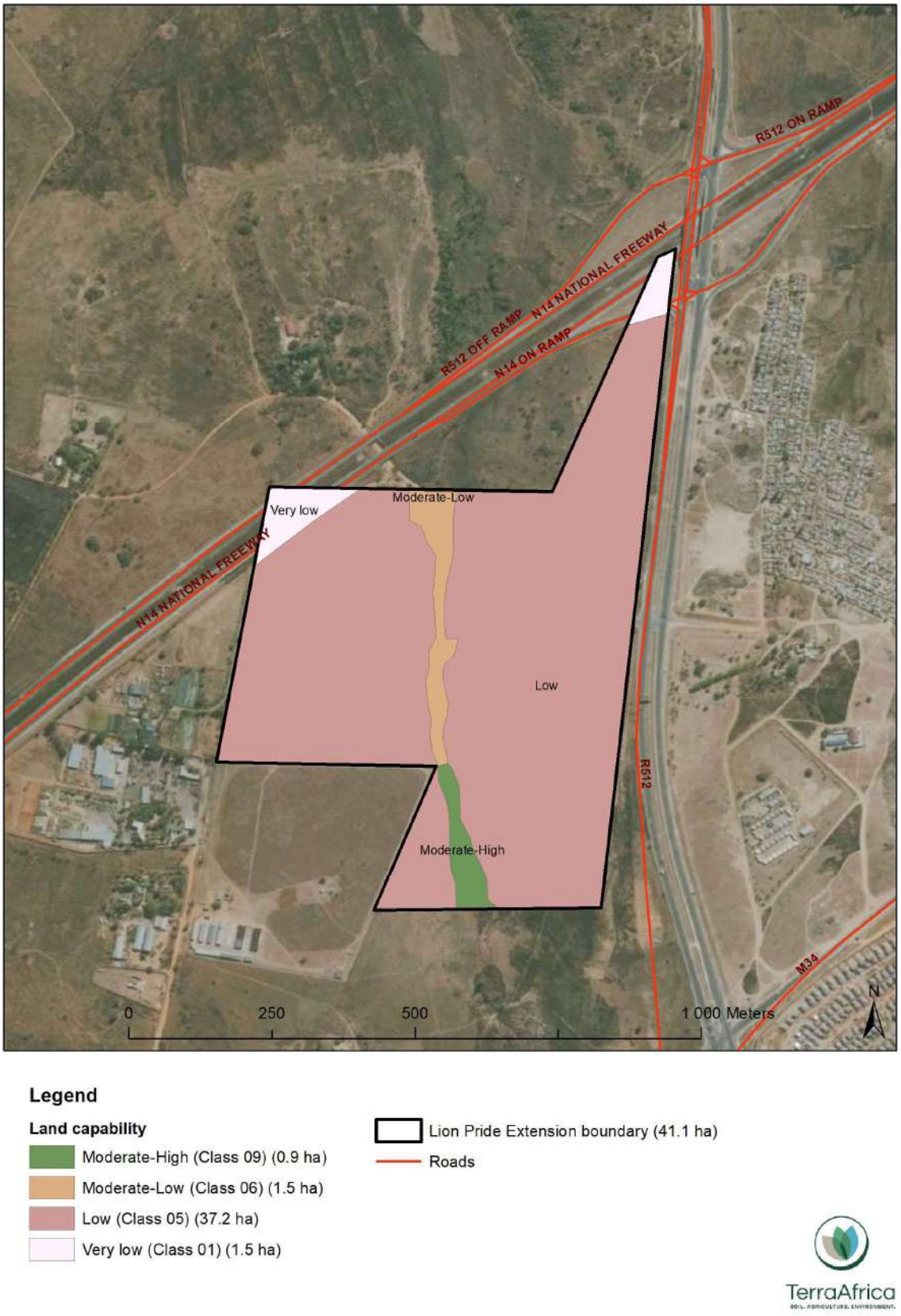


Figure 12: Land capability classification of the proposed Lion Pride Extension Residential Township area

10.5 Agricultural potential

Following the soil and land capability classification, the Lion Pride Extension area was classified according to its agricultural potential. The agricultural potential of the site specifically refers to its suitability for rainfed crop production. The area can be divided into three agricultural potential classes (refer to **Figure 13**). The largest portion of the area has Low agricultural potential because the shallow, rocky soil profiles are not suitable for crop cultivation and have low water-holding capacity.

