COMPLAINCE STATMENT FOR WASTEWATER TREATMENT AT LINDLEY, FREE STATE PROVINCE

PREPARED FOR

NSVT CONSULTANTS

MAY 2023

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BACKGROUND TO THE STUDY

Digital Soils Africa (Pty) LTD (DSA) were tasked by NSVT Consultants to undertake an Agricultural Compliance Statement for the Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), Environmental Impact Assessment ("EIA") Regulations, 2014. As per GN960 of 2019, read with Section 24(5)(a) of the NEMA. An Environmental Screening Report (ESR) was generated for the application using the National Web-based Screening Tool. The ESR classifies the area as being of high sensitivity for the *Agricultural* theme.

During the site verification, the sensitivity was reduced to moderate. The Compliance Statement is reported according to the protocol for the specialist assessment and minimum report content requirements for the environmental impacts on agricultural resources (GN320 of 2020).

The study area is located in Lindley, near Reitz, in the Free State Province.

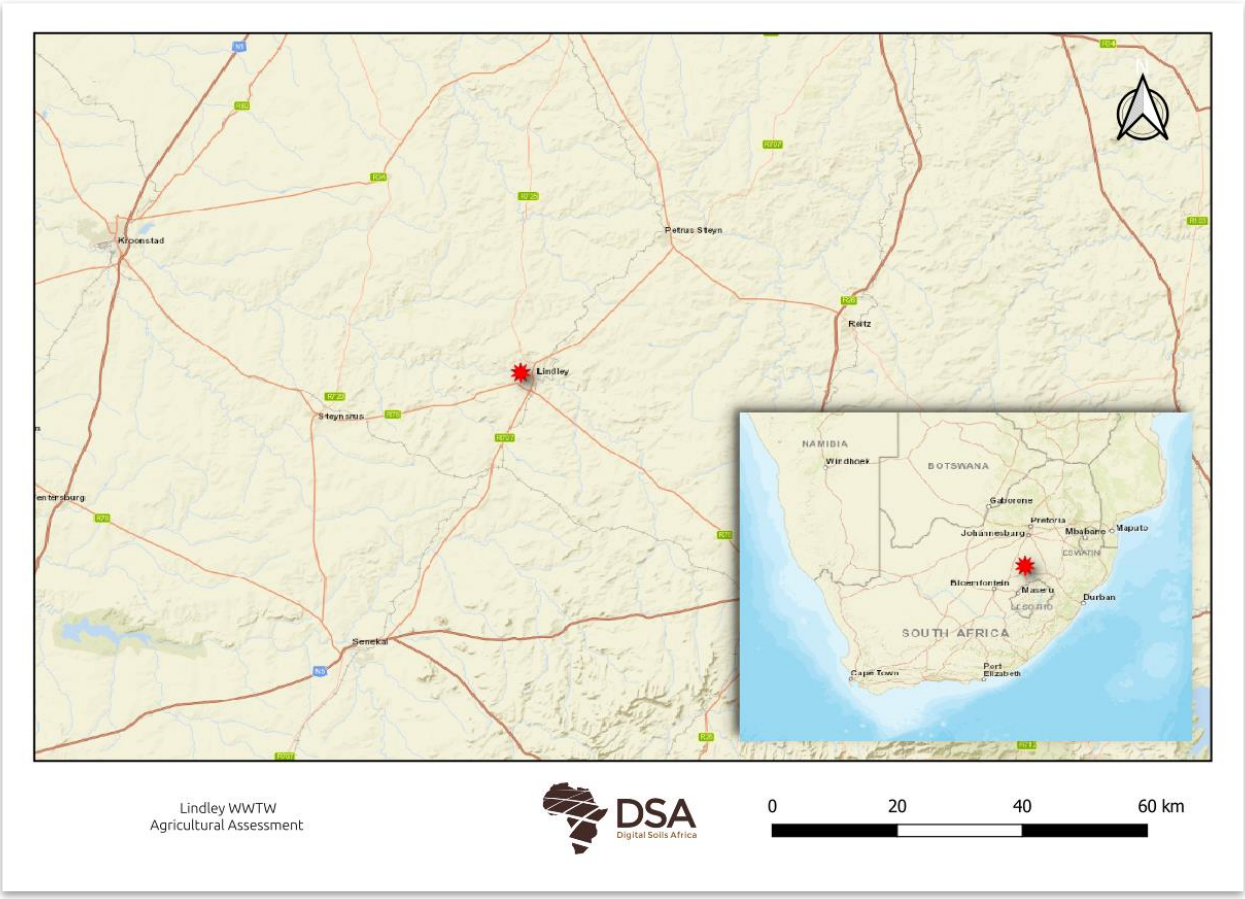


FIGURE 1: LOCATION OF THE STUDY AREA IN THE FREE STATE PROVINCE.

ENVIRONMENTAL SCREENING TOOL

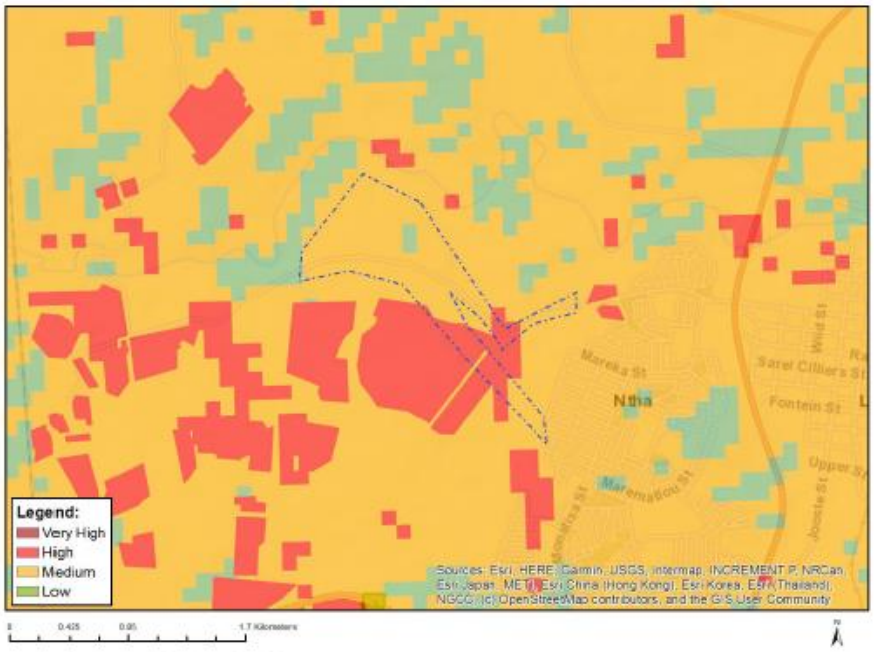
Agricultural sensitivity, as reported in the screening tool, is based upon the land use (SANLC, 2014) and land capability (Department of Agriculture, Forestry and Fisheries, 2017, also referred to as DAFF, 2017).

All cultivated land is considered a high sensitivity, while irrigation and unique crops, are considered very high sensitivity, irrespective of the land capability. The land use in the screening tool is based on the South African Nation Land Cover (SANLC, 2014). Meanwhile, there have been two more updated versions of the land use (2018 and 2020).

According to the Department of Agriculture, Forestry and Fisheries (2017), land capability is defined as the most intensive long-term use of land for purposes of rainfed farming determined by the interaction of climate, soil, and terrain. The following weight was given to each attribute when calculating the Land Capability:

Land capability = Climate (40%) + Terrain (30%) + Soil (30%)

According to the National Web based Environmental Screening Tool, the agricultural sensitivity is classified as high agricultural sensitivity (Figure 2), this is due to the land use being annual cultivated crops (Figure 3). The land capability (DAFF, 2017) classifies the soils as having a land capability of low medium and high (Figure 4).



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
Low	Land capability;01. Very low/02. Very low/03. Low-Very low/04. Low-Very low/05. Low
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

FIGURE 2: RESULTS FROM THE ENVIRONMENTAL SCREENING TOOL.

FIGURE 3: THE CROP BOUNDARY AS USED IN THE SCREENING TOOL.

