# IDENTIFICATION AND MAPPING OF SOILS RICH IN ORGANIC CARBON IN SOUTH AFRICA

## AS A CLIMATE CHANGE MITIGATION OPTION


environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

Published by Department of Environmental Affairs

This report must be cited as follows: Identification and mapping of soils rich in organic carbon in South Africa as a climate change mitigation option (2019). Department of Environmental Affairs, Pretoria, South Africa.

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**Acknowledgements:**
Dr Garry Paterson Agricultural Research Council
Stefanie Schütte Schulze and Associates
Prof Roland Schulze Schulze and Associates
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Photos courtesy of Mr Itchell Guiney and Mr Kent Buchanan
Additional cover photographs: NASA and Wikimedia

Published in Pretoria, South Africa – March 2019

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This report was kindly funded through the GIZ implemented Climate Support Programme, which is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports the IKI on the basis of a decision adopted by the German Bundestag.

# CONTENTS

## IDENTIFICATION AND MAPPING OF SOILS RICH IN ORGANIC CARBON IN SOUTH AFRICA AS A CLIMATE CHANGE MITIGATION OPTION

# INTRODUCTION

In an endeavour to map the extent of carbon stocks in South African ecosystems, the department undertook a National Terrestrial Carbon Sinks Assessment (NTCSA) following a directive of the National Climate Change Response Policy (NCCRP) to identify land use based principal climate change mitigation opportunities. The NTCSA demonstrated that the bulk of carbon is stored in the soil, which currently does not count towards many carbon storage projects and that conventional farming systems degrade the carbon stores in the soils. Poor agricultural practices lead to a breakdown of soil organic carbon that then is released into the atmosphere as the greenhouse gas, carbon dioxide.

In South Africa, the Agriculture, Forestry and Other Land use (AFOLU) sector contributes 6% to overall GHG emissions of the country. To date, the GHG emissions estimates of the country have included mineral soils carbon pool without estimating organic soils as the area of organic soils in South Africa was estimated to be insignificant. As this assumption may be incorrect, the current study on the identification and mapping of soils rich in organic carbon in South Africa was conducted with the view to determine the extent of organic soils as a climate change mitigation option in South Africa. This data can be incorporated into future GHG inventories as most GHG emissions contributions of the AFOLU sector are from $N_2O$ emissions from agricultural soils and $CH_4$ from enteric fermentation.

Further, this study will provide data needed to inform national climate change policy that recognises the importance of organic and humic carbon stocks both as a climate change mitigation measure and as an important ingredient for healthy soils essential for robust and resilient crop production.

Although the independent research and findings contained in this report do not necessarily represent the views, opinions and/or position of government, the department believes that this research is critical to enhance our understanding of soils and how health soils can play a role in climate change mitigation and in food security.

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## CHAPTER 1

# SETTING THE SCENE

### 1.1 Objectives of the project

The main purposes of this project were:

- To develop maps, in detail and at high resolution, of soil organic carbon content as percentages and as stocks of soils across the entire South Africa;
- Use the above maps as an input to the current electronic based National Carbon Sinks Atlas;
- with a focus on areas with soils high in organic carbon;
- Using the above maps to inform the development and implementation of appropriate management regimes and possible interventions to protect these important soil types through initiatives by the Department of Environmental Affairs (DEA) to avoid unnecessary carbon releases from these soils.

At the conclusion of the project raster files with all the relevant information were to be submitted to the DEA.

### 1.2 Overall Methodology

The overall methodology adopted in this Project on isolating soils rich in carbon was

- To use the 501 soil series of the South African Binomial Soil Classification which the Institute for Soil, Climate and Water (ISCW) had used to map the country into broad Land Types of soils (as against geomorphological land types) on a scale of 1:250 000.
- Each Land Type had been further sub-divided, but not mapped, into a maximum of five terrain unit (TU) classes made up of the crest, the scarp, the midslope, the footslope and the valley bottom.
- These TUs were then delineated with a 90m Digital Elevation Model (DEM) into 27 491 terrain units covering South Africa.
- The soil carbon content for the various soil series were then extracted from the ARC's Soil Carbon Database, which had been made available to the project, and analysed,
- With this soil carbon data then merged with the terrain unit database.
- This information was then used to map soil organic carbon in detail across South Africa for both natural vegetation conditions and for soils that had been modified by agricultural practices.

### 1.3 Contents of the report

Following the introduction above, the report contains six further chapters:

- **CHAPTER 2**, which is a literature review on soil organic carbon (SOC), with specific reference to South Africa;
- **CHAPTER 3** on the identification of terrain units from Land Types of soils as the spatial resolution for mapping SOCs;
- **CHAPTER 4** on mapping humic and organic soils across South Africa;
- **CHAPTER 5** on methodologies for enhancing ARC's soil carbon database to enable mapping of SOCs across South Africa at the resolution of terrain units;
- **CHAPTER 6** on mapped results of SOC percentages and stocks; and
- **CHAPTER 7** on the road ahead.

## CHAPTER 2

# SOIL ORGANIC CARBON:
## A LITERATURE REVIEW WITH SPECIFIC REFERENCE TO SOUTH AFRICA

### 2.1 Introduction

Carbon concentrations in the soil are highly variable and might be changing, slowly over time, both negatively and sometimes positively, due to a number of factors, including land use practices (du Preez et al. 2011a; b) and climatic interactions (Paustian et al. 2016). Increases of carbon (as carbon dioxide) in the atmosphere, together with other greenhouse gases have been identified as the main contributor to anthropogenic climate change (Falkowski et al. 2000; Lacis et al. 2010). Soil is a potential carbon source or sink, thus impacting the sequestration or release of greenhouse gases. The main way that carbon is incorporated in soils is through plant decomposition and conversion of carbon as soil organic carbon. Soil organic carbon has also been identified as beneficial to soil water storage properties and plant production. Maintaining high levels of soil organic carbon in existing soils and promoting practices that increase, rather than reduce, soil organic carbon thus has multiple benefits (Schütte 2017).

### 2.2 The carbon cycle, soil function and soil organic carbon

In this short literature review, the carbon cycle is first explained, followed by a section on soil and its properties and functions, a section on soil organic carbon and, finally, a review of South African soil carbon studies.

#### 2.2.1 THE CARBON CYCLE

Carbon cycles between the atmosphere and earth and a simplified carbon cycle are shown in **Figure 2.1**, with carbon cycling from $CO_2$ in the atmosphere, and its uptake on earth, by oceans or in terrestrial ecosystems by plants via photosynthesis. This carbon is then stored as decomposed plant matter and it might convert to soil organic carbon. If conditions are right, it can convert to fossil fuel reserves (for example coal and oil; Falkowski et al. 2000). Carbon emissions from the earth to the atmosphere involve the oxidisation of carbon in its various forms to mainly carbon dioxide ($CO_2$) via numerous pathways. These range from oxidation of soil organic matter by soil microbes to respiration by plants or animals, to disturbances such as fire, burning of human-harvested fossil fuels brought up from deeper earth layers, or (on time scales of millennia) by volcanism and weather reactions (Falkowski et al. 2000; Schütte 2017).

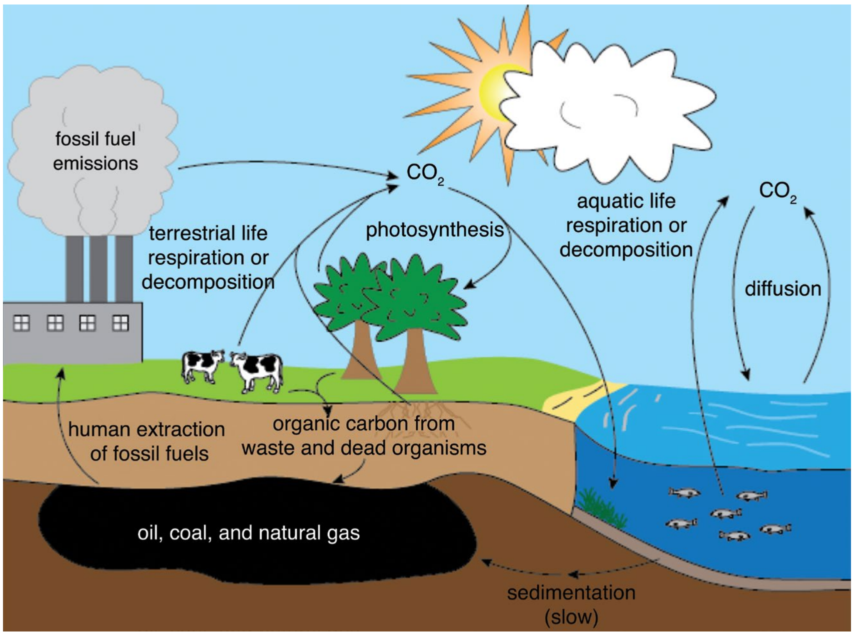



**FIGURE 2.1** The Earth's simplified carbon cycle over land and water (after Shmoop Editorial Team 2008)

Terrestrial carbon pools, namely, the sum of carbon in living terrestrial biomass and in soils, are approximately three times greater than the $CO_2$ pool in the atmosphere (Falkowski et al. 2000). Carbon sinks are understood to be the amount that oceans or terrestrial ecosystem can retain or remove from atmospheric carbon dioxide, while carbon sources are the reverse. Land use change also affects the carbon source/sink dynamics. As mentioned previously, a big part of the terrestrial carbon sink is in the form of soil carbon (**Section 2.2.3**), with soil being the focus of the next section.

### 2.2.2 SOIL AND ITS PROPERTIES AND FUNCTIONS

Soil may be defined as a living, complex and dynamic 'ecosystem of diverse living organisms (including plant roots), non-living organic matter and biologically-transformed organic / humic products, which inhabits, modifies and interpenetrates an inorganic mix of mineral particles, air, water and nutrient ions' (Shaxson 2006: 14). A typical soil consists of approximately 45% inorganic minerals, 20–30% water, 20–30% air and around 2–5% organic matter. Physical soil properties include texture, structure, density and porosity (Shaxson 2006), with soil texture determined by the relative proportions of sand, silt and clay particles while soil structure refers to the aggregation of the particles into larger, relatively stable secondary structures or aggregates. Maintaining good soil structure requires the interaction of soil biology with sufficient organic matter, under suitable conditions in regards to temperature, pH and water availability. Soil density, more generally expressed as soil bulk density, is a measure of soil compaction (Bauer 1974). Soil porosity, namely the amount of pore space between soil particles, is required for roots, water and gases in the root zone and depends on soil micro-organisms transforming organic matter into humic gums which, in turn, build soil aggregates. Functions of soil include serving as a rooting medium for plants, as well as providing nutrient and water supply, which in turn ensures plant productivity (Shaxson 2006).

Soil productivity is the ability of soil to sustain plant growth and is the result of interactions of physical, chemical, biological and hydric constituents. Loss of soil productivity is a problem in many developed and developing countries (Shaxson 2006). Soil productivity is increased, inter alia, through increased soil organic matter (SOM). SOM and its links to soil organic carbon (SOC) are explained next.

### 2.2.3 SOIL ORGANIC CARBON AND ITS BENEFITS

Soil organic matter is an important component in the soil, with carbon being a main ingredient (**Figure 2.2**). Soil organic carbon (SOC) gives an indication of the level of the SOM content in the soil, while the reverse is also true. Both terms, SOM and SOC, will be used here, as some studies were undertaken on soil carbon and others on soil organic matter. It is understood, however, that the one can be calculated from the other, by using a conversion factor, on the understanding that this factor is an approximation only, as the carbon content in SOM might vary. The chemical composition of SOM generally comprises 54.0% carbon, 5.2% hydrogen, 4.7% nitrogen, 35.7% oxygen and 0.4% sulphur (Schulten and Leinweber 2000). Small amounts of carbon in the soil can derive from non-organic sources, but this is not a focus here and in this Report soil carbon implies SOC, even if not stated explicitly.

**FIGURE 2.2** Organic matter in the soil (Department of Primary Industries and Regional Development 2017) is high in soil organic carbon

Soil has the ability to sequester $CO_2$ and thus reduce the effects of climate change (Paustian et al. 2016), and an increase in SOC is thus a strategy to reduce greenhouse gas emissions as proposed, for example, in the '4 per 1000' initiative (Global Climate Action Agenda 2015). Land use changes impact on soil carbon stocks, as do agricultural management practices (Foley et al. 2005). Climate change with its elevated temperatures is likely to increase soil respiration (Kirschbaum 1995; Paustian et al. 2016), while elevated $CO_2$ concentrations (designated by $[CO_2]$) might possibly increase soil carbon sequestration (Paustian et al. 2016). Climate change impacts on soil carbon stocks will, however, not be a focus of this review.

Soil carbon, has been found by many authors to be an important factor which is usually positively correlated to soil productivity and soil water properties (Franzluebbers 2002; Rawls et al. 2003; Olness and Archer 2005; Saxton and Rawls 2006; Resurreccion et al. 2011; da Costa et al. 2013; Ankenbauer and Loheide 2017). Increased organic carbon content can increase the water stress-free days for plant growth and thereby increase plant productivity (Ankenbauer and Loheide 2017). On the other hand, a reduction in soil carbon concentrations, mainly through agricultural practices, is likely to reduce soil water storage, thereby having the reverse effect.

Good soil husbandry extends the useful life of carbon within the soil/plant ecosystem and prevents its premature release back into the atmosphere as $CO_2$, while poor soil husbandry does the reverse (Shaxson 2006). Good soil husbandry in agriculture requires crop residues to be kept on the soil and / or other organic material to be added regularly (Shaxson 2006). In addition, a correlation between protected conservation areas and higher carbon content in the topsoil has been found, thereby linking conservation measures with maintaining or creating soil carbon sinks (Jantke et al. 2016).

In summary, increased carbon levels in the soil provide multiple benefits, including increased carbon capture (versus release as carbon dioxide to the atmosphere), increased soil structure, enhanced plant productivity, enhanced soil water retention properties (Shaxson 2006), while reduced soil carbon levels through, for example, agricultural practices, do the reverse.

All the above concepts deal with carbon related processes. The focus of the next section will be on South African soil carbon studies.

## 2.3 South African soil carbon studies

Carbon stocks in South Africa will be described first, followed by a display of maps of Gross Primary Production (GPP), used as a proxy for carbon, and then by maps of soil carbon. SOC is present mainly in the form of SOM and forms the largest part of the terrestrial carbon pool in South Africa (Department of Environmental Affairs 2017). The estimated average South African total ecosystem organic carbon stock, which is the sum of SOC and total biomass organic carbon, 6 396 $gC/m^2$, with a GPP of 373 $gC/m^2$ and a Net Primary Production (NPP) of 186 $gC/m^2$ (Department of Environmental Affairs 2017). The bulk of the carbon is stored in the soil.

South African soil carbon levels are generally low when compared to levels in the Northern Hemisphere (Kucharik et al. 2000) and they have been reviewed by du Preez et al. (2011 a; b). Since 2010 some South African carbon sink and carbon pool related studies have been published (for example, Knowles et al. 2014; Department of Environmental Affairs 2015; 2017), with GPP biomass being a proxy for carbon stocks (**Figure 2.3**). Because of their relative size, grasslands and savanna biomes contribute most to South Africa's terrestrial carbon stock, although per square metre the storage of forest biomes exceeds that of grasslands and savannas (Department of Environmental Affairs 2017: 5). Grasslands, while containing less above ground carbon storage, make up for it by contributing more below ground storage of up to 100 t/ha of carbon (Department of Environmental Affairs 2017: 5).

Carbon stocks, in the case of soil carbon, change slowly over time. Since 2008, there have been a number of studies on soil carbon in South Africa. Stronkhorst and Venter (2008) used 4 837 measured values of C in the topsoil from a soil database and compiled a map of SOC content (%, **Figure 2.4**).

A slightly different approach was used subsequently by the Department of Environmental Affairs (2015), with results shown in **Figure 2.5**. Soil organic carbon stocks ($g/m^2$) up to one metre depth were estimated. Data were extrapolated, with the driest, hottest third of the country's SOCs only being approximated owing to a lack of data. SOCs for soil depths of 0–300 mm were assumed to be those of the topsoil and for depths from 300–1 000 mm were assumed to be subsoil. SOC in the topsoil was reduced by a land use factor for cropping, compared to values from natural vegetation. A positive correlation was found between soil carbon and rainfall (Stronkhorst and Venter 2008; Department of Environmental Affairs 2017).

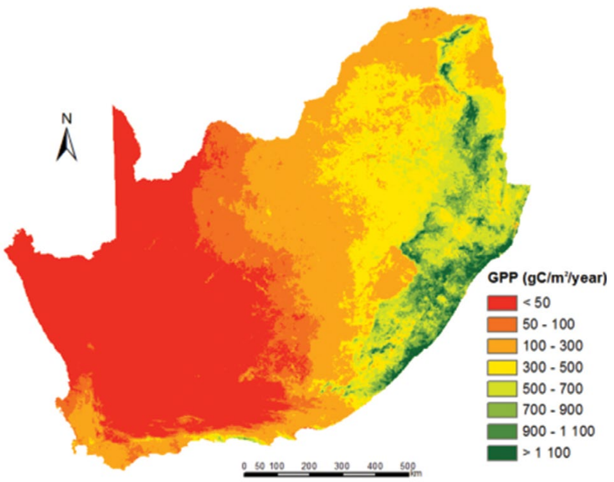



**FIGURE 2.3** Distribution of Gross Primary Production (gC/m[2]/year) in terrestrial ecosystems in South Africa (Knowles et al. 2014: 29)

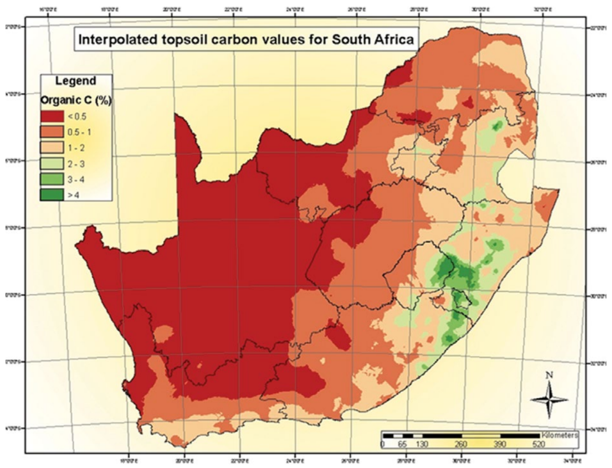



**FIGURE 2.4** Soil organic carbon content (%) distribution map for South Africa for the topsoil horizon only, from 4 837 measured values, and expressed as a percentage by mass (Stronkhorst and Venter 2008)

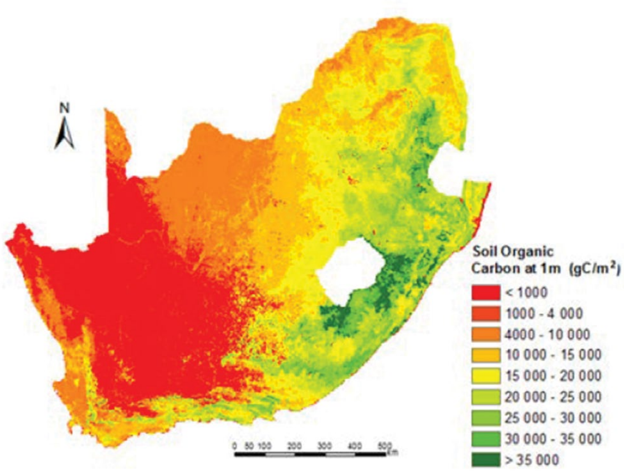



**FIGURE 2.5** Soil organic carbon stocks (g/m[2]) to 1m in depth (Department of Environmental Affairs 2015)

## 2.4 Summary of the literature reviewed on soil organic carbon

Carbon moves from the atmosphere, in the form of $CO_2$ as a gas, to the earth by, inter alia, plant photosynthesis and, as a form of carbon, it might be stored in vegetation and in the soil before returning to the atmosphere by respiration.

In terrestrial ecosystems, the majority of carbon is stored in the soil, mainly as organic matter, with SOC being the main ingredient. Anthropogenic activities such as burning of fossil fuels and certain land use changes have impacted upon the carbon cycle and have increased atmospheric $CO_2$ concentrations, while agricultural activities have often reduced soil carbon concentrations.

Carbon facilitates the improvement of soil by aggregating soil particles. This requires a regular carbon supply, for example through the retention of residual plant matter, cover crops, mulching or by working organic matter into the soil. It also requires soil biological activity which, similarly, requires a regular supply of carbon, low mechanical disturbance (for example less tilling) and reduced exposure to UV light (for example through mulching and less tilling).

While soil carbon is not essential for plant growth, it is beneficial by feeding beneficial soil microbes and by improving soil moisture properties and thus, through plant available water, plant productivity.

Increasing soil carbon concentrations by promoting sustainable agricultural practices can help sequester $CO_2$ and thus reduce greenhouse gas emissions.

CHAPTER 3

# IDENTIFYING TERRAIN UNITS FROM LAND TYPES OF SOILS

## TO ESTABLISH THE SPATIAL RESOLUTION FOR MAPPING SOIL-ORGANIC CARBON ACROSS SOUTH AFRICA

### 3.1 Soil mapping in South Africa at the level of land types

South African soils were mapped from field work in the 1970s, 1980s and 1990s as so-called Land Types, with original field mapping at a spatial scale of 1:50 000 and eventual production mapping at 1:250 000 (**Figure 3.1**), using the Binomial System from 'Soil Classification: A Binomial System for South Africa' (MacVicar et al. 1977). In this classification system, master soil horizons are classed into 5 diagnostic topsoil and 15 diagnostic subsoil horizons identified in South Africa (**Figure 3.2**), each with unique soil characteristics. From these diagnostic soil horizons, the concepts of soil forms and soil series are described and then the characteristics of the 501 soil series identified within 41 soil forms are given, with many of the soil series descriptions being key to Soil Organic Carbon (SOC) determinations.

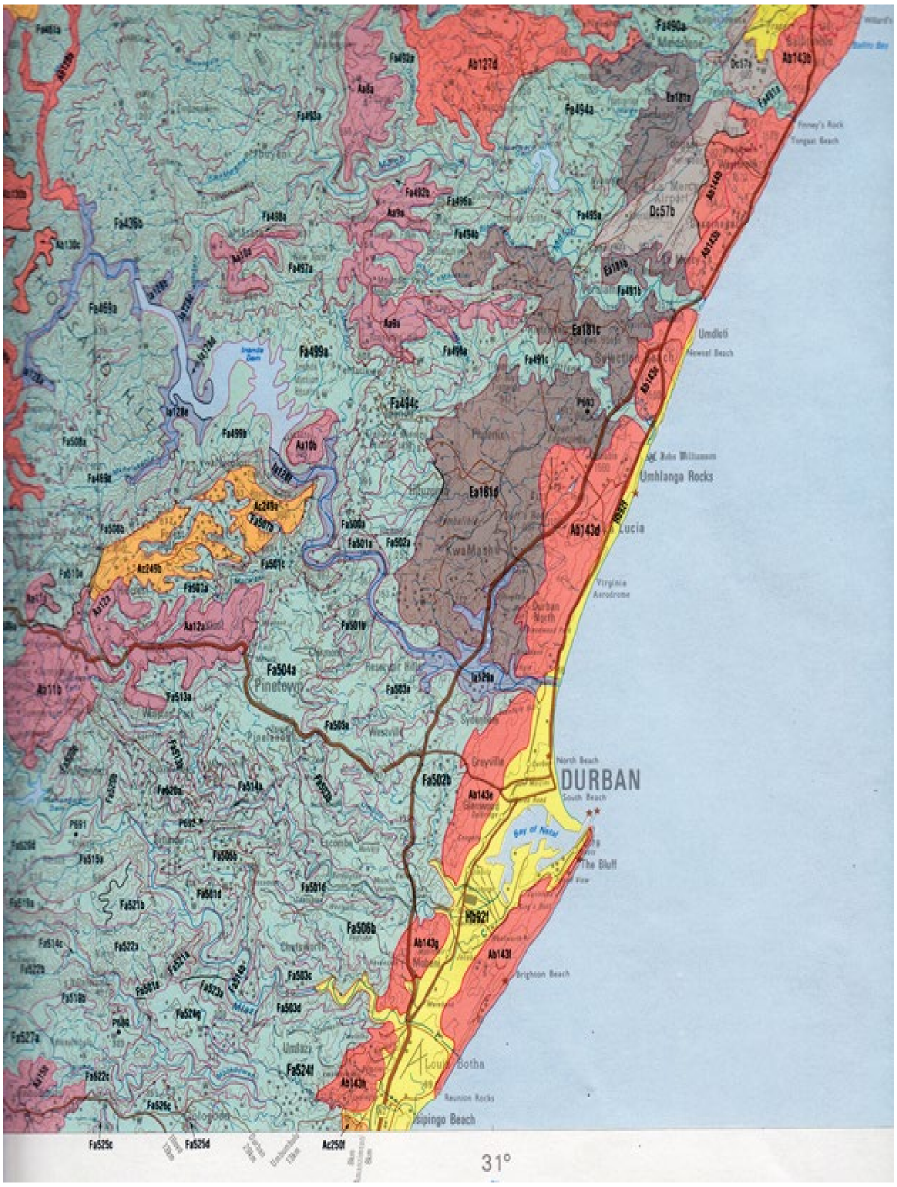



**FIGURE 3.1** Example of a land type map, with different colours denoting different land types (SIRI 1987)

## 3.2 Delineation of terrain units within soils land types

The over 6 000 mapped Land Types of soils were each made up of a number of associated soil series, with the areas and percentages of each soil series given in the documentation on each Land Type. Additionally, but not mapped within a Land Type, were up to 5 terrain units (TUs) which had been identified in the field, namely:

- the crest, which was convex shaped,
- the scarp, which was akin to a cliff,
- the midslope, which was concave in shape,
- the footslope, and
- the valley bottoms.

For each TU making up a Land Type mapping unit:

- the individual areas were given,
- as were the specific soil series making up each TU,
- together with the respective areas of each TU within a Land Type.

Hein Beukes (now retired), while still at the ARC, superimposed a Digital Elevation Model (DEM) with a resolution of 90 m (i.e. each pixel is 90x90 metres) over each mapped Land Type. He then used Neighbourhood Analysis to compute the slope of the pixels to the North, East, South and West from the pixel of interest to determine convexity or concavity to the neighbouring pixels (Beukes 2018, pers. com.). He then applied Zonal Statistics to delineate and map the individual TUs within a Land Type. Following that procedure, he superimposed satellite imagery at a 30 m resolution over the map of TUs to refine the delineations of the TUs, especially the valley bottoms in hilly areas, as a 90 m DEM, while a satisfactory spatial resolution in flattish terrain, was found to be too coarse where it was hilly.

From Beukes' ARC Database of Terrain Units per Land Type of soils, based on the refined 90 m DEM, 27 491 spatially defined TUs across South Africa were identified by the techniques described above, with:

- 6 793 of those TUs being convex-shaped crests
- 6 586 TUs being concave midslopes
- 7 046 TUs identified as footslopes and
- 7 066 TUs being valley bottoms

For each TU in this Database a GIS raster identifies the spatial extent of the TU, and in respect of SOC mapping the database:

- lists all soil series within that particular TU (up to a maximum of 15 per TU)
- the percentages of each soil series within the TU
- the percentages of each TU making up a Land Type
- the profile depth of each soil series within a TU and
- many other attributes unrelated to SOC mapping.

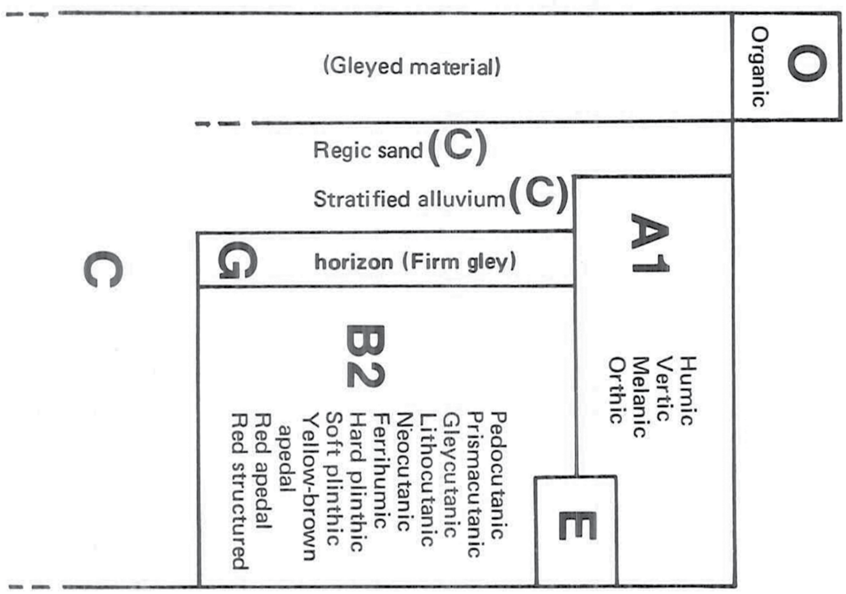



**FIGURE 3.2** Diagnostic topsoil and subsoil classes in the Binomial system (After MacVicar et al. 1977)

To illustrate the spatial detail from mapping South Africa's soils at the TU level, an area to the north and west of Durban in KwaZulu-Natal was selected (**Figure 3.3**). The figure shows the delineated crests in dark brown, midslopes in light brown, footslopes in green and the valley bottoms in dark blue (**Figure 3.3**). The black polygons on the map delineate Quinary (level five) Catchments, which are hydrologically and agriculturally relatively homogeneous spatial units now widely used in water resources and climate change studies, and for which area averaged soils attributes are a modelling input. Within a Quinary Catchment the large number of TUs, each of which has its own agro-hydrological attributes, is seen clearly. When the rectangular inset in **Figure 3.3** is zoomed in upon in **Figure 3.4**, the degree of detail of the TU delineations is even more amply evident.

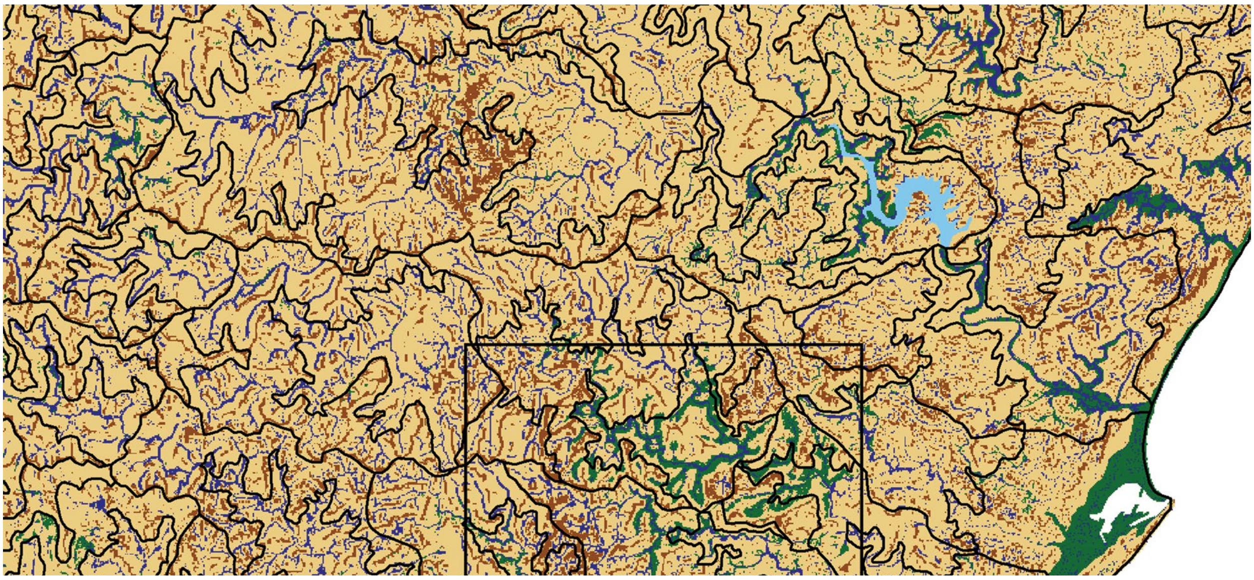


**FIGURE 3.3** Terrain units and Quinary Catchments west and north of Durban

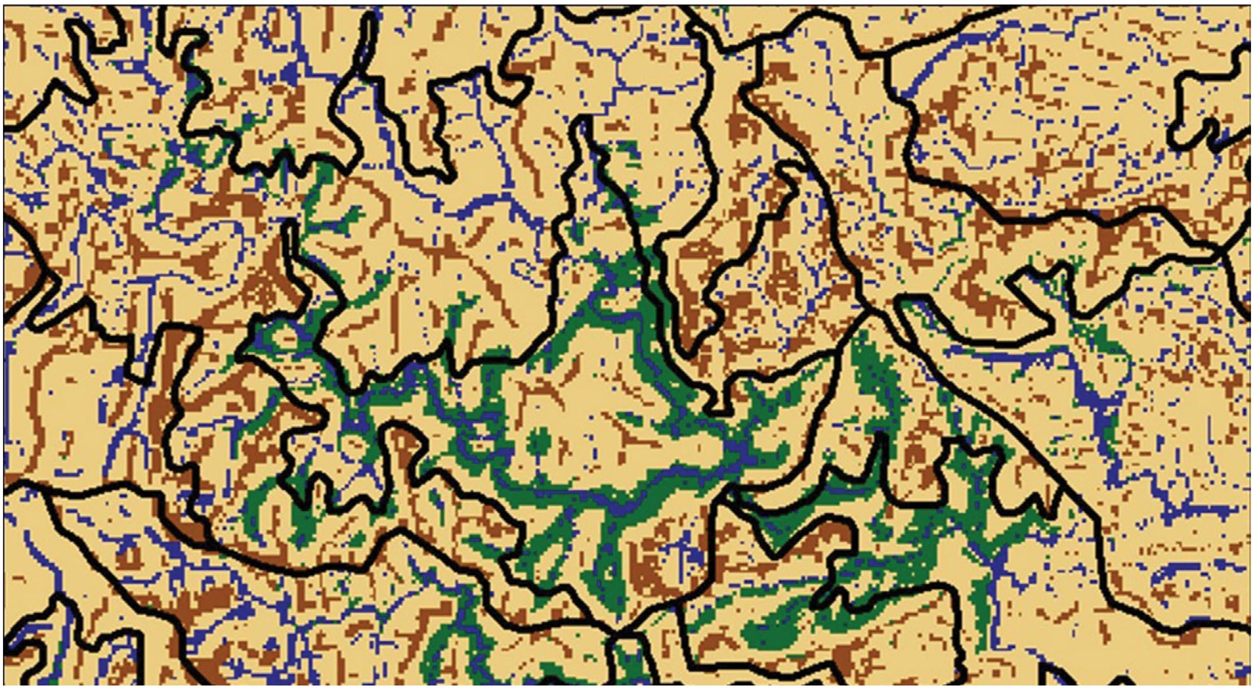


**FIGURE 3.4** Zooming in from the inset in Figure 3.3 to show more detail on soils Terrain Units within Quinary Catchments. It is at this level of detail that soil organic carbon was mapped using techniques described later in this Report.

### 3.3 Determination of the thicknesses of the topsoil and the subsoil from the terrain unit database for application in soil organic carbon mapping

In the TU Database only the thickness of the entire soil profile is given. However, in the Soil Organic Carbon Database (cf. following chapter) the SOC at each sample location was determined for both the topsoil horizon and the subsoil horizon. This distinction by horizon is crucial information, as there is generally a rapid decline in the percentage of SOC with soil depth. However, with the subsoil frequently being considerably thicker than the topsoil, its total carbon content (the carbon stock) may in fact be similar to that of the topsoil. In order to map soil carbon content at TU level, therefore, the total profile thickness had to be delineated into a topsoil thickness and a subsoil thickness using the algorithm illustrated in **Figure 3.5**. In essence, a maximum soil profile thickness of 1.5 m is assumed, and for all soils deeper than 0.5 m the topsoil is assumed to be 0.3 m thick with the balance being the subsoil. However, the topsoil is assumed to becoming progressively thinner when the soil is shallower than 0.5 m, with a lower limit of a soil profile depth assumed at 0.01 m, i.e. 10 mm, when the TU Database designates bare rock as the soil.

One of the specific objectives of this research was to use the Terrain Unit Database to map soils rich in carbon, with these defined as the humic and organic soils of the Binomial classification system. Procedures and results are described in the following chapter.

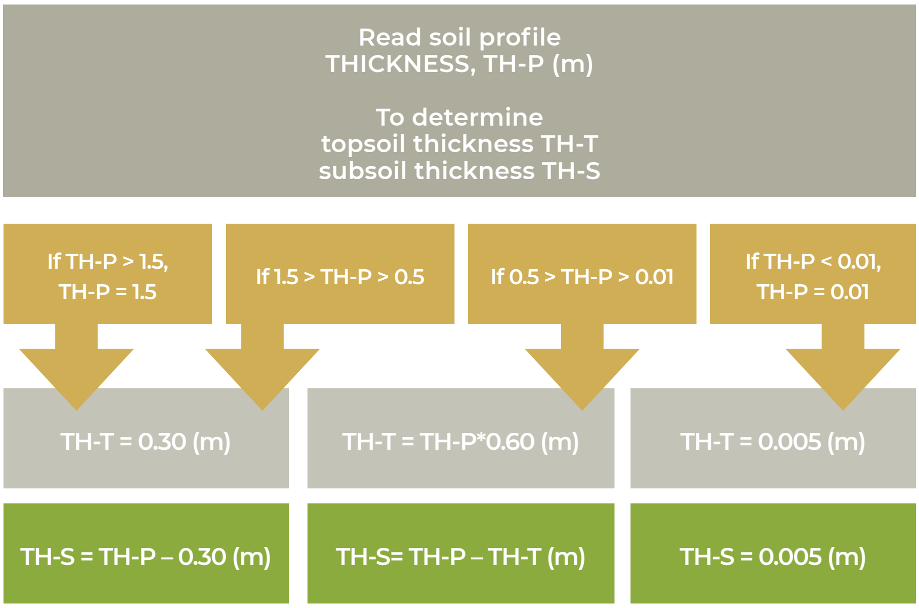



**FIGURE 3.5** Algorithm developed to delineate total soil profile thickness from the Terrain Unit Database into a topsoil and subsoil horizon thickness

CHAPTER 4

# MAPPING HUMIC AND ORGANIC SOILS ACROSS SOUTH AFRICA

### 4.1 The context and definitions of organic and humic soils

One of the purposes of this research was to identify and map the soil series/types that are high in organic carbon. These were identified as being soils of the humic and organic soil forms.

Organic soils are defined in 'Soil Classification: A Binomial System for South Africa' (MacVicar et al. 1977: 10) as having 'a sufficient organic carbon to ensure an average content of at least 10% throughout a vertical distance of 300 mm'. In the Binomial classification system organic soils are represented by the Champagne soil form (**Figure 4.1** left), made up of four soil series.

Humic soils, on the other hand, contain (among other definitions) 'more than 2% organic carbon throughout a depth of at least 450 mm' (MacVicar et al. 1977: 10). Four of South Africa's 41 soil forms have a humic topsoil. With the number of soil series in each given in brackets, these four soil forms are the Kranskop (3 soil series; Figure 4.1 right), Magwa (3), Inanda (3) and Nomanci (2) forms, with the series within the soil forms distinguished by their clay content in or near the topsoil.