The area where N14 freeway is located (Technosol) has no agricultural potential for it is already permanently converted to a road covered with a tar surface. Only one area of 0.9 ha of Oakleaf soils, have Moderate-High agricultural potential. The Oakleaf soils are suitable for both rainfed and irrigated crop production. However, this area is not currently cultivated with any crops. It is a very small area and not considered too small to be economically viable as a crop field.

The study area has potential for livestock farming. Following the grazing capacities as depicted in **Figure 6**, the Lion Pride Extension Residential Township area is suitable for 7 head of cattle or 28 head of sheep or goats. During the site visit, no evidence of existing livestock farming, and cattle herding activities were identified on site. This is likely because of the location of the land portion, which is surrounded by public roads, namely the N14 national road, the R114 provincial road as well as the public.

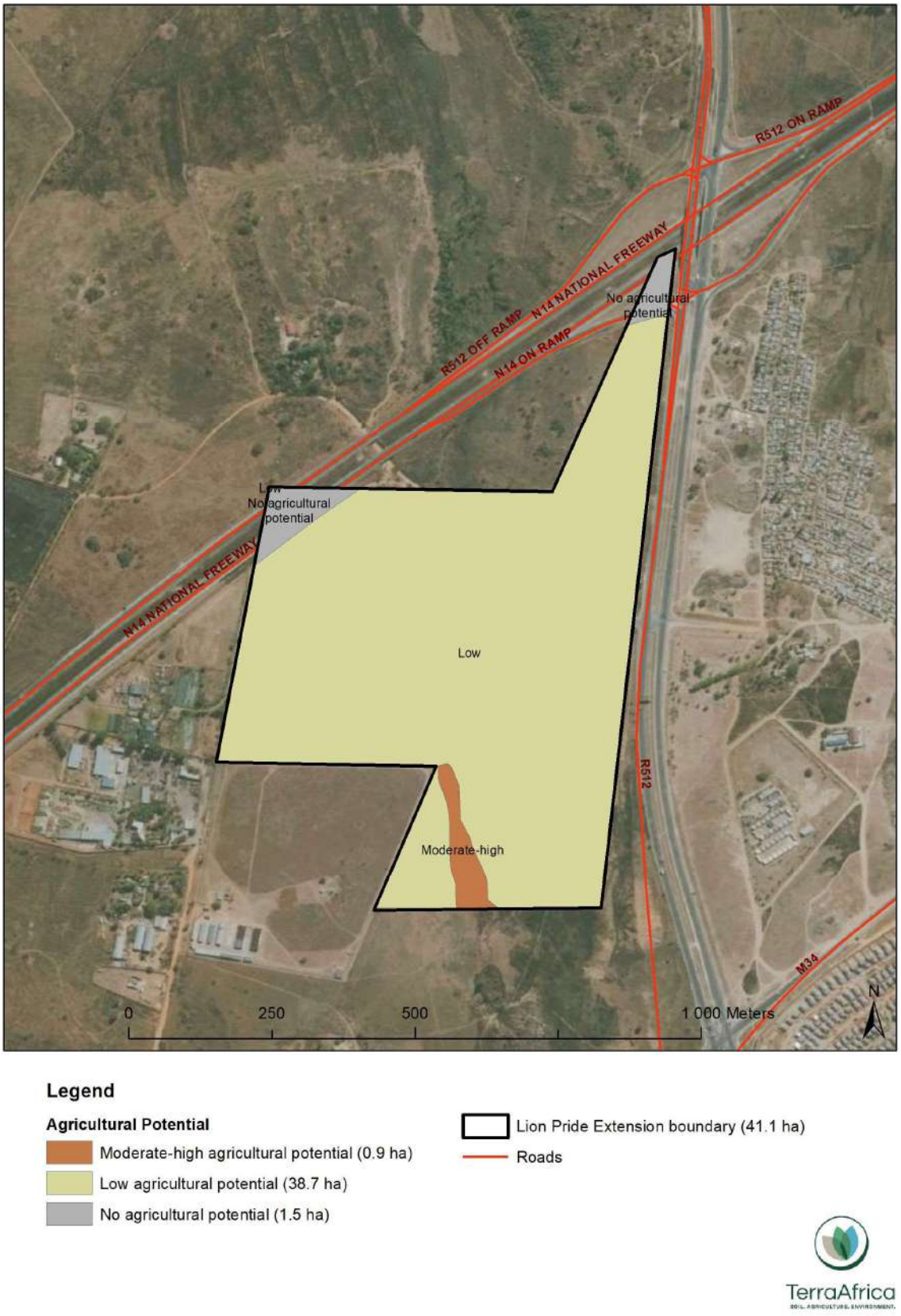


Figure 13: Agricultural potential of the Lion Pride Extension area

10.6 Current and historical agricultural activities

To determine the historical land use and land use change over time, Google Earth imagery were analysed. The analysis of historical aerial imagery on Google Earth, has indicated that the project site has no historical evidence that it has been used for crop cultivation since 2008. This has remained unchanged between September 2008 and the most recent aerial image dated February 2022 (see **Figure 15**).

Figure 14: Historical land use of the project area and surrounding area (dated September 2008)

Figure 15: Current land use of the project area and surrounding area (dated February 2022)

10.7 Verified site sensitivity

The historical imagery showed no activity of agricultural activities in the proposed study area. The sensitivity of the largest part of the area is low, with only the Katspruit and Oakleaf soil forms having a high sensitivity. The Oakleaf soil has moderate-high agricultural potential and the Katspruit soil is a hydric soil form associated with wetlands. The area where Urban Technosol is present, has very low sensitivity. The position of the different site sensitivities is shown in **Figure 16**.