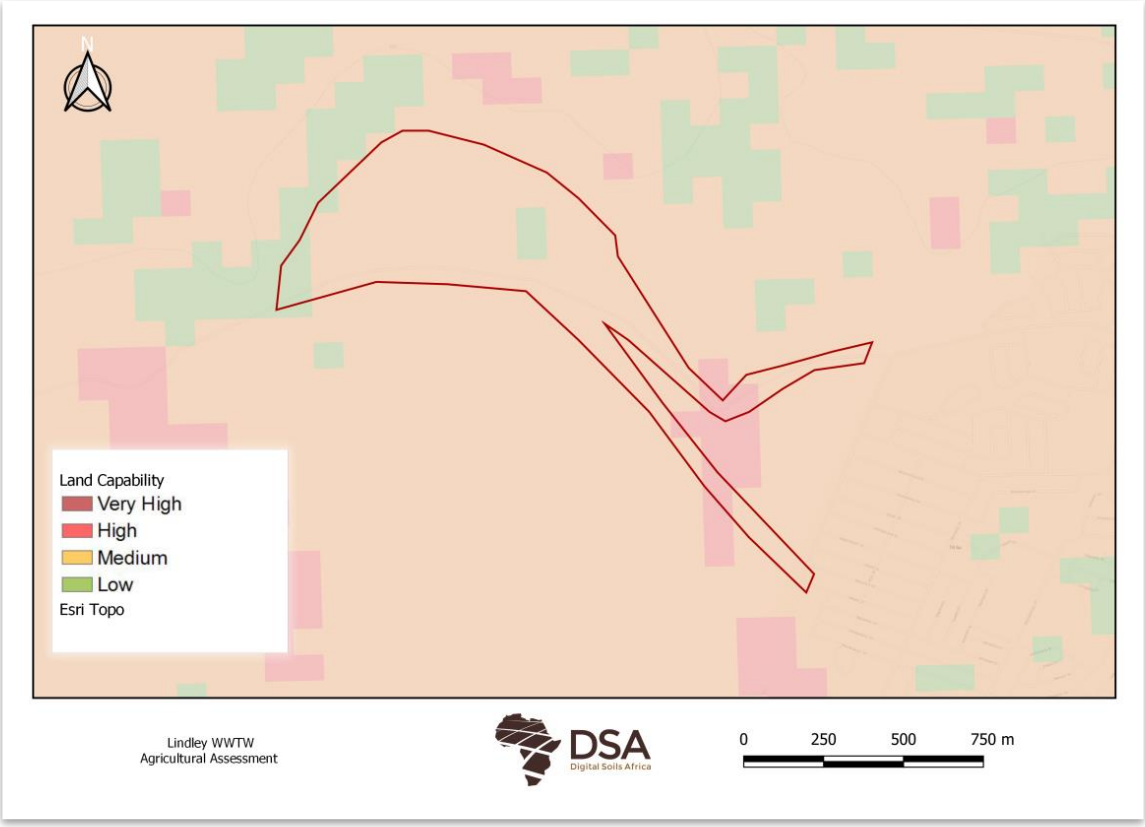


FIGURE 4:THE LAND CAPABILITY OF THE STUDY AS USED IN THE SCREENING TOOL.

Preservation and Development of Agricultural Land Framework Act (PD-ALF) is in the process of being published. The new statutory framework will replace the Subdivision of Agricultural Land Act, Act 70 of 1970.

Protected Agricultural Area, as in the draft framework, is defined as *"an agricultural land use zone, protected for purposes of food production and ensuring that high potential and best available agricultural land are protected against non-agricultural land uses in order to promote long-term agricultural production and food security."*

The study area is not situated in a Protected Agricultural Area, although very close to one (Figure 5).

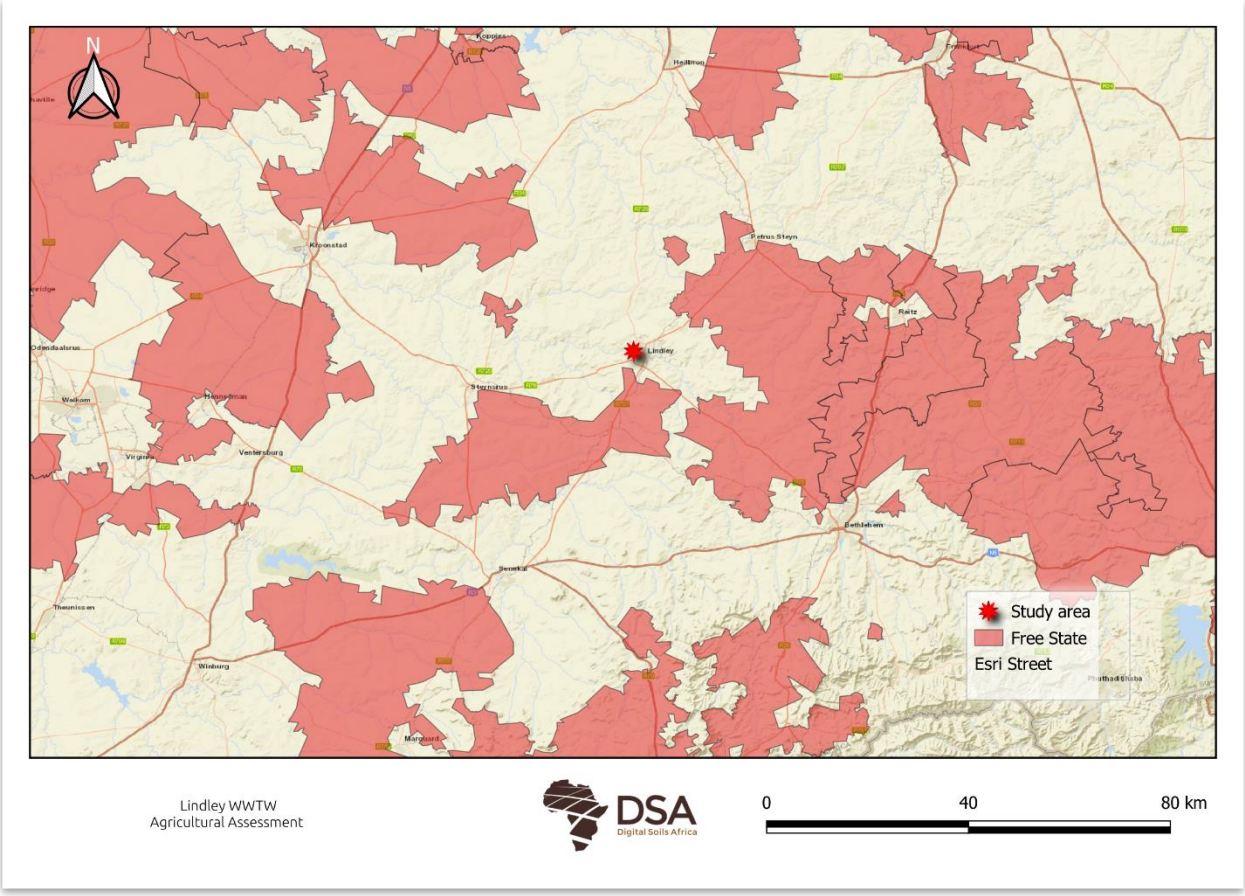


FIGURE 5: THE PROTECTED AGRICULTURAL AREAS FOR THE STUDY AREA.

As per the protocol, Terms of Reference applicable to an "Agricultural Compliance Statement" is as follows:

- The compliance statement must be prepared by a soil scientist or agricultural specialist registered with the SACNASP. (**pg25**)
- The compliance statement must:

- be applicable to the preferred site and proposed development footprint (pg4);
- confirm that the site is of “low” or “medium” sensitivity for agriculture(pg21);
- indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site (pg24).
- The compliance statement must contain, as a minimum, the following information:
- 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 (pg25);
- 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 (pg5);
- confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities (pg24);
- 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 (pg24);
- any conditions to which the statement is subjected (pg24);
- 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 (pg24).
- where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr (pg24);
- and a description of the assumptions made and any uncertainties or gaps in knowledge or data (not applicable).

RESULTS

CLIMATE CAPABILITY

The climate is warm and temperate. The Köppen-Geiger climate classification is Cwb. The average annual temperature is 16 °C. Rainfall is usually in the summer, with an annual precipitation of about 747 mm. The site has a semi-arid climate (Figure 6). Therefore, cultivation of dry land crops will be less possible.