### 4.2 Identifying and mapping organic and humic soils

From the Terrain Unit Database's 27 491 spatially defined TUs across South Africa, those TUs with either organic or humic soils were identified, the percentages of humic/organic soils per TU calculated, and the position in the landscape (namely whether on the crest, midslope, footslope or valley bottom) noted. The information on the locations, the landscape positions and the percentages of humic/organic soils per TU was used to produce the maps below.

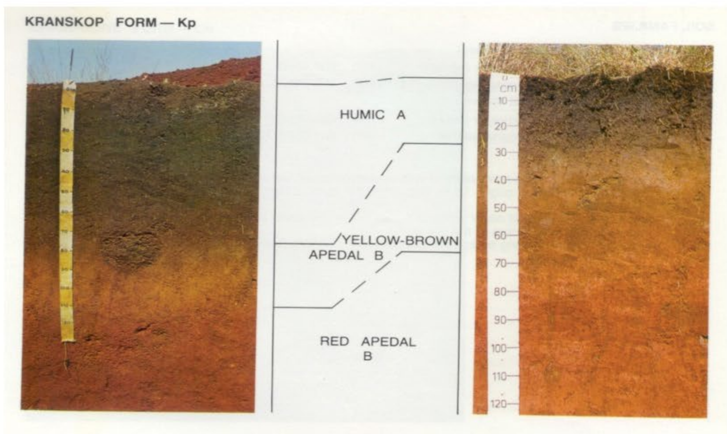




**FIGURE 4.1** An organic soil (left) and (right) a humic soil (MacVicar et al. 1977)

#### 4.2.1 LOCATIONS OF HUMIC AND ORGANIC SOILS

Only 885 out of South Africa's 27 491 TUs (namely 3.2%) contain either humic or organic soils. It is for this reason that most of **Figure 4.2** is blank. The humic and organic soils are found predominantly in the southern half of KwaZulu-Natal, the north-eastern parts of the Eastern Cape and along the Garden Route in southern parts of the Western Cape Province, with smaller patches elsewhere.

#### 4.2.2 POSITIONS IN THE LANDSCAPE OF HUMIC AND ORGANIC SOILS

At national level **Figure 4.3** shows that it is very difficult with the naked eye to distinguish which of the four terrain units contains more (or fewer) humic and organic soils than the others. However, analysis reveals that of the 885 terrain units with humic or organic soils, 222 were crests, 266 midslopes, 239 footslopes and 158 valley bottoms, making up, respectively, 3.27%, 4.04%, 3.39% and 2.24% of those landscape units.

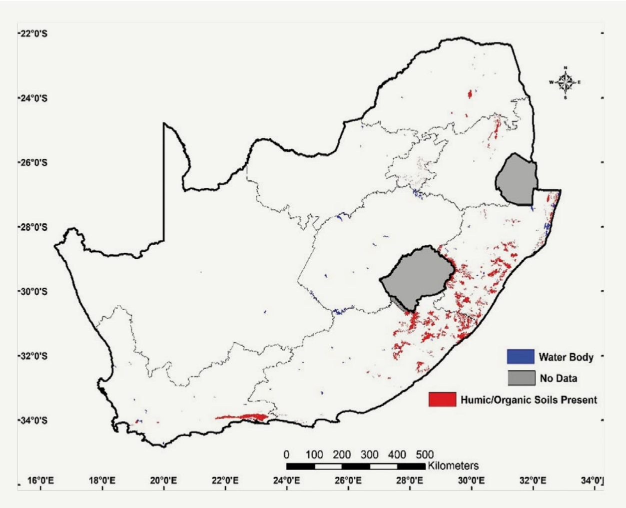



**FIGURE 4.2** Locations of humic and organic soils across South Africa

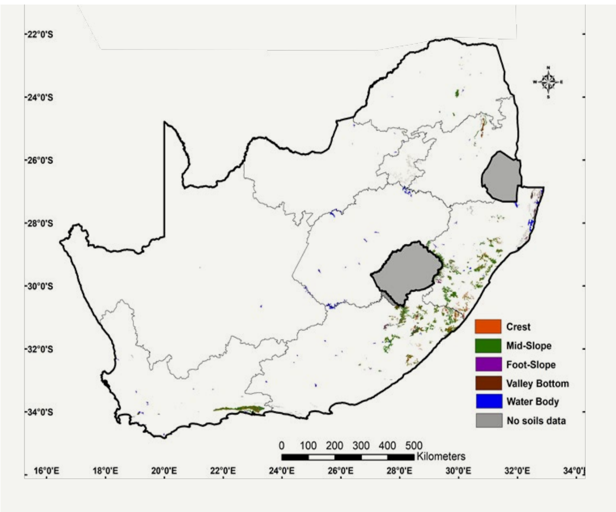



**FIGURE 4.3** Landscape positions of humic and organic soils across South Africa

#### 4.2.3 PERCENTAGES OF HUMIC AND ORGANIC SOILS PER QUALIFYING TERRAIN UNIT

On a national scale **Figure 4.4** shows that most of the humic and organic soils appear to occur in small percentages only within the qualifying TUs. Because of the difficulty in interpreting the percentages on a South Africa level, the information was up-scaled to a KwaZulu-Natal resolution in **Figure 4.5**, and in **Figure 4.6** even further to an area west of Durban.

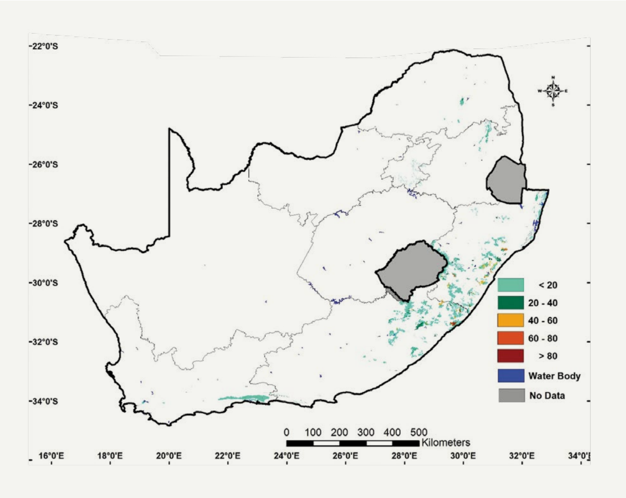



**FIGURE 4.4** Percentages of areas with humic and organic soils across South Africa within qualifying TU

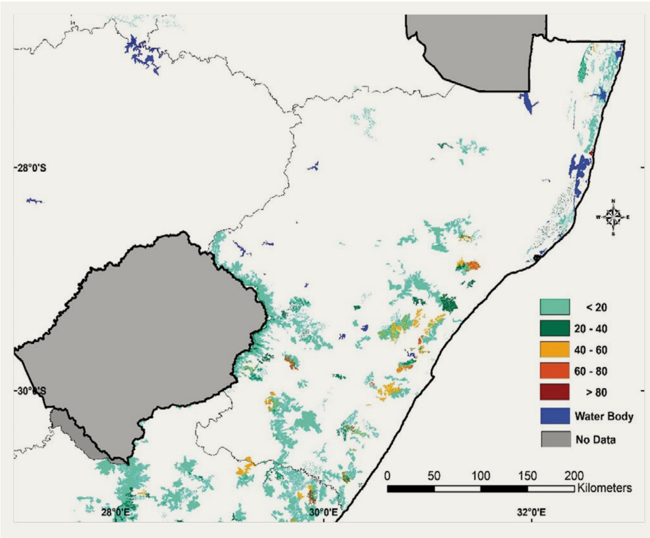



**FIGURE 4.5** Percentages of areas with humic and organic soils within qualifying TUs across KwaZulu-Natal

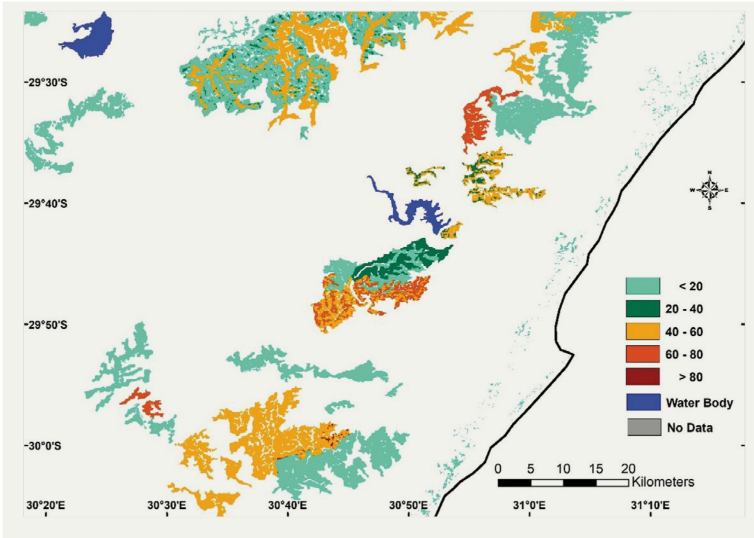



**FIGURE 4.6** Percentages of areas with humic and organic soils within qualifying TUs around Durban

## 4.3 Some interpretation

One of the project objectives was to make recommendations of appropriate management regimes and required intervention to protect these important soil types and to avoid carbon loss from them.

Clearly, in order to make such recommendations, one will need to drill deeper spatially than presenting conclusions on a national scale, as the differences between Figures 4.4, 4.5 and 4.6 show. There are, as shown in Figure 4.6, spatial units where the percentages of humic and organic soils do exceed 60% of a TU, and in places even 80%. Thus, there are good reasons to pursue the matter of possibly ring-fencing soils high in organic carbon content.

Additionally, however, one will need to assess soil organic carbon contents of other soils and, in particular, wetland soils and possibly those experiencing lateral drainage, from the extensive ARC soil organic carbon database. This, however, would need to be undertaken in a separate project and in intensive consultation with experienced soil scientists.

CHAPTER 5

# METHODOLOGIES

## ENHANCING THE SOIL CARBON DATABASE TO ENABLE MAPPING OF SOIL ORGANIC CARBON ACROSS SOUTH AFRICA AT THE LEVEL OF TERRAIN UNITS

### 5.1 Working with the Agricultural Research Council (ARC) Soil Carbon Database

The project acquired the ARC Soil Profile Database, from which organic carbon content data were extracted. From here on this database is called the 'Soil Carbon Database' in this document. The database was received in two versions as Excel workbooks, one without a column for land use (designated Carbon1) and one with (Carbon 2).

The database contains data derived in the field using both the 1977 Binomial Soil Classification (MacVicar et al. 1977) and the later Taxonomic Soil Classification of South Africa (SCWG, 1991), whereas the terrain unit data used for mapping soil carbon uses only the Binomial System. For purposes of mapping Soil Organic Carbon, therefore, the Project team had to undertake a detailed reconciliation between the two classification systems at the level of soil series, as such a reconciliation had, to the best of our knowledge, not ever been undertaken at that level by the ARC or others.

In order to compile detailed soil carbon maps for South Africa at the spatial resolution of soils terrain units the Binomial soil classification was required, as that was the classification used in the TU Database. However, to include carbon changes with depth within a soil profile the ARC's Soil Carbon Database was required, and this Database was developed with both the Binomial and Taxonomic classifications. Consequently, some fundamental assumptions had to be made, namely:

- that the discretisation in the TU Database from the 90 m DEM into crests, midslopes, footslopes and valley bottoms was realistic and spatially correct,
- that the soil series information per terrain unit of each Land Type was correct, taking the mapping scale into account,
- that the identification of the soils in the Soil Carbon Database into soil forms / families and series was correct,
- that the locations at which carbon samples were specified in the Soil Carbon Database were accurate, and furthermore, and
- that when a 'reconciliation' of soils information between the Binomial and Taxonomic soils classifications was made, that it was correct.

### 5.2 Evaluating the quality of information, and simplifications to the ARC's Soil Carbon Database for applications in SOC Mapping

#### 5.2.1 SOME GENERAL QUALITY CONTROLS, ASSUMPTIONS MADE AND CORRECTIVE MEASURES UNDERTAKEN

A thorough check of the Soil Carbon Database was undertaken in light of subsequent analyses to be undertaken, and some of the problems identified together with their respective corrective measures are shown in **Table 5.1**, with more details provided in **Appendix 1**. These problems could be reduced in future work by consulting with the original data originators (Paterson 2018, pers. com.)

#### 5.2.2 EVALUATION OF INFORMATION BY LAND COVER

In this Project one of the objectives was to distinguish between SOC characteristics of natural vegetation and agricultural land in mapping, based on the finding that in South Africa continual cultivation reduces the soil carbon content, particularly in the topsoil, by around 45% on average, but varying by ~ 30% to 75% (du Preez et al. 2011b). The land cover groupings in the original Soil Carbon Database were, therefore, evaluated. These original groupings proved to be both relatively complex and inconsistent, as shown in **Table 5.2** (left column).

**TABLE 5.1** Problems identified in the Soil Carbon Database and corrective measures

| Problem identified | Corrective measure |
|---|---|
| Soil texture % does not add up to 100% | Estimated by weighting |
| Soil carbon % add to > 100 % | Eliminated |
| Clay content > 100% | Eliminated |
| No clay content given | Estimated from soil series definitions |
| No carbon content given | Eliminated |
| Soil classes blank | Not used for calculations |
| Carbon results in more than 2 subsoils | Carbon results depth / volume weighted |

**TABLE 5.2** Original land cover groupings in the Soil Carbon Database and simplified land cover clusters

| Land Cover per ARC Classification | Land Cover Grouping (as simplified) |
|---|---|
| Blank | Unspecified |
| Abandoned field / disturbed land | Agricultural |
| Agronomic cash crops | Agricultural |
| Barren | Natural vegetation |
| Built-up area | Other |
| Bushland | Natural vegetation |
| Cultivated flowers | Agricultural |
| Cultivated pastures | Agricultural |
| Cultivated, unknown | Agricultural |
| Dwarf shrubveld, open | Natural vegetation |
| Dwarf shrubveld, sparse | Natural vegetation |
| Fruit trees | Agricultural |
| Fynbos | Natural vegetation |
| Grassveld, closed | Natural vegetation |
| Grassveld, open | Natural vegetation |
| Grassveld, sparse | Natural vegetation |
| Marsh | Natural vegetation |
| Natural forest | Natural vegetation |
| Normal weathering | Natural vegetation |
| Origin unknown | Unspecified |
| Other | Other |
| Other fragments | Other |
| Plantation (forestry) | Agricultural |
| Plantation (Non-forestry) | Agricultural |
| Shrubveld, closed | Natural vegetation |
| Shrubveld, closed dwarf | Natural vegetation |
| Shrubveld, open | Natural vegetation |
| Shrubveld, open dwarf | Natural vegetation |
| Shrubveld, sparse | Natural vegetation |
| Shrubveld, sparse dwarf | Natural vegetation |
| Succulent (Karoo) | Natural vegetation |
| Thicket | Natural vegetation |
| Treeveld, closed | Natural vegetation |
| Treeveld, open | Natural vegetation |
| Treeveld, sparse | Natural vegetation |
| Type unknown | Unknown |
| Unknown | Unknown |
| Vegetables | Agricultural |
| Vineyards | Agricultural |

These land cover groupings therefore first had to be

- quality controlled (for example by deleting duplicate rows, which brought the number of rows in the Carbon2 spreadsheet down to 19 595 from 21 507) and
- simplified, with similar land covers grouped together, as far as possible into the natural vegetation and agricultural land categories.

The land covers from **Table 5.2** (left column) were simplified into those shown in the right-hand column of **Table 5.2**, namely:

- unspecified (namely no information provided in the database),
- agricultural,
- natural vegetation and
- unknown and other

In total, 11 099 soil profiles were grouped by land cover, with a breakdown per land cover grouping shown in **Table 5.3**.

**TABLE 5.3** Number of soil profiles using a simplified land cover grouping

| Land cover grouping | Number of soil profiles |
|---|---|
| All land cover classes | 11 099 |
| Unspecified and other | 4 509 |
| Agricultural | 2 064 |
| Natural vegetation | 4 526 |

Note that these 11 099 soil profiles with the simplified land cover information were, in many cases, sampled for different soil horizons, and after removing duplicate rows, 19 131 rows with soil carbon data remained – this number now matching the row numbers of the original Database which had been supplied without land use information. The 11 099 values for which there was a National Profile Number in the Soil Carbon Database were assumed to be equal to the number of locations sampled.

These 11 099 soil profiles were further analysed by terrain units as given in the profile descriptions (**Tables 5.2** and **Table 5.3**), and by soil classification system (**Table 5.6**).

### 5.2.3 EVALUATION OF INFORMATION BY TERRAIN UNIT

As in the case of land cover, the original descriptions of Terrain Units in the Soil Carbon Database were sometimes complex (**Table 5.4**) and did not match the TUs in the Terrain Unit Database. The non-specified cases could be reduced in future work by consulting with the original data originators (Paterson 2018, pers. com.).

**TABLE 5.4** Numbers of soil profiles in the original TU descriptions in the Soil Carbon Database

| Terrain unit description | Number of soil profiles |
|---|---|
| All Terrain Units | 11 099 |
| TU Not Specified | 4 830 |
| Closed depression | 5 |
| Crest | 756 |
| Footslope | 1 747 |
| Lower footslope | 278 |
| Lower midslope | 173 |
| Midslope | 2 017 |
| Scarp | 12 |
| Terrace | 8 |
| Upper footslope | 435 |
| Upper midslope | 384 |
| Valley bottom | 454 |

Simplification was thus necessary. Other than the soil profile descriptions for which no TU was actually specified (4 830 in number; **Table 5.4**), for the remaining profiles the TUs were therefore grouped into the four TU types for which mapping was possible, namely the crest, midslope, footslope and valley bottom, with the numbers of each given in **Table 5.5**. Note the dominance of TUs in the midslope and footslope categories at the expense of soil carbon samples having been taken on the crest and in the valley bottom.

**TABLE 5.5** Simplification of numbers of soil profiles by standard terrain unit descriptions

| Terrain unit descriptions | Number of soil profiles |
|---|---|
| All Terrain Units | 11 099 |
| Crest | 776 |
| Midslope | 2 574 |
| Footslope | 2 460 |
| Valley Bottom | 459 |
| Unspecified | 4 830 |

### 5.2.4 EVALUATION OF INFORMATION ON PROFILE SAMPLES BY SOIL CLASSIFICATION SYSTEM

Because the Soil Carbon Database was populated from fieldwork carried out over some three decades, this period in time also saw the transition from the Binomial classification system of the 1970s (MacVicar et al. 1977) being used to the Taxonomic system of the early 1990s (SCWG, 1991). **Table 5.6** shows that each of the two classification systems was used in soil carbon analyses at approximately half the 11 099 sample locations.

**TABLE 5.6** Number of soil profiles by Soil Classification System

| Soil classification system | Number of soil profiles |
|---|---|
| Total from both classifications | 11 099 |
| Binominal | 5 356 |
| Taxonomic | 5 740 |
| Unspecified | 3 |

This use of two soil classification systems, however, proved a major challenge to this Project as all the Terrain Unit delineations were populated with soils information from the Binomial system only, thus requiring a "reconciliation" to be made of "equivalent" soil characteristics between those carbon analyses carried out with the Taxonomic system and those with the Binomial system.

### 5.3 The location of revised sample points in the Soil Carbon Database

Following the stringent quality checks to which the Soil Carbon Database was subjected, with a number of sample points in the original database eliminated for reasons discussed above, the locations of the 11 099 sample points used in subsequent analyses were mapped and are shown in **Figure 5.1**.

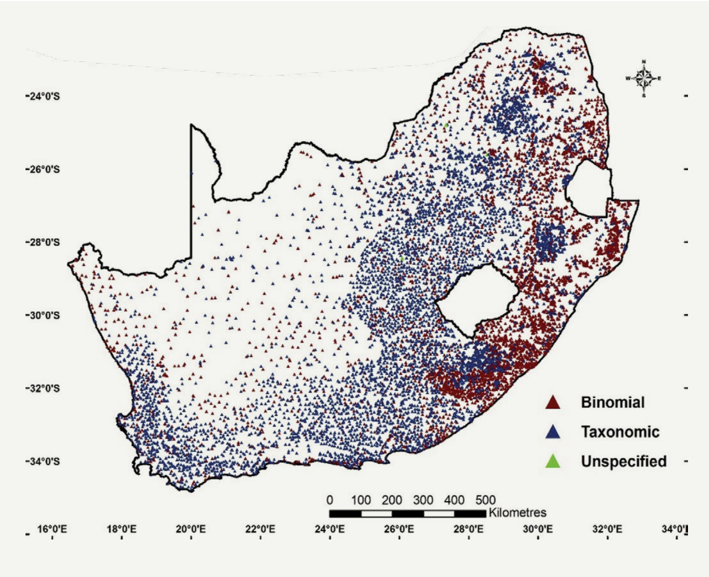



**FIGURE 5.1** Locations of the 11 099 sample points from which soil carbon data were used in this study, with a distinction made between samples classified by the Binomial system (wine red) and the Taxonomic system (blue)

A number of features stand out on the map.

- The first is that there are more soil carbon sample points in the wetter east and south of the country where more intensive agriculture is practised.
- Secondly, in places there appear strong provincial concentrations of sample points, and the clusters of sample points within the Free State and the Western Cape stand out clearly. This is a result of several provincially funded projects (Paterson 2018, pers. com.).
- Thirdly, there is a high density of sample points covering the former homelands of the Transkei and Ciskei, now part of the Eastern Cape
- Fourthly, gaps appear within KwaZulu-Natal which had been part of the KwaZulu homeland. The political situation there, at the time, hindered data collection (Paterson 2018, pers. com.).

## 5.4 Reconciling/matching soil forms and families of the taxonomic soil classification with the soil forms and series of the binomial classification

### 5.4.1 BACKGROUND

As already stated, soil carbon mapping is to be undertaken at terrain unit spatial resolution with the more than 27 000 soils terrain units identified across South Africa each having been defined by relatively similar soil series from the Binomial classification system. The 5 740 locations in the Soil Carbon Database where soils had been described / classified by the Taxonomic system, therefore had to be matched with an equivalent Binomial soil series for the terrain unit level soil carbon mapping to be undertaken.

### 5.4.2 AN INITIAL MATCHING OF THE BINOMIAL AND TAXONOMIC CLASSIFICATION SYSTEMS AT SOIL FORM LEVEL

In **Table 5.7** an initial matching of the Binomial and Taxonomic classification systems, adapted from van der Waals (undated), is shown at the primary level of soil forms, with new soil forms ringed in red.

Binomial System (1977) -Taxonomic System (1991) for South African Soil Classification Correlation

| Binomial system soil form (1977) | Topsoil horizon | Second horizon/material | Third horizon/material | New second subsoil horizon | New third subsoil horizon | Taxonomic system soil form (1991) | Fey (2010) soil group |
|---|---|---|---|---|---|---|---|
| Lamotte<br>Houwhoek | Orthic<br>Orthic | E<br>E | Ferrihumic B / unconsolidated material<br>Ferrihumic B / saprolite | | Podzol B / unconsolidated material with signs of wetness | Lamotte | Podzolic<br>Podzolic |
| | | | | | Podzol B/ unconsolidated material without signs of wetness | Concordia | |
| | | | | | Podzol B/ saprolite | Houwhoek | Podzolic<br>Duplex |
| Estcourt | Orthic | E | Prismacutanic B | | | Estcourt | |
| New | Orthic | | | E | Pedocutanic B | Klapmuts | Duplex |
| Vilafontes | Orthic | E | Neocutanic B | | | Vilafontes | Cumulic |
| New | Orthic | | | E | Neocarbonate B | Kinkelbos | Cumulic |
| Cartref | Orthic | E | Lithocutanic B | | | Cartref | Lithic |
| Fernwood | Orthic | Regic sand | | E | Unspecified | Fernwood | Cumulic |
| Shepstone | Orthic | E | Red apedal | | | Discontinued | |
| Westleigh | Orthic | Soft plinthic B | | | | Westleigh | Plinthic |
| (Mispah) | Orthic | | | Hard plinthic | | Dresden | |
| Avalon | Orthic | Yellow-brown apedal B | Soft plinthic B | | | Avalon | |
| Glencoe | Orthic | Yellow-brown apedal B | Hard plinthic | | | Glencoe | Plinthic<br>Oxidic |
| Pinedene | Orthic | Yellow-brown apedal B | Gleycutanic B | | Unspecified material with signs of wetness | Pinedene | |
| Griffin | Orthic | Yellow-brown apedal B | Red Apedal B | | | Griffin | Oxidic<br>Calcic |
| Clovelly | Orthic | Yellow-brown apedal B | Not specified | Yellow-brown apedal B | Soft carbonate B | Molopo | |
| Clovelly | Orthic | Yellow-brown apedal B | Not specified | Yellow-brown apedal B Neocarbonate B | Hardpan carbonate | Askham | Calcic |
| Bainsvlei | Orthic | Red apedal B | Soft plinthic B | | Unspecified | Clovelly | Oxidic |
| | | | | | Unspecified material with signs of wetness | Montagu | Cumulic |
| | | | | Neocarbonate B | Soft carbonate B | Addo | Calcic |
| | | | | | Hardpan carbonate | Prieska | Calcic<br>Silicic |
| | | | | | Dorbank | Trawal | |
| | | | | | Unspecified | Augrabies | Cumulic |
| | | | | | | Bainsvlei | Plinthic |
| Hutton | Orthic | Red apedal B | Not specified | Red Apedal B | Hard plinthic | Lichtenburg | Plinthic<br>Oxidic |
| Hutton<br>Shortlands | Orthic<br>Orthic | Red apedal B<br>Red structured B | Not specified | Red Apedal B<br>Neocarbonate B | Unspecified material with signs of wetness | Bloemdal | |
| | | | | | Soft carbonate B | Kimberley | Calcic |
| | | | | | Hardpan carbonate | Plooysburg | Calcic<br>Silicic |
| | | | | | Dorbank | Garies | |
| | | | | | Unspecified | Hutton | Oxidic |
| | | | | | Unspecified material with signs of wetness | Montagu | Cumulic |

**TABLE 5.7** Examples of matching of soil forms between the Taxonomic soil classification system with "equivalents" in the Binomial system (after van der Waals, undated)

### 5.4.3 REFINING THE MATCHING OF THE TAXONOMIC CLASSIFICATION SYSTEM TO THAT OF THE BINOMIAL SOIL SERIES

With each soil form of the Taxonomic classification system having been matched to an equivalent soil form of the Binomial system, a next step for subsequent mapping purposes was to match the individual soil families within each of the Taxonomic system's soil forms to one of the 501 potentially possible equivalent soil series of the Binomial classification soil series.

This task was more complex than assigning a simple equivalence of a Taxonomic soil family to a Binomial soil series because, while the soil series within a Binomial soil form were distinguished predominantly by clay content, the Taxonomic families within a soil form were not. However, in the Soil Carbon Database those profiles which had been described with the Taxonomic system also included a soil textural breakdown, and hence a value of clay content for the designated soil family.

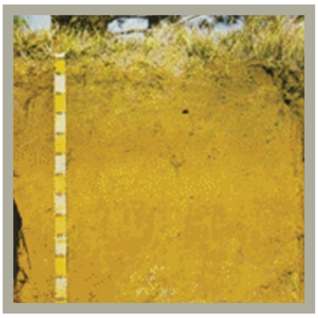
Each soil family within a Taxonomic soil form was, therefore, sub-delineated further into the same clay classes that were used in the Binomial classification, namely:

- 0 – 6% clay
- 6 – 15% clay
- 15 – 35% clay
- 35 – 55% clay and
- > 55% clay

For each of those sub-delineations an equivalent Binomial soil series was assigned. This lengthy and manual procedure would thus enable soil carbon mapping at a spatial resolution of terrain units of which > 27 000 covered South Africa.

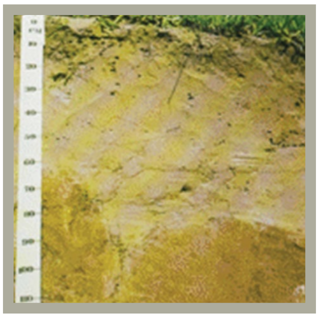
Three examples of the above procedure are illustrated in **Tables 5.8**, **5.9** and **5.10**, with the first example from a soil form common to both the Taxonomic and Binomial systems and the other two examples from soil forms that are new and unique to the Taxonomic system.

**TABLE 5.8** Example of assigning binomial soil series to sub-delineated soil families of the taxonomic system based on clay content, for a soil form common to both classification systems



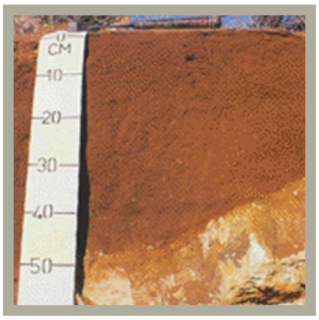
| Soil form: AVALON | | | | | |
|---|---|---|---|---|---|
| Symbol | Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
| Av | Av1100 | Blackmoor | ≥ 6 and < 15 | S (Subsoil) | Av11 |
| Av | Av1100 | Blackmoor | ≥ 15 and < 35 | S | Av14 |
| Av | Av1100 | Blackmoor | ≥ 35 and < 55 | S | Av16 |
| Av | Av1100 | Blackmoor | ≥ 55 | S | Av17 |
| Av | Av1200 | Woodburn | ≥ 6 and < 15 | S | Av11 |
| Av | Av1200 | Woodburn | ≥ 15 and < 35 | S | Av14 |
| Av | Av1200 | Woodburn | ≥ 35 and < 55 | S | Av16 |
| Av | Av1200 | Woodburn | ≥ 55 | S | Av17 |
| Av | Av2100 | Avondale | ≥ 6 and <15 | S | Av21 |
| Av | Av2100 | Avondale | ≥ 15 and <35 | S | Av24 |
| Av | Av2100 | Avondale | ≥ 35 and <55 | S | Av26 |
| Av | Av2100 | Avondale | ≥ 55 | S | Av27 |
| Av | Av2200 | Vryheid | ≥ 6 and <15 | S | Av21 |
| Av | Av2200 | Vryheid | ≥ 15 and <35 | S | Av24 |
| Av | Av2200 | Vryheid | ≥ 35 and <55 | S | Av26 |
| Av | Av2200 | Vryheid | ≥ 55 | S | Av27 |
| Av | Av3100 | Kameelbos | ≥ 6 and <15 | S | Av31 |
| Av | Av3100 | Kameelbos | ≥ 15 and <35 | S | Av34 |
| Av | Av3100 | Kameelbos | ≥ 35 and <55 | S | Av36 |
| Av | Av3100 | Kameelbos | ≥ 55 | S | Av37 |
| Av | Av3200 | Mafikeng | ≥ 6 and <15 | S | Av31 |
| Av | Av3200 | Mafikeng | ≥ 15 and <35 | S | Av34 |
| Av | Av3200 | Mafikeng | ≥ 35 and <55 | S | Av36 |
| Av | Av3200 | Mafikeng | ≥ 55 | S | Av37 |

**TABLE 5.9** First example of a soil form unique to the Taxonomic soil classification system with Binomial soil series assigned to sub-delineated soil families of the Taxonomic system, based on clay content



| Soil form: KINKELBOS | | | | | |
|---|---|---|---|---|---|
| **Symbol** | **Taxonomic code** | **Soil family** | **Sub-classification by clay %** | **Defining horizon** | **Soil series: binomial** |
| Kk | Kk1110 | Nyanga | < 6 | S | Vf11 |
| Kk | Kk1110 | Nyanga | ≥ 6 | S | Vf14 |
| Kk | Kk1110 | Nyanga | < 6 | S | Vf21 |
| Kk | Kk1110 | Nyanga | ≥ 6 | S | Vf24 |
| Kk | Kk1210 | Alfred | < 6 | S | Vf11 |
| Kk | Kk1210 | Alfred | ≥ 6 | S | Vf14 |
| Kk | Kk1210 | Alfred | < 6 | S | Vf21 |
| Kk | Kk1210 | Alfred | ≥ 6 | S | Vf24 |
| Kk | Kk2110 | Bluedowns | < 6 | S | Vf11 |
| Kk | Kk2110 | Bluedowns | ≥ 6 | S | Vf14 |
| Kk | Kk2110 | Bluedowns | < 6 | S | Vf21 |
| Kk | Kk2110 | Bluedowns | ≥ 6 | S | Vf24 |
| Kk | Kk2210 | Voltas | < 6 | S | Vf11 |
| Kk | Kk2210 | Voltas | ≥ 6 | S | Vf14 |
| Kk | Kk2210 | Voltas | < 6 | S | Vf21 |
| Kk | Kk2210 | Voltas | ≥ 6 | S | Vf24 |

**TABLE 5.10** Second example of a soil form unique to the Taxonomic soil classification system with Binomial soil series assigned to sub-delineated soil families of the Taxonomic system, based on clay content




| Soil form: PLOOYSBURG | | | | | |
|---|---|---|---|---|---|
| **Symbol** | **Taxonomic code** | **Soil family** | **Sub-classification by clay %** | **Defining horizon** | **Soil series: binomial** |
| Py | Py1000 | Brakkies | < 6 | S | Hu31 |
| Py | Py1000 | Brakkies | ≥ 6 and <15 | S | Hu34 |
| Py | Py1000 | Brakkies | ≥ 15 and <35 | S | Hu36 |
| Py | Py1000 | Brakkies | ≥ 35 and <55 | S | Hu37 |
| Py | Py1000 | Brakkies | ≥ 55 | S | Hu38 |
| Py | Py2000 | Rietrivier | < 6 | S | Hu31 |
| Py | Py2000 | Rietrivier | ≥ 6 and <15 | S | Hu34 |
| Py | Py2000 | Rietrivier | ≥ 15 and <35 | S | Hu36 |
| Py | Py2000 | Rietrivier | ≥ 35 and <55 | S | Hu37 |
| Py | Py2000 | Rietrivier | ≥ 55 | S | Hu38 |

What the three examples illustrate is that the sub-delineations of the Taxonomic soil forms are, in the first instance, clay content based, with sometimes two clay classes (for example **Table 5.9**), sometimes four (for example **Table 5.8**) and sometimes all five possible clay classes used (for example **Table 5.10**). Other criteria used were whether the Taxonomic soil families had been classified as being either dystrophic, mesotrophic or eutrophic. Depending on the soil form, either the topsoil (designated 'T' in the 'Defining Horizon" column, but not shown in the tables above), or the subsoil (designated 'S') were the defining horizon for decisions made.

Note that where a soil form is common to both soil classification systems (as in the case of Avalon soils above), the equivalent Binomial soil series have the form symbol (for example 'Av' in **Table 5.8**). On the other hand, where the Taxonomic soil form is unique and is not present in the Binomial classification, the equivalent soil series are derived from the Binomial system.

The procedures described above were necessitated by the eventual mapping resolution being that of terrain units, where each TU's soil information was solely according to the soil series of the Binomial classification system. While every care was taken to ensure that the Binomial soil series equivalents of the Taxonomic system were interpreted as correctly / representatively as possible, it must be stressed that this was a manual task covering the 73 Taxonomic soil forms, delineated into 402 soil families, with those in turn 'expanded' to 1 278 clay content based sub-delineations. Any improved soil series equivalents will, therefore, be welcomed!

In **Appendix 2** the Binomial equivalents are tabulated for all 73 Taxonomic soil forms, 402 soil families and 1 278 sub-delineations, in each case with an accompanying photo of the soil form taken from the Taxonomic handbook (SCWG 1991).

## 5.5 Determination of soil carbon percentages per soil series

### 5.5.1 THE NEED TO DISTINGUISH BETWEEN SOIL CARBON CONTENT OF SOUTH AFRICAN SOILS UNDER NATURAL CONDITIONS AND THAT FOLLOWING AGRICULTURAL PRACTICES

The organic matter content of a mature natural soil is determined by specific combinations of soil forming factors which include climate, topography, vegetation and organisms, parent material and time. However, this equilibrium is disturbed by human interventions such as land use change or cultivation.

For example, a review by Swanepoel et al. (2015) found the following:

- Soil organic matter in dryland agricultural fields in southern Africa has declined by 25% in semi-arid areas, by 53% in sub-humid areas and by 46% in humid areas, with an average decline of 46% due to cultivation.
- Regarding this significant decrease in SOM, findings show a higher SOM loss during the first five years of cultivation and equilibrium conditions only reached after ~ 35 years of cultivation.
- One reason for this decrease is that cultivation reduces the relatively strong correlation between clay and SOM found in undisturbed soils.
- The decrease under cultivation is a huge concern, as it results in both elevated levels of GHGs in the atmosphere, and loss of soil quality which influences the production potential of soils in a region that is already food insecure.

Given the above findings and points of discussion, care should thus be taken when estimating and mapping soil organic carbon to distinguish clearly between SOC under natural conditions as opposed to under cultivated conditions.

The quality-controlled ARC Soil Carbon Database used in this study was therefore divided between those samples assumed to have been taken under conditions of natural vegetation and those stated to have been taken from agricultural areas (refer to **Section 5.2.2** and **Table 5.3**).

### 5.5.2 DETERMINING THE SOURCE AND CONFIDENCE LEVEL OF SOIL ORGANIC CARBON PERCENTAGES FOR EACH BINOMIAL SOIL SERIES

- After each of the 5 740 soil carbon profiles originally described by the Taxonomic system had been assigned a Binomial soil series equivalent (see **Section 5.4**; **Tables 5.8** to **5.10**; **Appendix 2**), and assuming these to be correct, a new list of the 501 Binomial and equivalent soil series was prepared.
- **Table 5.11** shows an extract from this list of samples with agricultural land uses (with a similar list having been prepared for samples taken under natural vegetation).
- For each soil series in this list the number of sample locations at which carbon percentages were available was noted for both the topsoil (**Table 5.11** column 2) and the subsoil (**Table 5.11** column 4).
- From the extract shown in Table 5.11, it is seen that for some soil series samples with carbon percentages were taken at many locations, for other soil series at just a few locations, and for yet other soil series at no locations whatsoever (with the same applying to locations at which carbon density information was available; columns 3 and 5). This is not surprising, as the series delineation is simply a classification convention. It was to be expected that there would be such an uneven distribution, owing to the uneven natural occurrence within South Africa, as well as the scattered nature of the soil sampling points (Paterson 2018, pers. com.).

For final mapping, however, soil carbon information for every soil series is needed. For calculations of average soil carbon percentages for each soil series at a later stage the following procedure was therefore adopted:

- 1$^{st}$ level of assurance: Where soil carbon samples had been taken at ≥ 20 locations, averages of SOC% could be calculated at what was termed a 1$^{st}$ level of assurance / confidence (for example for soil series Av26);
- 2$^{nd}$ level of assurance: Where samples were taken at between 10 and 19 locations, average SOC% was at the 2$^{nd}$ level of assurance / confidence (for example soil series Av20);
- 3$^{rd}$ level of assurance: Samples at 5 to 9 locations would have SOC% averages calculated at the 3$^{rd}$ level of assurance / confidence (for example Av27);
- 4$^{th}$ level of assurance: Where a soil series had samples from fewer than 5 locations, but a sample from at least 1 location, the characteristics of those samples were taken, but to it were added soil carbon characteristics from 'similar' (surrogate) soil series which had samples at other locations, until at least 5 samples had been attained, and where
  - 'similar' implied those soil series with similar clay contents, horizon sequences, distinctions between dystrophic / mesotrophic / eutrophic soils etc., and
  - with these classed as soil series at the 4$^{th}$ level of either single or multiple associations; noting that
  - where a soil series was not found at any location, a procedure similar to that above for 1 to 4 locations was followed, with these also classed as soil series at the 4$^{th}$ level of assurance / confidence.