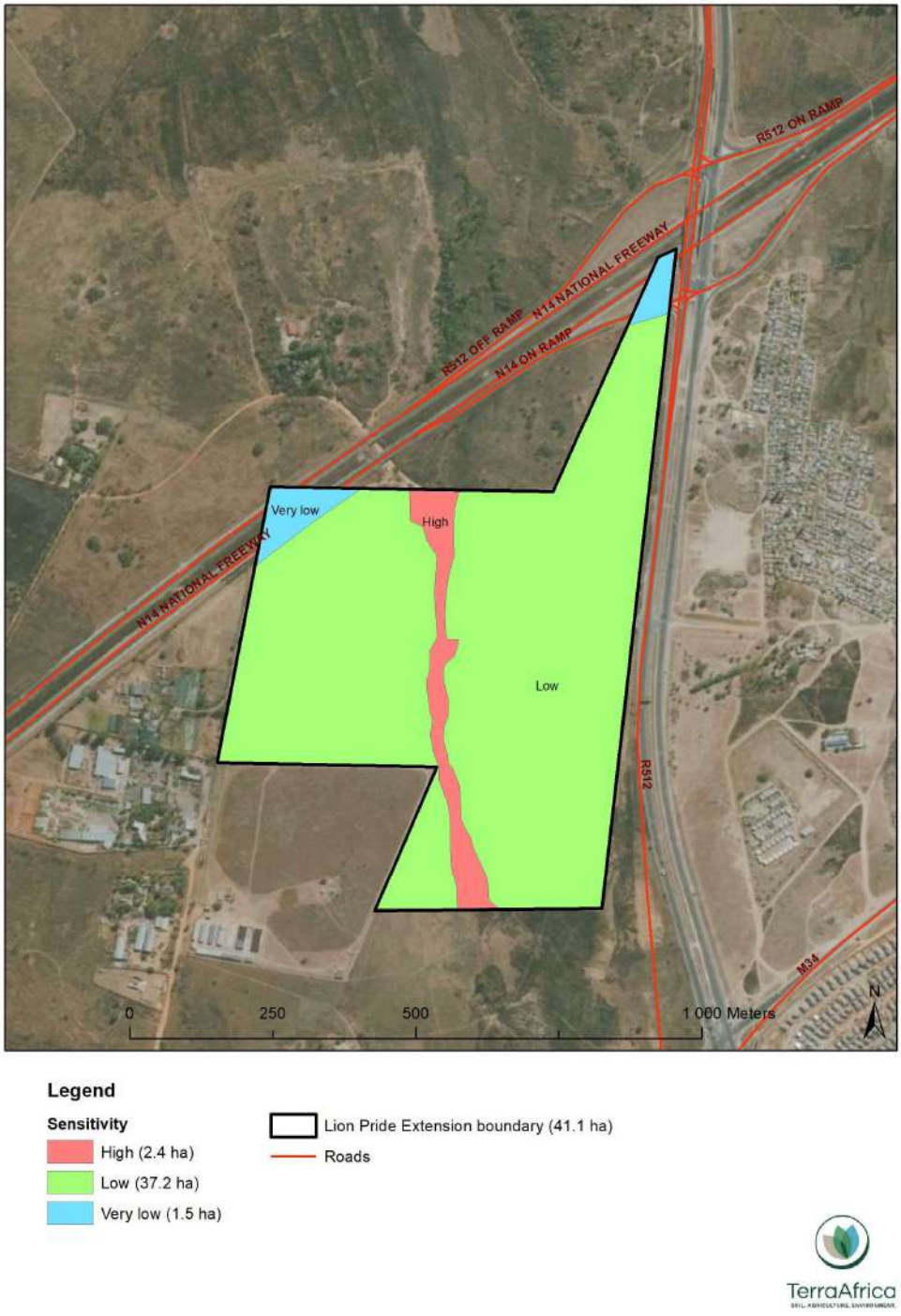


Figure 16: Agricultural and soil sensitivity of the Lion Pride Extension area

11. IMPACT ASSESSMENT

11.1 Project description

Proposed mixed land use township, “Lion Pride Extension”, on Portion 162, remainder of Portion 23 and remainder of Portion 196 of the farm Nooitgedacht 534-JQ within the jurisdiction of Mogale City Local Municipality, Gauteng Province. The proposed development involves the development of Residential 1 and Residential 3 land use township on approximately 41 hectares with the current zoning “Agriculture”.

11.2 Construction phase impacts

11.2.1 Loss of current land capability

Once construction commences and soil is stripped, the current land capability of all areas where the surface infrastructure will be constructed, will be lost. The areas that will be directly impacted include: 0.9 ha of land with Moderate-High (Class 09) land capability and 1.5 ha of land with Moderate-Low (Class 06) land capability..

The impact will remain the same throughout the operational phase and it is not expected that the infrastructure will be decommissioned.

	Without mitigation	**With mitigation / enhancement**
Status	Negative (-)	Negative (-)
Severity	4	3
Spatial Scale	2	2
Duration	5	5
Frequency of activity	5	5
Frequency of impact	5	5
Impact rating	High (110) -	High (100) -
Mitigation: • The mitigation measures are limited as the project infrastructure is considered to become a permanent feature of the landscape. • The project infrastructure footprint should be kept to the project layout as provided by the client.		

11.2.2 Loss of agricultural production and agricultural-related employment

Although the field crops boundaries data indicates that the project area consists of rainfed Annual crop cultivation, no evidence was found of any cultivars being planted or livestock farming activities. Also, no crops are produced on site and historical imagery indicates that there has been no active crop production for at least the past 9 years.

It is expected that the impact on agricultural production and agricultural-related employment will remain the same during the operational phase and there will be no decommissioning.