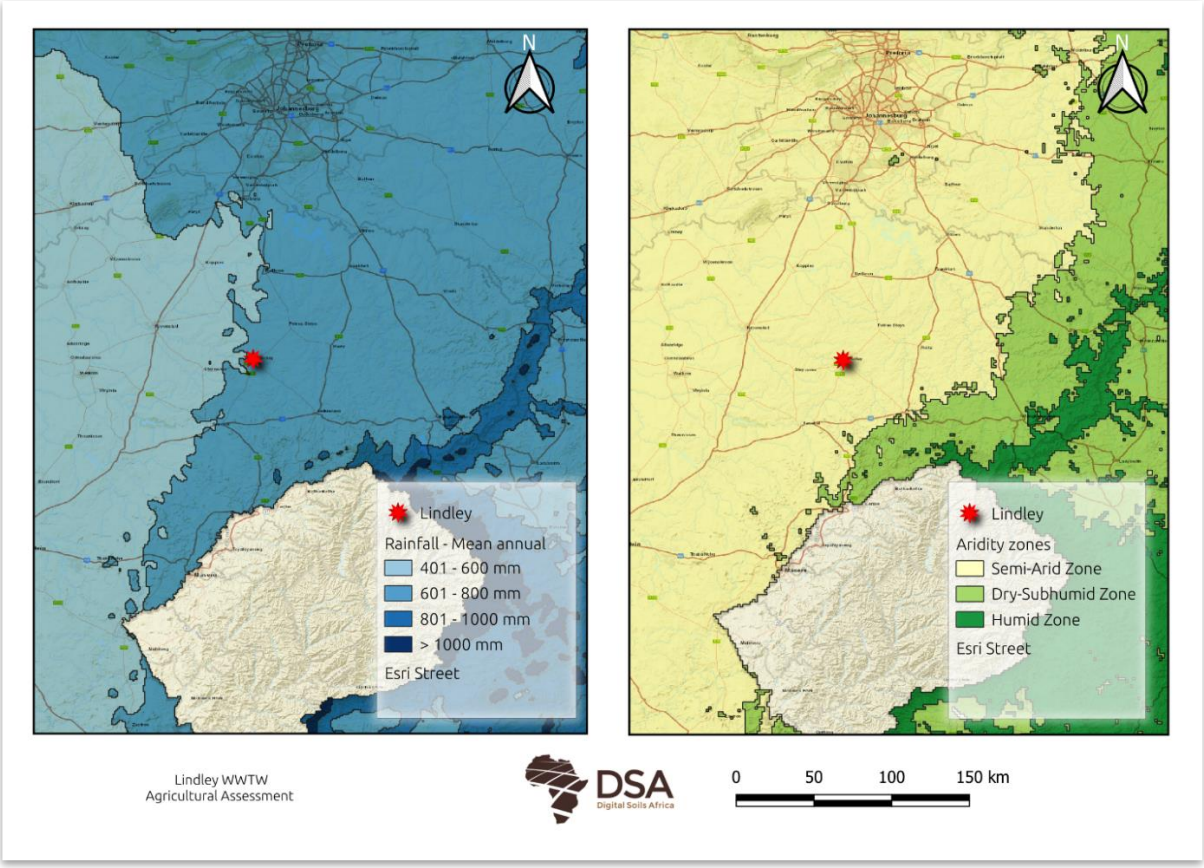


FIGURE 6: CLIMATE OF THE SITE AND THE SURROUNDING AREA (SCHULZE, 2007).

TABLE 1: CLIMATIC PROPERTIES OF LINDLEY (CLIMATE-DATA.ORG).

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature	20.7 °C	20.3 °C	18.9 °C	15.7 °C	12.3 °C	9 °C	8.8 °C	12.1 °C	16 °C	18.3 °C	19.4 °C	20.5 °C
Min. Temperature	15.2 °C	14.9 °C	13.4 °C	10 °C	6.1 °C	2.6 °C	2 °C	4.7 °C	8.4 °C	11.3 °C	12.8 °C	14.6 °C
Max. Temperature	26.7 °C	26.1 °C	24.9 °C	21.8 °C	19.2 °C	16.4 °C	16.5 °C	19.9 °C	23.9 °C	25.6 °C	26.4 °C	26.8 °C
Rainfall mm	131	90	87	49	23	13	8	19	21	81	90	135
Humidity	62%	62%	60%	58%	53%	52%	45%	38%	35%	43%	49%	57%
Rainy days	11	9	8	5	2	1	1	2	2	7	8	11
avg. Sun hours	9.8	9.7	9.2	8.5	8.7	8.5	8.9	9.3	9.9	10.1	10.3	10.3

Climate capability is highest weighted factor (40%) in the calculation of the Land capability (DAFF, 2017) which is used in the Screening Tool to determine the agricultural sensitivity. Soil capability (30%) and Terrain capability (30%) contribute the remaining considerations. The climate capability consists of 9 values, with 1 being the lowest value and 9 being the highest value (There is however no evaluation value of 1 & 2).

The Climate capability determined by the following factors:

- Moisture supply capacity (50%)
- Physiological capacity (20%)
- Climatic constraints (30%)

The climate capability according to the Department of Agriculture, Forestry and Fisheries, 2017, is a value of 5 (Figure 7). This is considered a moderate climate capability.

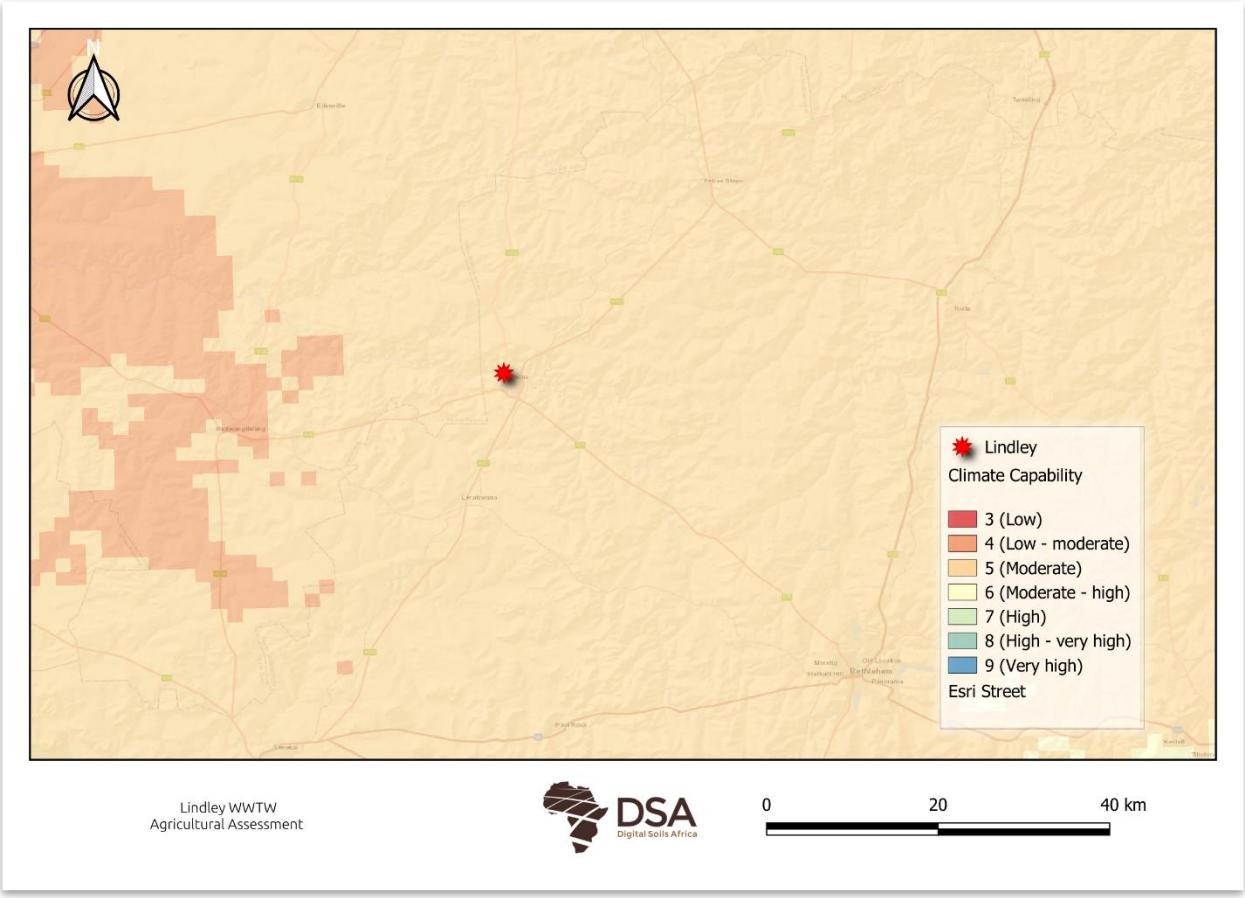


FIGURE 7: THE CLIMATE CAPABILITY OF THE SITE AND SURROUNDING AREA (DAFF, 2017).

SOIL

LANDTYPE

A land type is an area which can be demarcated at a scale of 1:250 000 with similar soil forming factors and therefore soil distribution patterns. A land type does therefore not represent uniform soil polygons, but rather information regarding the occurrence of different soils on different terrain units can be obtained from the land type inventory. Landtype data was used in calculating the soil capability (DAFF, 2017), and therefore, indirectly used in the Screening tool for estimating the agricultural sensitivity.

The study area comprises of the Dc landtype, which consists of sandy topsoils overlaying clayey subsoils. These soils are generally moderate to high potential agricultural soils. The area falls entirely in land type Dc10 (Land Type Survey Staff, 1972 – 2002). However, the Ca (6) and Ca (5) land types are also present in the surrounding area, which might also contain plinthic subsoils soils.