Information similar to that in **Table 5.11** was prepared for all 501 soil series for both natural vegetation soil carbon samples and for those with agricultural practices. This information is given in **Appendix 3**.

From this information, the medians of soil carbon percentages could be calculated, as could soil carbon density, the results from which could then be mapped at the spatial scale of the 27 491 terrain units identified across South Africa.

**TABLE 5.11** Extract showing, for agricultural lands, the number of locations for each soil series with SOC data available from the combined Binomial and Taxonomic soil carbon database. Also shown are the surrogate soil series that did not have enough samples for a specific soil series and were therefore supplemented with characteristics from other, similar surrogate series to make up at least 5 samples, with levels of assurance also given for each soil series.

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 Samples | **Level 3:** > 5 Samples | **Level 4:** single or multiple associations |
| Ar10 | 9 | 9 | 8 | 8 | | | Ar10 | Ar10 |
| Ar11 | 0 | 0 | 0 | 0 | | | | Ar10 |
| Ar12 | 0 | 0 | 0 | 0 | | | | Ar10 |
| Ar20 | 15 | 14 | 13 | 12 | | Ar20 | Ar20 | Ar20 |
| Ar21 | 1 | 1 | 1 | 1 | | | | Ar21new=Ar21+Ar20 |
| Ar22 | 0 | 0 | 1 | 1 | | | | Ar21new |
| Ar30 | 3 | 3 | 2 | 2 | | | | Ar30new=Ar30+Ar31 |
| Ar31 | 1 | 1 | 0 | 0 | | | | Ar30new |
| Ar32 | 0 | 0 | 0 | 0 | | | | Ar30new |
| Ar40 | 3 | 3 | 2 | 2 | | | | Ar40new=Ar40+Ar41 |
| Ar41 | 2 | 2 | 1 | 1 | | | | Ar40new |
| Ar42 | 0 | 0 | 0 | 0 | | | | Ar40new |
| Av10 | 0 | 0 | 0 | 0 | | | | Av10new=Cv11+Cv20+Cv21 |
| Av11 | 0 | 0 | 0 | 0 | | | | Av10new |
| Av12 | 0 | 0 | 0 | 0 | | | | Av12new=Cv11+Cv20+Cv21+Cv22 |
| Av13 | 0 | 0 | 0 | 0 | | | | Av13new=Cv14+Hu14 |
| Av14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Av15 | 0 | 0 | 0 | 0 | | | | Cv15new |
| Av16 | 4 | 4 | 4 | 4 | | | | Av16new=Av16+Cv16 |
| Av17 | 3 | 3 | 3 | 3 | | | | Av17new=Av17+Cv17 |
| Av20 | 0 | 0 | 0 | 0 | | | | Av20new=Av21+Cv20+Cv21 |
| Av21 | 1 | 1 | 1 | 1 | | | | Av21new=Av21+Cv21 |
| Av22 | 0 | 0 | 0 | 0 | | | | Av22new=Av21+Cv21+Cv22 |
| Av23 | 0 | 0 | 0 | 0 | | | | Av23new=Av24+Bv24+Cv23 |
| Av24 | 3 | 3 | 3 | 3 | | | | Av24new=Av24+Bv24 |
| Av25 | 0 | 0 | 0 | 0 | | | | Av24 |
| Av26 | 24 | 24 | 24 | 24 | Av26 | Av26 | Av26 | Av26 |
| Av27 | 5 | 5 | 5 | 5 | | | Av27 | Av27 |
| Av30 | 0 | 0 | 0 | 0 | | | | Av31 |
| Av31 | 6 | 6 | 4 | 4 | | | Av31 | Av31 |
| Av32 | 1 | 1 | 1 | 1 | | | | Av32new=Av32+Av31 |
| Av33 | 1 | 1 | 1 | 1 | | | | Av33new=Av33+Av34 |
| Av34 | 32 | 32 | 30 | 30 | Av34 | Av34 | Av34 | Av34 |
| Av35 | 1 | 1 | 1 | 1 | | | | Av35new=Av35+Av34 |
| Av36 | 60 | 60 | 60 | 60 | Av36 | Av36 | Av36 | Av36 |
| Av37 | 3 | 3 | 3 | 3 | | | | Av37new=Av37+Cv37 |
| Bo10 | 6 | 6 | 6 | 6 | | | Bo10 | Bo10 |
| Bo11 | 9 | 9 | 9 | 9 | | | Bo11 | Bo11 |
| Bo20 | 3 | 3 | 2 | 2 | | | | Bo20new=Bo20+Wo20+Bo10 |
| Bo21 | 7 | 7 | 7 | 7 | | | Bo21 | Bo21 |
| Bo30 | 0 | 0 | 0 | 0 | | | | Bo30new=Bo10+Bo20 |

## 5.6 Requirements and procedures for the calculations of soil carbon stocks

In order to calculate soil carbon stocks in the topsoil and the subsoil, soil organic carbon percentages have to be converted to a mass of carbon by

- considering the thicknesses of the two soil horizons and by
- converting the SOC% to a mass of carbon, initially per $m^2$, and later for the respective areas of the soil series which make up a terrain unit.

For this conversion, the dry bulk density of the soil is required.

A soil's dry bulk density, $\rho_b$, is its mass/volume. It is expressed in SI units of $kg/m^3$ or in $tons/m^3$. Numerous equations for bulk density have been developed, usually related to the soil's clay content (%). For this study a relationship based on clay content and developed with South African data (Van der Merwe 1973; Hutson, 1984; Schulze 1995) was used (**Figure 5.2**).

The formula for dry bulk density, derived from the points in **Figure 5.2**, is
$\rho_b$ = - 0.0079 * Clay % (kg/kg) / Volume ($m^3$) +1.7243
or, assuming a soil volume of $1m^3$,
$\rho_b$ = - 0.0079 * Clay % +1.7243 [ in $t/m^3$]

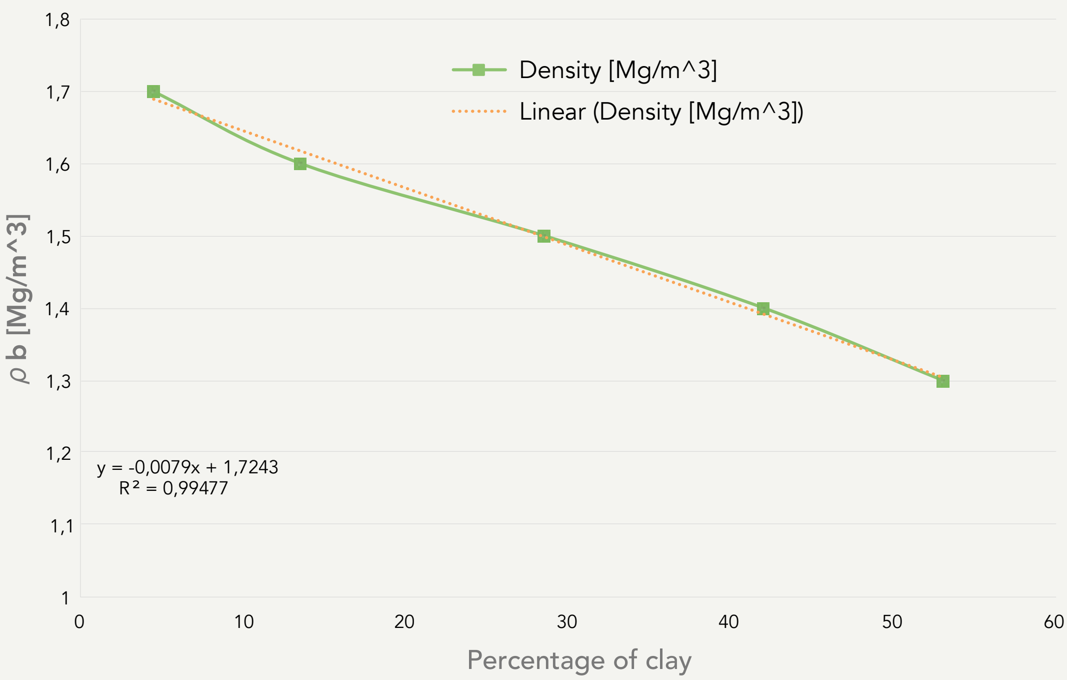



**FIGURE 5.2** The dry bulk density to clay percentage relationship developed for South African soils (Based on Van der Merwe 1973; Hutson 1984; Schulze 1995)

A column for soil bulk density was added to the Soil Carbon Database worksheet, based on the formula above and the clay content given in the database. Where no clay content was in the database (in 1 471 samples), the soil bulk density was also left blank. An analysis of the bulk density values thus calculated for qualifying samples in the Soil Carbon Database showed a range from 0.969 to 1.724 t/m$^3$, with an average of 1.524 t/m$^3$.

Armed with information on soil carbon percentages for the top- and subsoils, the bulk density to clay relationship and thicknesses of the top- and subsoils, soil carbon densities could be computed for the two soil horizons for each soil series. This information is summarised for the topsoils and subsoils of all 501 soil series for both natural vegetation and agricultural land uses in **Appendix 4**, with an extract from the Appendix for natural vegetation given in **Table 5.12.**

**TABLE 5.12** Extract from Appendix 4 on soil carbon density and percentages for the topsoil and subsoil under land cover conditions of natural vegetation and agricultural land uses

| Soil series with carbon sample information | Natural veg carbon density (t/m3) in the topsoil (median) | Natural veg carbon percentage (by weight) in the topsoil (median) | Natural veg carbon density(t/m³) in the subsoil (median) | Natural veg carbon percentage (by weight) in the subsoil (median) |
|---|---|---|---|---|
| Ar10 | 0,0218 | 1,80 | 0,0126 | 1,07 |
| Ar11 | 0,0215 | 1,65 | 0,0096 | 0,78 |
| Ar12 | 0,0215 | 1,65 | 0,0096 | 0,78 |
| Ar20 | 0,0157 | 1,25 | 0,0088 | 0,70 |
| Ar21 | 0,0151 | 1,17 | 0,0088 | 0,70 |
| Ar22 | 0,0151 | 1,17 | 0,0088 | 0,70 |
| Ar30 | 0,0257 | 2,00 | 0,0163 | 1,21 |
| Ar31 | 0,0273 | 3,08 | 0,0163 | 1,201 |
| Ar32 | 0,0273 | 3,08 | 0,0163 | 1,21 |
| Ar40 | 0,0142 | 1,53 | 0,0091 | 0,70 |
| Ar41 | 0,0139 | 1,41 | 0,0086 | 0,70 |
| Ar42 | 0,0140 | 1,50 | 0,0086 | 0,70 |
| Av10 | N/A | 0,65 | N/A | N/A |
| Av11 | 0,0073 | 0,45 | 0,0039 | 0,23 |
| Av12 | N/A | 0,65 | N/A | N/A |
| Av13 | 0,0125 | 0,75 | 0,0056 | 0,34 |
| Av14 | 0,0128 | 0,77 | 0,0081 | 0,50 |
| Av15 | 0,0101 | 0,62 | 0,0054 | 0,33 |
| Av16 | 0,0175 | 1,15 | 0,0056 | 0,38 |
| Av17 | 0,0294 | 2,40 | 0,0090 | 0,55 |
| Av20 | 0,0072 | 0,43 | 0,0032 | 0,19 |
| Av21 | 0,0075 | 0,45 | 0,0045 | 0,27 |
| Av22 | 0,0028 | 1,22 | 0,0018 | 0,11 |
| Av23 | 0,0077 | 0,89 | 0,0028 | 0,17 |
| Av24 | 0,0184 | 1,12 | 0,0060 | 0,42 |
| Av25 | 0,0174 | 1,00 | 0,0049 | 0,37 |
| Av26 | 0,0111 | 0,70 | 0,0046 | 0,30 |
| Av27 | 0,0203 | 1,25 | 0,0050 | 0,37 |
| Av30 | 0,0049 | 0,29 | 0,0020 | 0,12 |
| Av31 | 0,0049 | 0,29 | 0,0020 | 0,12 |
| Av32 | 0,0049 | 0,29 | 0,0020 | 0,12 |
| Av33 | 0,0066 | 0,40 | 0,0047 | 0,30 |
| Av34 | 0,0091 | 0,55 | 0,0030 | 0,19 |
| Av35 | 0,0088 | 0,53 | 0,0032 | 0,20 |
| Av36 | 0,0104 | 0,66 | 0,0045 | 0,30 |
| Av37 | 0,0142 | 0,99 | 0,0057 | 0,40 |

CHAPTER 6

# RESULTS

## SOIL ORGANIC CARBON PERCENTAGES AND STOCKS ACROSS SOUTH AFRICA AT THE SPATIAL RESOLUTION OF TERRAIN UNITS

### 6.1 Percentage soil organic carbon (SOC%) in South African soils

First making a distinction between those samples of soil organic carbon collected at locations under natural vegetation and those under agricultural land uses, the median values of the percentage of SOC were calculated for each of the 501 soil series of the Binomial soil classification system of South Africa, using the procedures described in Chapter 5. Thereafter the SOC% for each of the 27 491 terrain units (TUs) covering South Africa was calculated by area-weighting the SOCs of each of the soil series making up a TU according to the respective thicknesses of the topsoil horizon and subsoil horizon of each soil series in that TU.

#### 6.1.1 SOC% UNDER CONDITIONS OF NATURAL VEGETATION

The percentages of soil organic carbon for topsoils if they were under natural vegetation, based on medians of the sample values per soil series as calculated by procedures explained in Chapter 5, were mapped at a spatial resolution of TUs, with results shown in **Figure 6.1**. The divide between higher topsoil SOCs in the more humid east, in places averaging up to 3.5% per TU, and the arid west with generally < 1.0% SOC per TU, is clearly visible in **Figure 6.1.**

The level of spatial detail possible when mapping at the resolution of TUs is clearly illustrated in **Figure 6.2** in which the SOC results are scaled to provincial level for KwaZulu-Natal in the top map and even more so to an area around Durban in the bottom map.

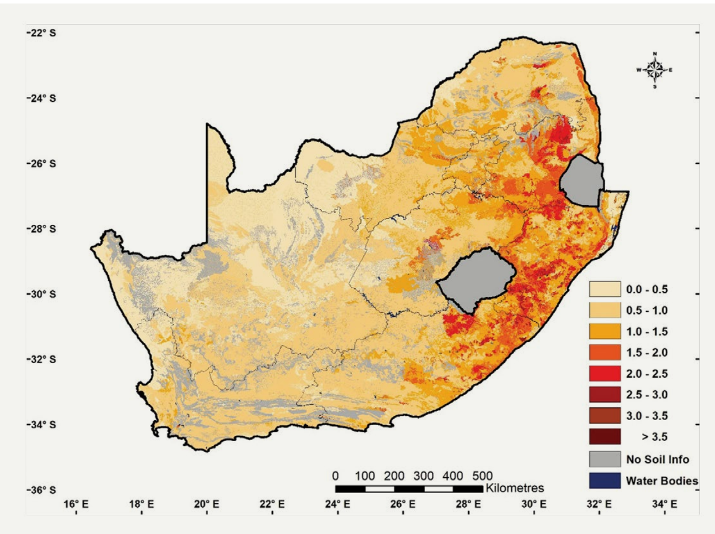



**FIGURE 6.1** Median percentages of soil organic carbon in the topsoils across South Africa if they were under natural vegetation.

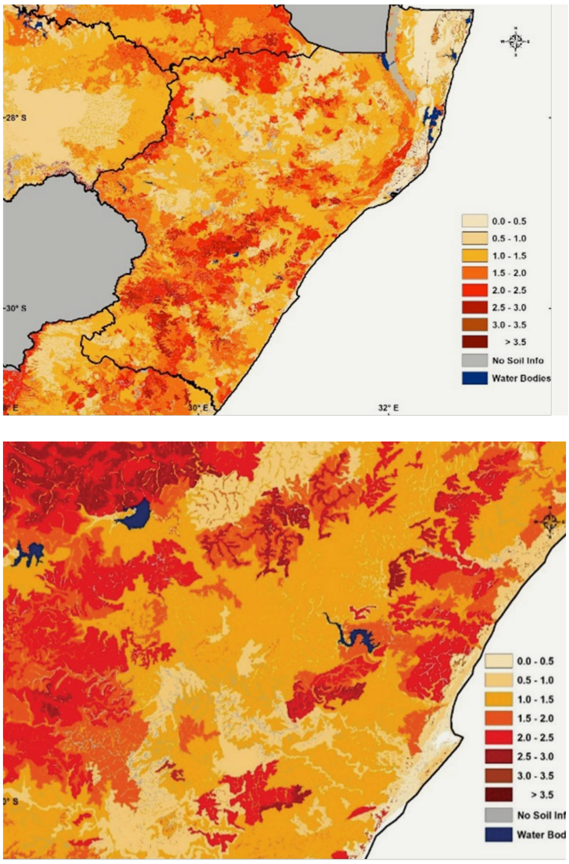



**FIGURE 6.2 (right)** Median percentages soil organic carbon in the topsoils if they were under natural vegetation, scaled to provincial level for KwaZulu-Natal (top) and to the area around Durban (bottom), all mapped at a spatial resolution of terrain units.

The reduction of SOC% in the subsoil is very evident for natural vegetation conditions when results from **Figure 6.3** are compared with those in **Figure 6.1**, to the extent that when compared, **Figure 6.4** shows ratios of top- to subsoil in the order of 2+ in the east and around 1.5 in the west.

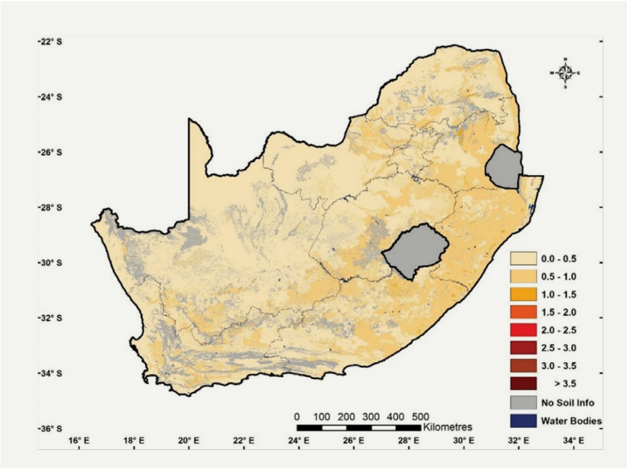



**FIGURE 6.3** Median percentages soil organic carbon in the subsoils across South Africa if they were under natural vegetation, mapped at a spatial resolution of terrain units

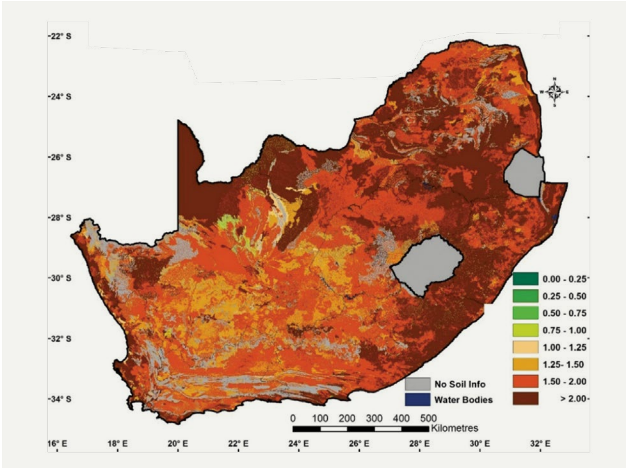



**FIGURE 6.4** Ratio of topsoil to subsoil percentage soil organic carbon across South Africa under natural vegetation, mapped at a spatial resolution of terrain units

### 6.1.2 SOC% UNDER CONDITIONS OF AGRICULTURAL LAND USES

The loss of SOC% when natural vegetation is converted to agricultural practices becomes obvious when the top- and subsoil SOC% maps in **Figure 6.5** are compared with the corresponding maps in **Figures 6.1** and **6.3**. Again, as in the case of natural vegetation, ratios of top- to subsoil SOCs frequently exceed a factor of 2, but for agricultural land uses the ratios (where there is enough information) remain high even in the more arid west (**Figure 6.6**).

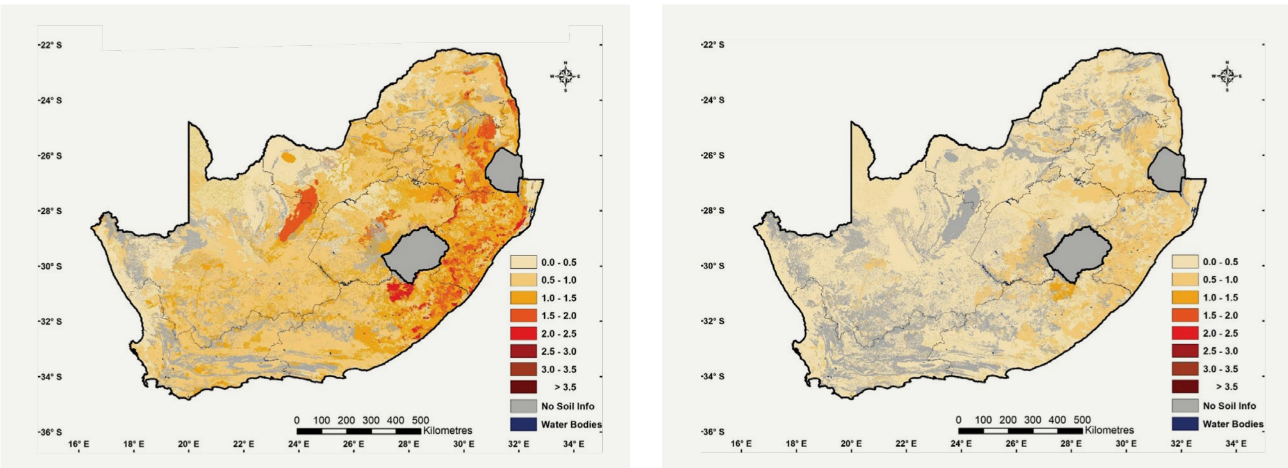



**FIGURE 6.5** Median percentages of soil organic carbon in the topsoils (top) and subsoils (bottom) across South Africa if these were under agricultural land uses, mapped at a spatial resolution of terrain units

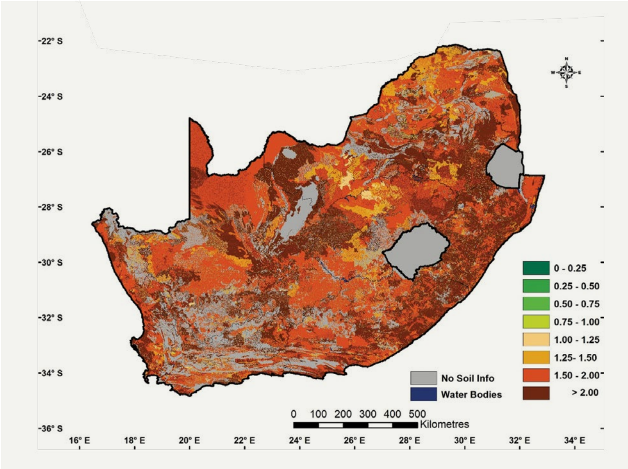



**FIGURE 6.6** Ratios of topsoil to subsoil percentages of soil organic carbon across South Africa under agricultural land uses, mapped at a spatial resolution of terrain units

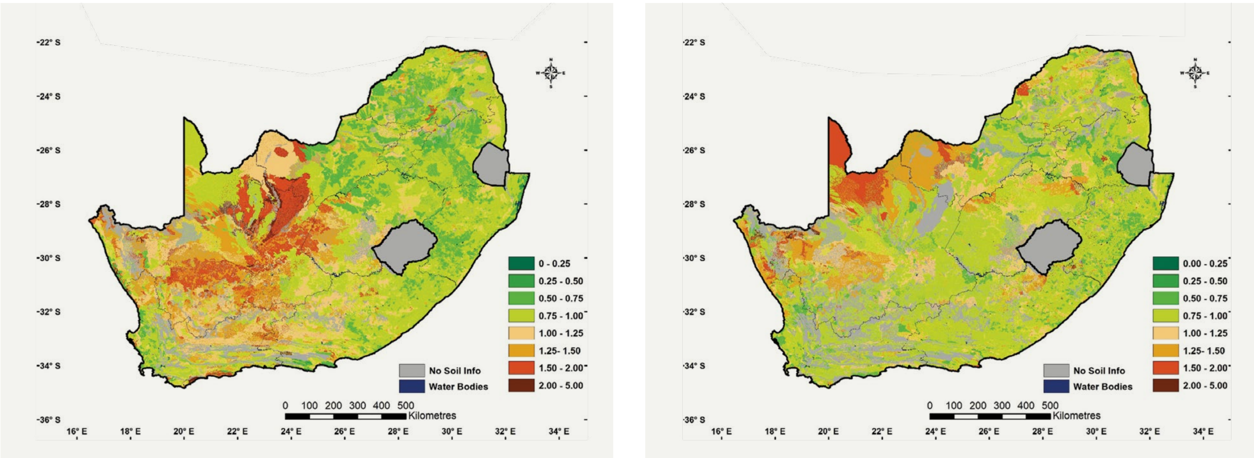



**FIGURE 6.7** Ratios, between agricultural land uses and natural vegetation, of percentages of soil organic carbon in the topsoils (top) and the subsoils (bottom) across South Africa, mapped.

### 6.1.3 COMPARISONS OF PERCENTAGE SOIL ORGANIC CARBON BETWEEN NATURAL VEGETATION AND AGRICULTURAL LAND USES

When the SOC percentages between natural vegetation and agricultural land uses are compared as ratios, then **Figure 6.7 (left)** shows that, for the topsoil in the more humid east, where most of South Africa's intensive agriculture is practised, SOC% losses resulting from agricultural land uses are of the order of 0.5, or 50%. This corroborates earlier findings by Swanpoel et al. (2015). However, for the topsoil the ratios are around unity and even > 1 in places in the more arid west, suggesting that SOC losses there occur on a much reduced scale. For the subsoil horizon (**Figure 6.7**, **right**), patterns of SOC loss under agriculture are similar to those for the topsoil in the wetter east, but with the SOC losses continuing through to the drier west.

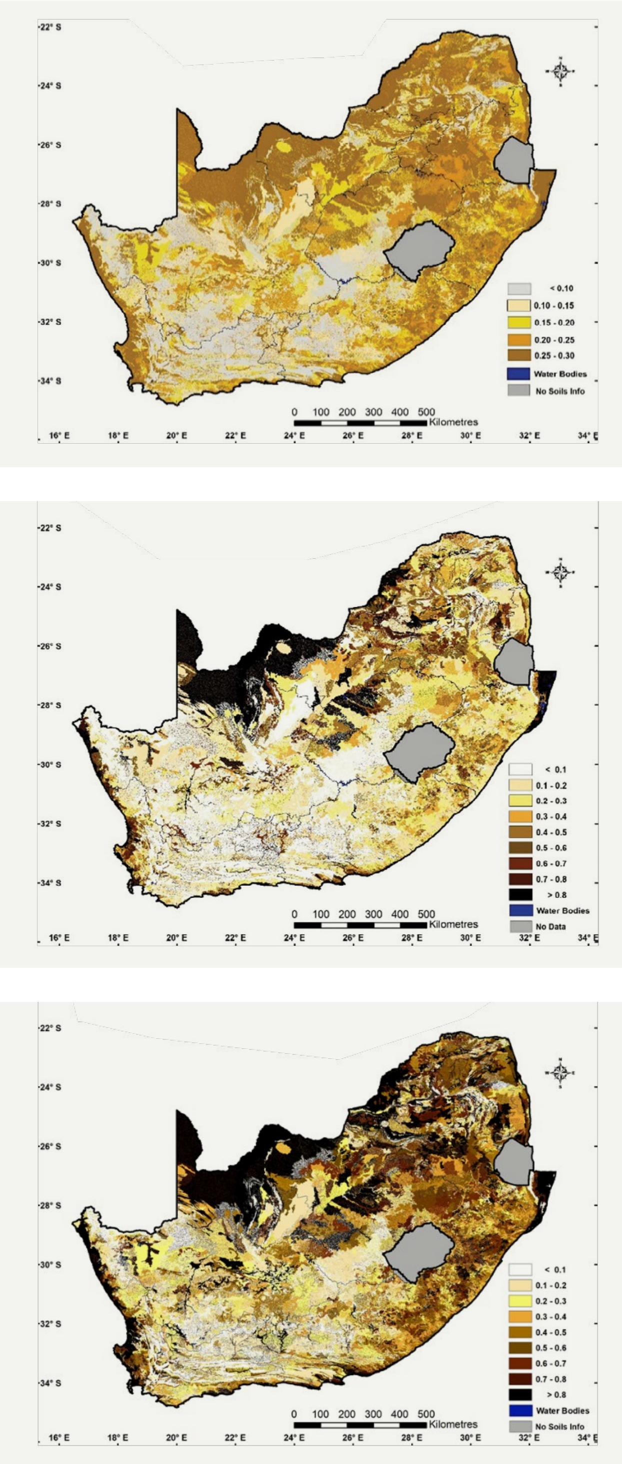



**FIGURE 6.8 (left)** Thicknesses (m) of the topsoil horizons (top), the subsoil horizons (middle) and the entire soil profiles (bottom), averaged per terrain unit.

## 6.2 Carbon stocks in South African soils

### 6.2.1 A REMINDER OF PROCEDURES

In **Chapter 5** the procedures for estimating carbon stocks of South African soils were outlined. As a reminder, when soil carbon percentages (which were obtained from the ARC's Soil Carbon Database for 11 099 locations across South Africa), are converted to carbon densities, then the soil's bulk density is required for each sample point, with that derived from the clay percentage at the sample point. Then, when expanding the carbon density information from the sample points to mapping carbon stocks for the topsoil, subsoil and the entire soil profile using the actual soils information from the terrain unit database across the country, the thicknesses of the topsoil, subsoil and the entire soil profile are also needed for each soil series making up a TU. These thicknesses are shown at TU spatial resolution in **Figure 6.8**.

### 6.2.2 SOIL CARBON STOCKS UNDER NATURAL VEGETATION

Soil carbon densities, in kg carbon per $m^2$, were first calculated for the topsoil and the subsoil for each of the 501 soil series of the Binomial soil classification of South Africa as the median of actual field sample values or, where too few or no samples of a soil series were available from the Soil Carbon Database, from soil series with properties considered "equivalent" to those of the soil series in question (cf. **Table 5.11** and **Appendix 2**). This information was then used in conjunction with the TU information, as described in **Section 6.2.1** above.

For topsoils under natural vegetation, **Figure 6.9** (left map) shows that the TU averaged carbon stocks are in the range of 3–10 kg/$m^2$ in the east of South Africa, decreasing to 1–2 and even < 1 kg/$m^2$ in the west.  Again, the value of being able to zoom in and map at the spatial resolution of terrain units is evident in the detail shown in **Figure 6.9** (right map) in the case of topsoil carbon stocks in an area around Durban.

Soil organic carbon stocks for the subsoil are, as expected, considerably lower than for the topsoil (**Figure 6.10**), while those for the entire soil profile are shown in **Figure 6.11**.

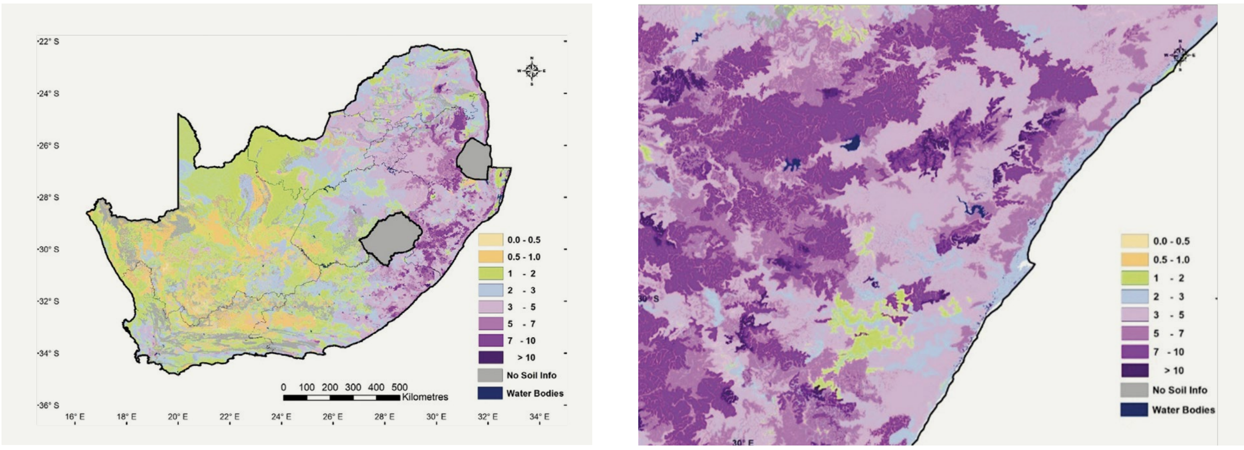



**FIGURE 6.9** Median values of soil organic carbon stocks (kg/m2) across South Africa (top map) in the topsoils when land cover is under natural vegetation, and zooming in to the area around Durban (bottom), all mapped at the spatial resolution of terrain units.

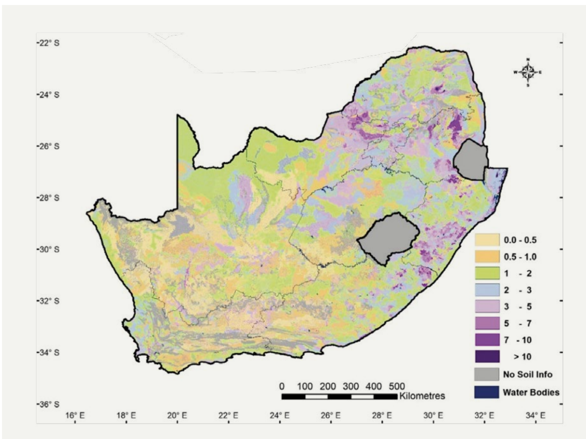



**FIGURE 6.10** Median values of soil organic carbon stocks (kg/$m^2$) across South Africa in the subsoil, when the land cover is under natural vegetation, mapped at a spatial resolution of terrain units.

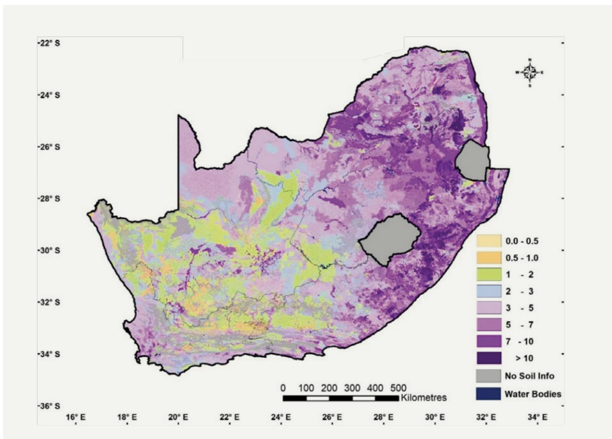



**FIGURE 6.11** Median values of soil organic carbon stocks (kg/$m^2$) across South Africa in the entire soil profile when land cover is under natural vegetation, mapped at a spatial resolution of terrain units.

Once again the value of being able to map at the spatial resolution of the > 27 000 terrain units covering South Africa is evident in **Figure 6.12**, both the zoomed-in maps of KwaZulu-Natal and of the area around Durban.

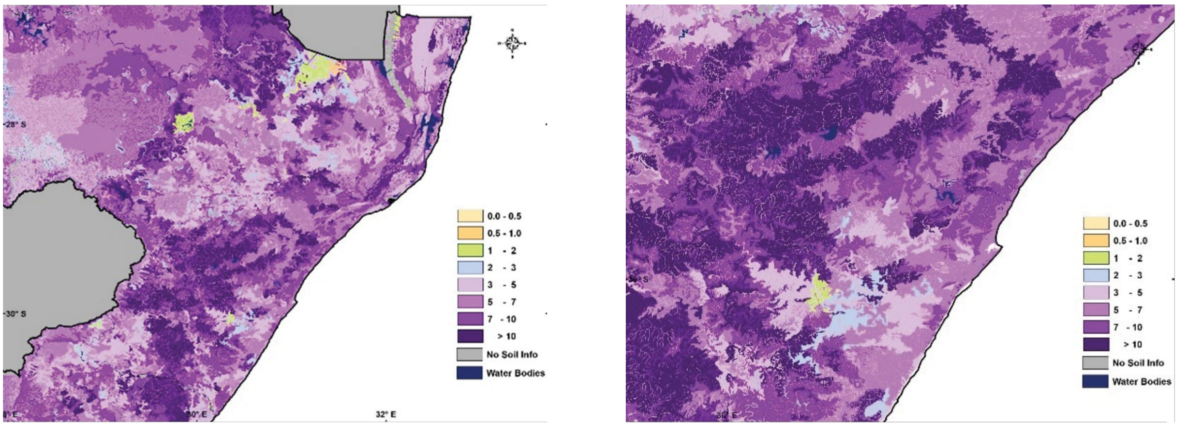
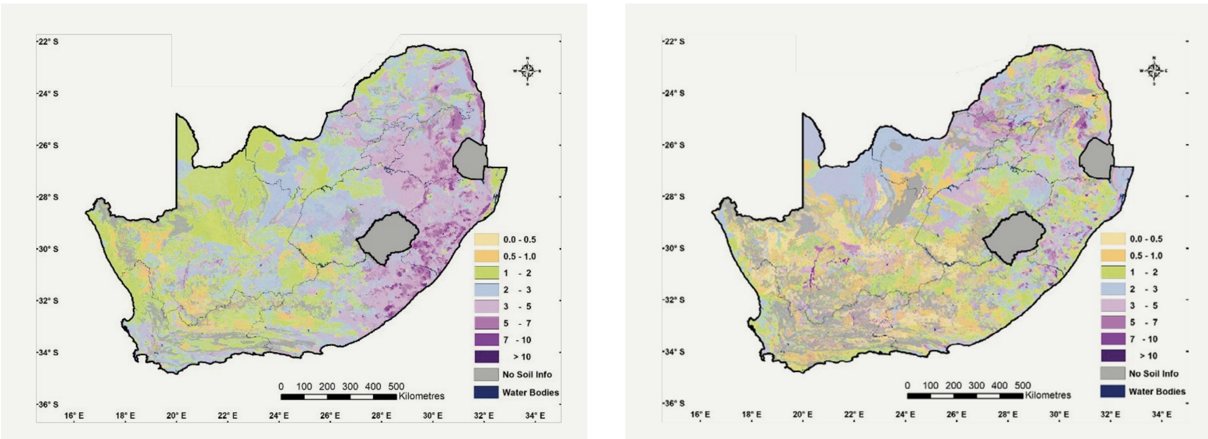



**FIGURE 6.12** Median values of soil organic carbon stocks (kg/m²) across South Africa under natural vegetation in the entire soil profile (top), and zooming in to KwaZulu-Natal (bottom left) and to the area around Durban (bottom right), all mapped at a spatial resolution of terrain units

### 6.2.3 SOIL CARBON STOCKS UNDER AGRICULTURAL LAND USES

Soil carbon stocks under agricultural land uses, shown in **Figure 6.13** for the topsoil (top left), the subsoil (top right) and for the entire soil profile (bottom).