	Without mitigation	With mitigation / enhancement
Status	Negative (-)	Negative (-)
Severity	2	2
Spatial Scale	2	2
Duration	5	5
Frequency of activity	4	4
Frequency of impact	1	1
Impact rating	Low (45) -	Low (45) -

Mitigation:

- The on-site mitigation measures are limited as the project infrastructure is considered to become a permanent feature of the landscape.
- The project infrastructure footprint should be kept within the site boundaries as provided by the client.

11.2.3 Disturbance of soil horizon organisation

Prior to construction, the available topsoil (a combination of all soil horizons above the underlying material such the hard plinthic subsoil-horizon of the Glencoe form) will be removed and stored elsewhere. Once the soil is stripped and transported from its original position, it becomes a new matrix with different physical and biological properties because of mixing of the soil horizons and storing it in stockpiles.

	Without mitigation	With mitigation / enhancement
Status	Negative (-)	Negative (-)
Severity	4	4
Spatial Scale	2	2
Duration	5	5
Frequency of activity	5	5
Frequency of impact	5	5
Impact rating	High (110) -	High (110) -

Mitigation:

- The mitigation measures are limited as the topsoil will necessarily be removed for the purpose of infrastructure construction.
- The project infrastructure footprint should be kept within the site boundaries as provided by the client.
- Any topsoil stockpiles must be protected against wind and water erosion until vegetation has established on the exposed topsoil surfaces.
- If it is observed that topsoil stockpile surfaces remain bare, natural vegetation must be established on the topsoil stockpiles.

11.2.4 Soil contamination with hydrocarbons and solid waste

The following construction activities can result in the pollution of soil with hydrocarbons and/or solid waste:

- Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the mechanical removal of vegetation during site clearing.
- Spills from vehicles transporting workers, equipment and construction material to and from the construction site.
- The generation of domestic waste by construction and operational workers.
- Spills from fuel storage tanks during construction.
- Polluted water from wash bays and workshops during the construction phase.
- Accidental spills of other hazardous chemicals used and stored on site.
- Pollution from concrete mixing.

	Without mitigation	With mitigation / enhancement
Status	Negative (-)	Negative (-)
Severity	3	2
Spatial Scale	1	1
Duration	4	2
Frequency of activity	4	4
Frequency of impact	5	3
Impact rating	Medium-low (72) -	Low (35) -

Mitigation:

- High level maintenance must be undertaken on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills.
- Impermeable and bunded surfaces must be used for storage tanks and to park vehicles on;
- Site surface water and wash water must be contained and treated before reuse or discharge from site;
- Spills of fuel and lubricants from vehicles and equipment must be contained using a drip tray with plastic sheeting filled with adsorbent material;
- Spill kits should be available on site and should be serviced regularly;
- Waste disposal at the construction site and during operation must be avoided by separating, trucking out and recycling of waste;
- Potentially contaminating fluids and other wastes must be contained in containers stored on hard surface levels in bunded locations; and
- Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately by trained staff with the correct equipment and protocols.

11.2.4 Soil erosion

Once earthworks commence at the proposed project site, vegetation will be removed from the surface and expose the soil surfaces underneath to soil erosion that can be caused by both wind and water movement. Soil erosion will result in removal of soil particles from site to the areas where it is deposited as dust particles or as sediment in lower landscape positions.

	Without mitigation	With mitigation / enhancement
Status	Negative (-)	Negative (-)
Severity	3	2
Spatial Scale	1	1
Duration	4	2

Frequency of activity	4	4
Frequency of impact	5	3
Impact rating	Medium-low (72) -	Low (35) -
Mitigation: • Only remove vegetation prior to construction in an area. • Avoid stripping vegetation and stockpiling of topsoil during periods of heavy rain. • Construct a storm water system as part of the Stormwater Management Plan of the site. • Park vehicles and equipment in designated parking areas to prevent vegetation disturbance of additional areas. • Monitor the area to determine whether there is any erosion and rehabilitated eroded areas direclt after detection.		