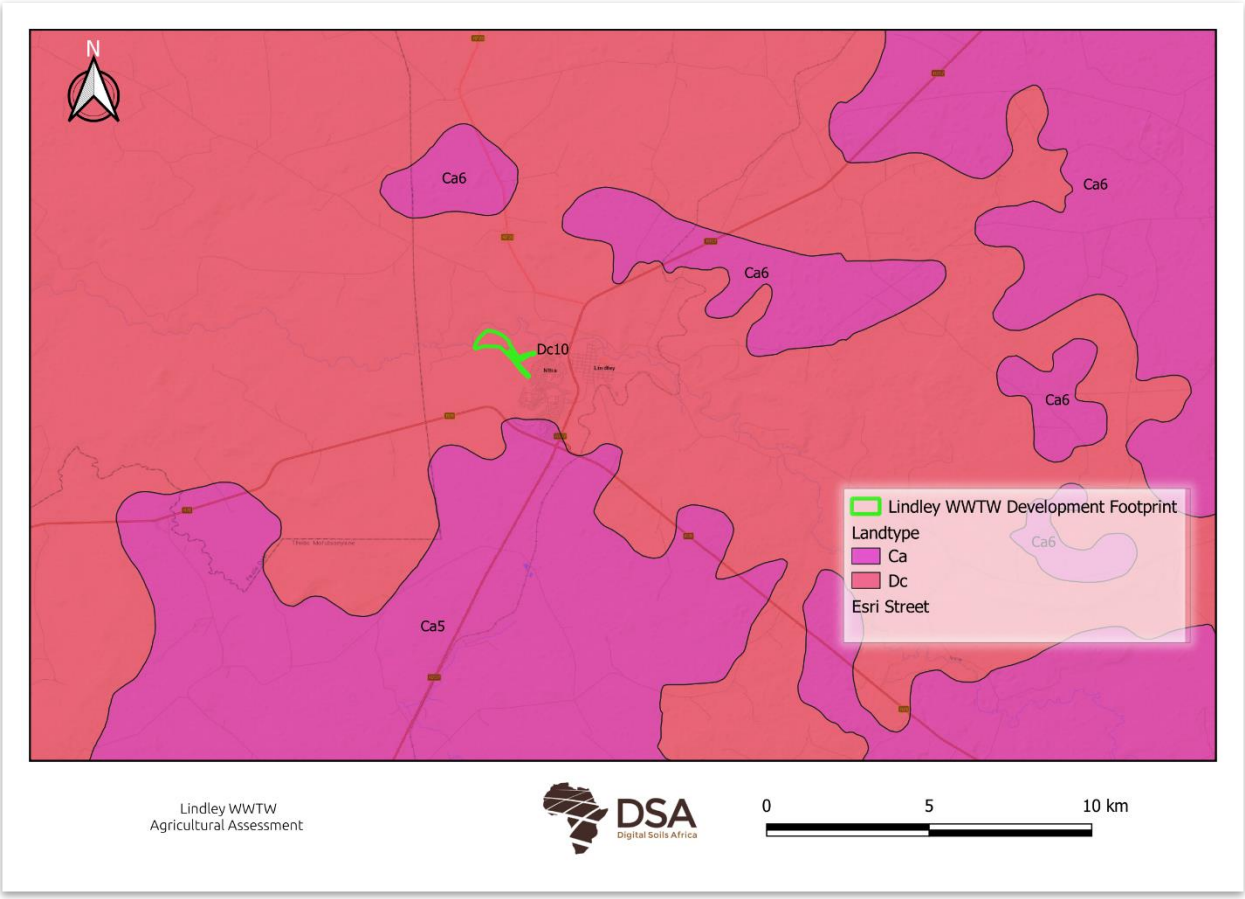


FIGURE 8: LANDTYPES FOUND IN THE STUDY AREA AND THE SURROUNDING AREA (LAND TYPE SURVEY STAFF, 1972 – 2002).

SOIL CAPABILITY

The soil capability consists of 9 values, with 1 being the lowest value and 9 being the highest value. The main factors contributing to the Soil capability consist of:

- Plan available water (80%)
- Soil sensitivity (17%)
- Soil fertility (3%)

The soil capability according to the Department of Agriculture, Forestry and Fisheries, 2017, is a value of 3 (Low) to 6 (Moderate - high). This is considered a moderate soil capability.

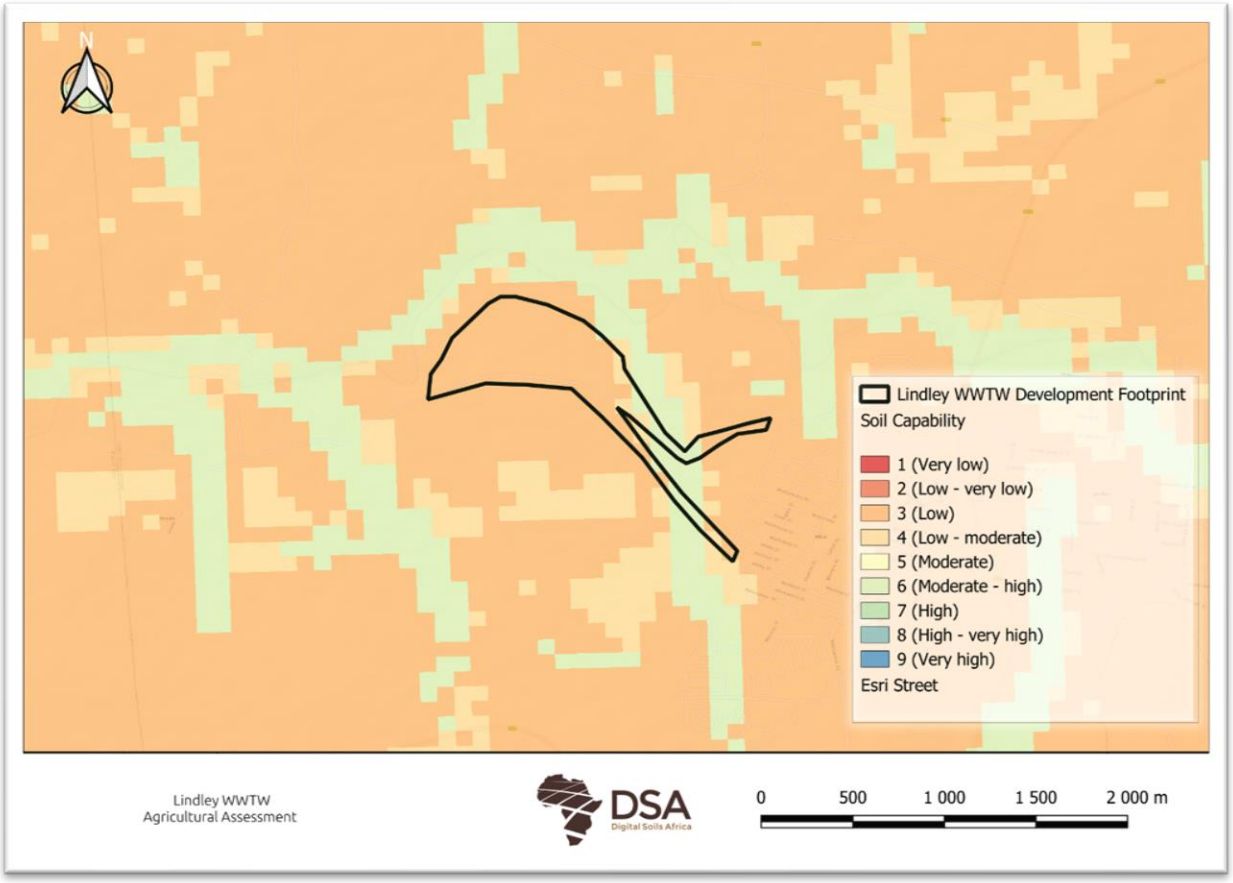


FIGURE 9: THE SOIL CAPABILITY OF THE SITE AND SURROUNDING AREA (DAFF, 2017).

TERRAIN CAPABILITY

Terrain plays an important role in a plants' physiological growth requirements, and from a sensitivity and accessibility perspective, Therefore, the two terrain modelling concerns included in the terrain capability modelling exercise were plant physiology and terrain sensitivity. The Terrain capability consists of 9 values, with 1 being the lowest value and 9 being the highest value.

The terrain capability according to the Department of Agriculture, Forestry and Fisheries, 2017, is a value of 5-7 (Moderate – high). This is considered a Moderate terrain capability.