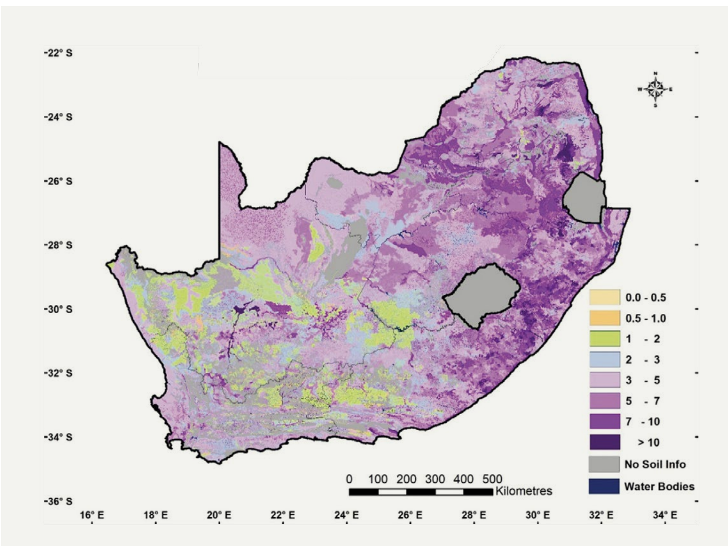




**FIGURE 6.13** Median values of soil organic carbon stocks (kg/m²) under agricultural land uses across South Africa in the topsoil (top left), the subsoil (top right) and in the entire soil profile (bottom), all mapped at a spatial resolution of terrain units

### 6.2.4 COMPARISONS OF SOIL ORGANIC CARBON STOCKS BETWEEN AGRICULTURAL LAND USES AND NATURAL VEGETATION

This comparison is shown in **Figure 6.14**, and values are generally in the order of 0.75 in the east, implying that SOC stocks under agricultural land uses would have decreased by ~ 25% compared to those under natural vegetation, with the values changing to around unity in the drier west, implying that there is little difference between carbon stocks when natural vegetation is converted to cropped fields.

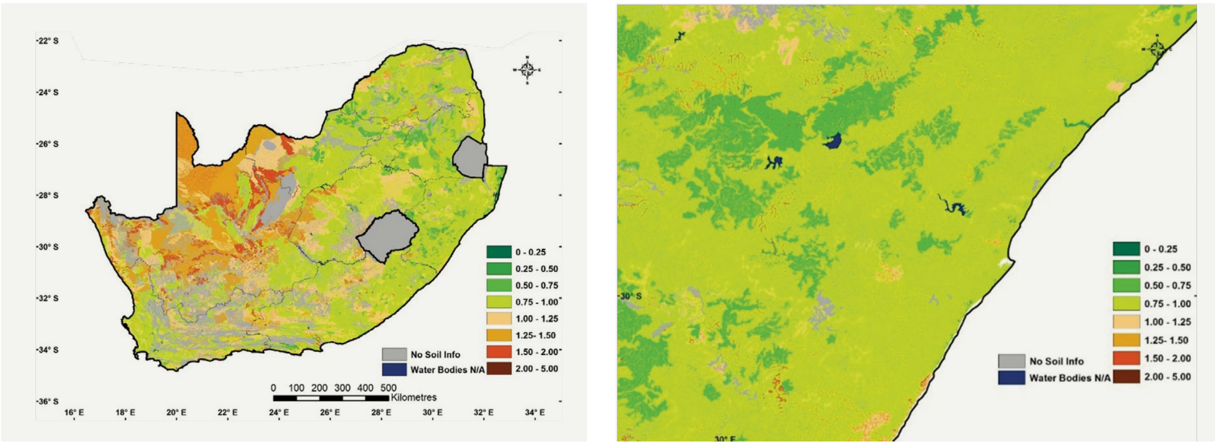



**FIGURE 6.14** Ratios, between agricultural land uses and natural vegetation, of soil organic carbon stocks in the entire soil profile across South Africa (left), and zoomed into the area around Durban (right), all mapped at a spatial resolution of terrain units a spatial resolution of terrain units

# CHAPTER 7

# TAKING STOCK AND LOOKING AHEAD

## 7.1 Taking stock ...

This report has:

- Provided a literature review on SOC, with specific reference to South Africa.
- Described how over 27 000 terrain units were identified from a 90 m Digital Elevation Model, and linked to the soils 'Land Type' information, to be used as the spatial resolution for mapping SOCs.
- Used the terrain unit information which was linked to the various soil series from the Binomial soil classification which had been associated with each terrain unit, in order to map humic and organic soils across South Africa.
- Described the methodologies which were developed for enhancing the ARC's soil carbon database, derived from two different soil classification systems which first had to be 'reconciled' with mapping procedures, to enable mapping of SOC percentages and stocks across South Africa at the spatial resolution of terrain units.
- Presented detailed mapped results for SOC percentages and stocks at terrain unit level under land cover conditions of natural vegetation and agricultural land uses, for the topsoil as well as the subsoil horizons in both cases.

In many respects this was done at a resolution and with innovative techniques hitherto not attempted in South Africa, and with the results potentially also making a significant input to the Electronic National Carbon Sinks Atlas developed by the Department of Environmental Affairs.

## 7.2 And ... looking ahead

Two aspects can be addressed here, namely ones concerning further validation of assumptions made in the methodology and, secondly, where further short-term research would greatly enhance the present product.

### 7.2.1 FURTHER VALIDATION OF ASSUMPTIONS MADE IN THE METHODOLOGY

While every step in the methodology was considered to be based on solid reasoning, there remain areas where further validation would be prudent. Three cases were identified:

- 'Matching' the Binomial and Taxonomic soil classification systems of South Africa was a key aspect of the research project. This was necessitated by the > 27 000 soils terrain units which were used as the basis of soil carbon mapping having been partly populated with information at soil series level from the Binomial classification but with the majority of soil carbon samples having been assessed using the taxonomic classification. The matching process was a tedious and manual one, and in future research this should be further validated, to correct possible misinterpretations.
- Scrutiny of soil carbon percentages in **Appendix 4** identified a number of soil series other than those from the organic soil form (Champagne) and the humic soil forms (Kranskop, Magwa, Inanda and Nomanci) with high (> 2%) organic percentages. These other soil series, frequently with orthic topsoils, should be re-assessed to check whether the high SOCs are valid, or whether they may be artefacts of assumptions in the cases where only a few or no samples were available and values from soils with similar properties had to be used. This concept of organic-rich orthic topsoils has been incorporated into the latest edition of the soil classification system (Paterson 2018, pers. com.).
- Another cursory assessment indicates that the methodology developed may, in certain cases, have resulted in anomalously high or anomalously low SOC estimates. These will have to be scrutinised manually one by one to check the validity of the results.

### 7.2.2 PROPOSED ADDITIONAL SHORT-TERM RESEARCH EMANATING FROM THIS PROJECT

Four short-term mini research assignments emanating from findings of this project have been identified:

- First, statistical assessments on SOC should be made of specific soil series where results are available from 10 or more sample locations. This report used the median of values for mapping but, in addition, the standard deviations, ranges and means should be analysed.
- Second, a confidence indicator should be assigned to the SOC value of each terrain unit. In **Table 5.11** and in **Appendix 3** already four levels of assurance of results are indicated, namely, where there were 20 or more values from SOC measurements for a specific soil series (level 1), where there were between 10 and 19 values (level 2), from 5 to 9 values (level 3) and where there were either fewer than 5 or even no measured values of SOC for a given soil series. In the last case, surrogate values from similar soils with data had to be sought to achieve a minimum of 5 values (level 4 assurance). If each soil series were to be assigned a confidence indicator according to its level of assurance, and then the indicators of all the soil series making up a terrain unit were weighted in accordance with their relative area within the terrain unit, then a confidence value could be assigned to the terrain unit and the SOC confidence then mapped.
- Third, highlighting areas high in SOC should go beyond mapping only organic and humic soils, as in **Chapter 4**. As already indicated in **Section 7.2.1**, many other soil series have been shown in this analysis to have SOC contents in excess of 2%, and these should also be mapped. In particular, melanic soils, but also others, fall into this category. This would then be the initial step towards further in-field assessments of those soils for purposes of ring-fencing them because they would be considered carbon sink areas.
- Maps on SOCs shown in this report to be under natural vegetation contrasted with those under agricultural land use practices assume the entire South Africa to be under one or other of these two land covers. This is, however, not the case any longer, as only a fraction of the country is still under natural vegetation, and land converted to agricultural uses may be under either intensive or extensive use, irrigation or commercial forest plantations, or else the converted areas may be urban land or dams. The mapping should, therefore, be re-visited to account for all the above scenarios by considering actual land uses. Such an analysis would also show how many areas of potentially high SOCs have already been irreversibly converted to, say, urbanisation or dams.

These four mini-projects that have been described would greatly enhance the value of the present report. Careful scrutiny of the report may identify further additional short research projects.

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# APPENDIX 1: SOIL CARBON DATABASE QUALITY CONTROLS

Following an in-depth quality control of the Soil Carbon Database supplied by the ARC, a number of corrections were applied, as shown in the table below.

### QUALITY CONTROL: PROBLEMS IDENTIFIED

Three typical problems were identified in the Database, namely:

- Where a texture component was negative or > 100 %, this sample was not used for bulk density calculations and therefore could not be used for carbon density estimates. No changes were made in this Database, but the cases identified were omitted in the relevant calculations.
- Carbon percentages exceeded 100%.
- Values had been left blank.

### CORRECTIVE MEASURES

* This sample is not to be used for bulk density calculations and therefore not for carbon density estimates. Note again that no change was made in the Database, but these cases were omitted in the calculations.

** Values were replaced with a blank and this sample was not used for further calculations

*** This sample was not used in further calculations.

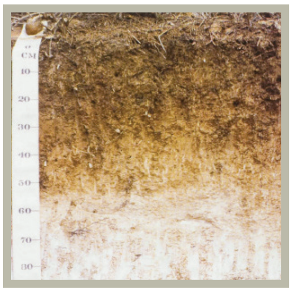
| Problem column | Location number | Project sample ID | Problem | Corrective measure |
|---|---|---|---|---|
| coSa_% (coarse Sand) | 13109 | 17331 | a | * |
| coSa_% | 23288 | 32604 | a | * |
| coSa_% | 23290 | 32609 | a | * |
| coSa_% | 23290 | 32610 | a | * |
| coSa_% | 23295 | 32626 | a | * |
| coSa_% | 23296 | 32627 | a | * |
| coSa_% | 23296 | 32628 | a | * |
| coSa_% | 23297 | 32631 | a | * |
| coSa_% | 23299 | 32637 | a | * |
| coSa_% | 23300 | 32639 | a | * |
| coSa_% | 23300 | 32640 | a | * |
| coSa_% | 23681 | 33597 | a | * |
| coSa_% | 23820 | 33833 | a | * |
| coSa_% | 24054 | 34370 | a | * |
| coSa_% | 25218 | 37384 | a | * |
| coSa_% | 26497 | 40766 | a | * |
| meSa_% (median Sand) | 23681 | 33597 | a | * |
| meSa_% | 25764 | 38826 | a | * |
| fiSa_% (fine Sand) | 15960 | 22366 | a | * |
| fiSa_% | 22130 | 29753 | a | * |
| coSi_% (coarse Silt) | 12939 | 16972 | a | * |
| coSi_% | 13898 | 18430 | a | * |
| coSi_% | 22800 | 31323 | a | * |
| coSi_% | 23653 | 33535 | a | * |
| coSi_% | 25218 | 37384 | a | * |
| coSi_% | 25724 | 38696 | a | * |
| coSi_% | 25965 | 39348 | a | * |
| coSi_% | 26017 | 39486 | a | * |
| coSi_% | 26214 | 40011 | a | * |
| coSi_% | 26464 | 40667 | a | * |
| coSi_% | 26469 | 40684 | a | * |
| coSi_% | 26715 | 41353 | a | * |
| coSi_% | 27103 | 42346 | a | * |
| coSi_% | 27104 | 42347 | a | * |
| fiSi_% (fine Silt) | 12939 | 16972 | a | * |
| fiSi_% | 13807 | 18234 | a | * |
| fiSi_% | 13984 | 18571 | a | * |

| Problem column | Location number | Project sample ID | Problem | Corrective measure |
|---|---|---|---|---|
| fiSi_% | 22939 | 31681 | a | * |
| fiSi_% | 23635 | 33488 | a | * |
| fiSi_% | 23820 | 33833 | a | * |
| fiSi_% | 24677 | 35984 | a | * |
| fiSi_% | 25637 | 38424 | a | * |
| fiSi_% | 26721 | 41366 | a | * |
| coSi% | 27595 | 43591 | a | Value change: 1371 to 13.71% |
| coSi% | 23895 | 34008 | a | Value change: 1480.92 to 14.8092% |
| fiSi_% | 23895 | 34008 | a | Value change: 2139.68 to 21.3968% |
| Clay% | 23895 | 34008 | a | Value change: 2518.64 to 25.1864% |
| Carbon% | 551 | 1339 | b | ** |
| Carbon% | 14532 | 19669 | b | ** |
| Carbon% | 21918 | 29333 | b | ** |
| Carbon% | 22036 | 29566 | b | ** |
| Upper_Depth_mm | 7298 | 10004 | not 0 but 1 mm | Replaced with 0 mm |
| Upper_Depth_mm | 2672 | 5627 | 900 | ** |
| Lower_Depth_mm | 2672 | 5627 | 901 | ** |
| SoilClass | 14215 | 19069 | c | *** |
| SoilClass | 14292 | 19146 | c | *** |
| SoilClass | 19657 | 24976 | c | *** |
| SoilClass | 19659 | 24977 | c | *** |
| SoilClass | 21216 | 27951 | c | *** |
| SoilClass | 21216 | 27952 | c | *** |
| SoilClass | 21216 | 27953 | c | *** |
| SoilClass | 21304 | 28070 | c | *** |
| SoilClass | 21304 | 28071 | c | *** |
| SoilClass | 21307 | 28076 | c | *** |
| SoilClass | 21311 | 28083 | c | *** |
| SoilClass | 21311 | 28084 | c | *** |
| SoilClass | 21532 | 28558 | c | *** |
| SoilClass | 21533 | 28559 | c | *** |
| SoilClass | 21534 | 28560 | c | *** |
| SoilClass | 21819 | 29141 | c | *** |
| SoilClass | 22044 | 29584 | c | *** |
| SoilClass | 24645 | 35888 | c | *** |
| SoilClass | 24645 | 35889 | c | *** |
| SoilClass | 26601 | 41064 | c | *** |
| SoilClass | 26601 | 41065 | c | *** |
| SoilClass | 26601 | 41066 | c | *** |
| SoilClass | 26933 | 41926 | c | *** |
| SoilClass | 26933 | 41927 | c | *** |
| SoilClass | 26934 | 41928 | c | *** |
| SoilClass | 27140 | 42448 | c | *** |
| SoilClass | 27140 | 42449 | c | *** |
| SoilClass | 27140 | 42450 | c | *** |
| SoilClass | 27141 | 42451 | c | *** |
| SoilClass | 27141 | 42452 | c | *** |
| SoilClass | 27141 | 42453 | c | *** |
| SoilClass | 27142 | 42454 | c | *** |
| SoilClass | 27142 | 42455 | c | *** |
| SoilClass | 27142 | 42456 | c | *** |
| SoilClass | 27142 | 42457 | c | *** |
| SoilClass | 27142 | 42458 | c | *** |

# APPENDIX 2:
# LINKING OF TAXONOMIC TO BINOMIAL SOIL CLASSIFICATION SYSTEMS

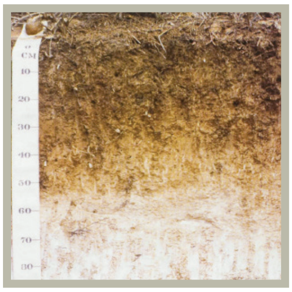
**(Schulze and Schütte, 2018; Photo credits: MacVicar et al. 1977; SCWG 1991)**

**Soil form: ADDO**
**Soil code: Ad**



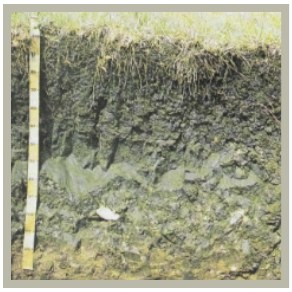
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ad1111 | Glenconnor | <6 | S (Subsoil) | Oa41 |
| Ad1111 | Glenconnor | ≥6 and <15 | S | Oa44 |
| Ad1111 | Glenconnor | ≥15 and <35 | S | Oa46 |
| Ad1111 | Glenconnor | ≥35 | S | Oa47 |
| Ad1112 | Dalby | <6 | S | Oa41 |
| Ad1112 | Dalby | ≥6 and <15 | S | Oa44 |
| Ad1112 | Dalby | ≥15 and <35 | S | Oa46 |
| Ad1112 | Dalby | ≥35 | S | Oa47 |
| Ad1121 | Centlivres | <6 | S | Oa41 |
| Ad1121 | Centlivres | ≥6 and <15 | S | Oa44 |
| Ad1121 | Centlivres | ≥15 and <35 | S | Oa46 |
| Ad1121 | Centlivres | ≥35 | S | Oa47 |
| Ad1122 | Kentvale | <6 | S | Oa41 |
| Ad1122 | Kentvale | ≥6 and <15 | S | Oa44 |
| Ad1122 | Kentvale | ≥15 and <35 | S | Oa46 |
| Ad1122 | Kentvale | ≥35 | S | Oa47 |
| Ad1211 | Spekboom | <6 | S | Oa21 |
| Ad1211 | Spekboom | ≥6 and <15 | S | Oa24 |
| Ad1211 | Spekboom | ≥15 and <35 | S | Oa26 |
| Ad1211 | Spekboom | ≥35 | S | Oa27 |
| Ad1212 | Gorah | <6 | S | Oa21 |
| Ad1212 | Gorah | ≥6 and <15 | S | Oa24 |
| Ad1212 | Gorah | ≥15 and <35 | S | Oa26 |
| Ad1212 | Gorah | ≥35 | S | Oa27 |
| Ad1221 | Walkraal | <6 | S | Oa21 |
| Ad1221 | Walkraal | ≥6 and <15 | S | Oa24 |
| Ad1221 | Walkraal | ≥15 and <35 | S | Oa26 |
| Ad1221 | Walkraal | ≥35 | S | Oa27 |
| Ad1222 | Sylvania | <6 | S | Oa21 |
| Ad1222 | Sylvania | ≥6 and <15 | S | Oa24 |
| Ad1222 | Sylvania | ≥15 and <35 | S | Oa26 |
| Ad1222 | Sylvania | ≥35 | S | Oa27 |
| Ad2111 | Maurmond | <6 | S | Oa31 |
| Ad2111 | Maurmond | ≥6 and <15 | S | Oa34 |
| Ad2111 | Maurmond | ≥15 and <35 | S | Oa36 |
| Ad2111 | Maurmond | ≥35 | S | Oa37 |
| Ad2112 | Airedale | <6 | S | Oa31 |
| Ad2112 | Airedale | ≥6 and <15 | S | Oa34 |
| Ad2112 | Airedale | ≥15 and <35 | S | Oa36 |
| Ad2112 | Airedale | ≥35 | S | Oa37 |
| Ad2121 | Felsenheim | <6 | S | Oa31 |
| Ad2121 | Felsenheim | ≥6 and <15 | S | Oa34 |
| Ad2121 | Felsenheim | ≥15 and <35 | S | Oa36 |
| Ad2121 | Felsenheim | ≥35 | S | Oa37 |
| Ad2122 | Longhill | <6 | S | Oa31 |
| Ad2122 | Longhill | ≥6 and <15 | S | Oa34 |

**Soil form: ADDO**
**Soil code: Ad**



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ad2122 | Longhill | ≥15 and <35 | S | Oa36 |
| Ad2122 | Longhill | ≥35 | S | Oa37 |
| Ad2211 | Mimosa | <6 | S | Oa11 |
| Ad2211 | Mimosa | ≥6 and <15 | S | Oa14 |
| Ad2211 | Mimosa | ≥15 and <35 | S | Oa16 |
| Ad2211 | Mimosa | ≥35 | S | Oa17 |
| Ad2212 | Peperboom | <6 | S | Oa11 |
| Ad2212 | Peperboom | ≥6 and <15 | S | Oa14 |
| Ad2212 | Peperboom | ≥15 and <35 | S | Oa16 |
| Ad2212 | Peperboom | ≥35 | S | Oa17 |
| Ad2221 | Suttondale | <6 | S | Oa11 |
| Ad2221 | Suttondale | ≥6 and <15 | S | Oa14 |
| Ad2221 | Suttondale | ≥15 and <35 | S | Oa16 |
| Ad2221 | Suttondale | ≥35 | S | Oa17 |
| Ad2222 | Tregaron | <6 | S | Oa11 |
| Ad2222 | Tregaron | ≥6 and <15 | S | Oa14 |
| Ad2222 | Tregaron | ≥15 and <35 | S | Oa16 |
| Ad2222 | Tregaron | ≥35 | S | Oa17 |

**Soil form: ARCADIA**
**Soil code: Ar**

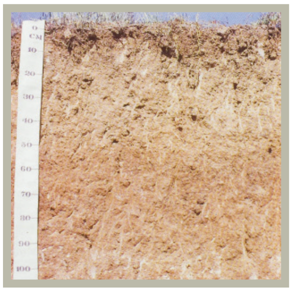


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ar1100 | Lonehill | N/A | T(Topsoil) | Ar10 |
| Ar1200 | Rustenburg | N/A | T | Ar20 |
| Ar2100 | Minerva | N/A | T | Ar11 |
| Ar2200 | Diepslot | N/A | T | Ar21 |
| Ar3100 | Bospoort | N/A | T | Ar12 |
| Ar3200 | Deercroft | N/A | T | Ar22 |

**Soil form: ASKHAM**
**Soil code: Ak**

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ak1000 | Aroab | <6 | S | Cv31 |
| Ak1000 | Aroab | ≥6 and <15 | S | Cv34 |
| Ak1000 | Aroab | ≥15 and <35 | S | Cv36 |
| Ak1000 | Aroab | ≥35 | S | Cv37 |
| Ak2000 | Noenieput | <6 | S | Cv44 |
| Ak2000 | Noenieput | ≥6 and <15 | S | Cv46 |
| Ak2000 | Noenieput | ≥15 and <35 | S | Cv47 |
| Ak2000 | Noenieput | ≥35 | S | Cv48 |
| Ag1110 | Hefnaar | <6 | S | Oa41 |
| Ag1110 | Hefnaar | ≥6 and <15 | S | Oa44 |
| Ag1110 | Hefnaar | ≥15 and <35 | S | Oa46 |
| Ag1110 | Hefnaar | ≥35 | S | Oa47 |
| Ag1120 | Giyani | <6 | S | Oa41 |
| Ag1120 | Giyani | ≥6 and <15 | S | Oa44 |
| Ag1120 | Giyani | ≥15 and <35 | S | Oa46 |
| Ag1120 | Giyani | ≥35 | S | Oa47 |
| Ag1210 | Khubus | <6 | S | Oa21 |
| Ag1210 | Khubus | ≥6 and <15 | S | Oa24 |
| Ag1210 | Khubus | ≥15 and <35 | S | Oa26 |

## Soil form: AUGRABIES
## Soil code: Ag

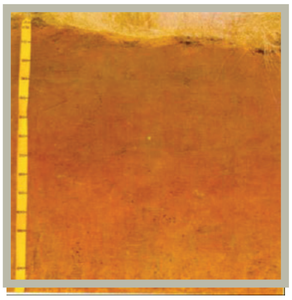


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ag1210 | Khubus | ≥35 | S | Oa27 |
| Ag1220 | Shilowa | <6 | S | Oa21 |
| Ag1220 | Shilowa | ≥6 and <15 | S | Oa24 |
| Ag1220 | Shilowa | ≥15 and <35 | S | Oa26 |
| Ag1220 | Shilowa | ≥35 | S | Oa27 |
| Ag2110 | Spoegrivier | <6 | S | Oa31 |
| Ag2110 | Spoegrivier | ≥6 and <15 | S | Oa34 |
| Ag2110 | Spoegrivier | ≥15 and <35 | S | Oa36 |
| Ag2110 | Spoegrivier | ≥35 | S | Oa37 |
| Ag2120 | Tankwa | <6 | S | Oa31 |
| Ag2120 | Tankwa | ≥6 and <15 | S | Oa34 |
| Ag2120 | Tankwa | ≥15 and <35 | S | Oa36 |
| Ag2120 | Tankwa | ≥35 | S | Oa37 |
| Ag2210 | Landplaas | <6 | S | Oa11 |
| Ag2210 | Landplaas | ≥6 and <15 | S | Oa14 |
| Ag2210 | Landplaas | ≥15 and <35 | S | Oa16 |
| Ag2210 | Landplaas | ≥35 | S | Oa17 |
| Ag2220 | Sakrivier | <6 | S | Oa11 |
| Ag2220 | Sakrivier | ≥6 and <15 | S | Oa14 |
| Ag2220 | Sakrivier | ≥15 and <35 | S | Oa16 |
| Ag2220 | Sakrivier | ≥35 | S | Oa17 |

## Soil form: AVALON
## Soil code: Av

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Av1100 | Blackmoor | ≥6 and <15 | S | Av11 |
| Av1100 | Blackmoor | ≥15 and <35 | S | Av14 |
| Av1100 | Blackmoor | ≥35 and <55 | S | Av16 |
| Av1100 | Blackmoor | ≥55 | S | Av17 |
| Av1200 | Woodburn | ≥6 and <15 | S | Av11 |
| Av1200 | Woodburn | ≥15 and <35 | S | Av14 |
| Av1200 | Woodburn | ≥35 and <55 | S | Av16 |
| Av1200 | Woodburn | ≥55 | S | Av17 |
| Av2100 | Avondale | ≥6 and <15 | S | Av21 |
| Av2100 | Avondale | ≥15 and <35 | S | Av24 |
| Av2100 | Avondale | ≥35 and <55 | S | Av26 |
| Av2100 | Avondale | ≥55 | S | Av27 |
| Av2200 | Vryheid | ≥6 and <15 | S | Av21 |
| Av2200 | Vryheid | ≥15 and <35 | S | Av24 |
| Av2200 | Vryheid | ≥35 and <55 | S | Av26 |
| Av2200 | Vryheid | ≥55 | S | Av27 |
| Av3100 | Kameelbos | ≥6 and <15 | S | Av31 |
| Av3100 | Kameelbos | ≥15 and <35 | S | Av34 |
| Av3100 | Kameelbos | ≥35 and <55 | S | Av36 |
| Av3100 | Kameelbos | ≥55 | S | Av37 |
| Av3200 | Mafikeng | ≥6 and <15 | S | Av31 |
| Av3200 | Mafikeng | ≥15 and <35 | S | Av34 |
| Av3200 | Mafikeng | ≥35 and <55 | S | Av36 |
| Av3200 | Mafikeng | ≥55 | S | Av37 |

## Soil form: BAINSVLEI
## Soil code: Bv



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Bv1100 | Morningside | <6 | S | Bv11 |
| Bv1100 | Morningside | ≥6 and <15 | S | Bv14 |
| Bv1100 | Morningside | ≥15 and <35 | S | Bv16 |
| Bv1100 | Morningside | ≥35 | S | Bv17 |
| Bv1200 | Roodebult | <6 | S | Bv11 |
| Bv1200 | Roodebult | ≥6 and <15 | S | Bv14 |
| Bv1200 | Roodebult | ≥15 and <35 | S | Bv16 |
| Bv1200 | Roodebult | ≥35 | S | Bv17 |
| Bv2100 | Brandkraal | <6 | S | Bv21 |
| Bv2100 | Brandkraal | ≥6 and <15 | S | Bv24 |
| Bv2100 | Brandkraal | ≥15 and <35 | S | Bv26 |
| Bv2100 | Brandkraal | ≥35 | S | Bv27 |
| Bv2200 | Moorfield | <6 | S | Bv21 |
| Bv2200 | Moorfield | ≥6 and <15 | S | Bv24 |
| Bv2200 | Moorfield | ≥15 and <35 | S | Bv26 |
| Bv2200 | Moorfield | ≥35 | S | Bv27 |
| Bv3100 | Florida | <6 | S | Bv31 |
| Bv3100 | Florida | ≥6 and <15 | S | Bv34 |
| Bv3100 | Florida | ≥15 and <35 | S | Bv36 |
| Bv3100 | Florida | ≥35 | S | Bv37 |
| Bv3200 | Amalia | <6 | S | Bv31 |
| Bv3200 | Amalia | ≥6 and <15 | S | Bv34 |
| Bv3200 | Amalia | ≥15 and <35 | S | Bv36 |
| Bv3200 | Amalia | ≥35 | S | Bv37 |

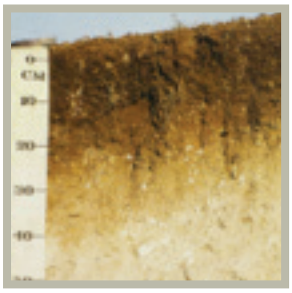
## Soil form: BLOEMDAL
## Soil code: Bd

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Bd1100 | Aandrus | <6 | S | Hu11 |
| Bd1100 | Aandrus | ≥6 and <15 | S | Hu14 |
| Bd1100 | Aandrus | ≥15 and <35 | S | Hu16 |
| Bd1100 | Aandrus | ≥35 | S | Hu17 |
| Bd1200 | Wilton | <6 | S | Hu11 |
| Bd1200 | Wilton | ≥6 and <15 | S | Hu14 |
| Bd1200 | Wilton | ≥15 and <35 | S | Hu16 |
| Bd1200 | Wilton | ≥35 | S | Hu17 |
| Bd2100 | Rietpoort | <6 | S | Hu21 |
| Bd2100 | Rietpoort | ≥6 and <15 | S | Hu24 |
| Bd2100 | Rietpoort | ≥15 and <35 | S | Hu26 |
| Bd2100 | Rietpoort | ≥35 | S | Hu27 |
| Bd2200 | Waldo | <6 | S | Hu21 |
| Bd2200 | Waldo | ≥6 and <15 | S | Hu24 |
| Bd2200 | Waldo | ≥15 and <35 | S | Hu26 |
| Bd2200 | Waldo | ≥35 | S | Hu27 |
| Bd3100 | Vrede | <6 | S | Hu31 |
| Bd3100 | Vrede | ≥6 and <15 | S | Hu34 |
| Bd3100 | Vrede | ≥15 and <35 | S | Hu36 |
| Bd3100 | Vrede | ≥35 | S | Hu37 |
| Bd3200 | Roodeplaat | <6 | S | Hu31 |
| Bd3200 | Roodeplaat | ≥6 and <15 | S | Hu34 |
| Bd3200 | Roodeplaat | ≥15 and <35 | S | Hu36 |
| Bd3200 | Roodeplaat | ≥35 | S | Hu37 |

## Soil form: BONHEIM
## Soil code: B0

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Bo1110 | Eureka | <35 | T | Bo10 |
| Bo1110 | Eureka | ≥35 | T | Bo11 |
| Bo1110 | Eureka | <35 | T | Bo20 |
| Bo1110 | Eureka | ≥35 | T | Bo21 |
| Bo1210 | Windermere | <35 | T | Bo10 |
| Bo1210 | Windermere | ≥35 | T | Bo11 |
| Bo1210 | Windermere | <35 | T | Bo20 |
| Bo1210 | Windermere | ≥35 | T | Bo21 |
| Bo2110 | Golela | <35 | T | Bo10 |
| Bo2110 | Golela | ≥35 | T | Bo11 |
| Bo2110 | Golela | <35 | T | Bo20 |
| Bo2110 | Golela | ≥35 | T | Bo21 |
| Bo2210 | Rockvale | <35 | T | Bo10 |
| Bo2210 | Rockvale | ≥35 | T | Bo11 |
| Bo2210 | Rockvale | <35 | T | Bo20 |
| Bo2210 | Rockvale | ≥35 | T | Bo21 |
| Bo3110 | Tembani | <35 | T | Bo30 |
| Bo3110 | Tembani | ≥35 | T | Bo31 |
| Bo3110 | Tembani | <35 | T | Bo40 |
| Bo3110 | Tembani | ≥35 | T | Bo41 |
| Bo3210 | Lutengele | <35 | T | Bo30 |
| Bo3210 | Lutengele | ≥35 | T | Bo31 |
| Bo3210 | Lutengele | <35 | T | Bo40 |
| Bo3210 | Lutengele | ≥35 | T | Bo41 |

## Soil form: BRANDVLEI
## Soil code: Br

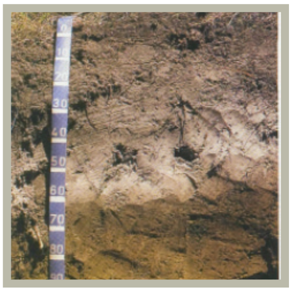


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Br1000 | Grootvloer | <6 | S | Oa11 |
| Br1000 | Grootvloer | ≥6 and <15 | S | Oa14 |
| Br1000 | Grootvloer | ≥15 and <35 | S | Oa16 |
| Br1000 | Grootvloer | ≥35 | S | Oa17 |
| Br2000 | Kolke | <6 | S | Oa11 |
| Br2000 | Kolke | ≥6 and <15 | S | Oa14 |
| Br2000 | Kolke | ≥15 and <35 | S | Oa16 |
| Br2000 | Kolke | ≥35 | S | Oa17 |

## Soil form: CARTREF
## Soil code: Cf

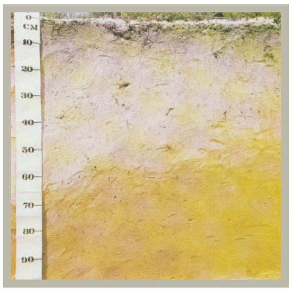
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cf1100 | Frosterley | <6 | S | Cf10 |
| Cf1100 | Frosterley | ≥6 and <15 | S | Cf11 |
| Cf1100 | Frosterley | ≥15 and <35 | S | Cf12 |
| Cf1100 | Frosterley | ≥35 | S | Cf13 |
| Cf1200 | Egolomi | <6 | S | Cf10 |
| Cf1200 | Egolomi | ≥6 and <15 | S | Cf11 |
| Cf1200 | Egolomi | ≥15 and <35 | S | Cf12 |
| Cf1200 | Egolomi | ≥35 | S | Cf13 |
| Cf2100 | Steenbras | <6 | S | Cf10 |
| Cf2100 | Steenbras | ≥6 and <15 | S | Cf11 |
| Cf2100 | Steenbras | ≥15 and <35 | S | Cf12 |
| Cf2100 | Steenbras | ≥35 | S | Cf13 |
| Cf2200 | Witzenberg | <6 | S | Cf10 |
| Cf2200 | Witzenberg | ≥6 and <15 | S | Cf11 |
| Cf2200 | Witzenberg | ≥15 and <35 | S | Cf12 |

**Soil form: CONCORDIA**
**Soil code: Cc**



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cf2200 | Witzenberg | ≥35 | S | Cf13 |
| Cc1000 | Spioenkop | <6 | S | Lt11 |
| Cc1000 | Spioenkop | ≥6 | S | Lt14 |
| Cc2000 | Windheuwel | <6 | S | Lt21 |

**Soil form: CONSTANTIA**
**Soil code: Cc**



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cc2000 | Windheuwel | ≥6 | S | Lt24 |
| Ct1100 | Potberg | <6 | S | Ct21 |
| Ct1100 | Potberg | ≥6 and <15 | S | Ct14 |
| Ct1200 | Philippi | <6 | S | Ct21 |
| Ct1200 | Philippi | ≥6 and <15 | S | Ct24 |
| Ct2100 | Papegaaikop | <6 | S | Ct21 |
| Ct2100 | Papegaaikop | ≥6 and <15 | S | Ct24 |
| Ct2200 | Thesen | <6 | S | Ct21 |

**Soil form: CHAMPAGNE**
**Soil code: Ch**

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ct2200 | Thesen | ≥6 and <15 | S | Ct24 |
| Ch1100 | Gwaing | <20 | N/A | Ch11 |
| Ch1100 | Gwaing | ≥20 | N/A | Ch21 |
| Ch1200 | Manhica | <20 | N/A | Ch11 |
| Ch1200 | Manhica | ≥20 | N/A | Ch21 |
| Ch2100 | Graskop | <20 | N/A | Ch11 |
| Ch2100 | Graskop | ≥20 | N/A | Ch21 |
| Ch2100 | Rietfontein | <20 | N/A | Ch11 |

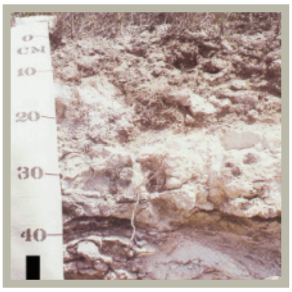
**Soil form: CLOVELLY**
**Soil code: Cv**

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ch2100 | Rietfontein | ≥20 | N/A | Ch21 |
| Cv1100 | Twyfelaar | <6 | S | Cv11 |
| Cv1100 | Twyfelaar | ≥6 and <15 | S | Cv14 |
| Cv1100 | Twyfelaar | ≥15 and <35 | S | Cv16 |
| Cv1100 | Twyfelaar | ≥35 and <55 | S | Cv17 |
| Cv1100 | Twyfelaar | ≥55 | S | Cv18 |
| Cv1200 | Brereton | <6 | S | Cv11 |
| Cv1200 | Brereton | ≥6 and <15 | S | Cv14 |
| Cv1200 | Brereton | ≥15 and <35 | S | Cv16 |
| Cv1200 | Brereton | ≥35 and <55 | S | Cv17 |
| Cv1200 | Brereton | ≥55 | S | Cv18 |
| Cv2100 | Buckland | <6 | S | Cv21 |
| Cv2100 | Buckland | ≥6 and <15 | S | Cv24 |
| Cv2100 | Buckland | ≥15 and <35 | S | Cv26 |
| Cv2100 | Buckland | ≥35 and <55 | S | Cv27 |

## Soil form: CLOVELLY
## Soil code: Cv

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cv2100 | Buckland | ≥55 | S | Cv28 |
| Cv2200 | Leiden | <6 | S | Cv21 |
| Cv2200 | Leiden | ≥6 and <15 | S | Cv24 |
| Cv2200 | Leiden | ≥15 and <35 | S | Cv26 |
| Cv2200 | Leiden | ≥35 and <55 | S | Cv27 |
| Cv2200 | Leiden | ≥55 | S | Cv28 |
| Cv3100 | Setlagole | <6 | S | Cv31 |
| Cv3100 | Setlagole | ≥6 and <15 | S | Cv34 |
| Cv3100 | Setlagole | ≥15 and <35 | S | Cv36 |
| Cv3100 | Setlagole | ≥35 and <55 | S | Cv37 |
| Cv3100 | Setlagole | ≥55 | S | Cv38 |
| Cv3200 | Mooilaagte | <6 | S | Cv31 |
| Cv3200 | Mooilaagte | ≥6 and <15 | S | Cv34 |
| Cv3200 | Mooilaagte | ≥15 and <35 | S | Cv36 |
| Cv3200 | Mooilaagte | ≥35 and <55 | S | Cv37 |