11.2.4 Soil compaction and surface sealing

Where permanent buildings and surface roads will be constructed, soil will become permanently sealed-off from rainwater infiltration. Soil will also be compacted as part of civil engineering procedures to ensure the stability of the infrastructure. Soil compaction affects the soil porosity, thereby decreasing the water infiltration rate of soil. Compacted soil surfaces and sealed off areas increase stormwater runoff rates and can cause soil erosion in areas outside the site boundary.

	Without mitigation	**With mitigation / management**
Status	Negative (-)	Negative (-)
Severity	4	4
Spatial Scale	2	2
Duration	5	5
Frequency of activity	5	5
Frequency of impact	5	5
Impact rating	High (110) -	High (110) -
Mitigation: • Restrict traffic and vehicle movement to access roads and within the site boundaries. • Demarcate parking areas and monitor the vehicles and equipment are not parked outside of these areas in nearby fields during the construction phase.		

11.3 Operational phase impacts

During the operational phase, the impacts on land capability and physical soil properties within the site boundary, will remain unchanged. However, emissions and run-off from the light industrial site can result in soil contamination outside of the site.

11.3.1 Soil pollution of soil outside the site boundaries, including agricultural fields

Dust emissions containing trace element particles as well as organic (carbon-containing) contaminants, will settle on surfaces outside of the site. Stormwater run-off can also contain pollutants such as petroleum hydrocarbons that spilled on sealed

surfaces inside of the site. Both dust and stormwater run-off can result in elevated levels of soil contaminants in nearby soil, including the agricultural crop-fields.

	Without mitigation	With mitigation / enhancement
Status	Negative (-)	Negative (-)
Severity	3	1
Spatial Scale	2	1
Duration	4	2
Frequency of activity	4	3
Frequency of impact	4	3
Impact rating	Medium-low (72) -	Low (30) -

Mitigation:

- High level maintenance must be undertaken on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;
- Impermeable and bunded surfaces must be used for storage tanks and to park vehicles on;
- Site surface water and wash water must be contained and treated before reuse or discharge from site;
- Spills of fuel and lubricants from vehicles and equipment must be contained using a drip tray with plastic sheeting filled with adsorbent material;
- Potentially contaminating fluids and other wastes must be contained in containers stored on hard surface levels in bunded locations; and
- Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately by trained staff with the correct equipment and protocols.

11.4 Decommissioning and closure phase

It is expected that the infrastructure will remain on site and there will be no decommissioning and closure phases.

12. ACCEPTABILITY STATEMENT

The proposed Lion Pride Extention project area is located on natural soil forms (Glenrosa, Mispah, Katspruit and Oakleaf forms) as well as soils already affected by human activities (Urban Technosols). The grazing capacity of the entire area is 6 (ha/LSU) and the site therefore has grazing available for 7 head of cattle. However, no evidence of current cattle (or other livestock) has been observed on site.

The area has no evidence of agricultural activities as shown by historical imagery. No agricultural production figures for the past 5 years are available but from the observations made during the site visit, the following conclusions were reached:

- No crop production took place on the site in the past five years.
- There is no evidence of livestock farming on the site.
- The grazing capacity of the entire site would allow for 4 head of cattle.

- It is anticipated that job opportunities will be created during the construction and operational phases of the development. No figures were received from the applicant but can be added to the report as soon as it become available.

The Lion Pride Extension is considered a viable land use option for an area where it is evident that no agricultural activities occured for many years and located near other businesses (1.9 km from Kwikspar Lanseria). It is my professional opinion that this application be considered favourably, permitting that the soil management measures are followed to prevent soil erosion and pollution. The project infrastructure should also remain within the development area boundaries indicated in the project layout.

13. REFERENCE LIST

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South Africa (Republic) 2018. *Long-term grazing capacity for South Africa*: Data layer. Government Gazette Vol. 638, No. 41870. 31 August 2018. Regulation 10 of the Conservation of Agricultural Resources Act (CARA): Act 43 of 1983. Pretoria. Government Printing Works.

Sparks, D.L., 2003. Environmental Soil Chemistry. 2nd Edition, Elsevier Science.

The Soil Classification Working Group (2018). *Soil Classification – Taxonomic System for South Africa.* Dept. of Agric., Pretoria.