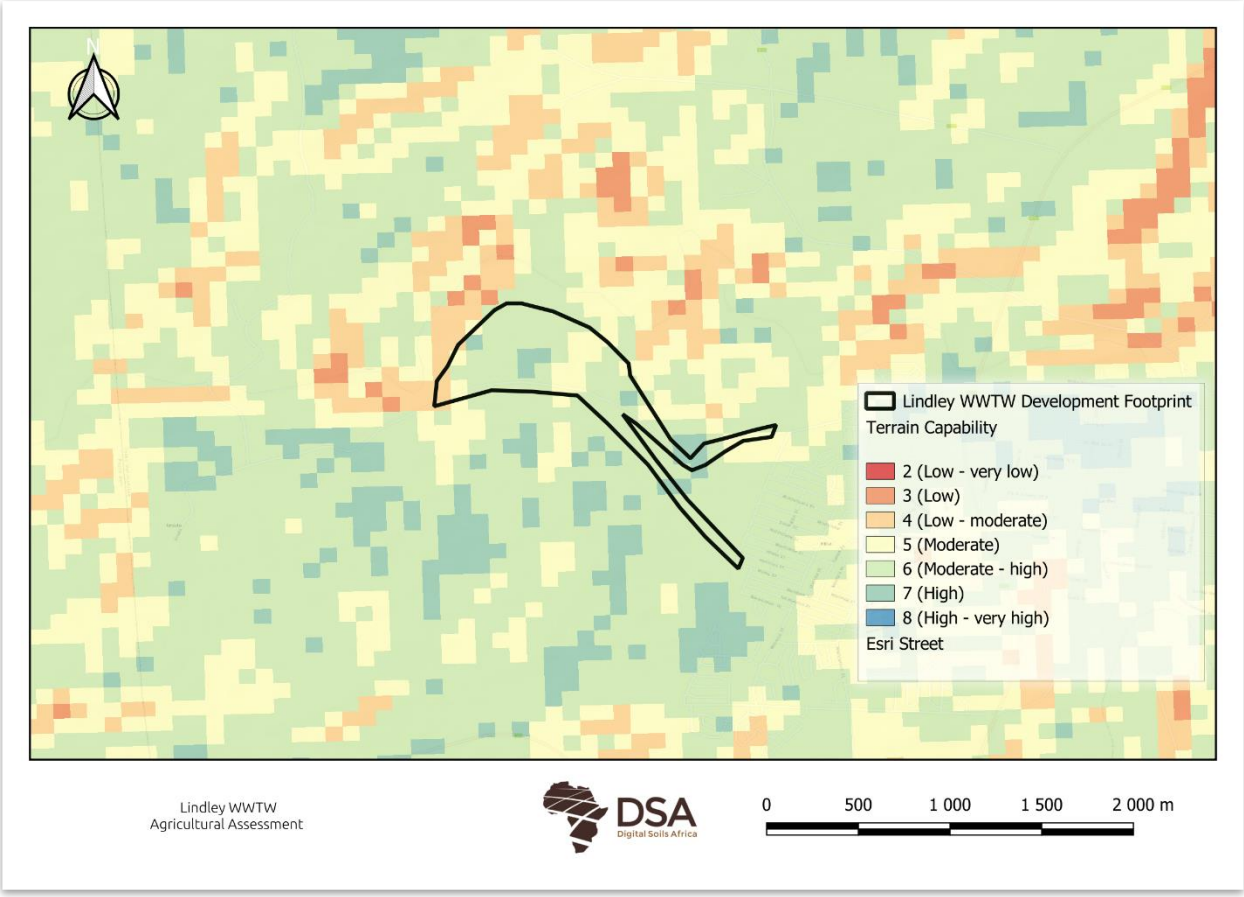


FIGURE 10: THE TERRAIN CAPABILITY OF THE SITE AND SURROUNDING AREA (DAFF, 2017).

LAND CAPABILITY

The new Land capability (Department of Agriculture, Forestry and Fisheries, 2017) has fifteen classes, as opposed to the eight classes described by Schoeman et al. (2002). The data is usable on a scale of 1:50 000 – 1: 100 000, therefore, not suitable for farm scale recommendations. Classes 1 to 7 are of low land capability and only suitable for wilderness or grazing. Classes 8 to 15 are considered to have arable land capability with the potential for high yields increasing with the land capability class number.

TABLE 2: LAND CAPABILITY CLASS AND THE DESCRIPTION OF THE CLASS

Land Capability Class	Description
1-2	Very Low
3-4	Very Low to Low
5	Low
6-7	Low to Moderate
8	Moderate
9-10	Moderate to High
11	High
12-13	High to Very High
14-15	Very High

The Land capability according to the Department of Agriculture, Forestry and Fisheries, 2017, is a value of 5 (Low) to 9 (Moderate – high), which is generally considered to have moderately arable land capability. Therefore, the site ranges from grazing to arable according to the desktop land capability.

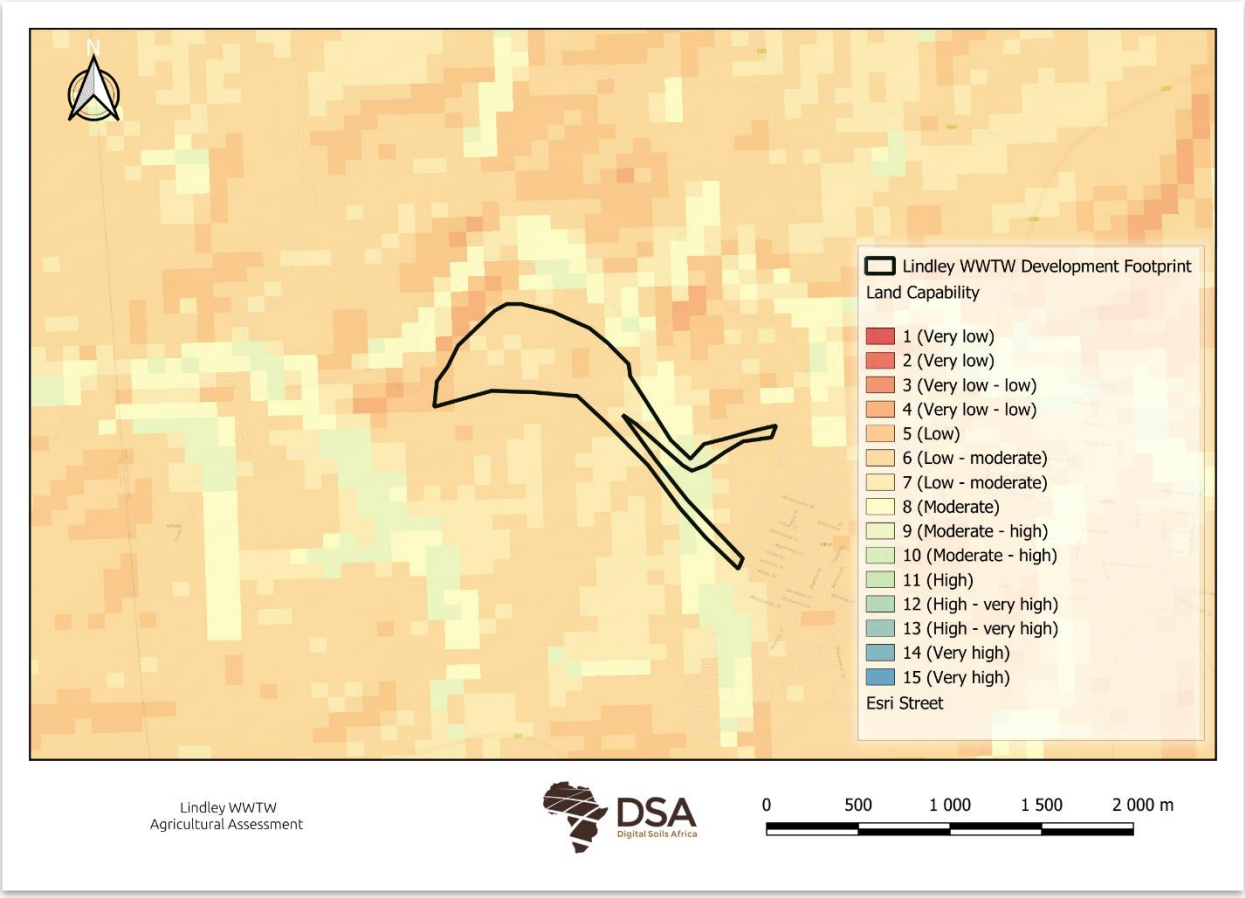


FIGURE 11: LAND CAPABILITY CLASS MAP OF THE STUDY AREA (DAFF, 2017).

GRAZING CAPACITY

The unit used in the grazing capacity is hectares per large stock unit (ha/LSU). The site has a high grazing capacity of 5 ha/LSU (Figure 12). A homogeneous unit of vegetation expressed as the area of land required (in hectares) to maintain a single animal unit (LSU) over an extended number of years without deterioration to vegetation or soil. Where an LSU = An animal with a mass of 450 kg and which gains 0.5 kg per day on forage with a digestible energy of 55%. (Trollope et. Al., 1990).