## Soil form: COEGA
## Soil code: Cg



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cv3200 | Mooilaagte | ≥55 | S | Cv38 |
| Cg1000 | Nabies | N/A | N/A | Ms10 |

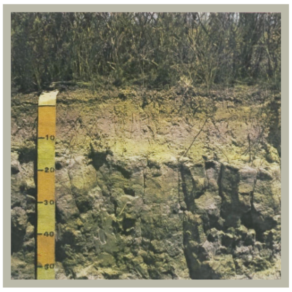
## Soil form: DRESDEN
## Soil code: Dr

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Cg2000 | Marydale | N/A | N/A | Ms22 |

## Soil form: DUNDEE
## Soil code: Du

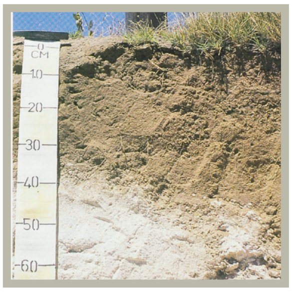
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Dr1000 | Tevreden | N/A | N/A | Ms22 |
| Dr2000 | Hilldrop | N/A | N/A | Ms12 |
| Du1110 | Nonoti | N/A | N/A | Du10 |
| Du1120 | Sabie | N/A | N/A | Du10 |
| Du1210 | Mtamvuna | N/A | N/A | Du10 |
| Du1220 | Kowie | N/A | N/A | Du10 |
| Du2110 | Marico | N/A | N/A | Du10 |
| Du2120 | Visrivier | N/A | N/A | Du10 |

## Soil form: ESTCOURT
## Soil code: Es



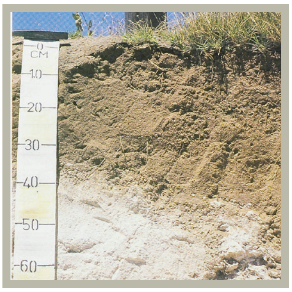
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Du2210 | Seekoei | N/A | N/A | Du10 |
| Du2220 | Olifants | N/A | N/A | Du10 |
| Es1100 | Zastron | <6 | S | Es31 |
| Es1100 | Zastron | ≥6 and <15 | S | Es34 |
| Es1100 | Zastron | ≥15 and <35 | S | Es36 |
| Es1100 | Zastron | ≥35 | S | Es37 |
| Es1200 | Nuweplaas | <6 | S | Es11 |
| Es1200 | Nuweplaas | ≥6 and <15 | S | Es14 |
| Es1200 | Nuweplaas | ≥15 and <35 | S | Es16 |
| Es1200 | Nuweplaas | ≥35 | S | Es17 |
| Es2100 | Chiltern | <6 | S | Es31 |
| Es2100 | Chiltern | ≥6 and <15 | S | Es34 |
| Es2100 | Chiltern | ≥15 and <35 | S | Es36 |
| Es2100 | Chiltern | ≥35 | S | Es37 |
| Es2200 | Haarlem | <6 | S | Es11 |
| Es2200 | Haarlem | ≥6 and <15 | S | Es14 |

## Soil form: ETOSHA
## Soil code: Et



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Es2200 | Haarlem | ≥15 and <35 | S | Es16 |
| Es2200 | Haarlem | ≥35 | S | Es17 |
| Et1111 | Platdoorns | <6 | S | Oa31 |
| Et1111 | Platdoorns | ≥6 and <15 | S | Oa34 |
| Et1111 | Platdoorns | ≥15 and <35 | S | Oa36 |
| Et1111 | Platdoorns | ≥35 | S | Oa37 |
| Et1112 | Belmont | <6 | S | Oa31 |
| Et1112 | Belmont | ≥6 and <15 | S | Oa34 |
| Et1112 | Belmont | ≥15 and <35 | S | Oa36 |
| Et1112 | Belmont | ≥35 | S | Oa37 |
| Et1121 | Oshivelo | <6 | S | Oa31 |
| Et1121 | Oshivelo | ≥6 and <15 | S | Oa34 |
| Et1121 | Oshivelo | ≥15 and <35 | S | Oa36 |
| Et1121 | Oshivelo | ≥35 | S | Oa37 |
| Et1122 | Oshikati | <6 | S | Oa31 |
| Et1122 | Oshikati | ≥6 and <15 | S | Oa34 |
| Et1122 | Oshikati | ≥15 and <35 | S | Oa36 |
| Et1122 | Oshikati | ≥35 | S | Oa37 |
| Et1211 | Tuli | <6 | S | Oa11 |
| Et1211 | Tuli | ≥6 and <15 | S | Oa14 |
| Et1211 | Tuli | ≥15 and <35 | S | Oa16 |
| Et1211 | Tuli | ≥35 | S | Oa17 |
| Et1212 | Kildare | <6 | S | Oa11 |
| Et1212 | Kildare | ≥6 and <15 | S | Oa14 |
| Et1212 | Kildare | ≥15 and <35 | S | Oa16 |
| Et1212 | Kildare | ≥35 | S | Oa17 |
| Et1221 | Pontdrif | <6 | S | Oa11 |
| Et1221 | Pontdrif | ≥6 and <15 | S | Oa14 |
| Et1221 | Pontdrif | ≥15 and <35 | S | Oa16 |
| Et1221 | Pontdrif | ≥35 | S | Oa17 |
| Et1222 | Tierkloof | <6 | S | Oa11 |
| Et1222 | Tierkloof | ≥6 and <15 | S | Oa14 |

## Soil form: ETOSHA
## Soil code: Et




| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Et1222 | Tierkloof | ≥15 and <35 | S | Oa16 |
| Et1222 | Tierkloof | ≥35 | S | Oa17 |
| Et2111 | Vetkuil | <6 | S | Oa31 |
| Et2111 | Vetkuil | ≥6 and <15 | S | Oa34 |
| Et2111 | Vetkuil | ≥15 and <35 | S | Oa36 |
| Et2111 | Vetkuil | ≥35 | S | Oa37 |
| Et2112 | Sannieshof | <6 | S | Oa31 |
| Et2112 | Sannieshof | ≥6 and <15 | S | Oa34 |
| Et2112 | Sannieshof | ≥15 and <35 | S | Oa36 |
| Et2112 | Sannieshof | ≥35 | S | Oa37 |
| Et2121 | Namutoni | <6 | S | Oa31 |
| Et2121 | Namutoni | ≥6 and <15 | S | Oa34 |
| Et2121 | Namutoni | ≥15 and <35 | S | Oa36 |
| Et2121 | Namutoni | ≥35 | S | Oa37 |
| Et2122 | Ombalantu | <6 | S | Oa31 |
| Et2122 | Ombalantu | ≥6 and <15 | S | Oa34 |
| Et2122 | Ombalantu | ≥15 and <35 | S | Oa36 |
| Et2122 | Ombalantu | ≥35 | S | Oa37 |
| Et2211 | Armoed | <6 | S | Oa11 |
| Et2211 | Armoed | ≥6 and <15 | S | Oa14 |
| Et2211 | Armoed | ≥15 and <35 | S | Oa16 |
| Et2211 | Armoed | ≥35 | S | Oa17 |
| Et2212 | Migdol | <6 | S | Oa11 |
| Et2212 | Migdol | ≥6 and <15 | S | Oa14 |
| Et2212 | Migdol | ≥15 and <35 | S | Oa16 |
| Et2212 | Migdol | ≥35 | S | Oa17 |
| Et2221 | Ulco | <6 | S | Oa11 |
| Et2221 | Ulco | ≥6 and <15 | S | Oa14 |
| Et2221 | Ulco | ≥15 and <35 | S | Oa16 |
| Et2221 | Ulco | ≥35 | S | Oa17 |
| Et2222 | Lieberwalt | <6 | S | Oa11 |
| Et2222 | Lieberwalt | ≥6 and <15 | S | Oa14 |

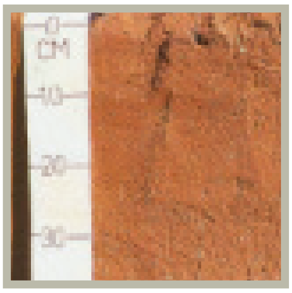
## Soil form: FERNWOOD
## Soil code: Fw

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Et2222 | Lieberwalt | ≥15 and <35 | S | Oa16 |
| Et2222 | Lieberwalt | ≥35 | S | Oa17 |
| Fw1110 | Penicuik | N/A | S | Fw11 |
| Fw1120 | Cornubia | N/A | S | Fw11 |
| Fw1210 | Hopefield | N/A | S | Fw11 |
| Fw1220 | Duinzicht | N/A | S | Fw11 |
| Fw2110 | Waterton | N/A | S | Fw31 |
| Fw2120 | Kwambonambi | N/A | S | Fw31 |

### Soil form: GAMOEP
### Soil code: Gm

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Fw2210 | Rosa | N/A | S | Fw31 |
| Fw2220 | Keimouth | N/A | S | Fw31 |
| Gm1110 | Ghaap | <6 | S | Oa31 |
| Gm1110 | Ghaap | ≥6 and <15 | S | Oa34 |
| Gm1110 | Ghaap | ≥15 and <35 | S | Oa36 |
| Gm1110 | Ghaap | ≥35 | S | Oa37 |
| Gm1120 | Gletwyn | <6 | S | Oa31 |
| Gm1120 | Gletwyn | ≥6 and <15 | S | Oa34 |
| Gm1120 | Gletwyn | ≥15 and <35 | S | Oa36 |
| Gm1120 | Gletwyn | ≥35 | S | Oa37 |
| Gm1210 | Kirkwood | <6 | S | Oa21 |
| Gm1210 | Kirkwood | ≥6 and <15 | S | Oa24 |
| Gm1210 | Kirkwood | ≥15 and <35 | S | Oa26 |
| Gm1210 | Kirkwood | ≥35 | S | Oa27 |
| Gm1220 | Merriman | <6 | S | Oa21 |
| Gm1220 | Merriman | ≥6 and <15 | S | Oa24 |
| Gm1220 | Merriman | ≥15 and <35 | S | Oa26 |
| Gm1220 | Merriman | ≥35 | S | Oa27 |
| Gm2110 | Vyekraal | <6 | S | Oa31 |
| Gm2110 | Vyekraal | ≥6 and <15 | S | Oa34 |
| Gm2110 | Vyekraal | ≥15 and <35 | S | Oa36 |
| Gm2110 | Vyekraal | ≥35 | S | Oa37 |
| Gm2120 | Klondyke | <6 | S | Oa31 |
| Gm2120 | Klondyke | ≥6 and <15 | S | Oa34 |
| Gm2120 | Klondyke | ≥15 and <35 | S | Oa36 |
| Gm2120 | Klondyke | ≥35 | S | Oa37 |
| Gm2210 | Deepdrift | <6 | S | Oa21 |
| Gm2210 | Deepdrift | ≥6 and <15 | S | Oa24 |
| Gm2210 | Deepdrift | ≥15 and <35 | S | Oa26 |
| Gm2210 | Deepdrift | ≥35 | S | Oa27 |
| Gm2220 | Conway | <6 | S | Oa21 |
| Gm2220 | Conway | ≥6 and <15 | S | Oa24 |

### Soil form: GARIES
### Soil code: Gr

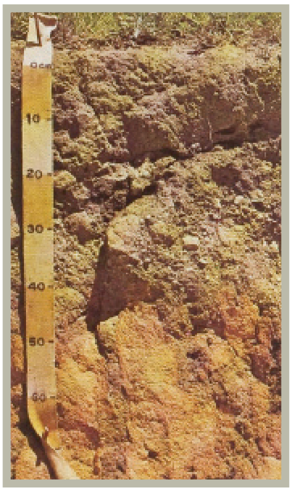


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gm2220 | Conway | ≥15 and <35 | S | Oa26 |
| Gm2220 | Conway | ≥35 | S | Oa27 |
| Gr1000 | Nuwerus | <6 | S | Hu21 |
| Gr1000 | Nuwerus | ≥6 and <15 | S | Hu24 |
| Gr1000 | Nuwerus | ≥15 and <35 | S | Hu26 |
| Gr1000 | Nuwerus | ≥35 and <55 | S | Hu27 |
| Gr1000 | Nuwerus | ≥55 | S | Hu28 |
| Gr2000 | Kotzesrus | <6 | S | Hu21 |
| Gr2000 | Kotzesrus | ≥6 and <15 | S | Hu24 |
| Gr2000 | Kotzesrus | ≥15 and <35 | S | Hu26 |

## Soil form: GLENCOE
## Soil code: Gc

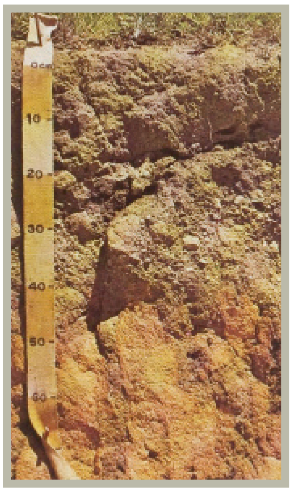
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gr2000 | Kotzesrus | ≥35 and <55 | S | Hu27 |
| Gr2000 | Kotzesrus | ≥55 | S | Hu28 |
| Gc1100 | Leeupan | <6 | S | Gc11 |
| Gc1100 | Leeupan | ≥6 and <15 | S | Gc14 |
| Gc1100 | Leeupan | ≥15 and <35 | S | Gc16 |
| Gc1100 | Leeupan | ≥35 | S | Gc17 |
| Gc1200 | Springvale | <6 | S | Gc11 |
| Gc1200 | Springvale | ≥6 and <15 | S | Gc14 |
| Gc1200 | Springvale | ≥15 and <35 | S | Gc16 |
| Gc1200 | Springvale | ≥35 | S | Gc17 |
| Gc2100 | Driehoek | <6 | S | Gc21 |
| Gc2100 | Driehoek | ≥6 and <15 | S | Gc24 |
| Gc2100 | Driehoek | ≥15 and <35 | S | Gc26 |
| Gc2100 | Driehoek | ≥35 | S | Gc27 |
| Gc2200 | Croyden | <6 | S | Gc21 |
| Gc2200 | Croyden | ≥6 and <15 | S | Gc24 |
| Gc2200 | Croyden | ≥15 and <35 | S | Gc26 |
| Gc2200 | Croyden | ≥35 | S | Gc27 |
| Gc3100 | Draaihoek | <6 | S | Gc31 |
| Gc3100 | Draaihoek | ≥6 and <15 | S | Gc34 |
| Gc3100 | Draaihoek | ≥15 and <35 | S | Gc35 |
| Gc3100 | Draaihoek | ≥35 | S | Gc36 |
| Gc3200 | Vlakput | <6 | S | Gc31 |
| Gc3200 | Vlakput | ≥6 and <15 | S | Gc34 |

## Soil form: GLENROSA
## Soil code: Gs



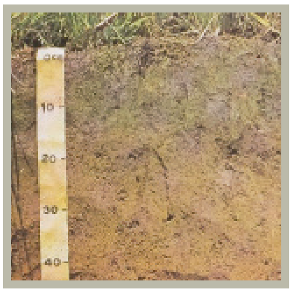
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gc3200 | Vlakput | ≥15 and <35 | S | Gc35 |
| Gc3200 | Vlakput | ≥35 | S | Gc36 |
| Gs1111 | Dumisa | <6 | T | Gs10 |
| Gs1111 | Dumisa | ≥6 and <15 | T | Gs14 |
| Gs1111 | Dumisa | ≥15 and <35 | T | Gs17 |
| Gs1111 | Dumisa | ≥35 | T | Gs19 |
| Gs1112 | Keurkloof | <6 | T | Gs20 |
| Gs1112 | Keurkloof | ≥6 and <15 | T | Gs24 |
| Gs1112 | Keurkloof | ≥15 and <35 | T | Gs27 |
| Gs1112 | Keurkloof | ≥35 | T | Gs29 |
| Gs1121 | Kilspindie | <6 | T | Gs10 |
| Gs1121 | Kilspindie | ≥6 and <15 | T | Gs14 |
| Gs1121 | Kilspindie | ≥15 and <35 | T | Gs17 |
| Gs1121 | Kilspindie | ≥35 | T | Gs19 |
| Gs1122 | Kammievlei | <6 | T | Gs20 |
| Gs1122 | Kammievlei | ≥6 and <15 | T | Gs24 |
| Gs1122 | Kammievlei | ≥15 and <35 | T | Gs27 |
| Gs1122 | Kammievlei | ≥35 | T | Gs29 |
| Gs1211 | Tsende | <6 | T | Gs10 |
| Gs1211 | Tsende | ≥6 and <15 | T | Gs14 |
| Gs1211 | Tsende | ≥15 and <35 | T | Gs17 |
| Gs1211 | Tsende | ≥35 | T | Gs19 |
| Gs1212 | Bergsig | <6 | T | Gs20 |
| Gs1212 | Bergsig | ≥6 and <15 | T | Gs24 |
| Gs1212 | Bergsig | ≥15 and <35 | T | Gs27 |

## Soil form: GLENROSA
## Soil code: Gs



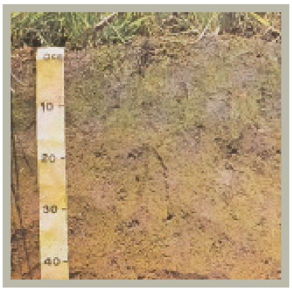
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gs1212 | Bergsig | ≥35 | T | Gs29 |
| Gs1221 | Maringo | <6 | T | Gs10 |
| Gs1221 | Maringo | ≥6 and <15 | T | Gs14 |
| Gs1221 | Maringo | ≥15 and <35 | T | Gs17 |
| Gs1221 | Maringo | ≥35 | T | Gs19 |
| Gs1222 | Wheatland | <6 | T | Gs20 |
| Gs1222 | Wheatland | ≥6 and <15 | T | Gs24 |
| Gs1222 | Wheatland | ≥15 and <35 | T | Gs27 |
| Gs1222 | Wheatland | ≥35 | T | Gs29 |
| Gs2111 | Overberg | <6 | T | Gs10 |
| Gs2111 | Overberg | ≥6 and <15 | T | Gs14 |
| Gs2111 | Overberg | ≥15 and <35 | T | Gs17 |
| Gs2111 | Overberg | ≥35 | T | Gs19 |
| Gs2112 | Inverdoorn | <6 | T | Gs20 |
| Gs2112 | Inverdoorn | ≥6 and <15 | T | Gs24 |
| Gs2112 | Inverdoorn | ≥15 and <35 | T | Gs27 |
| Gs2112 | Inverdoorn | ≥35 | T | Gs29 |
| Gs2121 | Botrivier | <6 | T | Gs10 |
| Gs2121 | Botrivier | ≥6 and <15 | T | Gs14 |
| Gs2121 | Botrivier | ≥15 and <35 | T | Gs17 |
| Gs2121 | Botrivier | ≥35 | T | Gs19 |
| Gs2122 | Teviot | <6 | T | Gs20 |
| Gs2122 | Teviot | ≥6 and <15 | T | Gs24 |
| Gs2122 | Teviot | ≥15 and <35 | T | Gs27 |
| Gs2122 | Teviot | ≥35 | T | Gs29 |
| Gs2211 | Bisho | <6 | T | Gs10 |
| Gs2211 | Bisho | ≥6 and <15 | T | Gs14 |
| Gs2211 | Bisho | ≥15 and <35 | T | Gs17 |
| Gs2211 | Bisho | ≥35 | T | Gs19 |
| Gs2212 | Kakamas | <6 | T | Gs20 |
| Gs2212 | Kakamas | ≥6 and <15 | T | Gs24 |
| Gs2212 | Kakamas | ≥15 and <35 | T | Gs27 |
| Gs2212 | Kakamas | ≥35 | T | Gs29 |
| Gs2221 | Solitude | <6 | T | Gs10 |
| Gs2221 | Solitude | ≥6 and <15 | T | Gs14 |
| Gs2221 | Solitude | ≥15 and <35 | T | Gs17 |
| Gs2221 | Solitude | ≥35 | T | Gs19 |
| Gs2222 | Merwespont | <6 | T | Gs20 |
| Gs2222 | Merwespont | ≥6 and <15 | T | Gs24 |

## Soil form: GRIFFIN
## Soil code: Gf



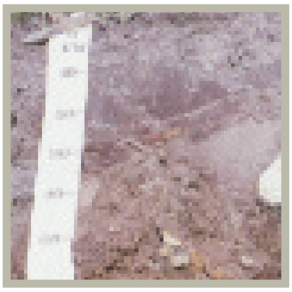
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gs2222 | Merwespont | ≥15 and <35 | T | Gs27 |
| Gs2222 | Merwespont | ≥35 | T | Gs29 |
| Gf1100 | Woodstock | ≥6 and <15 | S | Gf10 |
| Gf1100 | Woodstock | ≥15 and <35 | S | Gf11 |
| Gf1100 | Woodstock | ≥35 and < 55 | S | Gf12 |
| Gf1100 | Woodstock | ≥55 | S | Gf13 |
| Gf1200 | Deelspruit | ≥6 and <15 | S | Gf10 |
| Gf1200 | Deelspruit | ≥15 and <35 | S | Gf11 |
| Gf1200 | Deelspruit | ≥35 and <55 | S | Gf12 |
| Gf1200 | Deelspruit | ≥55 | S | Gf13 |
| Gf2100 | Maritzdrif | ≥6 and <15 | S | Gf20 |

## Soil form: GRIFFIN
## Soil code: Gf



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gf2100 | Maritzdrif | ≥15 and <35 | S | Gf21 |
| Gf2100 | Maritzdrif | ≥35 and <55 | S | Gf22 |
| Gf2100 | Maritzdrif | ≥55 | S | Gf23 |
| Gf2200 | Braeside | ≥6 and <15 | S | Gf20 |
| Gf2200 | Braeside | ≥15 and <35 | S | Gf21 |

## Soil form: GROENKOP
## Soil code: Gk

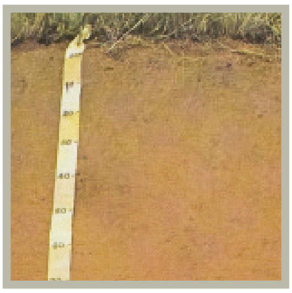


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gf2200 | Braeside | ≥35 and <55 | S | Gf22 |
| Gf2200 | Braeside | ≥55 | S | Gf23 |
| Gk1100 | Bosrug | <6 | T | Ss11 |
| Gk1100 | Bosrug | ≥6 and <15 | T | Ss14 |
| Gk1200 | Ratelbos | <6 | T | Ss11 |
| Gk1200 | Ratelbos | ≥6 and <15 | T | Ss14 |
| Gk2100 | Noordhoek | <6 | T | Ss11 |
| Gk2100 | Noordhoek | ≥6 and <15 | T | Ss14 |

## Soil form: HOUWHOEK
## Soil code: Hh

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Gk2200 | Tierkop | <6 | T | Ss11 |
| Gk2200 | Tierkop | ≥6 and <15 | T | Ss14 |
| Hh1100 | Bergplaas | <6 | S | Hh30 |
| Hh1100 | Bergplaas | ≥6 | S | Hh31 |
| Hh1200 | Keurrug | <6 | S | Hh30 |
| Hh1200 | Keurrug | ≥6 | S | Hh31 |
| Hh2100 | Kouma | <6 | S | Hh10 |
| Hh2100 | Kouma | ≥6 | S | Hh11 |

## Soil form: HUTTON
## Soil code: Hu

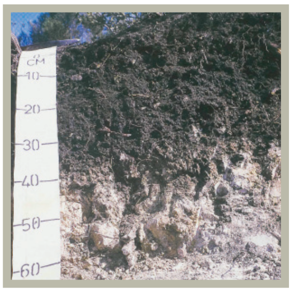


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Hh2200 | Ysternek | <6 | S | Hh10 |
| Hh2200 | Ysternek | ≥6 | S | Hh11 |
| Hu1100 | Lillieburn | <6 | S | Hu11 |
| Hu1100 | Lillieburn | ≥6 and <15 | S | Hu14 |
| Hu1100 | Lillieburn | ≥15 and <35 | S | Hu16 |
| Hu1100 | Lillieburn | ≥35 and <55 | S | Hu17 |
| Hu1100 | Lillieburn | ≥55 | S | Hu18 |
| Hu1200 | Kelvin | <6 | S | Hu11 |
| Hu1200 | Kelvin | ≥6 and <15 | S | Hu14 |
| Hu1200 | Kelvin | ≥15 and <35 | S | Hu16 |
| Hu1200 | Kelvin | ≥35 and <55 | S | Hu17 |
| Hu1200 | Kelvin | ≥55 | S | Hu18 |
| Hu2100 | Hayfield | <6 | S | Hu21 |
| Hu2100 | Hayfield | ≥6 and <15 | S | Hu24 |
| Hu2100 | Hayfield | ≥15 and <35 | S | Hu26 |
| Hu2100 | Hayfield | ≥35 and <55 | S | Hu27 |
| Hu2100 | Hayfield | ≥55 | S | Hu28 |
| Hu2200 | Suurbekom | <6 | S | Hu21 |
| Hu2200 | Suurbekom | ≥6 and <15 | S | Hu24 |
| Hu2200 | Suurbekom | ≥15 and <35 | S | Hu26 |

## Soil form: HUTTON
## Soil code: Hu

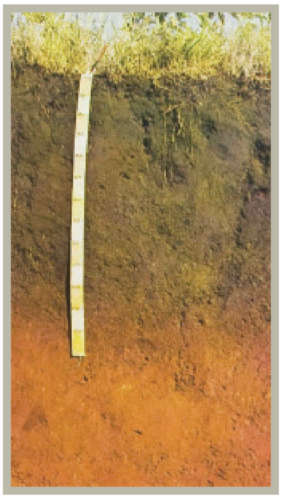
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Hu2200 | Suurbekom | ≥35 and <55 | S | Hu27 |
| Hu2200 | Suurbekom | ≥55 | S | Hu28 |
| Hu3100 | Stella | <6 | S | Hu31 |
| Hu3100 | Stella | ≥6 and <15 | S | Hu34 |
| Hu3100 | Stella | ≥15 and <35 | S | Hu36 |
| Hu3100 | Stella | ≥35 and <55 | S | Hu37 |
| Hu3100 | Stella | ≥55 | S | Hu38 |
| Hu3200 | Ventersdorp | <6 | S | Hu31 |
| Hu3200 | Ventersdorp | ≥6 and <15 | S | Hu34 |
| Hu3200 | Ventersdorp | ≥15 and <35 | S | Hu36 |

## Soil form: IMMERPAN
## Soil code: Im




| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Hu3200 | Ventersdorp | ≥35 and <55 | S | Hu37 |
| Hu3200 | Ventersdorp | ≥55 | S | Hu38 |
| Im1000 | Kilkenny | <35 | T | Mw10 |
| Im1000 | Kilkenny | ≥35 | T | Mw11 |

## Soil form: INANDA
## Soil code: Is



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Im2000 | Kalkpan | <35 | T | Mw20 |
| Im2000 | Kalkpan | ≥35 | T | Mw21 |
| Ia1100 | Himeville | ≥15 and <35 | S | Ia10 |
| Ia1100 | Himeville | ≥35 and <55 | S | Ia11 |
| Ia1100 | Himeville | ≥55 | S | Ia12 |
| Ia1200 | Highlands | <35 | S | Ia10 |
| Ia1200 | Highlands | ≥35 | S | Ia12 |
| Ia2100 | Mayfield | ≥15 and <35 | S | Ia10 |
| Ia2100 | Mayfield | ≥35 and <55 | S | Ia11 |
| Ia2100 | Mayfield | ≥55 | S | Ia12 |

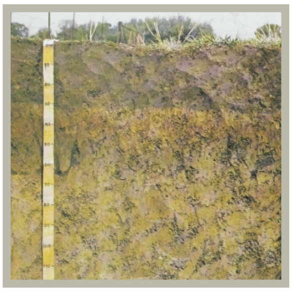
## Soil form: INHOEK
## Soil code: Ik

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ia2200 | Glenariff | <35 | S | Ia10 |
| Ia2200 | Glenariff | ≥35 | S | Ia12 |
| Ik1100 | Oatlands | <35 | T | Ik10 |
| Ik1100 | Oatlands | ≥35 | T | Ik11 |
| Ik1200 | Shingwedzi | <35 | T | Ik20 |
| Ik1200 | Shingwedzi | ≥35 | T | Ik21 |
| Ik2100 | Headford | <35 | T | Ik10 |
| Ik2100 | Headford | ≥35 | T | Ik11 |

## Soil form: JONKERSBERG
## Soil code: Jb

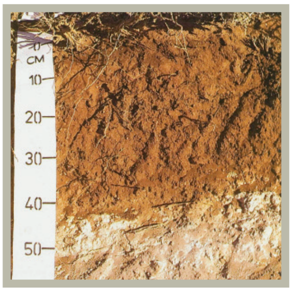
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ik2200 | Sterkfontein | <35 | T | Ik20 |
| Ik2200 | Sterkfontein | ≥35 | T | Ik21 |
| Jb1000 | Geelhoutboom | <6 | S | Hh10 |
| Jb1000 | Geelhoutboom | ≥6 | S | Hh11 |

## Soil form: KATSPRUIT
## Soil code: Ka



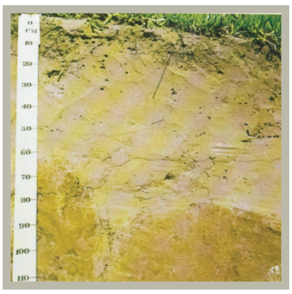
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Jb2000 | Tonnelbos | <6 | S | Hh10 |
| Jb2000 | Tonnelbos | ≥6 | S | Hh11 |

## Soil form: KIMBERLEY
## Soil code: Ky



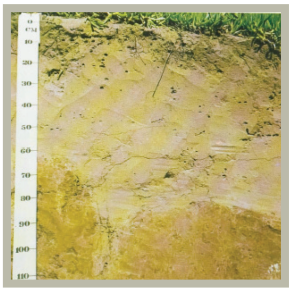

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ka1000 | Lammermoor | N/A | N/A | Ka10 |
| Ka2000 | Slangspruit | N/A | N/A | Ka20 |
| Ky1100 | Taung | <6 | S | Hu31 |
| Ky1100 | Taung | ≥6 and <15 | S | Hu34 |
| Ky1100 | Taung | ≥15 and <35 | S | Hu36 |
| Ky1100 | Taung | ≥35 | S | Hu37 |
| Ky1200 | Riverton | <6 | S | Hu31 |
| Ky1200 | Riverton | ≥6 and <15 | S | Hu34 |
| Ky1200 | Riverton | ≥15 and <35 | S | Hu36 |
| Ky1200 | Riverton | ≥35 | S | Hu37 |
| Ky2100 | Nanaga | <6 | S | Hu31 |
| Ky2100 | Nanaga | ≥6 and <15 | S | Hu34 |
| Ky2100 | Nanaga | ≥15 and <35 | S | Hu36 |
| Ky2100 | Nanaga | ≥35 | S | Hu37 |
| Ky2200 | Douglas | <6 | S | Hu31 |
| Ky2200 | Douglas | ≥6 and <15 | S | Hu34 |

## Soil form: KINKELBOS
## Soil code: Kk



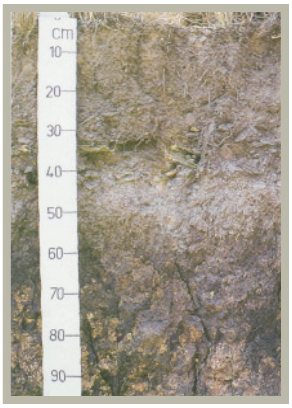
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ky2200 | Douglas | ≥15 and <35 | S | Hu36 |
| Ky2200 | Douglas | ≥35 | S | Hu37 |
| Kk1110 | Nyanga | <6 | S | Vf11 |
| Kk1110 | Nyanga | ≥6 | S | Vf14 |
| Kk1112 | Baievlei | <6 | S | Vf21 |
| Kk1112 | Baievlei | ≥6 | S | Vf24 |
| Kk1210 | Alfred | <6 | S | Vf11 |
| Kk1210 | Alfred | ≥6 | S | Vf14 |
| Kk1210 | Oakhill | <6 | S | Vf21 |
| Kk1210 | Oakhill | ≥6 | S | Vf24 |

## Soil form: KINKELBOS
## Soil code: Kk



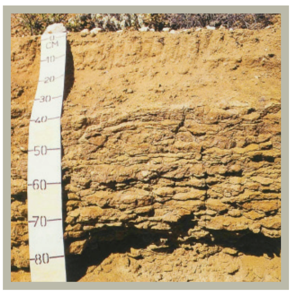
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Kk2110 | Bluedowns | <6 | S | Vf11 |
| Kk2110 | Bluedowns | ≥6 | S | Vf14 |
| Kk2110 | Laaiplek | <6 | S | Vf21 |
| Kk2110 | Laaiplek | ≥6 | S | Vf24 |
| Kk2210 | Voltas | <6 | S | Vf11 |
| Kk2210 | Voltas | ≥6 | S | Vf14 |

## Soil form: KLAPMUTS
## Soil code: Km



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Kk2210 | Voorbaai | <6 | S | Vf21 |
| Kk2210 | Voorbaai | ≥6 | S | Vf24 |
| Km1110 | Broadline | <6 | S | Es10 |
| Km1110 | Broadline | ≥6 and <15 | S | Es12 |
| Km1110 | Broadline | ≥15 and <35 | S | Es16 |
| Km1110 | Broadline | ≥35 | S | Es17 |
| Km1120 | Napier | <6 | S | Es12 |
| Km1120 | Napier | ≥6 and <15 | S | Es15 |
| Km1120 | Napier | ≥15 and <35 | S | Es16 |
| Km1120 | Napier | ≥35 | S | Es17 |
| Km1210 | Ramsgate | <6 | S | Es10 |
| Km1210 | Ramsgate | ≥6 and <15 | S | Es12 |
| Km1210 | Ramsgate | ≥15 and <35 | S | Es16 |
| Km1210 | Ramsgate | ≥35 | S | Es17 |
| Km1220 | Mangeti | <6 | S | Es12 |
| Km1220 | Mangeti | ≥6 and <15 | S | Es15 |
| Km1220 | Mangeti | ≥15 and <35 | S | Es16 |
| Km1220 | Mangeti | ≥35 | S | Es17 |
| Km2110 | Wellington | <6 | S | Es30 |
| Km2110 | Wellington | ≥6 and <15 | S | Es33 |
| Km2110 | Wellington | ≥15 and <35 | S | Es36 |
| Km2110 | Wellington | ≥35 | S | Es37 |
| Km2120 | Bossieveld | <6 | S | Es32 |
| Km2120 | Bossieveld | ≥6 and <15 | S | Es35 |
| Km2120 | Bossieveld | ≥15 and <35 | S | Es36 |
| Km2120 | Bossieveld | ≥35 | S | Es37 |
| Km2210 | Longdown | <6 | S | Es30 |
| Km2210 | Longdown | ≥6 and <15 | S | Es33 |
| Km2210 | Longdown | ≥15 and <35 | S | Es36 |
| Km2210 | Longdown | ≥35 | S | Es37 |
| Km2220 | Humansdorp | <6 | S | Es32 |
| Km2220 | Humansdorp | ≥6 and <15 | S | Es35 |

## Soil form: KNERSVLAKTE
## Soil code: Kn



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Km2220 | Humansdorp | ≥15 and <35 | S | Es36 |
| Km2220 | Humansdorp | ≥35 | S | Es37 |

## Soil form: KRANSKOP
## Soil code: Kp

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Kn1000 | Bitterfontein | N/A | N/A | Ms14 |
| Kn2000 | Kapel | N/A | N/A | Ms24 |
| Kp1100 | Forduin | <35 | S | Kp10 |
| Kp1100 | Forduin | ≥35 and <55 | S | Kp11 |
| Kp1100 | Forduin | ≥55 | S | Kp12 |
| Kp1200 | Dargle | <35 | S | Kp10 |
| Kp1200 | Dargle | ≥35 and <55 | S | Kp11 |
| Kp1200 | Dargle | ≥55 | S | Kp12 |
| Kp2100 | Stonyhill | <35 | S | Kp10 |
| Kp2100 | Stonyhill | ≥35 and <55 | S | Kp11 |
| Kp2100 | Stonyhill | ≥55 | S | Kp12 |
| Kp2200 | Nungwane | <35 | S | Kp10 |

## Soil form: KROONSTAD
## Soil code: Kd

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Kp2200 | Nungwane | ≥35 and <55 | S | Kp11 |
| Kp2200 | Nungwane | ≥55 | S | Kp12 |
| Kd1000 | Morgendal | <6 | S | Kd11 |
| Kd1000 | Morgendal | ≥6 and <15 | S | Kd14 |
| Kd1000 | Morgendal | ≥15 and <35 | S | Kd17 |
| Kd1000 | Morgendal | ≥35 | S | Kd19 |
| Kd2000 | Grabouw | <6 | S | Kd11 |
| Kd2000 | Grabouw | ≥6 and <15 | S | Kd14 |

## Soil form: LAMOTTE
## Soil code: Lt

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Kd2000 | Grabouw | ≥15 and <35 | S | Kd17 |
| Kd2000 | Grabouw | ≥35 | S | Kd19 |
| Lt1100 | Kruisfontein | <6 | S | Lt11 |
| Lt1100 | Kruisfontein | ≥6 | S | Lt14 |
| Lt1200 | Langbos | <6 | S | Lt11 |
| Lt1200 | Langbos | ≥6 | S | Lt14 |
| Lt2100 | Laprovence | <6 | S | Lt11 |

## Soil form: LONGLANDS
## Soil code: Lo

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Lt2100 | Laprovence | ≥6 | S | Lt14 |
| Lt2200 | Drakenstein | <6 | S | Lt11 |
| Lo1000 | Sherbrook | <6 | S | Lo20 |
| Lo1000 | Sherbrook | ≥6 and <15 | S | Lo21 |
| Lo1000 | Sherbrook | ≥15 and <35 | S | Lo22 |
| Lo1000 | Sherbrook | ≥35 | S | Lo13 |
| Lo2000 | Ermelo | <6 | S | Lo20 |
| Lo2000 | Ermelo | ≥6 and <15 | S | Lo21 |

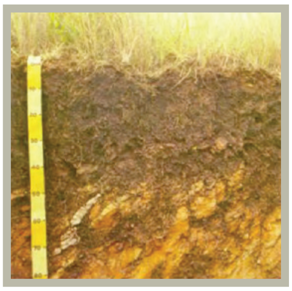
## Soil form: LUSIKI
## Soil code: Lu

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Lo2000 | Ermelo | ≥15 and <35 | S | Lo22 |
| Lo2000 | Ermelo | ≥35 | S | Lo13 |
| Lu1110 | Erradale | <35 | S | No10 |
| Lu1110 | Erradale | ≥35 | S | No11 |
| Lu1120 | Argyll | <35 | S | No10 |
| Lu1120 | Argyll | ≥35 | S | No11 |
| Lu1210 | Woodland | <35 | S | No10 |
| Lu1210 | Woodland | ≥35 | S | No11 |
| Lu1220 | Hopewell | <35 | S | No10 |
| Lu1220 | Hopewell | ≥35 | S | No11 |
| Lu2110 | Matata | <35 | S | No10 |
| Lu2110 | Matata | ≥35 | S | No11 |
| Lu2120 | Coleraine | <35 | S | No10 |
| Lu2120 | Coleraine | ≥35 | S | No11 |
| Lu2210 | Dubana | <35 | S | No10 |
| Lu2210 | Dubana | ≥35 | S | No11 |