Appendix 1 – Soil survey data

Name	x	y	Soil form	Soil Depth	Land Capability
L36	27.9193132672	-25.9893365898	Glenrosa	100	Low
L37	27.9213983289	-25.9902622705	Katspruit	1500	Low-Moderate
L38	27.9208775315	-25.9876226265	Katspruit	700	Low-Moderate
L39	27.9234860246	-25.9865975009	Glenrosa	200	Low
L40	27.9187496367	-25.9910789606	Glenrosa	100	Low
L41	27.9217875214	-25.9937374614	Oakleaf	1500	Moderate-High
L42	27.9225566407	-25.9917909714	Glenrosa	200	Low
L44	27.9233207166	-25.9888447955	Glenrosa	100	Low

Appendix 2 – Sample analysis results

	Ca	Mg	Na	K	S	P BRAY 1	pH KCl	KUK	EC
NP no	cmol(+)/kg	cmol(+)/kg	cmol(+)/kg	cmol(+)/kg	mg/kg	mg/kg		cmol(+)/kg	Ms/m
L 4 A	2,30	1,09	0,12	0,39	7,91	2,92	4,72	3,97	39,8
L 10 A	4,21	2,18	0,15	0,16	0,53	5,20	5,28	6,75	51,8

Field number	% Clay	% Silt	Silt + Clay %	% Sand	total
L 4 A	30,42042	17,41169	47,83211	52,782	100,6141
L 10 A	18,42625	7,92527	26,35152	74,672	101,0235

Appendix 3 – Curriculum vitae of specialist

MARINÉ PIENAAR

Specialist Scientist

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Wolmaransstad,
South Africa

EXPERTISE

Soil Quality Assessment

Soil Policy and Guidelines

Agricultural Agro-Ecosystem Assessment

Sustainable Agriculture

Data Consolidation

Land Use Planning

Soil Pollution

Hydropedology

EDUCATION

MASTER'S DEGREE
Environmental Science
University of Witwatersrand
2010 – 2018

BACHELOR'S DEGREE
Agricultural Science
University of Pretoria
2001 – 2004

PROFESSIONAL PROFILE

I contribute specialist knowledge on agriculture and soil management to ensure long-term sustainability of projects in Africa. For the past thirteen years, it has been my calling and I have consulted on more than 200 projects. My clients include environmental and engineering companies, mining houses, and project developers. I enjoy the multi-disciplinary nature of the projects that I work on and I am fascinated by the evolving nature of my field of practice. The next section provide examples of the range of projects completed. A comprehensive project list is available on request.

PROJECT EXPERIENCE

Global Assessment on Soil Pollution

Food and Agricultural Organisation (FAO) of the United Nations (UN)

Author of the regional assessment of Soil in Sub-Saharan Africa. The report is due for release in February 2021. The different sections included:

- Analysis of soil and soil-related policies and guidelines for each of the 48 regional countries
- Description of the major sources of soil pollution in the region
- The extent of soil pollution in the region and as well as the nature and extent of soil monitoring
- Case study discussions of the impacts of soil pollution on human and environmental health in the region
- Recommendations and guidelines for policy development and capacitation to address soil pollution in Sub-Saharan Africa

Data Consolidation and Amendment

Range of projects: Mining Projects, Renewal Energy

These projects included developments where previous agricultural and soil studies are available that are not aligned with the current legal and international best practice requirements such as the IFC Principles. Other projects are expansion projects or changes in the project infrastructure layout. Tasks on such projects include the incorporation of all relevant data, site verification, updated baseline reporting and alignment of management and monitoring measures.