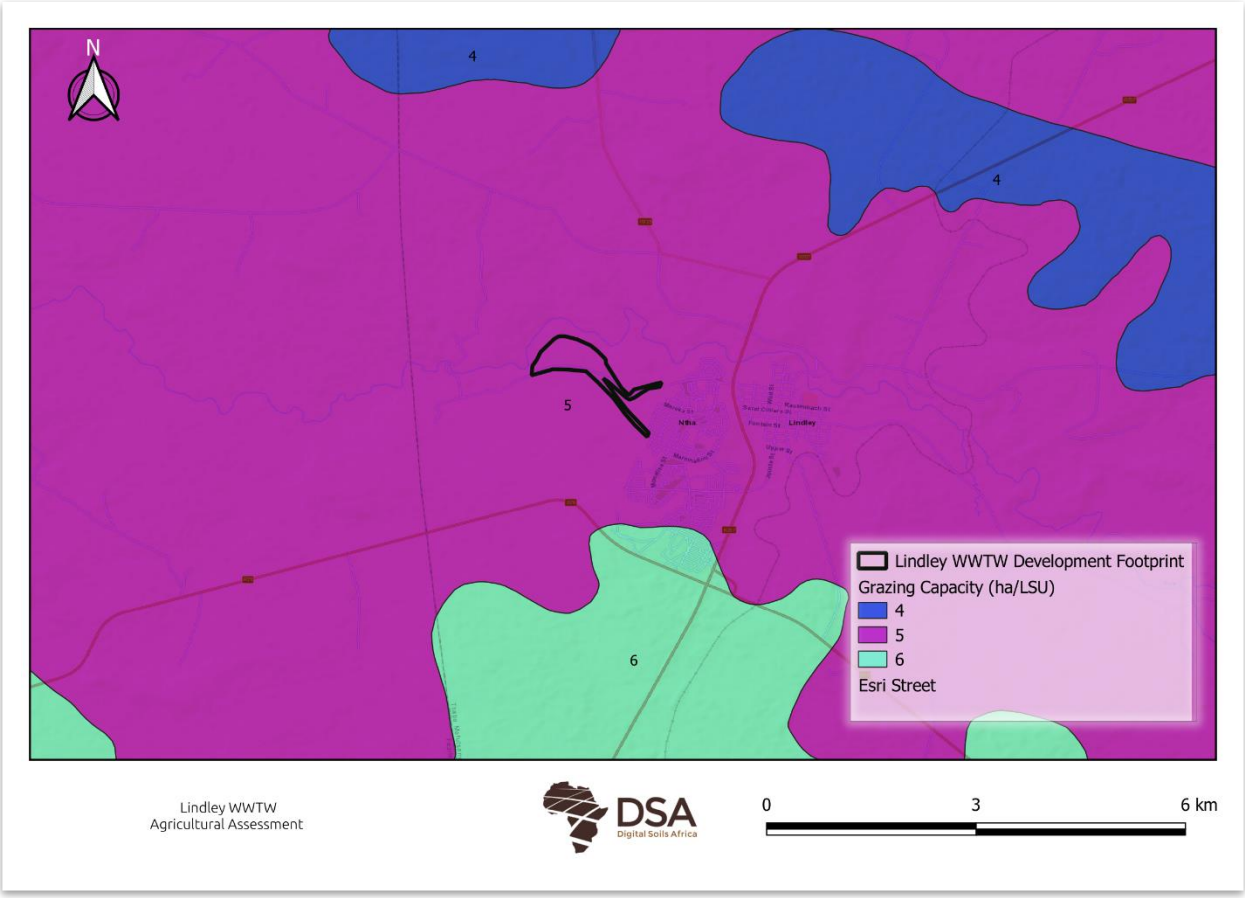


FIGURE 12: GRAZING CAPACITY FOR THE SITE AND THE SURROUNDING AREA (DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES, 2016).

LAND USE

South African National Land-Cover 2020 (SANLC 2020) (GeoTerraImage, 2020) was compared to the 2014 Land Cover to determine if there was a land use change since 2014. The primary land-use in the area is Grassland (Natural Grassland) (13), while there is also indication of commercial annual rain-fed crops (Cultivated) (40), and herbaceous wetlands (22) areas present in the Development Footprint (**Error! Reference source not found.**).

TABLE 3: LEGEND TO FIGURE 13

No.	Class Name	Class Definition
13	Grassland (Natural Grassland)	Natural and/or semi-natural indigenous grasslands, typically devoid of any significant tree or bush cover, and where the grassland component is typically dominant over any adjacent bare ground exposure. Typically representative of low, grass-dominated vegetation communities in the Grassland and Savanna Biomes.
22	Commercial annual rain-fed crops / dryland (Cultivated)	Natural or semi-natural wetlands covered in permanent or seasonal herbaceous vegetation. The mapped wetland extent represents the surface wetland extent detectable from image detectable surface vegetation characteristics, (which may differ from soil-profile based wetland delineations). This wetland class represents wetlands identified in the current national land-cover modelling. The class represents primarily riparian wetland areas but can also include emergent aquatic vegetation in pans.
40	Herbaceous wetlands (Wetlands)	Active or recently active cultivated lands used for the production of agricultural crops, in this case specifically associated with commercial annual crops, The plants only remain in the field for one growing seasons and one harvest, and are grown non-irrigated, rainfed fields.

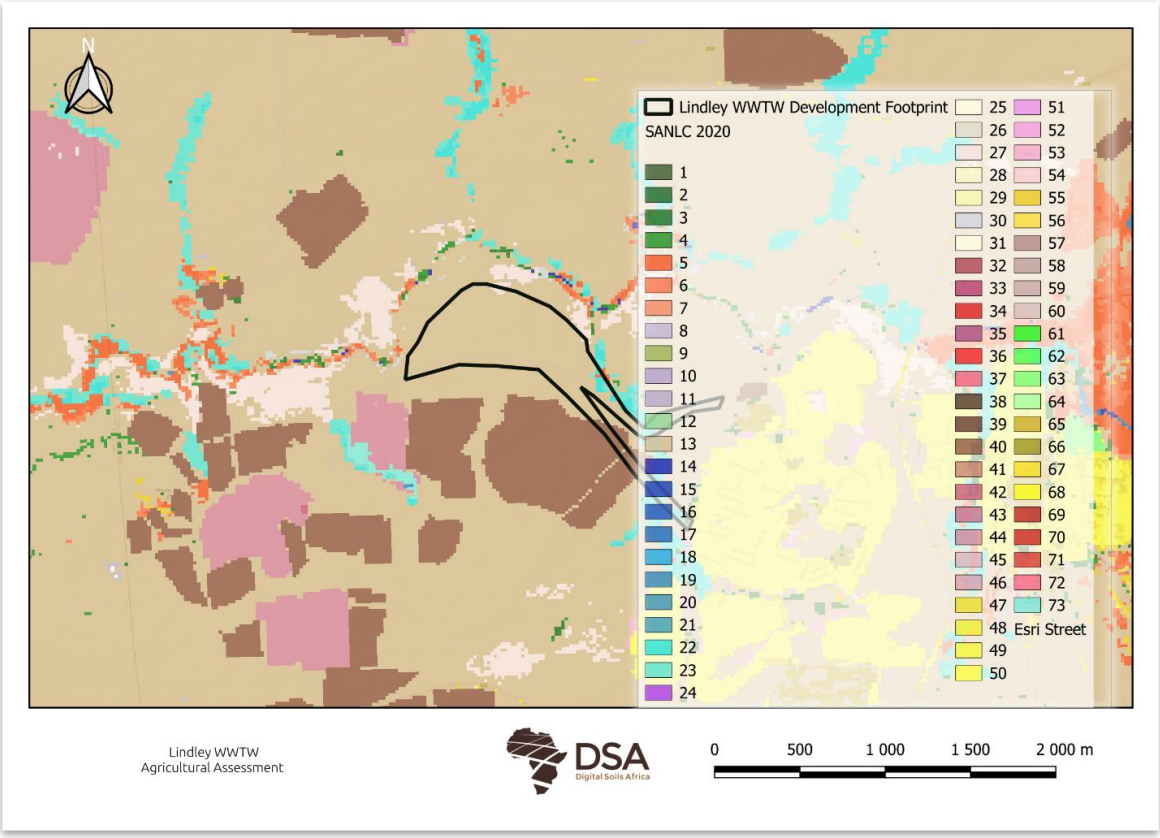


FIGURE 13: SOUTH AFRICAN NATIONAL LAND-COVER 2020 (SANLC 2020).