## Soil form: MAGWA
## Soil code: Ma

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Lu2220 | Clifton | <35 | S | No10 |
| Lu2220 | Clifton | ≥35 | S | No11 |
| Ma1100 | Glenesk | <35 | S | Ma10 |
| Ma1100 | Glenesk | <35 | S | Ma10 |
| Ma1100 | Glenesk | ≥35 and <55 | S | Ma11 |
| Ma1100 | Glenesk | ≥55 | S | Ma12 |
| Ma1200 | Connemara | <35 | S | Ma10 |
| Ma1200 | Connemara | ≥35 and <55 | S | Ma11 |
| Ma1200 | Connemara | ≥55 | S | Ma12 |
| Ma2100 | Lambasi | <35 | S | Ma10 |
| Ma2100 | Lambasi | ≥35 and <55 | S | Ma11 |
| Ma2100 | Lambasi | ≥55 | S | Ma12 |
| Ma2200 | Ntsubane | <35 | S | Ma10 |

## Soil form: MAYO
## Soil code: My



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ma2200 | Ntsubane | ≥35 and <55 | S | Ma11 |
| Ma2200 | Ntsubane | ≥55 | S | Ma12 |
| My1100 | Glenecho | <35 | T | My10 |
| My1100 | Glenecho | ≥35 | T | My11 |
| My1200 | Legdaar | <35 | T | My20 |
| My1200 | Legdaar | ≥35 | T | My21 |
| My2100 | Grassmere | <35 | T | My10 |
| My2100 | Grassmere | ≥35 | T | My11 |

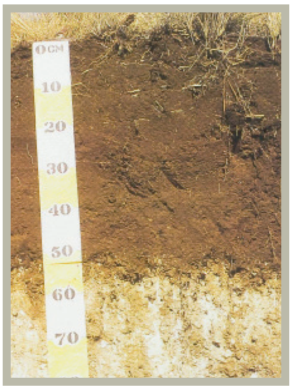
## Soil form: MILKWOOD
## Soil code: Mw

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| My2200 | Boyela | <35 | T | My20 |
| My2200 | Boyela | ≥35 | T | My21 |
| Mw1000 | Effingham | <35 | T | Mw10 |
| Mw1000 | Effingham | ≥35 | S | Mw11 |

## Soil form: MISPAH
## Soil code: Ms

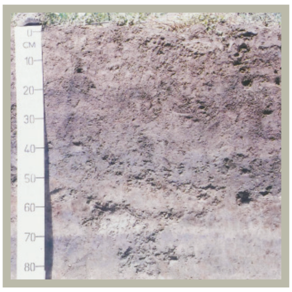
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Mw2000 | Mpetu | <35 | S | Mw20 |
| Mw2000 | Mpetu | ≥35 | S | Mw21 |
| Ms1100 | Myhill | N/A | N/A | Ms10 |
| Ms1100 | Myhill | N/A | N/A | Ms20 |

## Soil form: MOLOPO
## Soil code: Mp



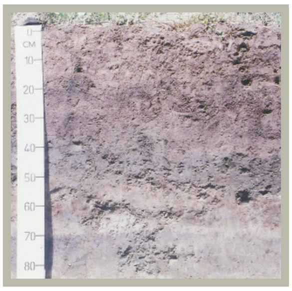

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ms2100 | Gulu | N/A | N/A | Ms10 |
| Ms2100 | Gulu | N/A | N/A | Ms20 |
| Mp1100 | Hendriksrust | <6 | S | Cv31 |
| Mp1100 | Hendriksrust | ≥6 and <15 | S | Cv34 |
| Mp1100 | Hendriksrust | ≥15 and <35 | S | Cv36 |
| Mp1100 | Hendriksrust | ≥35 and <55 | S | Cv37 |
| Mp1100 | Hendriksrust | ≥55 | S | Cv38 |
| Mp1200 | Kalkfontein | <6 | S | Cv21 |
| Mp1200 | Kalkfontein | ≥6 and <15 | S | Cv24 |
| Mp1200 | Kalkfontein | ≥15 and <35 | S | Cv26 |
| Mp1200 | Kalkfontein | ≥35 and <55 | S | Cv27 |
| Mp1200 | Kalkfontein | ≥55 | S | Cv28 |
| Mp2100 | Omkyk | <6 | S | Cv31 |
| Mp2100 | Omkyk | ≥6 and <15 | S | Cv34 |
| Mp2100 | Omkyk | ≥15 and <35 | S | Cv36 |
| Mp2100 | Omkyk | ≥35 and <55 | S | Cv37 |
| Mp2100 | Omkyk | ≥55 | S | Cv38 |
| Mp2200 | Pomfret | <6 | S | Cv21 |
| Mp2200 | Pomfret | ≥6 and <15 | S | Cv24 |
| Mp2200 | Pomfret | ≥15 and <35 | S | Cv26 |

## Soil form: MONTAGU
## Soil code: Mu



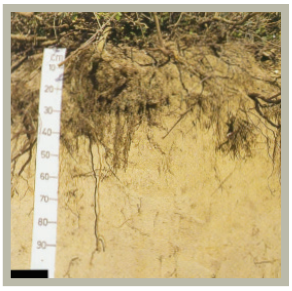
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Mp2200 | Pomfret | ≥35 and <55 | S | Cv27 |
| Mp2200 | Pomfret | ≥55 | S | Cv28 |
| Mu1110 | Baden | <6 | S | Oa41 |
| Mu1110 | Baden | ≥6 and <15 | S | Oa44 |
| Mu1110 | Baden | ≥15 and <35 | S | Oa46 |
| Mu1110 | Baden | ≥35 | S | Oa47 |
| Mu1120 | Esperanza | <6 | S | Oa41 |

## Soil form: MONTAGU
## Soil code: Mu



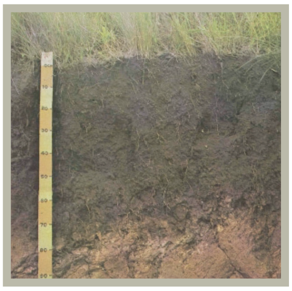
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Mu1120 | Esperanza | ≥6 and <15 | S | Oa44 |
| Mu1120 | Esperanza | ≥15 and <35 | S | Oa46 |
| Mu1120 | Esperanza | ≥35 | S | Oa47 |
| Mu1210 | Scoma | <6 | S | Oa21 |
| Mu1210 | Scoma | ≥6 and <15 | S | Oa24 |
| Mu1210 | Scoma | ≥15 and <35 | S | Oa26 |
| Mu1210 | Scoma | ≥35 | S | Oa27 |
| Mu1220 | Rawdon | <6 | S | Oa21 |
| Mu1220 | Rawdon | ≥6 and <15 | S | Oa24 |
| Mu1220 | Rawdon | ≥15 and <35 | S | Oa26 |
| Mu1220 | Rawdon | ≥35 | S | Oa27 |
| Mu2110 | Knipes | <6 | S | Oa31 |
| Mu2110 | Knipes | ≥6 and <15 | S | Oa34 |
| Mu2110 | Knipes | ≥15 and <35 | S | Oa36 |
| Mu2110 | Knipes | ≥35 | S | Oa37 |
| Mu2120 | Apieshoek | <6 | S | Oa31 |
| Mu2120 | Apieshoek | ≥6 and <15 | S | Oa34 |
| Mu2120 | Apieshoek | ≥15 and <35 | S | Oa36 |
| Mu2120 | Apieshoek | ≥35 | S | Oa37 |
| Mu2210 | Trenly | <6 | S | Oa11 |
| Mu2210 | Trenly | ≥6 and <15 | S | Oa14 |
| Mu2210 | Trenly | ≥15 and <35 | S | Oa16 |
| Mu2210 | Trenly | ≥35 | S | Oa17 |
| Mu2220 | Rooidam | <6 | S | Oa11 |
| Mu2220 | Rooidam | ≥6 and <15 | S | Oa14 |

## Soil form: NAMIB
## Soil code: Nb



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Mu2220 | Rooidam | ≥15 and <35 | S | Oa16 |
| Mu2220 | Rooidam | ≥35 | S | Oa17 |
| Nb1100 | Nortier | N/A | N/A | Fw11 |
| Nb1200 | Beachwood | N/A | N/A | Fw21 |

## Soil form: NOMANCI
## Soil code: No



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Nb2100 | Kalahari | N/A | N/A | Fw11 |
| Nb2200 | Henkries | N/A | N/A | Fw21 |
| No1100 | Boston | <35 | T | No10 |
| No1100 | Boston | ≥35 | T | No11 |
| No1200 | Overwood | <35 | T | No10 |
| No1200 | Overwood | ≥35 | T | No11 |
| No2100 | Deepdene | <35 | T | No10 |
| No2100 | Deepdene | ≥35 | T | No11 |

## Soil form: OAKLEAF
## Soil code: Oa

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| No2200 | Peakvale | <35 | T | No10 |
| No2200 | Peakvale | ≥35 | T | No11 |
| Oa1110 | Ritchie | <6 | S | Oa41 |
| Oa1110 | Ritchie | ≥6 and <15 | S | Oa44 |
| Oa1110 | Ritchie | ≥15 and <35 | S | Oa46 |
| Oa1110 | Ritchie | ≥35 | S | Oa47 |
| Oa1120 | Buchuberg | <6 | S | Oa41 |
| Oa1120 | Buchuberg | ≥6 and <15 | S | Oa44 |
| Oa1120 | Buchuberg | ≥15 and <35 | S | Oa46 |
| Oa1120 | Buchuberg | ≥35 | S | Oa47 |
| Oa1210 | Caledon | <6 | S | Oa21 |
| Oa1210 | Caledon | ≥6 and <15 | S | Oa24 |
| Oa1210 | Caledon | ≥15 and <35 | S | Oa26 |
| Oa1210 | Caledon | ≥35 | S | Oa27 |
| Oa1220 | Dipene | <6 | S | Oa21 |
| Oa1220 | Dipene | ≥6 and <15 | S | Oa24 |
| Oa1220 | Dipene | ≥15 and <35 | S | Oa26 |
| Oa1220 | Dipene | ≥35 | S | Oa27 |
| Oa2110 | Cooper | <6 | S | Oa31 |
| Oa2110 | Cooper | ≥6 and <15 | S | Oa34 |
| Oa2110 | Cooper | ≥15 and <35 | S | Oa36 |
| Oa2110 | Cooper | ≥35 | S | Oa37 |
| Oa2120 | Patrysdal | <6 | S | Oa31 |
| Oa2120 | Patrysdal | ≥6 and <15 | S | Oa34 |
| Oa2120 | Patrysdal | ≥15 and <35 | S | Oa36 |
| Oa2120 | Patrysdal | ≥35 | S | Oa37 |
| Oa2210 | Gannaga | <6 | S | Oa11 |
| Oa2210 | Gannaga | ≥6 and <15 | S | Oa14 |
| Oa2210 | Gannaga | ≥15 and <35 | S | Oa16 |
| Oa2210 | Gannaga | ≥35 | S | Oa17 |
| Oa2220 | Rooihoogte | <6 | S | Oa11 |
| Oa2220 | Rooihoogte | ≥6 and <15 | S | Oa14 |

## Soil form: OUDTSHOORN
## Soil code: Ou

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Oa2220 | Rooihoogte | ≥15 and <35 | S | Oa16 |
| Oa2220 | Rooihoogte | ≥35 | S | Oa17 |
| Ou1110 | Stoltsvlakte | <6 | S | Oa41 |
| Ou1110 | Stoltsvlakte | ≥6 and <15 | S | Oa44 |
| Ou1110 | Stoltsvlakte | ≥15 and <35 | S | Oa46 |
| Ou1110 | Stoltsvlakte | ≥35 | S | Oa47 |
| Ou1120 | Vleirivier | <6 | S | Oa41 |
| Ou1120 | Vleirivier | ≥6 and <15 | S | Oa44 |
| Ou1120 | Vleirivier | ≥15 and <35 | S | Oa46 |
| Ou1120 | Vleirivier | ≥35 | S | Oa47 |
| Ou1210 | Doringbaai | <6 | S | Oa21 |
| Ou1210 | Doringbaai | ≥6 and <15 | S | Oa24 |
| Ou1210 | Doringbaai | ≥15 and <35 | S | Oa26 |
| Ou1210 | Doringbaai | ≥35 | S | Oa27 |
| Ou1220 | Highgate | <6 | S | Oa21 |
| Ou1220 | Highgate | ≥6 and <15 | S | Oa24 |
| Ou1220 | Highgate | ≥15 and <35 | S | Oa26 |

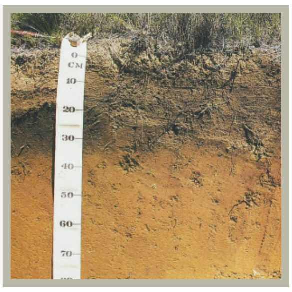
## Soil form: OUDTSHOORN
## Soil code: Ou

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ou1220 | Highgate | ≥35 | S | Oa27 |
| Ou2110 | Dysselsdorp | <6 | S | Oa31 |
| Ou2110 | Dysselsdorp | ≥6 and <15 | S | Oa34 |
| Ou2110 | Dysselsdorp | ≥15 and <35 | S | Oa36 |
| Ou2110 | Dysselsdorp | ≥35 | S | Oa37 |
| Ou2120 | Badshoogte | <6 | S | Oa31 |
| Ou2120 | Badshoogte | ≥6 and <15 | S | Oa34 |
| Ou2120 | Badshoogte | ≥15 and <35 | S | Oa36 |
| Ou2120 | Badshoogte | ≥35 | S | Oa37 |
| Ou2210 | Volmoed | <6 | S | Oa11 |
| Ou2210 | Volmoed | ≥6 and <15 | S | Oa14 |
| Ou2210 | Volmoed | ≥15 and <35 | S | Oa16 |
| Ou2210 | Volmoed | ≥35 | S | Oa17 |
| Ou2220 | Baroe | <6 | S | Oa11 |
| Ou2220 | Baroe | ≥6 and <15 | S | Oa14 |

## Soil form: PINEDENE
## Soil code: Pn

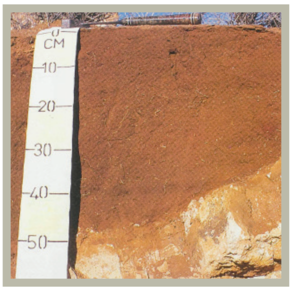
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ou2220 | Baroe | ≥15 and <35 | S | Oa16 |
| Ou2220 | Baroe | ≥35 | S | Oa17 |
| Pn1100 | Goudini | <6 | S | Pn11 |
| Pn1100 | Goudini | ≥6 and <15 | S | Pn14 |
| Pn1100 | Goudini | ≥15 and <35 | S | Pn16 |
| Pn1100 | Goudini | ≥35 and <55 | S | Pn17 |
| Pn1200 | Jutland | <6 | S | Pn11 |
| Pn1200 | Jutland | ≥6 and <15 | S | Pn14 |
| Pn1200 | Jutland | ≥15 and <35 | S | Pn16 |
| Pn1200 | Jutland | ≥35 and <55 | S | Pn17 |
| Pn2100 | Ceres | <6 | S | Pn21 |
| Pn2100 | Ceres | ≥6 and <15 | S | Pn24 |
| Pn2100 | Ceres | ≥15 and <35 | S | Pn26 |
| Pn2100 | Ceres | ≥35 and <55 | S | Pn27 |
| Pn2200 | Reitz | <6 | S | Pn21 |
| Pn2200 | Reitz | ≥6 and <15 | S | Pn24 |
| Pn2200 | Reitz | ≥15 and <35 | S | Pn26 |
| Pn2200 | Reitz | ≥35 and <55 | S | Pn27 |
| Pn3100 | Mariendal | <6 | S | Pn31 |
| Pn3100 | Mariendal | ≥6 and <15 | S | Pn34 |
| Pn3100 | Mariendal | ≥15 and <35 | S | Pn36 |
| Pn3100 | Mariendal | ≥35 | S | Pn37 |
| Pn3200 | Wolwepan | <6 | S | Pn31 |
| Pn3200 | Wolwepan | ≥6 and <15 | S | Pn34 |

## Soil form: PINEGROVE
## Soil code: Pg



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Pn3200 | Wolwepan | ≥15 and <35 | S | Pn36 |
| Pn3200 | Wolwepan | ≥35 | S | Pn37 |

## Soil form: PLOOYSBURG
## Soil code: Py




| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Pg1000 | Highbury | N/A | T | Ss14 |
| Pg2000 | Ruitersbos | N/A | T | Ss16 |
| Py1000 | Brakkies | <6 | S | Hu31 |
| Py1000 | Brakkies | ≥6 and <15 | S | Hu34 |
| Py1000 | Brakkies | ≥15 and <35 | S | Hu36 |
| Py1000 | Brakkies | ≥35 and <55 | S | Hu37 |
| Py1000 | Brakkies | ≥55 | S | Hu38 |
| Py2000 | Rietrivier | <6 | S | Hu31 |
| Py2000 | Rietrivier | ≥6 and <15 | S | Hu34 |
| Py2000 | Rietrivier | ≥15 and <35 | S | Hu36 |

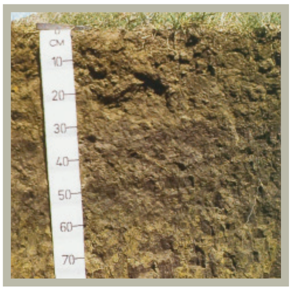
## Soil form: PRIESKA
## Soil code: Pr

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Py2000 | Rietrivier | ≥35 and <55 | S | Hu37 |
| Py2000 | Rietrivier | ≥55 | S | Hu38 |
| Pr1110 | Hougham | <6 | S | Oa41 |
| Pr1110 | Hougham | ≥6 and <15 | S | Oa44 |
| Pr1110 | Hougham | ≥15 and <35 | S | Oa46 |
| Pr1110 | Hougham | ≥35 | S | Oa47 |
| Pr1120 | Ingleside | <6 | S | Oa41 |
| Pr1120 | Ingleside | ≥6 and <15 | S | Oa44 |
| Pr1120 | Ingleside | ≥15 and <35 | S | Oa46 |
| Pr1120 | Ingleside | ≥35 | S | Oa47 |
| Pr1210 | Naawte | <6 | S | Oa21 |
| Pr1210 | Naawte | ≥6 and <15 | S | Oa24 |
| Pr1210 | Naawte | ≥15 and <35 | S | Oa26 |
| Pr1210 | Naawte | ≥35 | S | Oa27 |
| Pr1220 | Angelierspan | <6 | S | Oa21 |
| Pr1220 | Angelierspan | ≥6 and <15 | S | Oa24 |
| Pr1220 | Angelierspan | ≥15 and <35 | S | Oa26 |
| Pr1220 | Angelierspan | ≥35 | S | Oa27 |
| Pr2110 | Downs | <6 | S | Oa31 |
| Pr2110 | Downs | ≥6 and <15 | S | Oa34 |
| Pr2110 | Downs | ≥15 and <35 | S | Oa36 |
| Pr2110 | Downs | ≥35 | S | Oa37 |
| Pr2120 | Baarboon | <6 | S | Oa31 |
| Pr2120 | Baarboon | ≥6 and <15 | S | Oa34 |
| Pr2120 | Baarboon | ≥15 and <35 | S | Oa36 |
| Pr2120 | Baarboon | ≥35 | S | Oa37 |
| Pr2210 | Verby | <6 | S | Oa11 |
| Pr2210 | Verby | ≥6 and <15 | S | Oa14 |
| Pr2210 | Verby | ≥15 and <35 | S | Oa16 |
| Pr2210 | Verby | ≥35 | S | Oa17 |
| Pr2220 | Rooinek | <6 | S | Oa11 |
| Pr2220 | Rooinek | ≥6 and <15 | S | Oa14 |

## Soil form: RENSBURG
## Soil code: Rg

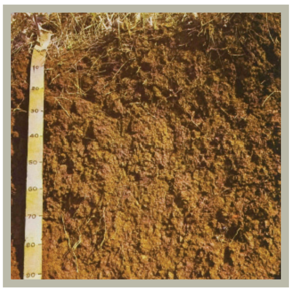
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Pr2220 | Rooinek | ≥15 and <35 | S | Oa16 |
| Pr2220 | Rooinek | ≥35 | S | Oa17 |

## Soil form: SEPANE
## Soil code: Se



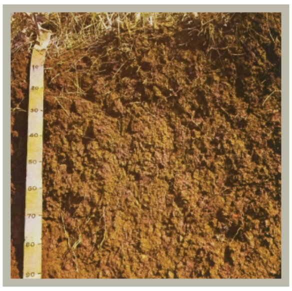
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Rg1000 | Greendale | N/A | S | Rg10 |
| Rg2000 | Rietkuil | N/A | S | Rg20 |
| Se1110 | Rapoeli | <35 | S | Va10 |
| Se1110 | Rapoeli | ≥35 and <55 | S | Va11 |
| Se1110 | Rapoeli | ≥55 | S | Va12 |
| Se1120 | Muiskraal | <35 | S | Va20 |
| Se1120 | Muiskraal | ≥35 and <55 | S | Va21 |
| Se1120 | Muiskraal | ≥55 | S | Va22 |
| Se1210 | Katdoorn | <35 | S | Va10 |
| Se1210 | Katdoorn | ≥35 and <55 | S | Va11 |
| Se1210 | Katdoorn | ≥55 | S | Va12 |
| Se1220 | Ramabesa | <35 | S | Va20 |
| Se1220 | Ramabesa | ≥35 and <55 | S | Va21 |
| Se1220 | Ramabesa | ≥55 | S | Va22 |
| Se2110 | Sweethome | <35 | S | Va30 |
| Se2110 | Sweethome | ≥35 and <55 | S | Va31 |
| Se2110 | Sweethome | ≥55 | S | Va32 |
| Se2120 | Grootvlei | <35 | S | Va40 |
| Se2120 | Grootvlei | ≥35 and <55 | S | Va41 |
| Se2120 | Grootvlei | ≥55 | S | Va42 |
| Se2210 | Crondale | <35 | S | Va30 |
| Se2210 | Crondale | ≥35 and <55 | S | Va31 |
| Se2210 | Crondale | ≥55 | S | Va32 |
| Se2220 | Droogpan | <35 | S | Va40 |

## Soil form: SHORTLANDS
## Soil code: Sd



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Se2220 | Droogpan | ≥35 and <55 | S | Va41 |
| Se2220 | Droogpan | ≥55 | S | Va42 |
| Sd1110 | Tongaat | <35 | S | Sd10 |
| Sd1110 | Tongaat | ≥35 and <55 | S | Sd11 |
| Sd1110 | Tongaat | ≥55 | S | Sd12 |
| Sd1120 | Groothoek | <35 | S | Sd10 |
| Sd1120 | Groothoek | ≥35 and <55 | S | Sd11 |
| Sd1120 | Groothoek | ≥55 | S | Sd12 |
| Sd1210 | Empangeni | <35 | S | Sd10 |
| Sd1210 | Empangeni | ≥35 and <55 | S | Sd11 |
| Sd1210 | Empangeni | ≥55 | S | Sd12 |
| Sd1220 | Sebati | <35 | S | Sd10 |
| Sd1220 | Sebati | ≥35 and <55 | S | Sd11 |
| Sd1220 | Sebati | ≥55 | S | Sd12 |

## Soil form: SHORTLANDS
## Soil code: Sd



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Sd2110 | Bayala | <35 | S | Sd20 |
| Sd2110 | Bayala | ≥35 and <55 | S | Sd21 |
| Sd2110 | Bayala | ≥55 | S | Sd22 |
| Sd2120 | Roedtan | <35 | S | Sd20 |
| Sd2120 | Roedtan | ≥35 and <55 | S | Sd21 |
| Sd2120 | Roedtan | ≥55 | S | Sd22 |
| Sd2210 | Bolweni | <35 | S | Sd20 |
| Sd2210 | Bolweni | ≥35 and <55 | S | Sd21 |
| Sd2210 | Bolweni | ≥55 | S | Sd22 |
| Sd2220 | Zebediela | <35 | S | Sd20 |
| Sd2220 | Zebediela | ≥35 and <55 | S | Sd21 |
| Sd2220 | Zebediela | ≥55 | S | Sd22 |
| Sd3110 | Pyramid | <35 | S | Sd30 |
| Sd3110 | Pyramid | ≥35 and <55 | S | Sd31 |
| Sd3110 | Pyramid | ≥55 | S | Sd32 |
| Sd3120 | Winfield | <35 | S | Sd30 |
| Sd3120 | Winfield | ≥35 and <55 | S | Sd31 |
| Sd3120 | Winfield | ≥55 | S | Sd32 |
| Sd3210 | Moletlane | <35 | S | Sd30 |
| Sd3210 | Moletlane | ≥35 and <55 | S | Sd31 |
| Sd3210 | Moletlane | ≥55 | S | Sd32 |
| Sd3220 | Steelpoort | <35 | S | Sd30 |

## Soil form: STEENDALE
## Soil code: Sn

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Sd3220 | Steelpoort | ≥35 and <55 | S | Sd31 |
| Sd3220 | Steelpoort | ≥55 | S | Sd32 |
| Sn1000 | Duivenhoks | <35 | T | Mw10 |
| Sn1000 | Duivenhoks | ≥35 | T | Mw11 |

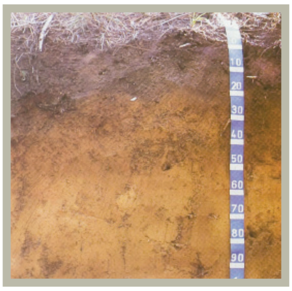
## Soil form: STERKSPRUIT
## Soil code: Ss

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Sn2000 | Brabant | <35 | T | Mw20 |
| Sn2000 | Brabant | ≥35 | T | Mw21 |
| Ss1100 | Smithfield | <6 | T | Ss21 |
| Ss1100 | Smithfield | ≥6 and <15 | T | Ss24 |
| Ss1100 | Smithfield | ≥15 and <35 | T | Ss26 |
| Ss1100 | Smithfield | ≥35 | T | Ss27 |
| Ss1200 | Bethulie | <6 | T | Ss11 |
| Ss1200 | Bethulie | ≥6 and <15 | T | Ss14 |
| Ss1200 | Bethulie | ≥15 and <35 | T | Ss16 |
| Ss1200 | Bethulie | ≥35 | T | Ss17 |
| Ss2100 | Hermon | <6 | T | Ss21 |
| Ss2100 | Hermon | ≥6 and <15 | T | Ss24 |
| Ss2100 | Hermon | ≥15 and <35 | T | Ss26 |
| Ss2100 | Hermon | ≥35 | T | Ss27 |
| Ss2200 | Kareepoort | <6 | T | Ss11 |

## Soil form: SWARTLAND
## Soil code: Sw

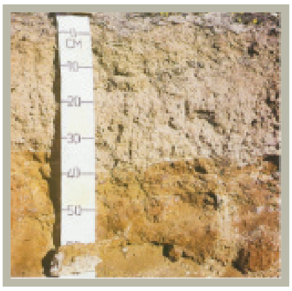
| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ss2200 | Kareepoort | ≥6 and <15 | T | Ss14 |
| Ss2200 | Kareepoort | ≥15 and <35 | T | Ss16 |
| Ss2200 | Kareepoort | ≥35 | T | Ss17 |
| Sw1111 | Spreyton | <35 | S | Sw30 |
| Sw1111 | Spreyton | ≥35 and <55 | S | Sw31 |
| Sw1111 | Spreyton | ≥55 | S | Sw32 |
| Sw1112 | Breipaal | <35 | S | Sw40 |
| Sw1112 | Breipaal | ≥35 and <55 | S | Sw41 |
| Sw1112 | Breipaal | ≥55 | S | Sw42 |
| Sw1121 | Gemvale | <35 | S | Sw30 |
| Sw1121 | Gemvale | ≥35 and <55 | S | Sw31 |
| Sw1121 | Gemvale | ≥55 | S | Sw32 |
| Sw1122 | Amandel | <35 | S | Sw40 |
| Sw1122 | Amandel | ≥35 and <55 | S | Sw41 |
| Sw1122 | Amandel | ≥55 | S | Sw42 |
| Sw1211 | Shangoni | <35 | S | Sw10 |
| Sw1211 | Shangoni | ≥35 and <55 | S | Sw11 |
| Sw1211 | Shangoni | ≥55 | S | Sw12 |
| Sw1212 | Burgersdorp | <35 | S | Sw20 |
| Sw1212 | Burgersdorp | ≥35 and <55 | S | Sw21 |
| Sw1212 | Burgersdorp | ≥55 | S | Sw22 |
| Sw1221 | Mtini | <35 | S | Sw10 |
| Sw1221 | Mtini | ≥35 and <55 | S | Sw11 |
| Sw1221 | Mtini | ≥55 | S | Sw12 |
| Sw1222 | Rouxville | <35 | S | Sw20 |
| Sw1222 | Rouxville | ≥35 and <55 | S | Sw21 |
| Sw1222 | Rouxville | ≥55 | S | Sw22 |
| Sw2111 | Adelaide | <35 | S | Sw30 |
| Sw2111 | Adelaide | ≥35 and <55 | S | Sw31 |
| Sw2111 | Adelaide | ≥55 | S | Sw32 |
| Sw2112 | Beaufort | <35 | S | Sw40 |
| Sw2112 | Beaufort | ≥35 and <55 | S | Sw41 |
| Sw2112 | Beaufort | ≥55 | S | Sw42 |
| Sw2121 | Riebeeck | <35 | S | Sw30 |
| Sw2121 | Riebeeck | ≥35 and <55 | S | Sw31 |
| Sw2121 | Riebeeck | ≥55 | S | Sw32 |
| Sw2122 | Drew | <35 | S | Sw40 |
| Sw2122 | Drew | ≥35 and <55 | S | Sw41 |
| Sw2122 | Drew | ≥55 | S | Sw42 |
| Sw2211 | Amatole | <35 | S | Sw10 |
| Sw2211 | Amatole | ≥35 and <55 | S | Sw11 |
| Sw2211 | Amatole | ≥55 | S | Sw12 |
| Sw2212 | Debe | <35 | S | Sw20 |
| Sw2212 | Debe | ≥35 and <55 | S | Sw21 |
| Sw2212 | Debe | ≥55 | S | Sw22 |
| Sw2221 | Bonnievale | <35 | S | Sw10 |
| Sw2221 | Bonnievale | ≥35 and <55 | S | Sw11 |
| Sw2221 | Bonnievale | ≥55 | S | Sw12 |

## Soil form: SWEETWATER
## Soil code: Sr



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Sw2222 | Calvinia | <35 | S | Sw20 |
| Sw2222 | Calvinia | ≥35 and <55 | S | Sw21 |
| Sw2222 | Calvinia | ≥55 | S | Sw22 |
| Sr1110 | Uplands | <35 | T | No10 |
| Sr1110 | Uplands | ≥35 | T | No11 |
| Sr1120 | Glenwood | <35 | T | No10 |
| Sr1120 | Glenwood | ≥35 | T | No11 |
| Sr1210 | Lincoln | <35 | T | No10 |
| Sr1210 | Lincoln | ≥35 | T | No11 |
| Sr1220 | Winshaw | <35 | T | No10 |
| Sr1220 | Winshaw | ≥35 | T | No11 |
| Sr2110 | Newton | <35 | T | No10 |
| Sr2110 | Newton | ≥35 | T | No11 |
| Sr2120 | Copling | <35 | T | No10 |
| Sr2120 | Copling | ≥35 | T | No11 |
| Sr2210 | Aberdaire | <35 | T | No10 |

## Soil form: TRAWAL
## Soil code: Tr

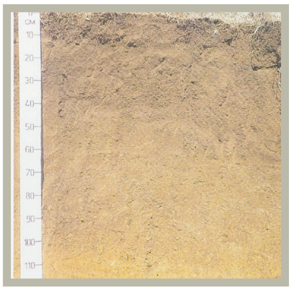


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Sr2210 | Aberdaire | ≥35 | T | No11 |
| Sr2220 | Fielden | <35 | T | No10 |
| Sr2220 | Fielden | ≥35 | T | No11 |
| Tr1120 | Dikneus | <6 | S | Oa41 |
| Tr1120 | Dikneus | ≥6 and <15 | S | Oa44 |
| Tr1120 | Dikneus | ≥15 and <35 | S | Oa46 |
| Tr1120 | Dikneus | ≥35 | S | Oa47 |
| Tr1120 | Saggiesberg | <6 | S | Oa41 |
| Tr1120 | Saggiesberg | ≥6 and <15 | S | Oa44 |
| Tr1120 | Saggiesberg | ≥15 and <35 | S | Oa46 |
| Tr1120 | Saggiesberg | ≥35 | S | Oa47 |
| Tr1210 | Graatjie | <6 | S | Oa21 |
| Tr1210 | Graatjie | ≥6 and <15 | S | Oa24 |
| Tr1210 | Graatjie | ≥15 and <35 | S | Oa26 |
| Tr1210 | Graatjie | ≥35 | S | Oa27 |
| Tr1220 | Roelf | <6 | S | Oa21 |
| Tr1220 | Roelf | ≥6 and <15 | S | Oa24 |
| Tr1220 | Roelf | ≥15 and <35 | S | Oa26 |
| Tr1220 | Roelf | ≥35 | S | Oa27 |
| Tr2110 | Wolwenes | <6 | S | Oa41 |
| Tr2110 | Wolwenes | ≥6 and <15 | S | Oa44 |
| Tr2110 | Wolwenes | ≥15 and <35 | S | Oa46 |
| Tr2110 | Wolwenes | ≥35 | S | Oa47 |
| Tr2120 | Katmakoep | <6 | S | Oa41 |
| Tr2120 | Katmakoep | ≥6 and <15 | S | Oa44 |
| Tr2120 | Katmakoep | ≥15 and <35 | S | Oa46 |
| Tr2120 | Katmakoep | ≥35 | S | Oa47 |
| Tr2210 | Perdekraal | <6 | S | Oa21 |
| Tr2210 | Perdekraal | ≥6 and <15 | S | Oa24 |
| Tr2210 | Perdekraal | ≥15 and <35 | S | Oa26 |
| Tr2210 | Perdekraal | ≥35 | S | Oa27 |
| Tr2220 | Janrap | <6 | S | Oa21 |

**Soil form: TSITSIKAMMA**
**Soil code: Ts**

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Tr2220 | Janrap | ≥6 and <15 | S | Oa24 |
| Tr2220 | Janrap | ≥15 and <35 | S | Oa26 |
| Tr2220 | Janrap | ≥35 | S | Oa27 |
| Ts1000 | Bakenkop | <6 | S | Lt11 |

**Soil form: TUKULU**
**Soil code: Tu**



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Ts1000 | Bakenkop | ≥6 | S | Lt14 |
| Ts2000 | Kurland | <6 | S | Lt11 |
| Ts2000 | Kurland | ≥6 | S | Lt14 |
| Tu1110 | Entunja | <6 | S | Oa41 |
| Tu1110 | Entunja | ≥6 and <15 | S | Oa44 |
| Tu1110 | Entunja | ≥15 and <35 | S | Oa46 |
| Tu1110 | Entunja | ≥35 | S | Oa47 |
| Tu1120 | Olivedale | <6 | S | Oa41 |
| Tu1120 | Olivedale | ≥6 and <15 | S | Oa44 |
| Tu1120 | Olivedale | ≥15 and <35 | S | Oa46 |
| Tu1120 | Olivedale | ≥35 | S | Oa47 |
| Tu1210 | Hoeko | <6 | S | Oa21 |
| Tu1210 | Hoeko | ≥6 and <15 | S | Oa24 |
| Tu1210 | Hoeko | ≥15 and <35 | S | Oa26 |
| Tu1210 | Hoeko | ≥35 | S | Oa27 |
| Tu1220 | Dikeni | <6 | S | Oa21 |
| Tu1220 | Dikeni | ≥6 and <15 | S | Oa24 |
| Tu1220 | Dikeni | ≥15 and <35 | S | Oa26 |
| Tu1220 | Dikeni | ≥35 | S | Oa27 |
| Tu2110 | Mostertshoek | <6 | S | Oa31 |
| Tu2110 | Mostertshoek | ≥6 and <15 | S | Oa34 |
| Tu2110 | Mostertshoek | ≥15 and <35 | S | Oa36 |
| Tu2110 | Mostertshoek | ≥35 | S | Oa37 |
| Tu2120 | Scheepersrus | <6 | S | Oa31 |
| Tu2120 | Scheepersrus | ≥6 and <15 | S | Oa34 |
| Tu2120 | Scheepersrus | ≥15 and <35 | S | Oa36 |
| Tu2120 | Scheepersrus | ≥35 | S | Oa37 |
| Tu2210 | Amalienstein | <6 | S | Oa11 |
| Tu2210 | Amalienstein | ≥6 and <15 | S | Oa14 |
| Tu2210 | Amalienstein | ≥15 and <35 | S | Oa16 |
| Tu2210 | Amalienstein | ≥35 | S | Oa17 |
| Tu2220 | Zandvliet | <6 | S | Oa11 |

**Soil form: VALSRIVIER**
**Soil code: Va**

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Tu2220 | Zandvliet | ≥6 and <15 | S | Oa14 |
| Tu2220 | Zandvliet | ≥15 and <35 | S | Oa16 |
| Tu2220 | Zandvliet | ≥35 | S | Oa17 |
| Va1111 | Slykspruit | <35 | S | Va30 |
| Va1111 | Slykspruit | ≥35 and <55 | S | Va31 |
| Va1111 | Slykspruit | ≥55 | S | Va32 |
| Va1112 | Luckhoff | <35 | S | Va40 |