Project examples:

- Northam Platinum's Booysendal Mine, South Africa
- Musonoi Mine, Kolwezi District, Democratic Republic of Congo
- Polihali Reservoir and Associated Infrastructure, Lesotho
- Kaiha 2 Hydropower Project, Liberia
- Aquarius Platinum's Kroondal and Marikana Mines

MARINÉ PIENAAR

Specialist Scientist

PROFESSIONAL MEMBERSHIP

South African Council for Natural Scientific Professions (SACNASP)

Soil Science Society of South Africa (SSSSA)

Soil Science Society of America (SSSA)

Network for Industrially Contaminated Land in Africa (NICOLA)

LANGUAGES

English (Fluent)

Afrikaans (Native)

French (Basic)

PRESENTATIONS

There is spinach in my fish pond
TEDx Talk
Available on YouTube

◆

Soil and the Extractive Industries
Session organiser and presenter
Global Soil Week, Berlin (2015)

◆

How to dismantle an atomic bomb
Conference presentation (2014)
Environmental Law Association (SA)

PROJECT EXPERIENCE (Continued)

Agricultural Agro-Ecosystem Assessments

Range of projects: Renewable Energy, Industrial and Residential Developments, Mining, Linear Developments (railways and power lines)

The assessments were conducted as part of the Environmental and Social Impact Assessment processes. The assessment process includes the assessment of soil physical and chemical properties as well as other natural resources that contributes to the land capability of the area.

Project examples:

- Mocuba Solar PV Development, Mozambique
- Italthai Railway between Tete and Quelimane, Mozambique
- Lichtenburg PV Solar Developments, South Africa
- Manica Gold Mine Project, Mozambique
- Khunab Solar PV Developments near Upington, South Africa
- Bomi Hills and Mano River Mines, Liberia
- King City near Sekondi-Takoradi and Appolonia City near Accra, Ghana
- Limpopo-Lipadi Game Reserve, Botswana
- Namoya Gold Mine, Democratic Republic of Congo

Sustainable Agriculture

Range of projects: Policy Development for Financial Institutions, Mine Closure Planning, Agricultural Project and Business Development Planning

Each of the projects completed had a unique scope of works and the methodology was designed to answer the questions. While global indicators of sustainable agriculture are considered, the unique challenges to viable food production in Africa, especially climate change and a lack of infrastructure, in these analyses.

Project examples:

- Measurement of sustainability of agricultural practices of South African farmers – survey design and pilot testing for the LandBank of South Africa
- Analysis of the viability of avocado and mango large-scale farming developments in Angola for McKinsey & Company
- Closure options analysis for the Tshipi Borwa Mine to increase agricultural productivity in the area, consultation to SLR Consulting
- Analysis of risks and opportunities for farm feeds and supplement suppliers of the Southern African livestock and dairy farming industries
- Sustainable agricultural options development for mine closure planning of the Camutue Diamond Mine, Angola

MARINÉ PIENAAR

Specialist Scientist

PROFESSIONAL DEVELOPMENT

Contaminated Land Management 101 Training
Network for Industrially Contaminated Land in Africa
2020

Intensive Agriculture in Arid & Semi-Arid Environments
CINADCO/MASHAV R&D Course, Israel
2015

World Soils and their Assessment Course
ISRIC – World Soil Information Centre, Netherlands
2015

Wetland Rehabilitation Course
University of Pretoria
2010

Course in Advanced Modelling of Water Flow and Solute Transport in the Vadose Zone with Hydrus
University of Kwazulu-Natal
2010

Environmental Law for Environmental Managers
North-West University Centre for Environmental Management
2009

PROJECT EXPERIENCE (Continued)

Soil Quality Assessments

Range of projects: Rehabilitated Land Audits, Mine Closure Applications, Mineral and Ore Processing Facilities, Human Resettlement Plans

The soil quality assessments included physical and chemical analysis of soil quality parameters to determine the success of land rehabilitation towards productive landscapes. The assessments are also used to understand the suitability for areas for Human Resettlement Plans

Project examples:

- Closure Planning for Yoctolux Colliery
- Soil and vegetation monitoring at Kingston Vale Waste Facility
- Exxaro Belfast Resettlement Action Plan Soil Assessment
- Soil Quality Monitoring of Wastewater Irrigated Areas around Matimba Power Station
- Keaton Vanggatfontein Colliery Bi-Annual Soil Quality Monitoring

REFERENCES

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