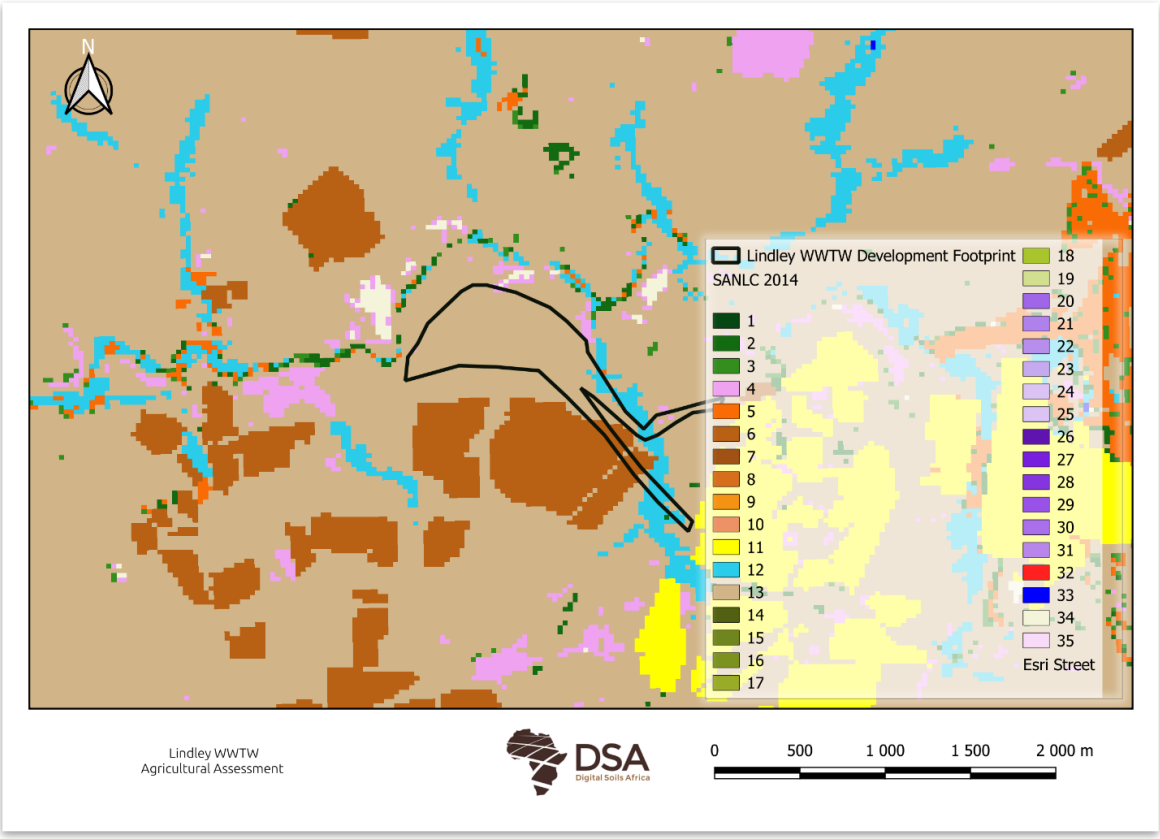


FIGURE 14: SOUTH AFRICAN NATIONAL LAND-COVER 2014 (SANLC 2014).

SITE VERIFICATION

LAND USE

The verification of the land use on the study area confirms most of the area is covered by grassland, but the area classified as commercial annual rain-fed crops / dryland (Cultivated) by the SANLC is not representative of the study area. This is shown by both google satellite and photographs taken on site.

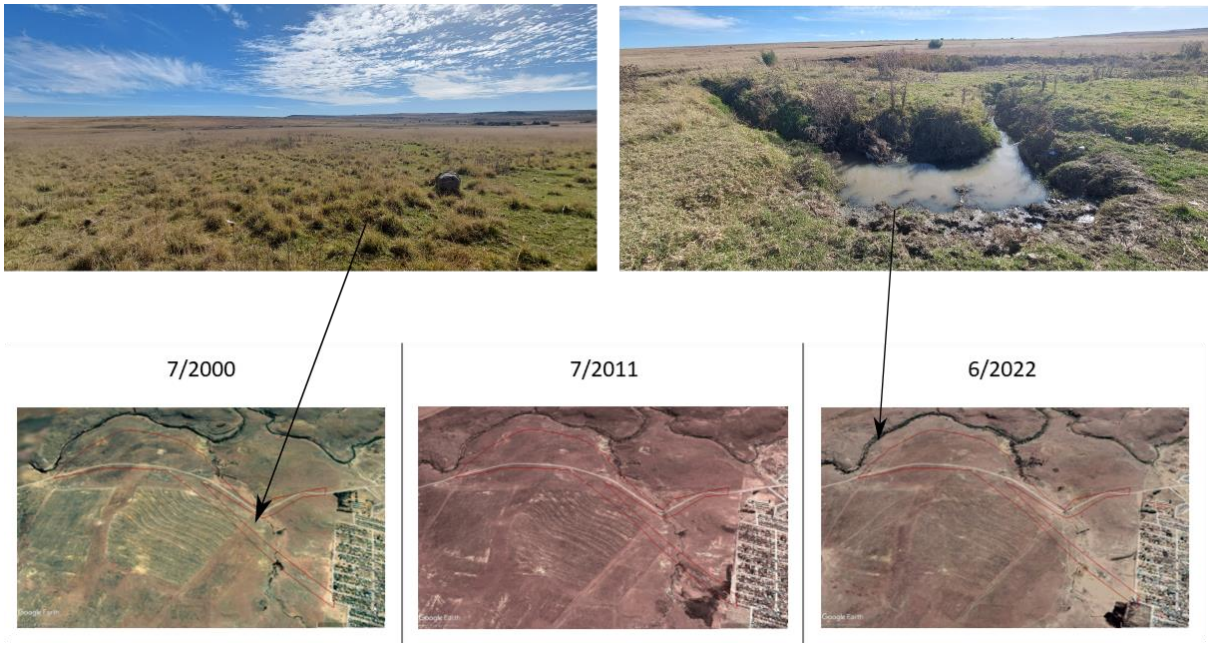


FIGURE 15: LAND USE OF THE STUDY AREA.

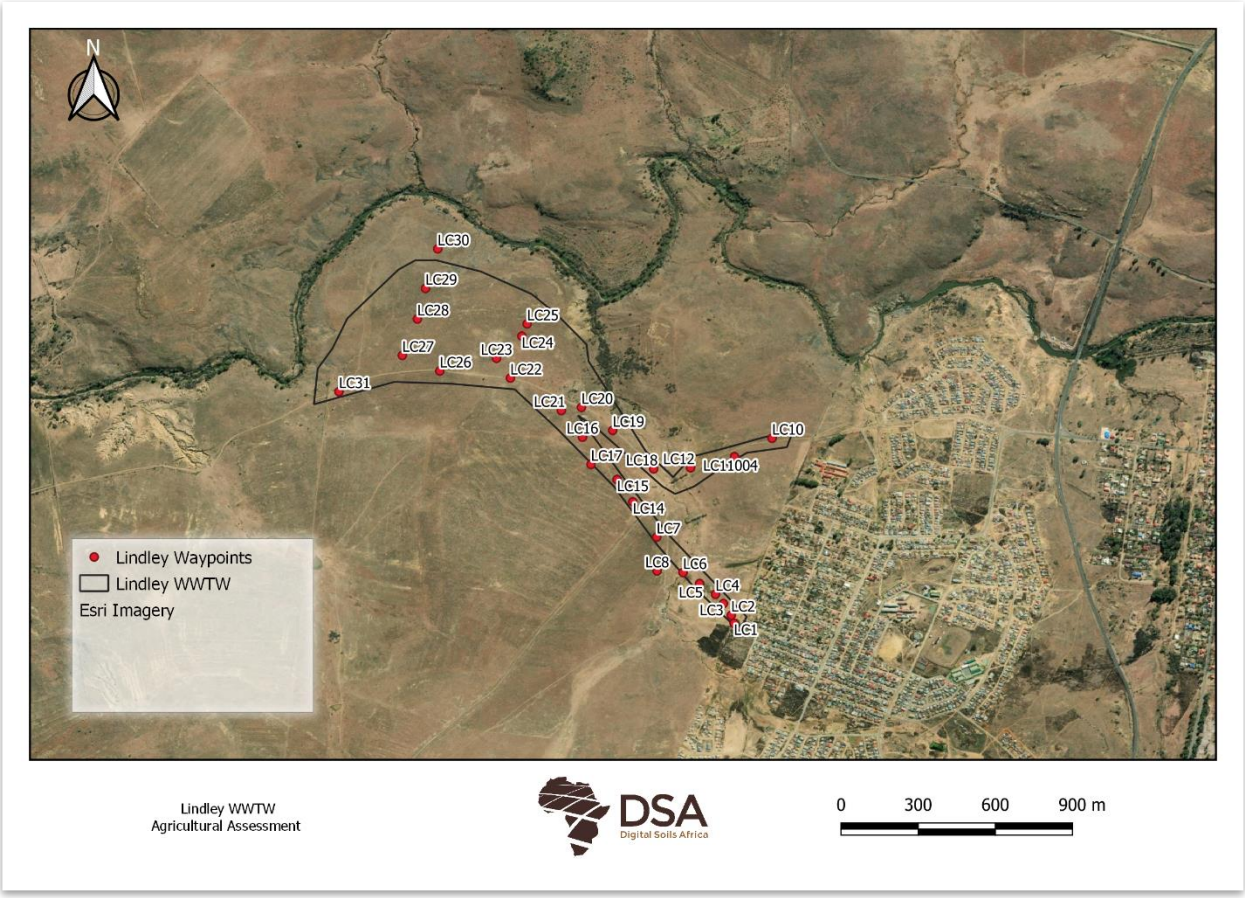


FIGURE 16: OBSERVATIONS MADE DURING THE STUDY.