## Soil form: VALSRIVIER
## Soil code: Va

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Va1112 | Luckhoff | ≥35 and <55 | S | Va41 |
| Va1112 | Luckhoff | ≥55 | S | Va42 |
| Va1121 | Goedemoed | <35 | S | Va30 |
| Va1121 | Goedemoed | ≥35 and <55 | S | Va31 |
| Va1121 | Goedemoed | ≥55 | S | Va32 |
| Va1122 | Aliwal | <35 | S | Va40 |
| Va1122 | Aliwal | ≥35 and <55 | S | Va41 |
| Va1122 | Aliwal | ≥55 | S | Va42 |
| Va1211 | Wepener | <35 | S | Va10 |
| Va1211 | Wepener | ≥35 and <55 | S | Va11 |
| Va1211 | Wepener | ≥55 | S | Va12 |
| Va1212 | Dewetsdorp | <35 | S | Va20 |
| Va1212 | Dewetsdorp | ≥35 and <55 | S | Va21 |
| Va1212 | Dewetsdorp | ≥55 | S | Va22 |
| Va1221 | Helvetia | <35 | S | Va10 |
| Va1221 | Helvetia | ≥35 and <55 | S | Va11 |
| Va1221 | Helvetia | ≥55 | S | Va12 |
| Va1222 | Serona | <35 | S | Va20 |
| Va1222 | Serona | ≥35 and <55 | S | Va21 |
| Va1222 | Serona | ≥55 | S | Va22 |
| Va2111 | Alice | <35 | S | Va30 |
| Va2111 | Alice | ≥35 and <55 | S | Va31 |
| Va2111 | Alice | ≥55 | S | Va32 |
| Va2112 | Keiskamma | <35 | S | Va40 |
| Va2112 | Keiskamma | ≥35 and <55 | S | Va41 |
| Va2112 | Keiskamma | ≥55 | S | Va42 |
| Va2121 | Homepark | <35 | S | Va30 |
| Va2121 | Homepark | ≥35 and <55 | S | Va31 |
| Va2121 | Homepark | ≥55 | S | Va32 |
| Va2122 | Mastenhof | <35 | S | Va40 |
| Va2122 | Mastenhof | ≥35 and <55 | S | Va41 |
| Va2122 | Mastenhof | ≥55 | S | Va42 |
| Va2211 | Meriba | <35 | S | Va10 |
| Va2211 | Meriba | ≥35 and <55 | S | Va11 |
| Va2211 | Meriba | ≥55 | S | Va12 |
| Va2212 | Telpoort | <35 | S | Va20 |
| Va2212 | Telpoort | ≥35 and <55 | S | Va21 |
| Va2212 | Telpoort | ≥55 | S | Va22 |
| Va2221 | Zuney | <35 | S | Va10 |
| Va2221 | Zuney | ≥35 and <55 | S | Va11 |
| Va2221 | Zuney | ≥55 | S | Va12 |

## Soil form: VILAFONTES
## Soil code: Vf

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Va2222 | Silvervale | <35 | S | Va20 |
| Va2222 | Silvervale | ≥35 and <55 | S | Va21 |
| Va2222 | Silvervale | ≥55 | S | Va22 |
| Vf1110 | Alexandria | <6 | S | Vf11 |
| Vf1110 | Alexandria | ≥6 | S | Vf14 |
| Vf1120 | Woburn | <6 | S | Vf11 |
| Vf1120 | Woburn | ≥6 | S | Vf14 |
| Vf1210 | Renishaw | <6 | S | Vf11 |
| Vf1210 | Renishaw | ≥6 | S | Vf14 |

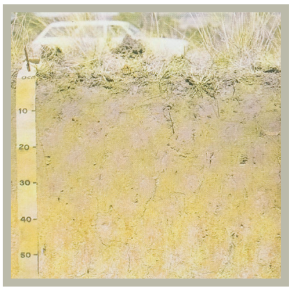
## Soil form: VILAFONTES
## Soil code: Vf

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Vf1220 | Freeland | <6 | S | Vf11 |
| Vf1220 | Freeland | ≥6 | S | Vf14 |
| Vf2110 | Blikhuis | <6 | S | Vf11 |
| Vf2110 | Blikhuis | ≥6 | S | Vf14 |
| Vf2120 | Buffelsbaai | <6 | S | Vf11 |
| Vf2120 | Buffelsbaai | ≥6 | S | Vf14 |
| Vf2210 | Glentana | <6 | S | Vf11 |

## Soil form: WASBANK
## Soil code: Wa

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Vf2210 | Glentana | ≥6 | S | Vf14 |
| Vf2220 | Jongensfontein | <6 | S | Vf11 |
| Vf2220 | Jongensfontein | ≥6 | S | Vf14 |
| Wa1000 | Louterwater | <6 | S | Wa20 |
| Wa1000 | Louterwater | ≥6 and <15 | S | Wa21 |
| Wa1000 | Louterwater | ≥15 and <35 | S | Wa23 |
| Wa1000 | Louterwater | ≥35 | S | Wa13 |
| Wa2000 | Lynedoch | <6 | S | Wa20 |

## Soil form: WESTLEIGH
## Soil code: We

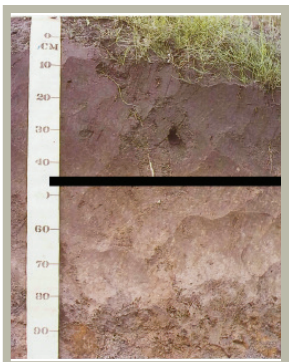


| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Wa2000 | Lynedoch | ≥6 and <15 | S | Wa21 |
| Wa2000 | Lynedoch | ≥15 and <35 | S | Wa23 |
| Wa2000 | Lynedoch | ≥35 | S | Wa13 |
| We1000 | Helena | <6 | S | We20 |
| We1000 | Helena | ≥6 and <15 | S | We21 |
| We1000 | Helena | ≥15 and <35 | S | We22 |
| We1000 | Helena | ≥35 | S | We13 |
| We2000 | Mareetsane | <6 | S | We20 |

## Soil form: WILLOWBROOK
## Soil code: Wo

| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| We2000 | Mareetsane | ≥6 and <15 | S | We21 |
| We2000 | Mareetsane | ≥15 and <35 | S | We22 |
| We2000 | Mareetsane | ≥35 | S | We13 |
| Wo1000 | Ottawa | <35 | T | Wo10 |

## Soil form: WITFONTEIN
## Soil code: Wf



| Taxonomic code | Soil family | Sub-classification by clay % | Defining horizon | Soil series: binomial |
|---|---|---|---|---|
| Wo1000 | Ottawa | ≥35 | T | Wo11 |
| Wo2000 | Kromdal | <35 | T | Wo20 |
| Wo2000 | Kromdal | ≥35 | T | Wo21 |
| Wf1100 | Applegrove | <6 | T | Ss11 |
| Wf1100 | Applegrove | ≥6 | T | Ss14 |
| Wf1200 | Goesabos | <6 | T | Ss11 |
| Wf1200 | Goesabos | ≥6 | T | Ss14 |
| Wf2100 | Phantom | <6 | T | Ss11 |
| Wf2100 | Phantom | ≥6 | T | Ss14 |
| Wf2200 | Lebanon | <6 | T | Ss11 |
| Wf2200 | Lebanon | ≥6 | T | Ss14 |

# APPENDIX 3A: NUMBER OF SOIL CARBON SAMPLES PER SOIL SERIES FOR NATURAL VEGETATION, AND LEVELS OF ASSURANCE

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Ar10 | 24 | 21 | 1 | 1 | Ar10 | Ar10 | Ar10 | Ar10 |
| Ar11 | 1 | 1 | 0 | 0 | | | | Ar11new=Ar11+Ar10+Ar12 |
| Ar12 | 2 | 2 | 1 | 1 | | | | Ar11new |
| Ar20 | 37 | 35 | 24 | 24 | Ar20 | Ar20 | Ar20 | Ar20 |
| Ar21 | 2 | 2 | 1 | 1 | | | | Ar21new=Ar20+Ar21+Ar22 |
| Ar22 | 3 | 3 | 1 | 1 | | | | Ar21new |
| Ar30 | 7 | 4 | 3 | 3 | | | Ar30 | Ar30 |
| Ar31 | 4 | 4 | 0 | 0 | | | | Ar31new=Ar31+Ar30 |
| Ar32 | 0 | 0 | 0 | 0 | | | | Ar31new |
| Ar40 | 28 | 22 | 20 | 17 | Ar40 | Ar40 | Ar40 | Ar40 |
| Ar41 | 2 | 2 | 1 | 1 | | | | Ar41new=Ar41+Ar40 |
| Ar42 | 1 | 1 | 1 | 1 | | | | Ar42new=Ar42+Ar40 |
| Av10 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Av11 | 1 | 1 | 1 | 1 | | | | Av11new=Av11+Cv11+Cv10 |
| Av12 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Av13 | 1 | 1 | 0 | 0 | | | | Av13new=Av13+Av15+Cv14 |
| Av14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Av15 | 2 | 2 | 2 | 2 | | | | Av15new=Av15+Cv14+Cv15 |
| Av16 | 18 | 17 | 15 | 14 | | Av16 | Av16 | Av16 |
| Av17 | 10 | 9 | 9 | 8 | | Av17 | Av17 | Av17 |
| Av20 | 0 | 0 | 0 | 0 | | | | Cv21 |
| Av21 | 2 | 2 | 1 | 1 | | | | Av21new=Av21+Cv21 |
| Av22 | 1 | 1 | 1 | 1 | | | | Av22new=Av22+Cv22 |
| Av23 | 1 | 0 | 0 | 0 | | | | Av23new=Av23+Cv23 |
| Av24 | 18 | 17 | 4 | 3 | | Av24 | Av24 | Av24 |
| Av25 | 3 | 3 | 3 | 3 | | | | Av25new=Av25+Av24 |
| Av26 | 38 | 35 | 29 | 26 | Av26 | Av26 | Av26 | Av26 |
| Av27 | 11 | 10 | 10 | 9 | | Av27 | Av27 | Av27 |
| Av30 | 2 | 2 | 2 | 2 | | | | Av30new=Av30+Av31 |
| Av31 | 12 | 12 | 7 | 7 | | Av31 | Av31 | Av31 |
| Av32 | 0 | 0 | 0 | 0 | | | | Av31 |
| Av33 | 8 | 8 | 7 | 7 | | | Av33 | Av33 |
| Av34 | 15 | 15 | 6 | 6 | | Av34 | Av34 | Av34 |
| Av35 | 1 | 1 | 1 | 1 | | | | Av35new=Av35+Av34 |
| Av36 | 44 | 44 | 32 | 32 | Av36 | Av36 | Av36 | Av36 |
| Av37 | 11 | 11 | 10 | 10 | | Av37 | Av37 | Av37 |
| Bo10 | 13 | 11 | 9 | 8 | | Bo10 | Bo10 | Bo10 |
| Bo11 | 42 | 39 | 20 | 20 | Bo11 | Bo11 | Bo11 | Bo11 |
| Bo20 | 4 | 4 | 3 | 3 | | | | Bo20new=Bo20+Bo40 |
| Bo21 | 18 | 18 | 14 | 14 | | Bo21 | Bo21 | Bo21 |
| Bo30 | 18 | 12 | 8 | 8 | | Bo30 | Bo30 | Bo30 |
| Bo31 | 22 | 20 | 18 | 18 | Bo31 | Bo31 | Bo31 | Bo31 |
| Bo40 | 10 | 6 | 7 | 7 | | Bo40 | Bo40 | Bo40 |
| Bo41 | 22 | 20 | 18 | 16 | Bo41 | Bo41 | Bo41 | Bo41 |
| Bv10 | 0 | 0 | 0 | 0 | | | | Bv10new=Av11+Cv10 |
| Bv11 | 0 | 0 | 0 | 0 | | | | Av11new |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Bv12 | 0 | 0 | 0 | 0 | | | | Av11new |
| Bv13 | 0 | 0 | 0 | 0 | | | | Bv13new=Av13+Cv13+Cv14 |
| Bv14 | 1 | 1 | 1 | 1 | | | | Bv14new=Bv14+Cv14 |
| Bv15 | 0 | 0 | 0 | 0 | | | | Bv15new=Av15+Cv15+Cv14 |
| Bv16 | 2 | 2 | 1 | 1 | | | | Bv16new=Bv16+Av16 |
| Bv17 | 1 | 1 | 1 | 1 | | | | Bv17new=Bv17+Av17 |
| Bv20 | 0 | 0 | 0 | 0 | | | | Bv20new=Av21+Av22+Cv20+Cv21 |
| Bv21 | 0 | 0 | 0 | 0 | | | | Bv20new |
| Bv22 | 0 | 0 | 0 | 0 | | | | Bv22new=Av22+Cv21+Cv22 |
| Bv23 | 1 | 0 | 0 | 0 | | | | Bv23new=Bv23+Av23+Cv23 |
| Bv24 | 3 | 3 | 1 | 1 | | | | Bv24new=Bv24+Av24 |
| Bv25 | 0 | 0 | 0 | 0 | | | | Bv25new=Av25+Cv25 |
| Bv26 | 14 | 10 | 5 | 5 | | Bv26 | Bv26 | Bv26 |
| Bv27 | 3 | 3 | 0 | 0 | | | | Bv27new=Bv27+Av27 |
| Bv30 | 0 | 0 | 0 | 0 | | | | Cv30 |
| Bv31 | 0 | 0 | 0 | 0 | | | | Av31 |
| Bv32 | 0 | 0 | 0 | 0 | | | | Cv31 |
| Bv33 | 1 | 1 | 0 | 0 | | | | Bv33new=Bv33+Av33 |
| Bv34 | 5 | 5 | 2 | 2 | | | Bv34 | Bv34 |
| Bv35 | 0 | 0 | 0 | 0 | | | | Bv35new=Av35+Cv35 |
| Bv36 | 11 | 11 | 10 | 10 | | Bv36 | Bv36 | Bv36 |
| Bv37 | 2 | 2 | 2 | 2 | | | | Bv37new=Bv37+Av37 |
| Cf10 | 11 | 10 | 1 | 1 | | Cf10 | Cf10 | Cf10 |
| Cf11 | 57 | 49 | 19 | 19 | Cf11 | Cf11 | Cf11 | Cf11 |
| Cf12 | 72 | 55 | 34 | 30 | Cf12 | Cf12 | Cf12 | Cf12 |
| Cf13 | 11 | 11 | 7 | 7 | | Cf13 | Cf13 | Cf13 |
| Cf20 | 2 | 1 | 1 | 1 | | | | Cf20new =Cf30+Cf20 |
| Cf21 | 6 | 3 | 1 | 1 | | | Cf21 | Cf21 |
| Cf22 | 2 | 2 | 0 | 0 | | | | Cf22new=Cf22+Cf32 |
| Cf30 | 5 | 4 | 3 | 3 | | | Cf30 | Cf30 |
| Cf31 | 6 | 6 | 5 | 5 | | | Cf31 | Cf31 |
| Cf32 | 27 | 26 | 16 | 16 | Cf32 | Cf32 | Cf32 | Cf32 |
| Ch10 | 1 | 1 | 0 | 0 | | | | Ch10new=Ch11+Ch10 |
| Ch11 | 6 | 3 | 3 | 2 | | | Ch11 | Ch11 |
| Ch20 | 1 | 1 | 0 | 0 | | | | Ch20new=Ch21+Ch20 |
| Ch21 | 6 | 3 | 5 | 2 | | | Ch21 | Ch21 |
| Ct10 | 3 | 1 | 1 | 1 | | | | Ct10new=Ct10+Ct11 |
| Ct11 | 6 | 2 | 2 | 2 | | | Ct11 | Ct11 |
| Ct12 | 1 | 1 | 1 | 1 | | | | Ct12new=Ct12+Ct11 |
| Ct13 | 2 | 1 | 1 | 1 | | | | Ct13new=Ct13+Vf13+Vf14 |
| Ct14 | 0 | 0 | 0 | 0 | | | | Vf13new |
| Ct15 | 0 | 0 | 0 | 0 | | | | Vf13new |
| Ct20 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Ct21 | 3 | 3 | 1 | 1 | | | | Ct21new=Ct21 + Vf21 |
| Ct22 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Ct23 | 1 | 1 | 0 | 0 | | | | Ct23new=Ct23 + Ct24 |
| Ct24 | 4 | 4 | 2 | 2 | | | | Ct23new |
| Ct25 | 0 | 0 | 0 | 0 | | | | Ct23new |
| Cv10 | 6 | 0 | 0 | 0 | | | Cv10 | Cv10 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Cv11 | 2 | 0 | 0 | 0 | | | | Cv11new=Cv11+Cv10 |
| Cv12 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Cv13 | 2 | 2 | 2 | 2 | | | | Cv13new=Cv13+Cv14 |
| Cv14 | 12 | 12 | 7 | 7 | | Cv14 | Cv14 | Cv14 |
| Cv15 | 1 | 1 | 1 | 1 | | | | Cv15new=Cv15+Cv14 |
| Cv16 | 60 | 58 | 27 | 26 | Cv16 | Cv16 | Cv16 | Cv16 |
| Cv17 | 46 | 41 | 28 | 26 | Cv17 | Cv17 | Cv17 | Cv17 |
| Cv18 | 7 | 5 | 6 | 4 | | | Cv18 | Cv18 |
| Cv20 | 2 | 0 | 0 | 0 | | | | Cv20new=Cv20+Cv21 |
| Cv21 | 7 | 7 | 4 | 4 | | | Cv21 | Cv21 |
| Cv22 | 3 | 1 | 1 | 1 | | | | Cv22new=Cv21+Cv22 |
| Cv23 | 9 | 7 | 4 | 4 | | | Cv23 | Cv23 |
| Cv24 | 18 | 17 | 9 | 8 | | Cv24 | Cv24 | Cv24 |
| Cv25 | 2 | 2 | 2 | 2 | | | | Cv25new=Cv25+Cv24 |
| Cv26 | 52 | 45 | 28 | 27 | Cv26 | Cv26 | Cv26 | Cv26 |
| Cv27 | 14 | 13 | 9 | 8 | | Cv27 | Cv27 | Cv27 |
| Cv28 | 2 | 2 | 2 | 2 | | | | Hu28 |
| Cv30 | 10 | 9 | 8 | 8 | | Cv30 | Cv30 | Cv30 |
| Cv31 | 35 | 35 | 12 | 12 | Cv31 | Cv31 | Cv31 | Cv31 |
| Cv32 | 0 | 0 | 0 | 0 | | | | Cv31 |
| Cv33 | 25 | 23 | 20 | 20 | Cv33 | Cv33 | Cv33 | Cv33 |
| Cv34 | 48 | 48 | 16 | 16 | Cv34 | Cv34 | Cv34 | Cv34 |
| Cv35 | 9 | 9 | 11 | 11 | | | Cv35 | Cv35 |
| Cv36 | 40 | 40 | 21 | 21 | Cv36 | Cv36 | Cv36 | Cv36 |
| Cv37 | 7 | 7 | 2 | 2 | | | Cv37 | Cv37 |
| Cv38 | 0 | 0 | 0 | 0 | | | | Hu38 |
| Cv40 | 1 | 1 | 1 | 1 | | | | Cv40new=Cv40+Cv41 |
| Cv41 | 6 | 6 | 4 | 4 | | | Cv41 | Cv41 |
| Cv42 | 3 | 3 | 3 | 3 | | | | Cv42new=Cv42+Cv41 |
| Cv43 | 10 | 9 | 8 | 8 | | Cv43 | Cv43 | Cv43 |
| Cv44 | 4 | 4 | 3 | 3 | | | | Cv44new=Cv44+Cv34 |
| Cv45 | 2 | 2 | 2 | 2 | | | | Cv45new=Cv45+Cv35 |
| Cv46 | 4 | 4 | 4 | 4 | | | | Cv46new=Cv46+Hu46 |
| Cv47 | 0 | 0 | 0 | 0 | | | | Cv37 |
| Cv48 | 0 | 0 | 0 | 0 | | | | Hu48new |
| Du10 | 59 | 55 | 36 | 32 | Du10 | Du10 | Du10 | Du10 |
| Es10 | 0 | 0 | 0 | 0 | | | | Kd10 |
| Es11 | 0 | 0 | 0 | 0 | | | | Kd11 |
| Es12 | 2 | 2 | 1 | 1 | | | | Es12new=Es12+Kd11 |
| Es13 | 17 | 15 | 13 | 13 | | Es13 | Es13 | Es13 |
| Es14 | 9 | 9 | 8 | 8 | | | Es14 | Es14 |
| Es15 | 4 | 4 | 4 | 4 | | | | Es15new=Es15+Kd15 |
| Es16 | 28 | 28 | 21 | 21 | Es16 | Es16 | Es16 | Es16 |
| Es17 | 6 | 6 | 6 | 6 | | | Es17 | Es17 |
| Es20 | 1 | 1 | 1 | 1 | | | | Es20new=Es20+Es21+Kd20 |
| Es21 | 2 | 1 | 1 | 1 | | | | Es21new=Es21+Es22+Kd21 |
| Es22 | 3 | 3 | 3 | 3 | | | | Es22new=Es21+Es22+Kd22 |
| Es30 | 2 | 2 | 1 | 1 | | | | Es30new=Es30+Es31+Es32+Kd10 |
| Es31 | 3 | 3 | 3 | 3 | | | | Es31new=Es31+Kd11 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Es32 | 1 | 1 | 1 | 1 | | | | Es32=Es32+Es31+Kd11 |
| Es33 | 25 | 21 | 17 | 17 | Es33 | Es33 | Es33 | Es33 |
| Es34 | 9 | 9 | 8 | 8 | | | Es34 | Es34 |
| Es35 | 4 | 4 | 4 | 4 | | | | Es35new=Es35+Kd15 |
| Es36 | 32 | 30 | 23 | 22 | Es36 | Es36 | Es36 | Es36 |
| Es37 | 11 | 11 | 10 | 10 | | Es37 | Es37 | Es37 |
| Es40 | 2 | 2 | 2 | 2 | | | | Es40new=Es40+Es41+Es42+Kd20 |
| Es41 | 1 | 1 | 1 | 1 | | | | Es41new=Es41+Es40+Kd21 |
| Es42 | 1 | 1 | 1 | 1 | | | | Es42new=Es42+Es41+Kd22 |
| Fw10 | 32 | 4 | 5 | 4 | Fw10 | Fw10 | Fw10 | Fw10 |
| Fw11 | 66 | 55 | 44 | 40 | Fw11 | Fw11 | Fw11 | Fw11 |
| Fw12 | 3 | 3 | 3 | 3 | | | | Fw12new=Fw12+Fw11 |
| Fw20 | 5 | 5 | 4 | 4 | | | Fw20 | Fw20 |
| Fw21 | 21 | 19 | 5 | 5 | Fw21 | Fw21 | Fw21 | Fw21 |
| Fw22 | 0 | 0 | 0 | 0 | | | | Fw22new=Fw12+Fw21 |
| Fw30 | 2 | 0 | 0 | 0 | | | | Fw30new=Fw30+Fw10 |
| Fw31 | 6 | 4 | 2 | 2 | | | Fw31 | Fw31 |
| Fw32 | 0 | 0 | 0 | 0 | | | | Fw32new=Fw12+Fw30 |
| Fw40 | 0 | 0 | 0 | 0 | | | | Fw40new=Fw30+Fw20 |
| Fw41 | 0 | 0 | 0 | 0 | | | | Fw41new=Fw31+Fw21 |
| Fw42 | 0 | 0 | 0 | 0 | | | | Fw42new=Fw12+Fw31 |
| Gc10 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Gc11 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Gc12 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Gc13 | 1 | 1 | 1 | 1 | | | | Gc13new=Gc13+Av13+Gc14+Av15 |
| Gc14 | 1 | 1 | 1 | 1 | | | | Gc13new |
| Gc15 | 0 | 0 | 0 | 0 | | | | Gc13new |
| Gc16 | 4 | 4 | 3 | 3 | | | | Gc16new=Gc16+Av16 |
| Gc17 | 1 | 1 | 0 | 0 | | | | Gc17new=Gc17+Av17 |
| Gc20 | 1 | 1 | 1 | 1 | | | | Gc20new=Gc20+Gc21+Av21+Av22 |
| Gc21 | 1 | 1 | 0 | 0 | | | | Gc20new |
| Gc22 | 0 | 0 | 0 | 0 | | | | Gc20new |
| Gc23 | 2 | 2 | 2 | 2 | | | | Gc23new=Gc23+Av23+Gc24 |
| Gc24 | 6 | 6 | 1 | 1 | | | Gc24 | Gc24 |
| Gc25 | 3 | 2 | 3 | 2 | | | | Gc25new=Gc25+av25+Gc24 |
| Gc26 | 11 | 10 | 9 | 8 | | Gc26 | Gc26 | Gc26 |
| Gc27 | 0 | 0 | 0 | 0 | | | | Av27 |
| Gc30 | 0 | 0 | 0 | 0 | | | | Av30new |
| Gc31 | 0 | 0 | 0 | 0 | | | | Av31 |
| Gc32 | 1 | 1 | 1 | 1 | | | | Gc32new=Gc32+Av31 |
| Gc33 | 1 | 1 | 1 | 1 | | | | Gc33new=Gc33+Av33 |
| Gc34 | 2 | 2 | 0 | 0 | | | | Gc34new=Gc34+Gc35+Av34 |
| Gc35 | 3 | 3 | 1 | 1 | | | | Gc35new=Gc35+Gc34+Av35 |
| Gc36 | 2 | 2 | 2 | 2 | | | | Gc36new=Gc36+Av36 |
| Gc37 | 0 | 0 | 0 | 0 | | | | Av37 |
| Gf10 | 0 | 0 | 0 | 0 | | | | Gf11 |
| Gf11 | 26 | 25 | 19 | 18 | Gf11 | Gf11 | Gf11 | Gf11 |
| Gf12 | 42 | 36 | 33 | 28 | Gf12 | Gf12 | Gf12 | Gf12 |
| Gf13 | 15 | 15 | 9 | 9 | | Gf13 | Gf13 | Gf13 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Gf20 | 2 | 2 | 1 | 1 | | | | Gf20new=Gf20+Hu21 |
| Gf21 | 7 | 7 | 2 | 2 | | | Gf21 | Gf21 |
| Gf22 | 8 | 8 | 1 | 1 | | | Gf22 | Gf22 |
| Gf23 | 3 | 3 | 1 | 1 | | | | Gf23new=Gf23+Hu28 |
| Gf30 | 0 | 0 | 0 | 0 | | | | Hu24 |
| Gf31 | 2 | 2 | 1 | 1 | | | | Gf31new=Gf31+Hu36 |
| Gf32 | 0 | 0 | 0 | | | | | Hu37 |
| Gf33 | 0 | 0 | 0 | 0 | | | | Hu38 |
| Gs10 | 14 | 14 | 2 | 2 | | Gs10 | Gs10 | Gs10 |
| Gs11 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs12 | 4 | 4 | 4 | 4 | | | | Gs12new=Gs12+Gs10 |
| Gs13 | 27 | 20 | 12 | 12 | Gs13 | Gs13 | Gs13 | Gs13 |
| Gs14 | 112 | 111 | 12 | 12 | Gs14 | Gs14 | Gs14 | Gs14 |
| Gs15 | 9 | 8 | 5 | 5 | | | Gs15 | Gs15 |
| Gs16 | 106 | 72 | 30 | 30 | Gs16 | Gs16 | Gs16 | Gs16 |
| Gs17 | 118 | 118 | 12 | 12 | Gs17 | Gs17 | Gs17 | Gs17 |
| Gs18 | 21 | 19 | 12 | 12 | Gs18 | Gs18 | Gs18 | Gs18 |
| Gs19 | 45 | 43 | 7 | 7 | Gs19 | Gs19 | Gs19 | Gs19 |
| Gs20 | 2 | 2 | 1 | 1 | | | | Gs20new=Gs20+Gs10 |
| Gs21 | 0 | 0 | 0 | 0 | | | | Gs20new |
| Gs22 | 0 | 0 | 0 | 0 | | | | Gs20new |
| Gs23 | 11 | 11 | 10 | 10 | | Gs23 | Gs23 | Gs23 |
| Gs24 | 7 | 7 | 3 | 3 | | | Gs24 | Gs24 |
| Gs25 | 1 | 1 | 1 | 1 | | | | Gs25new=Gs25+Gs24 |
| Gs26 | 5 | 5 | 5 | 5 | | | Gs26 | Gs26 |
| Gs27 | 6 | 6 | 0 | 0 | | | Gs27 | Gs27 |
| Gs28 | 1 | 1 | 1 | 1 | | | | Gs28new=Gs28+Gs27 |
| Gs29 | 1 | 1 | 0 | 0 | | | | Gs29new=Gs29+Gs19 |
| Hh10 | 0 | 0 | 0 | 0 | | | | Hh10new=Lt10+Lt11+Hh20 |
| Hh11 | 1 | 1 | 1 | 1 | | | | Hh11new=Hh11+Hh21+Lt14 |
| Hh20 | 1 | 1 | 1 | 1 | | | | Hh20new=Hh20+Lt11 |
| Hh21 | 2 | 2 | 2 | 2 | | | | Hh21new=Hh11+Hh21+Lt14 |
| Hh30 | 1 | 1 | 1 | 1 | | | | Hh30new=Lt12+Hh30+Lt11 |
| Hh31 | 1 | 1 | 1 | 1 | | | | Hh31new=Hh31+Hh21+Hh11+Lt14 |
| Hu10 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Hu11 | 2 | 1 | 0 | 0 | | | | Hu11new=Hu11+Cv11 |
| Hu12 | 0 | 0 | 0 | 0 | | | | Cv11 |
| Hu13 | 0 | 0 | 1 | 1 | | | | Hu14 |
| Hu14 | 7 | 7 | 0 | 0 | | | Hu14 | Hu14 |
| Hu15 | 4 | 4 | 3 | 3 | | | | Hu15new |
| Hu16 | 64 | 61 | 32 | 29 | Hu16 | Hu16 | Hu16 | Hu16 |
| Hu17 | 80 | 71 | 39 | 36 | Hu17 | Hu17 | Hu17 | Hu17 |
| Hu18 | 41 | 40 | 29 | 28 | Hu18 | Hu18 | Hu18 | Hu18 |
| Hu20 | 6 | 2 | 1 | 1 | | | Hu20 | Hu20 |
| Hu21 | 4 | 3 | 2 | 2 | | | | Hu21new=Hu21+Hu20+Hu22 |
| Hu22 | 1 | 1 | 1 | 1 | | | | Hu21new |
| Hu23 | 2 | 2 | 3 | 3 | | | | Hu23new=Hu23+Hu24 |
| Hu24 | 38 | 37 | 16 | 16 | Hu24 | Hu24 | Hu24 | Hu24 |
| Hu25 | 5 | 5 | 5 | 5 | | | Hu25 | Hu25 |
| Hu26 | 151 | 125 | 72 | 72 | Hu26 | Hu26 | Hu26 | Hu26 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Hu27 | 91 | 81 | 46 | 43 | Hu27 | Hu27 | Hu27 | Hu27 |
| Hu28 | 52 | 51 | 29 | 28 | Hu28 | Hu28 | Hu28 | Hu28 |
| Hu30 | 10 | 10 | 8 | 8 | | Hu30 | Hu30 | Hu30 |
| Hu31 | 42 | 42 | 25 | 25 | Hu31 | Hu31 | Hu31 | Hu31 |
| Hu32 | 12 | 12 | 8 | 8 | | Hu32 | Hu32 | Hu32 |
| Hu33 | 52 | 48 | 44 | 44 | Hu33 | Hu33 | Hu33 | Hu33 |
| Hu34 | 145 | 145 | 53 | 53 | Hu34 | Hu34 | Hu34 | Hu34 |
| Hu35 | 18 | 18 | 19 | 18 | | Hu35 | Hu35 | Hu35 |
| Hu36 | 236 | 229 | 162 | 159 | Hu36 | Hu36 | Hu36 | Hu36 |
| Hu37 | 55 | 50 | 41 | 39 | Hu37 | Hu37 | Hu37 | Hu37 |
| Hu38 | 13 | 13 | 7 | 7 | | Hu38 | Hu38 | Hu38 |
| Hu40 | 2 | 2 | 2 | 2 | | | | Hu40new=Hu40+Hu41+Hu42 |
| Hu41 | 3 | 3 | 3 | 3 | | | | Hu40new |
| Hu42 | 6 | 6 | 4 | 4 | | | Hu42 | Hu42 |
| Hu43 | 14 | 14 | 15 | 15 | | Hu43 | Hu43 | Hu43 |
| Hu44 | 6 | 6 | 5 | 5 | | | Hu44 | Hu44 |
| Hu45 | 11 | 11 | 9 | 9 | | Hu45 | Hu45 | Hu45 |
| Hu46 | 28 | 28 | 27 | 27 | Hu46 | Hu46 | Hu46 | Hu46 |
| Hu47 | 3 | 3 | 2 | 2 | | | | Hu47new=Hu47+Hu37 |
| Hu48 | 1 | 1 | 0 | 0 | | | | Hu48new=Hu48+Hu38 |
| Ia10 | 6 | 5 | 5 | 5 | | | Ia10 | Ia10 |
| Ia11 | 44 | 41 | 12 | 11 | Ia11 | Ia11 | Ia11 | Ia11 |
| Ia12 | 26 | 22 | 7 | 7 | Ia12 | Ia12 | Ia12 | Ia12 |
| Ik10 | 10 | 7 | 7 | 7 | | Ik10 | Ik10 | Ik10 |
| Ik11 | 16 | 14 | 6 | 6 | | Ik11 | Ik11 | Ik11 |
| Ik20 | 3 | 3 | 2 | 2 | | | | Ik20new=Ik20+Tk20+Bo20 |
| Ik21 | 1 | 1 | 0 | 0 | | | | Ik21new=Ik21+Bo21 |
| Ka10 | 54 | 49 | 21 | 18 | Ka10 | Ka10 | Ka10 | Ka10 |
| Ka20 | 25 | 21 | 11 | 8 | Ka20 | Ka20 | Ka20 | Ka20 |
| Kd10 | 5 | 4 | 5 | 5 | | | Kd10 | Kd10 |
| Kd11 | 12 | 11 | 4 | 4 | | Kd11 | Kd11 | Kd11 |
| Kd12 | 0 | 0 | 0 | 0 | | | | Es12new |
| Kd13 | 26 | 22 | 19 | 19 | Kd13 | Kd13 | Kd13 | Kd13 |
| Kd14 | 27 | 25 | 10 | 10 | Kd14 | Kd14 | Kd14 | Kd14 |
| Kd15 | 8 | 5 | 6 | 6 | | | Kd15 | Kd15 |
| Kd16 | 24 | 17 | 14 | 13 | Kd16 | Kd16 | Kd16 | Kd16 |
| Kd17 | 15 | 15 | 7 | 7 | | Kd17 | Kd17 | Kd17 |
| Kd18 | 6 | 6 | 5 | 5 | | | Kd18 | Kd18 |
| Kd19 | 3 | 3 | 2 | 2 | | | | Kd19new=Kd19+Es17 |
| Kd20 | 3 | 3 | 3 | 3 | | | | Kd20new=Kd20+Es20+Es40+Kd21 |
| Kd21 | 3 | 2 | 2 | 2 | | | | Kd21new=Kd21+Kd20+Kd22 |
| Kd22 | 4 | 3 | 3 | 3 | | | | Kd22new=Kd22+Kd21 |
| Kp10 | 17 | 17 | 8 | 8 | | Kp10 | Kp10 | Kp10 |
| Kp11 | 23 | 23 | 7 | 7 | Kp11 | Kp11 | Kp11 | Kp11 |
| Kp12 | 13 | 11 | 6 | 4 | | Kp12 | Kp12 | Kp12 |
| Lo10 | 3 | 3 | 2 | 2 | | | | Lo10new=Lo10+Cf10 |
| Lo11 | 18 | 12 | 6 | 6 | | Lo11 | Lo11 | Lo11 |
| Lo12 | 21 | 17 | 12 | 12 | Lo12 | Lo12 | Lo12 | Lo12 |
| Lo13 | 7 | 5 | 6 | 4 | | | Lo13 | Lo13 |
| Lo20 | 8 | 7 | 4 | 4 | | | Lo20 | Lo20 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Lo21 | 37 | 36 | 15 | 14 | Lo21 | Lo21 | Lo21 | Lo21 |
| Lo22 | 16 | 15 | 9 | 8 | | Lo22 | Lo22 | Lo22 |
| Lo30 | 1 | 1 | 1 | 1 | | | | Lo30new=Lo30+Cf30+Wa30 |
| Lo31 | 2 | 2 | 2 | 2 | | | | Lo31new=Lo31+Cf31+Wa31 |
| Lo32 | 3 | 3 | 3 | 3 | | | | Lo32new=Lo32+Cf32 |
| Lt10 | 1 | 1 | 1 | 1 | | | | Lt10new=Lt10+Lt11 |
| Lt11 | 9 | 8 | 8 | 8 | | | Lt11 | Lt11 |
| Lt12 | 1 | 1 | 1 | 1 | | | | Lt12new=Lt12+Lt11 |
| Lt13 | 0 | 0 | 0 | 0 | | | | Hh21new |
| Lt14 | 3 | 3 | 2 | 2 | | | | Lt14new=Lt14+Hh21 |
| Lt15 | 0 | 0 | 0 | 0 | | | | Lt15new=Lt14+Hh21+Hh31 |
| Lt20 | 0 | 0 | 0 | 0 | | | | Lt10new |
| Lt21 | 1 | 1 | 1 | 1 | | | | Lt11 |
| Lt22 | 0 | 0 | 0 | 0 | | | | Lt12new |
| Lt23 | 0 | 0 | 0 | 0 | | | | Hh11new |
| Lt24 | 0 | 0 | 0 | 0 | | | | Lt24new=Lt14+Hh21 |
| Lt25 | 0 | 0 | 0 | 0 | | | | Lt25new=Lt14+Hh21+Hh31 |
| Ma10 | 48 | 45 | 19 | 19 | Ma10 | Ma10 | Ma10 | Ma10 |
| Ma11 | 43 | 43 | 5 | 5 | Ma11 | Ma11 | Ma11 | Ma11 |
| Ma12 | 6 | 6 | 0 | 0 | | | Ma12 | Ma12 |
| Ms10 | 764 | 726 | 9 | 8 | Ms10 | Ms10 | Ms10 | Ms10 |
| Ms11 | 4 | 4 | 0 | 0 | | | | Ms11new=Ms11+Ms12 |
| Ms12 | 26 | 26 | 1 | 1 | Ms12 | Ms12 | Ms12 | Ms12 |
| Ms13 | 0 | 0 | 0 | 0 | | | | Ms14 |
| Ms14 | 28 | 28 | 0 | 0 | Ms14 | Ms14 | Ms14 | Ms14 |
| Ms20 | 125 | 105 | 3 | 3 | Ms20 | Ms20 | Ms20 | Ms20 |
| Ms21 | 0 | 0 | 0 | 0 | | | | Ms22 |
| Ms22 | 97 | 97 | 1 | 1 | Ms22 | Ms22 | Ms22 | Ms22 |
| Ms23 | 0 | 0 | 0 | 0 | | | | Ms22 |
| Ms24 | 5 | 5 | 0 | 0 | | | Ms24 | Ms24 |
| Mw10 | 22 | 19 | 5 | 5 | Mw10 | Mw10 | Mw10 | Mw10 |
| Mw11 | 30 | 26 | 3 | 3 | Mw11 | Mw11 | Mw11 | Mw11 |
| Mw20 | 0 | 0 | 0 | 0 | | | | My20 |
| Mw21 | 2 | 2 | 0 | 0 | | | | Mw21new=Mw21+My21 |
| My10 | 44 | 30 | 7 | 7 | My10 | My10 | My10 | My10 |
| My11 | 83 | 68 | 14 | 14 | My11 | My11 | My11 | My11 |
| My20 | 8 | 7 | 3 | 3 | | | My20 | My20 |
| My21 | 20 | 18 | 9 | 9 | My21 | My21 | My21 | My21 |
| No10 | 28 | 25 | 3 | 3 | No10 | No10 | No10 | No10 |
| No11 | 40 | 40 | 3 | 3 | No11 | No11 | No11 | No11 |
| Oa10 | 0 | 0 | 0 | 0 | | | | Oa11new |
| Oa11 | 2 | 2 | 1 | 1 | | | | Oa11new=Oa11+Oa31 |
| Oa12 | 0 | 0 | 0 | 0 | | | | Oa12new=Oa11+Oa31+Oa32 |
| Oa13 | 2 | 2 | 2 | 2 | | | | Oa13new=Oa13+Oa33 |
| Oa14 | 12 | 12 | 1 | 1 | | Oa14 | Oa14 | Oa14 |
| Oa15 | 0 | 0 | 0 | 0 | | | | Oa15new=Oa35+Oa14 |
| Oa16 | 51 | 47 | 34 | 34 | Oa16 | Oa16 | Oa16 | Oa16 |
| Oa17 | 34 | 34 | 17 | 17 | Oa17 | Oa17 | Oa17 | Oa17 |
| Oa20 | 0 | 0 | 0 | 0 | | | | Oa21 |
| Oa21 | 9 | 9 | 3 | 3 | | | Oa21 | Oa21 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Oa22 | 0 | 0 | 0 | 0 | | | | Oa21 |
| Oa23 | 4 | 4 | 5 | 5 | | | | Oa23new=Oa23+Oa41 |
| Oa24 | 52 | 52 | 31 | 31 | Oa24 | Oa24 | Oa24 | Oa24 |
| Oa25 | 1 | 1 | 1 | 1 | | | | Oa25new=Oa25+Oa24 |
| Oa26 | 131 | 131 | 109 | 109 | Oa26 | Oa26 | Oa26 | Oa26 |
| Oa27 | 38 | 38 | 31 | 31 | Oa27 | Oa27 | Oa27 | Oa27 |
| Oa30 | 0 | 0 | 0 | 0 | | | | Oa30new |
| Oa31 | 5 | 5 | 2 | 2 | | | Oa31 | Oa31 |
| Oa32 | 1 | 1 | 1 | 1 | | | | Oa32new=Oa32+Oa31 |
| Oa33 | 8 | 8 | 8 | 8 | | | Oa33 | Oa33 |
| Oa34 | 10 | 10 | 5 | 5 | | Oa34 | Oa34 | Oa34 |
| Oa35 | 4 | 4 | 2 | 2 | | | | Oa35new=Oa35+Oa34 |
| Oa36 | 69 | 64 | 32 | 32 | Oa36 | Oa36 | Oa36 | Oa36 |
| Oa37 | 32 | 30 | 13 | 13 | Oa37 | Oa37 | Oa37 | Oa37 |
| Oa40 | 0 | 0 | 0 | 0 | | | | Oa41 |
| Oa41 | 7 | 7 | 3 | 3 | | | Oa41 | Oa41 |
| Oa42 | 0 | 0 | 0 | 0 | | | | Oa41 |
| Oa43 | 6 | 5 | 6 | 6 | | | Oa43 | Oa43 |
| Oa44 | 36 | 36 | 20 | 20 | Oa44 | Oa44 | Oa44 | Oa44 |
| Oa45 | 1 | 1 | 1 | 1 | | | | Oa45new=Oa45+Oa44 |
| Oa46 | 115 | 114 | 80 | 80 | Oa46 | Oa46 | Oa46 | Oa46 |
| Oa47 | 26 | 26 | 17 | 17 | Oa47 | Oa47 | Oa47 | Oa47 |
| Pn10 | 0 | 0 | 0 | 0 | | | | Cv10 |
| Pn11 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Pn12 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Pn13 | 0 | 0 | 0 | 0 | | | | Cv13new |
| Pn14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Pn15 | 1 | 1 | 0 | 0 | | | | Pn15new=Pn15+Cv15+Cv14 |
| Pn16 | 2 | 2 | 0 | 0 | | | | Pn16new=Pn16+Cv16 |
| Pn17 | 4 | 4 | 3 | 3 | | | | Pn17new=Pn17+Cv17 |
| Pn20 | 0 | 0 | 0 | 0 | | | | Pn20new=Pn21+Cv20+Cv21 |
| Pn21 | 2 | 2 | 0 | 0 | | | | Pn21new=Pn21+Cv21 |
| Pn22 | 0 | 0 | 0 | 0 | | | | Pn22new=Pn21+Cv22 |
| Pn23 | 1 | 0 | 0 | 0 | | | | Pn23new=Pn23+Cv23 |
| Pn24 | 5 | 5 | 1 | 1 | | | Pn24 | Pn24 |
| Pn25 | 0 | 0 | 0 | 0 | | | | Pn25new=Pn24+Pn23 |
| Pn26 | 4 | 4 | 4 | 4 | | | | Pn26new=Pn26+Cv26 |
| Pn27 | 0 | 0 | 0 | 0 | | | | Pn27new=Cv27+Av27 |
| Pn30 | 0 | 0 | 0 | 0 | | | | Pn31 |
| Pn31 | 7 | 7 | 1 | 1 | | | Pn31 | Pn31 |
| Pn32 | 0 | 0 | 0 | 0 | | | | Pn31 |
| Pn33 | 1 | 0 | 0 | 0 | | | | Pn33new=Pn31+Pn34 |
| Pn34 | 5 | 5 | 0 | 0 | | | Pn34 | Pn34 |
| Pn35 | 0 | 0 | 0 | 0 | | | | Pn33new |
| Pn36 | 11 | 11 | 5 | 5 | | Pn36 | Pn36 | Pn36 |
| Pn37 | 2 | 2 | 2 | 2 | | | | Pn37new=Pn37+Cv37 |
| Rg10 | 8 | 5 | 4 | 4 | | | Rg10 | Rg10 |
| Rg20 | 44 | 41 | 29 | 28 | Rg20 | Rg20 | Rg20 | Rg20 |
| Sd10 | 9 | 5 | 1 | 1 | | | Sd10 | Sd10 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Sd11 | 15 | 13 | 6 | 6 | | Sd11 | Sd11 | Sd11 |
| Sd12 | 34 | 34 | 26 | 26 | Sd12 | Sd12 | Sd12 | Sd12 |
| Sd20 | 13 | 12 | 10 | 10 | | Sd20 | Sd20 | Sd20 |
| Sd21 | 51 | 51 | 34 | 33 | Sd21 | Sd21 | Sd21 | Sd21 |
| Sd22 | 35 | 33 | 28 | 26 | Sd22 | Sd22 | Sd22 | Sd22 |
| Sd30 | 3 | 3 | 2 | 2 | | | | Sd30new=Sd30+Hu46 |
| Sd31 | 9 | 9 | 9 | 9 | | | Sd31 | Sd31 |
| Sd32 | 2 | 2 | 2 | 2 | | | | Sd32new=Sd32+Hu38 |
| Sp10 | 0 | 0 | 0 | 0 | | | | Ct10new |
| Sp11 | 0 | 0 | 0 | 0 | | | | Ct11 |
| Sp12 | 0 | 0 | 0 | 0 | | | | Ct12new |
| Sp13 | 0 | 0 | 0 | 0 | | | | Ct13new |
| Sp14 | 0 | 0 | 0 | 0 | | | | Ct13new |
| Sp15 | 0 | 0 | 0 | 0 | | | | Ct13new |
| Sp20 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Sp21 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Sp22 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Sp23 | 0 | 0 | 0 | 0 | | | | Sp23new=Ct23+Vf11 |
| Sp24 | 0 | 0 | 0 | 0 | | | | Sp24new=Ct24+Vf24 |
| Sp25 | 0 | 0 | 0 | 0 | | | | Vf25new |
| Ss10 | 0 | 0 | 0 | 0 | | | | Ss10new=Ss11+Oa10+Ss20 |
| Ss11 | 1 | 1 | 1 | 1 | | | | Ss11new=Ss11+Oa10+Ss20+Ss21 |
| Ss12 | 0 | 0 | 0 | 0 | | | | Ss11new |
| Ss13 | 15 | 15 | 11 | 11 | | Ss13 | Ss13 | Ss13 |
| Ss14 | 7 | 7 | 5 | 5 | | | Ss14 | Ss14 |
| Ss15 | 0 | 0 | 0 | 0 | | | | Ss15new=Ss14+Oa14 |
| Ss16 | 29 | 29 | 19 | 19 | Ss16 | Ss16 | Ss16 | Ss16 |
| Ss17 | 0 | 0 | 0 | 0 | | | | Oa17 |
| Ss20 | 2 | 2 | 1 | 1 | | | | Ss20new=Ss20+Ss21+Oa31 |
| Ss21 | 1 | 1 | 1 | 1 | | | | Ss20new |
| Ss22 | 0 | 0 | 0 | 0 | | | | Ss22new=Ss21+Ss20+Oa31+Oa32 |
| Ss23 | 28 | 28 | 22 | 22 | Ss23 | Ss23 | Ss23 | Ss23 |
| Ss24 | 21 | 20 | 13 | 13 | Ss24 | Ss24 | Ss24 | Ss24 |
| Ss25 | 4 | 4 | 4 | 4 | | | | Ss25new=Ss25+Oa35 |
| Ss26 | 49 | 47 | 33 | 33 | Ss26 | Ss26 | Ss26 | Ss26 |
| Ss27 | 6 | 6 | 3 | 3 | | | Ss27 | Ss27 |
| Sw10 | 85 | 84 | 67 | 67 | Sw10 | Sw10 | Sw10 | Sw10 |
| Sw11 | 87 | 86 | 80 | 80 | Sw11 | Sw11 | Sw11 | Sw11 |
| Sw12 | 39 | 39 | 37 | 37 | Sw12 | Sw12 | Sw12 | Sw12 |
| Sw20 | 30 | 30 | 27 | 27 | Sw20 | Sw20 | Sw20 | Sw20 |
| Sw21 | 33 | 33 | 34 | 34 | Sw21 | Sw21 | Sw21 | Sw21 |
| Sw22 | 14 | 14 | 14 | 14 | | Sw22 | Sw22 | Sw22 |
| Sw30 | 59 | 55 | 35 | 35 | Sw30 | Sw30 | Sw30 | Sw30 |
| Sw31 | 48 | 43 | 35 | 35 | Sw31 | Sw31 | Sw31 | Sw31 |
| Sw32 | 22 | 22 | 21 | 21 | Sw32 | Sw32 | Sw32 | Sw32 |
| Sw40 | 15 | 15 | 8 | 8 | | Sw40 | Sw40 | Sw40 |
| Sw41 | 28 | 27 | 22 | 22 | Sw41 | Sw41 | Sw41 | Sw41 |
| Sw42 | 14 | 14 | 12 | 12 | | Sw42 | Sw42 | Sw42 |
| Tk10 | 1 | 1 | 1 | 1 | | | | Tk10new=Tk10+Ik10 |
| Tk11 | 0 | 0 | 0 | 0 | | | | Ik11 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Tk20 | 1 | 1 | 1 | 1 | | | | Ik20new |
| Tk21 | 1 | 1 | 1 | 1 | | | | Tk21new=Tk21+Bo21 |
| Va10 | 27 | 26 | 14 | 14 | Va10 | Va10 | Va10 | Va10 |
| Va11 | 24 | 23 | 18 | 18 | Va11 | Va11 | Va11 | Va11 |
| Va12 | 6 | 6 | 5 | 5 | | | Va12 | Va12 |
| Va20 | 24 | 22 | 19 | 19 | Va20 | Va20 | Va20 | Va20 |
| Va21 | 54 | 54 | 44 | 44 | Va21 | Va21 | Va21 | Va21 |
| Va22 | 13 | 13 | 10 | 10 | | Va22 | Va22 | Va22 |
| Va30 | 54 | 43 | 15 | 15 | Va30 | Va30 | Va30 | Va30 |
| Va31 | 38 | 31 | 25 | 25 | Va31 | Va31 | Va31 | Va31 |
| Va32 | 6 | 5 | 5 | 5 | | | Va32 | Va32 |
| Va40 | 38 | 35 | 12 | 12 | Va40 | Va40 | Va40 | Va40 |
| Va41 | 58 | 54 | 43 | 43 | Va41 | Va41 | Va41 | Va41 |
| Va42 | 17 | 17 | 12 | 12 | | Va42 | Va42 | Va42 |
| Vf10 | 1 | 1 | 1 | 1 | | | | Vf10new=Vf10+Vf11 |
| Vf11 | 5 | 5 | 3 | 3 | | | Vf11 | Vf11 |
| Vf12 | 0 | 0 | 0 | 0 | | | | Vf12new=Vf11+Ct12 |
| Vf13 | 1 | 0 | 0 | 0 | | | | Vf13new=Vf13+Vf14 |
| Vf14 | 5 | 5 | 2 | 2 | | | Vf14 | Vf14 |
| Vf15 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf20 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Vf21 | 2 | 2 | 3 | 3 | | | | Ct21new |
| Vf22 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Vf23 | 11 | 4 | 1 | 1 | | Vf23 | Vf23 | Vf23 |
| Vf24 | 5 | 4 | 1 | 1 | | | Vf24 | Vf24 |
| Vf25 | 1 | 1 | 1 | 1 | | | | Vf25new=Vf25+Vf24 |
| Vf30 | 0 | 0 | 0 | 0 | | | | Vf10new |
| Vf31 | 0 | 0 | 0 | 0 | | | | Vf31new=Vf32+Vf11 |
| Vf32 | 1 | 1 | 0 | 0 | | | | Vf32new=Vf32+Vf11+Ct32+Lt11 |
| Vf33 | 1 | 1 | 1 | 1 | | | | Vf33new=Vf33+Vf13+Vf14 |
| Vf34 | 1 | 1 | 1 | 1 | | | | Vf34new=Vf34+Vf14 |
| Vf35 | 0 | 0 | 0 | 0 | | | | Oa35new |
| Vf40 | 1 | 1 | 1 | 1 | | | | Vf40new=Vf40+Vf21+Ct21 |
| Vf41 | 2 | 2 | 2 | 2 | | | | Vf40new |
| Vf42 | 0 | 0 | 0 | 0 | | | | Vf42new=Vf41+Vf40Vf21+Ct21 |
| Vf43 | 0 | 0 | 0 | 0 | | | | Vf23 |
| Vf44 | 0 | 0 | 0 | 0 | | | | Vf24 |
| Vf45 | 0 | 0 | 0 | 0 | | | | Vf25new |
| Wa10 | 2 | 2 | 2 | 2 | | | | Wa10new=Wa10+Lo10 |
| Wa11 | 8 | 5 | 2 | 2 | | | Wa11 | Wa11 |
| Wa12 | 7 | 7 | 5 | 5 | | | Wa12 | Wa12 |
| Wa13 | 0 | 0 | 0 | 0 | | | | Lo13 |
| Wa20 | 3 | 3 | 0 | 0 | | | | Wa20new=Wa20+Lo20 |
| Wa21 | 12 | 12 | 4 | 4 | | Wa21 | Wa21 | Wa21 |
| Wa22 | 4 | 1 | 3 | 1 | | | | Wa22new=Wa22+Lo22 |
| Wa30 | 1 | 1 | 1 | 1 | | | | Wa30new=Wa30+Wa20+Wa10 |
| Wa31 | 2 | 2 | 2 | 2 | | | | Wa31new=Wa31+Wa21 |
| Wa32 | 1 | 1 | 1 | 1 | | | | Wa32new=Wa32+Wa22 |
| We10 | 0 | 0 | 0 | 0 | | | | We10new=Av30+Cv21 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| We11 | 0 | 0 | 0 | 0 | | | | Av13new |
| We12 | 17 | 15 | 13 | 13 | | We12 | We12 | We12 |
| We13 | 29 | 29 | 26 | 26 | We13 | We13 | We13 | We13 |
| We20 | 7 | 6 | 0 | 0 | | | We20 | We20 |
| We21 | 18 | 18 | 1 | 1 | | We21 | We21 | We21 |
| We22 | 40 | 40 | 16 | 16 | We22 | We22 | We22 | We22 |
| We30 | 1 | 1 | 1 | 1 | | | | We30new=We30+Av22+Cv22 |
| We31 | 1 | 1 | 1 | 1 | | | | We31new=We31+Av15+Av25+Av35 |
| We32 | 3 | 3 | 2 | 2 | | | | We32new=We32+Av26 |
| Wo10 | 5 | 5 | 2 | 2 | | | Wo10 | Wo10 |
| Wo11 | 12 | 8 | 8 | 6 | | Wo11 | Wo11 | Wo11 |
| Wo20 | 7 | 6 | 1 | 1 | | | Wo20 | Wo20 |
| Wo21 | 2 | 1 | 0 | 0 | | | | Wo21new=Wo21+Bo41 |