LAND CAPABILITY

The verification of the soil on the study area suggests that the soils are structured, with many soils exhibiting signs of saturation. The observations made during the field visit are presented in Figure 16 and the detailed description of the observations are in Appendix 2. Seven soil types were classified on site, with no soils classified as having a high soil capability. Therefore, the high land capability predicted in the screening tool is disputed.

Erosion was observed on site, which confirm the soil properties indicating erosion as a concern. Salts were observed on some soils; therefore, salinization is a concern for agriculture.

TABLE 4: SOIL TYPES CLASSIFIED IN THE STUDY

Soil Type	Soil Code	Horizon	Soil capability
Rensburg	Rg	Vertic	Low
		Gley	Low
Tukulu	Tu	Orthic	Low
		Neocutanic	Low
		Gleyic	Low
Glenrosa	Gs	Orthic	Low
		Lithic	Low
Tshiombo	Ts	Orthic	Low
		Neocutanic	Low
		Lithic	Low
Lepellane	Lp	Orthic	Low
		Unconsolidated material with wetness	Low
Sepane	Se	Orthic	Low
		Pedocutanic	Low
		Gleyic	Low
Mispah	Ms	Orthic	Low
		Rock	Low

FIGURE 17: SOIL PROPEORTEIES OF THE STUDY AREA.

COMPLIANCE STATEMENT

According to the screening tool, the site is classified as having a high agricultural sensitivity due to existing cultivated pastures and high land capability in the wetland area. The soil observations found the land capability to be low due to:

1- Structured soils
2- Erosion risks
3- Salinization risks
4- Poor drainage

No micro-siting should occur from the development.

Considerations for EMPr- It is recommended that an erosion inspection is completed 6 months after the project is completed by a suitably registered SACNASP professional. Avoid turning soil, i.e., ploughing. The topsoil should be placed separately to the subsoil during excavation and during backfilling, the subsoil should be returned first and then covered by the topsoil. This is to prevent crust formation which is typically more prevalent in subsoils.

Due to the small footprint and low impact on existing agricultural activities, it is the specialist's opinion that the development continues. The development will not have a significant impact on agricultural in the area and poses no threat to food security. In terms of agricultural sensitivity, the development should thus be allowed to proceed.

APPENDIX 1: SPECIALIST CV

DR DARREN BOUWER

EDUCATION

PhD Soil Science	University of the Free State	2018
M.Sc. Soil Science	University of the Free State	2013
B.Sc. Soil Science (Hon)	University of the Free State	2009
B.Sc. Soil Science	University of the Free State	2008
Matric certificate	Queens College	2005

PROFESSIONAL AFFILIATIONS

- SACNASP- Pri Nat Sci 400081/16
- Member of the Soil Science Society of South Africa
- Member of the Soil Classification Work Group
- Member of South African Soil Surveyors Organisation

WORK EXPERIENCE

- **Digital Soils Africa** / Soil Scientist - May 2012 – Present
- **Ghent University** / Researcher- January 2016 - December 2016
- **University of the Free State**/ Assistant Researcher- January 2011- December 2015

PUBLICATIONS

Total consultancy reports: >120 **Total Publications: 5**

Most relevant:

Bouwer, D., Le Roux, P. A., van Tol, J. J., & van Huyssteen, C. W. (2015). Using ancient and recent soil properties to design a conceptual hydrological response model. Geoderma, 241, 1–11.

Van Zijl, G. M., Bouwer, D., van Tol, J. J., & le Roux, P.A.L. (2014). Functional digital soil mapping: A case study from Namarroi, Mozambique. Geoderma, 219-220, 155–161.

SPECIALIST DECLARATION

I, Darren Bouwer, declare that –

- I act as the independent specialist in this application;
- I regard the information contained in this report to be true and correct;
- I do not have a conflict of interest in this project;
- I will conduct the work relating to the project in an objective manner.

Dr Darren Bouwer
PhD Soil Science
Pri Nat Sci 400081/16

APPENDIX 2: OBSERVATION DETAILS

Obs Nr	Topsoil	Subsoil Horizon	Subsoil Horizon	Soil Form	Soil Code	Depth to Clay (mm)	Total Depth	Field notes
LC 1	Vertic	Gley	-	Rensburg	Rg	Surface	600mm	Close to graveyard near sewage station
LC 2	Vertic	Gley	-	Rensburg	Rg	Surface	700mm	High clay
LC 3	Vertic	Gley	-	Rensburg	Rg	0- Surface	500mm	High clay. Horses grazing
LC 4	Vertic	Gley	-	Rensburg	Rg	0- Surface	500mm	High clay
LC 5	Vertic	Gley	-	Rensburg	Rg	Surface	500mm	High clay. White salt crust on surface. Bleached topsoil
LC 6	Orthic	Neocutanic	Gleyic	Tukulu	Tu	250	900m	Stream with polluted water flowing. High clay in Gleyic
LC 7	Orthic	Neocutanic	Gleyic	Tukulu	Tu	350	1.2m	Lithic material in Gleyic horizon
LC 8	Orthic	Neocutanic	Gleyic	Tukulu	Tu	300	1m	Lithic material in Gleyic horizon. Erosion
LC 9	Orthic	Neocutanic	Gleyic	Tukulu	Tu	250	900mm	High clay in Gleyic
LC 10	Orthic	Neocutanic	Gleyic	Tukulu	Tu	350	1.3m	Lithic material in Gleyic horizon. Cattle Grazing
LC 11	Orthic	Lithic	-	Glenrosa	Gs	-	200mm	Shallow topsoil
LC 12	Orthic	Lithic	-	Glenrosa	Gs	-	100mm	Shallow topsoil
LC 13	Orthic	Neocutanic	Gleyic	Tukulu	Tu	300	1.1m	Lithic material in Gleyic horizon
LC 14	Orthic	Neocutanic	Gleyic	Tukulu	Tu	300	1.2m	Lithic material in Gleyic horizon
LC 15	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	300	700mm	Signs of wetness prominent from 350mm
LC 16	Orthic	Neocutanic	Lithic	Tshiombo	Ts	350	850mm	Gleylithic
LC 17	Orthic	Neocutanic	Lithic	Tshiombo	Ts	300	900mm	Gleylithic
LC 18	Orthic	Neocutanic	Lithic	Tshiombo	Ts	300	900mm	Gleylithic. Erosion
LC 19	Orthic	Neocutanic	Lithic	Tshiombo	Ts	350	1m	Gleylithic
LC 20	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	350	800mm	Subsoil contain partly weathered rock
LC 21	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	300	700mm	Subsoil contain partly weathered rock
LC 22	Orthic	Lithic	-	Glenrosa	Gs	-	250mm	Shallow topsoil
LC 23	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	200	500mm	Hard rock fragments in subsoil
LC 24	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	300	700mm	Subsoil contain partly weathered rock
LC 25	Orthic	Hard Rock	-	Mispah	Ms	-	<100mm	Rocks prominent on surface
LC 26	Orthic	Lithic	-	Glenrosa	Gs	-	200mm	Shallow topsoil

LC 27	Orthic	Unconsolidated material with wetness	-	Lepellane	Lp	300	700mm	Subsoil contain partly weathered rock
LC 28	Orthic	Lithic	-	Glenrosa	Gs	-	200mm	Rocks on surface. Animals Grazing
LC 29	Orthic	Hard Rock	-	Mispah	Ms	-	<100mm	Rocks prominent on surface
LC 30	Orthic	Pedocutanic	Gleyic	Sepane	Se	300	1.3m	Well structured soil. Close to water source
LC 31	Orthic	Lithic	-	Glenrosa	Gs	-	250mm	Geolithic