# APPENDIX 3B: NUMBER OF SOIL CARBON SAMPLES PER SOIL SERIES FOR AGRICULTURAL LAND USES AND LEVELS OF ASSURANCE

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Ar10 | 9 | 9 | 8 | 8 | | | Ar10 | Ar10 |
| Ar11 | 0 | 0 | 0 | 0 | | | | Ar10 |
| Ar12 | 0 | 0 | 0 | 0 | | | | Ar10 |
| Ar20 | 15 | 14 | 13 | 12 | | Ar20 | Ar20 | Ar20 |
| Ar21 | 1 | 1 | 1 | 1 | | | | Ar21new=Ar21+Ar20 |
| Ar22 | 0 | 0 | 1 | 1 | | | | Ar21new |
| Ar30 | 3 | 3 | 2 | 2 | | | | Ar30new=Ar30+ArAr31 |
| Ar31 | 1 | 1 | 0 | 0 | | | | Ar30new |
| Ar32 | 0 | 0 | 0 | 0 | | | | Ar30new |
| Ar40 | 3 | 3 | 2 | 2 | | | | Ar40new=Ar40+Ar41 |
| Ar41 | 2 | 2 | 1 | 1 | | | | Ar40new |
| Ar42 | 0 | 0 | 0 | 0 | | | | Ar40new |
| Av10 | 0 | 0 | 0 | 0 | | | | Av10new=Cv11+Cv20+Cv21 |
| Av11 | 0 | 0 | 0 | 0 | | | | Av10new |
| Av12 | 0 | 0 | 0 | 0 | | | | Av12new=Cv11+Cv20+Cv21+Cv22 |
| Av13 | 0 | 0 | 0 | 0 | | | | Av13new=Cv14+Hu14 |
| Av14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Av15 | 0 | 0 | 0 | 0 | | | | Cv15new |
| Av16 | 4 | 4 | 4 | 4 | | | | Av16new=Av16+Cv16 |
| Av17 | 3 | 3 | 3 | 3 | | | | Av17new=Av17+Cv17 |
| Av20 | 0 | 0 | 0 | 0 | | | | Av20new=Av21+Cv20+Cv21 |
| Av21 | 1 | 1 | 1 | 1 | | | | Av21new=Av21+Cv21 |
| Av22 | 0 | 0 | 0 | 0 | | | | Av22new=Av21+Cv21+Cv22 |
| Av23 | 0 | 0 | 0 | 0 | | | | Av23new=Av24+Bv24+Cv23 |
| Av24 | 3 | 3 | 3 | 3 | | | | Av24new=Av24+Bv24 |
| Av25 | 0 | 0 | 0 | 0 | | | | Av24 |
| Av26 | 24 | 24 | 24 | 24 | Av26 | Av26 | Av26 | Av26 |
| Av27 | 5 | 5 | 5 | 5 | | | Av27 | Av27 |
| Av30 | 0 | 0 | 0 | 0 | | | | Av31 |
| Av31 | 6 | 6 | 4 | 4 | | | Av31 | Av31 |
| Av32 | 1 | 1 | 1 | 1 | | | | Av32new=Av32+Av31 |
| Av33 | 1 | 1 | 1 | 1 | | | | Av33new=Av33+Av34 |
| Av34 | 32 | 32 | 30 | 30 | Av34 | Av34 | Av34 | Av34 |
| Av35 | 1 | 1 | 1 | 1 | | | | Av35new=Av35+Av34 |
| Av36 | 60 | 60 | 60 | 60 | Av36 | Av36 | Av36 | Av36 |
| Av37 | 3 | 3 | 3 | 3 | | | | Av37new=Av37+Cv37 |
| Bo10 | 6 | 6 | 6 | 6 | | | Bo10 | Bo10 |
| Bo11 | 9 | 9 | 9 | 9 | | | Bo11 | Bo11 |
| Bo20 | 3 | 3 | 2 | 2 | | | | Bo20new=Bo20+Wo20+Bo10 |
| Bo21 | 7 | 7 | 7 | 7 | | | Bo21 | Bo21 |
| Bo30 | 0 | 0 | 0 | 0 | | | | Bo30new=Bo10+Bo20 |
| Bo31 | 2 | 2 | 2 | 2 | | | | Bo31new=Bo31+Wo11 |
| Bo40 | 0 | 0 | 0 | 0 | | | | Wo20new |
| Bo41 | 0 | 0 | 0 | 0 | | | | Wo21new |
| Bv10 | 0 | 0 | 0 | 0 | | | | Bv10new=Av11+Cv11+Av21+Pn21 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Bv11 | 0 | 0 | 0 | 0 | | | | Bv10new |
| Bv12 | 0 | 0 | 0 | 0 | | | | Bv10new |
| Bv13 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Bv14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Bv15 | 0 | 0 | 0 | 0 | | | | Bv15new=Bv14+Av15+Cv14 |
| Bv16 | 0 | 0 | 0 | 0 | | | | Bv16new=Bv16+Av16 |
| Bv17 | 0 | 0 | 0 | 0 | | | | Bv17new=Bv17+Av17+Cv9 |
| Bv20 | 0 | 0 | 0 | 0 | | | | Bv20new=Av21+Cv20+Cv21 |
| Bv21 | 0 | 0 | 0 | 0 | | | | Av21new |
| Bv22 | 0 | 0 | 0 | 0 | | | | Av22new |
| Bv23 | 0 | 0 | 0 | 0 | | | | Bv23new=Bv23+Av23+Cv23+Cv24 |
| Bv24 | 2 | 2 | 2 | 2 | | | | Av24new |
| Bv25 | 0 | 0 | 0 | 0 | | | | Bv25new=Av24+Cv24 |
| Bv26 | 6 | 6 | 6 | 6 | | | | Bv26 |
| Bv27 | 1 | 1 | 0 | 0 | | | | Bv27new=Bv27+Av27 |
| Bv30 | 0 | 0 | 0 | 0 | | | | Bv30new=Av31+Av32+Cv30 |
| Bv31 | 0 | 0 | 0 | 0 | | | | Av31 |
| Bv32 | 0 | 0 | 0 | 0 | | | | Av32new |
| Bv33 | 0 | 0 | 0 | 0 | | | | Bv34 |
| Bv34 | 7 | 7 | 7 | 7 | | | Bv34 | Bv34 |
| Bv35 | 1 | 1 | 1 | 1 | | | | Bv35new=Bv35+Bv34 |
| Bv36 | 17 | 17 | 18 | 18 | | Bv36 | Bv36 | Bv36 |
| Bv37 | 3 | 3 | 3 | 3 | | | | Bv37new=Bv37+Av37 |
| Cf10 | 5 | 5 | 3 | 3 | | | Cf10 | Cf10 |
| Cf11 | 11 | 11 | 9 | 9 | | Cf11 | Cf11 | Cf11 |
| Cf12 | 10 | 10 | 7 | 7 | | Cf12 | Cf12 | Cf12 |
| Cf13 | 4 | 4 | 4 | 4 | | | | Cf13new=Cf13+Lo13 |
| Cf20 | 1 | 1 | 1 | 1 | | | | Cf20new=Cf20+Lo20 |
| Cf21 | 0 | 0 | 0 | 0 | | | | Lo21 |
| Cf22 | 1 | 1 | 1 | 1 | | | | Cf22new=Cf22+Lo22 |
| Cf30 | 1 | 1 | 1 | 1 | | | | Cf30new=Cf30+Lo30+Cf10+Cf20 |
| Cf31 | 1 | 1 | 1 | 1 | | | | Cf31new=Cf31+Lo31+Cf11 |
| Cf32 | 1 | 1 | 1 | 1 | | | | Cf32new=Cf32+Cf22+Cf12+Lo22 |
| Ch10 | 0 | 0 | 0 | 0 | | | | Ch11new |
| Ch11 | 1 | 1 | 1 | 1 | | | | Ch11new=Ch11+Ch20 |
| Ch20 | 1 | 1 | 1 | 1 | | | | Ch11new |
| Ch21 | 0 | 0 | 0 | 0 | | | | Ch11new |
| Ct10 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Ct11 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Ct12 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Ct13 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Ct14 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Ct15 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Ct20 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Ct21 | 2 | 2 | 1 | 1 | | | | Ct21new=Ct21+Sp21 |
| Ct22 | 0 | 0 | 0 | 0 | | | | Ct21new |
| Ct23 | 1 | 1 | 1 | 1 | | | | Ct23new=Ct23+Vf24+Hh11 |
| Ct24 | 0 | 0 | 0 | 0 | | | | Ct23new |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Ct25 | 0 | 0 | 0 | 0 | | | | Ct23new |
| Cv10 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Cv11 | 2 | 2 | 2 | 2 | | | | Cv11new=Cv11+Cv20+Cv21 |
| Cv12 | 0 | 0 | 0 | 0 | | | | Cv12new=Cv11+Cv20+Cv21+Cv22 |
| Cv13 | 0 | 0 | 0 | 0 | | | | Cv13new=Cv14+Hu14 |
| Cv14 | 5 | 5 | 4 | 4 | | | Cv14 | Cv14 |
| Cv15 | 0 | 0 | 0 | 0 | | | | Hu14new |
| Cv16 | 12 | 12 | 11 | 11 | | Cv16 | Cv16 | Cv16 |
| Cv17 | 9 | 9 | 7 | 7 | | | Cv17 | Cv17 |
| Cv18 | 2 | 2 | 2 | 2 | | | | Cv18new=Cv18+Hu18 |
| Cv20 | 2 | 2 | 2 | 2 | | | | Cv20new=Cv20+Cv21 |
| Cv21 | 9 | 9 | 9 | 9 | | | Cv21 | Cv21 |
| Cv22 | 1 | 1 | 1 | 1 | | | | Cv22new=Cv22+Cv21+Hu21 |
| Cv23 | 1 | 1 | 1 | 1 | | | | Cv23new=Cv23+Cv24 |
| Cv24 | 8 | 8 | 9 | 9 | | | Cv24 | Cv24 |
| Cv25 | 0 | 0 | 0 | 0 | | | | Cv25new=Cv24+Hu25 |
| Cv26 | 16 | 16 | 14 | 14 | | Cv26 | Cv26 | Cv26 |
| Cv27 | 4 | 4 | 4 | 4 | | | | Cv27new=Cv27+Hu27 |
| Cv28 | 0 | 0 | 0 | 0 | | | | Hu28 |
| Cv30 | 1 | 1 | 1 | 1 | | | | Cv30new=Cv30+Cv31 |
| Cv31 | 12 | 12 | 11 | 11 | | Cv31 | Cv31 | Cv31 |
| Cv32 | 1 | 1 | 1 | 1 | | | | Cv32new=Cv32+Cv31 |
| Cv33 | 2 | 2 | 2 | 2 | | | | Cv33new=Cv33+Cv34 |
| Cv34 | 13 | 13 | 11 | 11 | | Cv34 | Cv34 | Cv34 |
| Cv35 | 0 | 0 | 0 | 0 | | | | Cv34 |
| Cv36 | 10 | 10 | 9 | 9 | | Cv36 | Cv36 | Cv36 |
| Cv37 | 3 | 3 | 3 | 3 | | | | Cv37new=Cv37+Hu37 |
| Cv38 | 1 | 1 | 1 | 1 | | | | Cv38new=Cv38+Hu38 |
| Cv40 | 0 | 0 | 0 | 0 | | | | Cv30new=Cv30+Cv31 |
| Cv41 | 0 | 0 | 0 | 0 | | | | Cv31 |
| Cv42 | 0 | 0 | 0 | 0 | | | | Cv32new |
| Cv43 | 0 | 0 | 0 | 0 | | | | Cv33new |
| Cv44 | 0 | 0 | 0 | 0 | | | | Cv34 |
| Cv45 | 0 | 0 | 0 | 0 | | | | Cv34 |
| Cv46 | 0 | 0 | 0 | 0 | | | | Cv36 |
| Cv47 | 0 | 0 | 0 | 0 | | | | Cv37new |
| Cv48 | 0 | 0 | 0 | 0 | | | | Cv38new |
| Du10 | 50 | 50 | 36 | 36 | Du10 | Du10 | Du10 | Du10 |
| Es10 | 2 | 2 | 1 | 1 | | | | Es10new=Es10+Kd10+Kd11 |
| Es11 | 0 | 0 | 0 | 0 | | | | Es11new=Es10+Es12+Kd11 |
| Es12 | 2 | 2 | 0 | 0 | | | | Es12new=Es12+Kd12 |
| Es13 | 2 | 2 | 2 | 2 | | | | Es13new=Es13+Es14 |
| Es14 | 5 | 5 | 6 | 6 | | | Es14 | Es14 |
| Es15 | 1 | 1 | 1 | 1 | | | | Es15new=Es15+Es14 |
| Es16 | 3 | 3 | 3 | 3 | | | | Es16new=Es16+Kd16+Kd17+Kd18 |
| Es17 | 8 | 8 | 9 | 9 | | | Es17 | Es17 |
| Es20 | 0 | 0 | 0 | 0 | | | | Es20new=Es22+Kd20+Kd21+Kd22 |
| Es21 | 0 | 0 | 0 | 0 | | | | Es20new |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Es22 | 1 | 1 | 1 | 1 | | | | Es22new=Es22+Kd22 |
| Es30 | 0 | 0 | 0 | 0 | | | | Es31 |
| Es31 | 5 | 5 | 3 | 3 | | | Es31 | Es31 |
| Es32 | 0 | 0 | 0 | 0 | | | | Es31 |
| Es33 | 1 | 1 | 1 | 1 | | | | Es33new=Es33+Es34 |
| Es34 | 4 | 4 | 3 | 3 | | | | Es34new=Es34+Es33+Es35 |
| Es35 | 1 | 1 | 1 | 1 | | | | Es35new=Es35+Es34 |
| Es36 | 2 | 2 | 2 | 2 | | | | Es36new=Es36+Kd17 |
| Es37 | 3 | 3 | 2 | 2 | | | | Es37new=Es37+Kd19 |
| Es40 | 1 | 1 | 1 | 1 | | | | Es40new=Es40+Kd20+Kd21+Kd22 |
| Es41 | 0 | 0 | 0 | 0 | | | | Es40new |
| Es42 | 0 | 0 | 0 | 0 | | | | Es40new |
| Fw10 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw11 | 30 | 29 | 24 | 24 | Fw11 | Fw11 | Fw11 | Fw11 |
| Fw12 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw20 | 2 | 2 | 2 | 2 | | | | Fw20new=Fw20+Fw11 |
| Fw21 | 2 | 2 | 1 | 1 | | | | Fw21new=Fw21+Fw11 |
| Fw22 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw30 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw31 | 2 | 2 | 2 | 2 | | | | Fw31new=Fw31+Fw11 |
| Fw32 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw40 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw41 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Fw42 | 0 | 0 | 0 | 0 | | | | Fw11 |
| Gc10 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Gc11 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Gc12 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Gc13 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Gc14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Gc15 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Gc16 | 2 | 2 | 2 | 2 | | | | Gc16new=Gc16+Av16 |
| Gc17 | 0 | 0 | 0 | 0 | | | | Gc17new=Av17+Cv17 |
| Gc20 | 0 | 0 | 0 | 0 | | | | Gc20new=Av21+Cv20+Cv21 |
| Gc21 | 0 | 0 | 0 | 0 | | | | Gc20new |
| Gc22 | 0 | 0 | 0 | 0 | | | | Gc20new |
| Gc23 | 0 | 0 | 0 | 0 | | | | Gc23new=Av24+Pn23+Pn24 |
| Gc24 | 0 | 0 | 0 | 0 | | | | Gc23new |
| Gc25 | 0 | 0 | 0 | 0 | | | | Gc23new |
| Gc26 | 2 | 2 | 2 | 2 | | | | Gc26new=Gc26+Av26 |
| Gc27 | 0 | 0 | 0 | 0 | | | | Gc27new=Av27+Cv27+Pn27 |
| Gc30 | 0 | 0 | 0 | 0 | | | | Gc30new=Av31+Cv30 |
| Gc31 | 0 | 0 | 0 | 0 | | | | Av31 |
| Gc32 | 0 | 0 | 0 | 0 | | | | Gc32new=Av31+Pn31 |
| Gc33 | 0 | 0 | 0 | 0 | | | | Gc33new=Gc34+Gc35+Cv33 |
| Gc34 | 3 | 3 | 3 | 3 | | | | Gc34new=Gc34+Av34 |
| Gc35 | 2 | 2 | 2 | 2 | | | | Gc35new=Gc35+Av35+Pn34 |
| Gc36 | 0 | 0 | 0 | 0 | | | | Av36 |
| Gc37 | 0 | 0 | 0 | 0 | | | | Gc37new=Av37+Cv37 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Gf10 | 0 | 0 | 0 | 0 | | | | Cv15new |
| Gf11 | 4 | 4 | 4 | 4 | | | | Gf11new=Gf11+Hu17 |
| Gf12 | 7 | 7 | 7 | 7 | | | Gf12 | Gf12 |
| Gf13 | 1 | 1 | 1 | 1 | | | | Gf13new=Gf13+Hu16 |
| Gf20 | 1 | 1 | 1 | 1 | | | | Gf20new=Gf20+Hu24 |
| Gf21 | 4 | 4 | 3 | 3 | | | | Gf21new=Gf21+Hu26 |
| Gf22 | 2 | 2 | 2 | 2 | | | | Gf22new=Gf22+Hu27 |
| Gf23 | 1 | 1 | 1 | 1 | | | | Gf23new=Gf23+Hu28 |
| Gf30 | 0 | 0 | 0 | 0 | | | | Hu24 |
| Gf31 | 0 | 0 | 0 | 0 | | | | Hu36 |
| Gf32 | 0 | 0 | 0 | 0 | | | | Hu37 |
| Gf33 | 0 | 0 | 0 | 0 | | | | Hu38 |
| Gs10 | 5 | 5 | 1 | 1 | | | Gs10 | Gs10 |
| Gs11 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs12 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs13 | 3 | 3 | 3 | 3 | | | | Gs13new=Gs13+Gs14 |
| Gs14 | 18 | 18 | 6 | 6 | | Gs14 | Gs14 | Gs14 |
| Gs15 | 3 | 3 | 3 | 3 | | | | Gs14 |
| Gs16 | 7 | 7 | 7 | 7 | | | Gs16 | Gs16 |
| Gs17 | 38 | 38 | 20 | 20 | Gs17 | Gs17 | Gs17 | Gs17 |
| Gs18 | 3 | 3 | 3 | 3 | | | | Gs18new=Gs18+Gs17 |
| Gs19 | 6 | 6 | 3 | 3 | | | Gs19 | Gs19 |
| Gs20 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs21 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs22 | 0 | 0 | 0 | 0 | | | | Gs10 |
| Gs23 | 0 | 0 | 0 | 0 | | | | Gs13new |
| Gs24 | 0 | 0 | 0 | 0 | | | | Gs14 |
| Gs25 | 0 | 0 | 0 | 0 | | | | Gs14 |
| Gs26 | 0 | 0 | 0 | 0 | | | | Gs16 |
| Gs27 | 0 | 0 | 0 | 0 | | | | Gs17 |
| Gs28 | 0 | 0 | 0 | 0 | | | | Gs18new |
| Gs29 | 0 | 0 | 0 | 0 | | | | Gs19 |
| Hh10 | 0 | 0 | 0 | 0 | | | | Lt10new |
| Hh11 | 1 | 1 | 1 | 1 | | | | Hh11new=Hh11+Vf14 |
| Hh20 | 0 | 0 | 0 | 0 | | | | Lt10new |
| Hh21 | 0 | 0 | 0 | 0 | | | | Hh21new=Hh11+Vf14 |
| Hh30 | 0 | 0 | 0 | 0 | | | | Lt10new |
| Hh31 | 0 | 0 | 0 | 0 | | | | Hh21new |
| Hu10 | 0 | 0 | 0 | 0 | | | | Hu10new=Cv11+Hu22+Cv20+Cv21 |
| Hu11 | 0 | 0 | 0 | 0 | | | | Hu10new |
| Hu12 | 0 | 0 | 0 | 0 | | | | Hu10new |
| Hu13 | 0 | 0 | 0 | 0 | | | | Hu14new |
| Hu14 | 2 | 2 | 2 | 2 | | | | Hu14new=Hu14+Cv14 |
| Hu15 | 0 | 0 | 0 | 0 | | | | Hu14new |
| Hu16 | 20 | 20 | 17 | 17 | Hu16 | Hu16 | Hu16 | Hu16 |
| Hu17 | 38 | 38 | 38 | 38 | Hu17 | Hu17 | Hu17 | Hu17 |
| Hu18 | 16 | 16 | 17 | 17 | | Hu18 | Hu18 | Hu18 |
| Hu20 | 0 | 0 | 0 | 0 | | | | Hu20new=Hu22+Cv20+Cv21 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Hu21 | 0 | 0 | 0 | 0 | | | | Hu21new=Hu22+Cv21 |
| Hu22 | 1 | 1 | 1 | 1 | | | | Hu22new=Hu22+Cv21+Cv22 |
| Hu23 | 0 | 0 | 0 | 0 | | | | Hu23new=Cv23+Hu24 |
| Hu24 | 23 | 23 | 21 | 21 | Hu24 | Hu24 | Hu24 | Hu24 |
| Hu25 | 2 | 2 | 2 | 2 | | | | Hu25new=Hu25+Hu24 |
| Hu26 | 44 | 44 | 35 | 35 | Hu26 | Hu26 | Hu26 | Hu26 |
| Hu27 | 34 | 34 | 31 | 31 | Hu27 | Hu27 | Hu27 | Hu27 |
| Hu28 | 9 | 9 | 10 | 10 | | | Hu28 | Hu28 |
| Hu30 | 0 | 0 | 0 | 0 | | | | Hu31 |
| Hu31 | 8 | 8 | 7 | 7 | | | Hu31 | Hu31 |
| Hu32 | 0 | 0 | 0 | 0 | | | | Hu32new=Cv32+Hu31 |
| Hu33 | 6 | 6 | 6 | 6 | | | Hu33 | Hu33 |
| Hu34 | 49 | 49 | 41 | 41 | Hu34 | Hu34 | Hu34 | Hu34 |
| Hu35 | 0 | 0 | 0 | 0 | | | | Hu34 |
| Hu36 | 95 | 95 | 84 | 84 | Hu36 | Hu36 | Hu36 | Hu36 |
| Hu37 | 24 | 24 | 24 | 24 | Hu37 | Hu37 | Hu37 | Hu37 |
| Hu38 | 6 | 6 | 6 | 6 | | | Hu38 | Hu38 |
| Hu40 | 0 | 0 | 0 | 0 | | | | Hu31 |
| Hu41 | 0 | 0 | 0 | 0 | | | | Hu31 |
| Hu42 | 0 | 0 | 0 | 0 | | | | Hu32new |
| Hu43 | 0 | 0 | 0 | 0 | | | | Hu33 |
| Hu44 | 0 | 0 | 0 | 0 | | | | Hu34 |
| Hu45 | 0 | 0 | 0 | 0 | | | | Hu34 |
| Hu46 | 3 | 3 | 3 | 3 | | | | Hu36 |
| Hu47 | 0 | 0 | 0 | 0 | | | | Hu37 |
| Hu48 | 0 | 0 | 0 | 0 | | | | Hu38 |
| Ia10 | 1 | 1 | 1 | 1 | | | | Ia10new=Ia10+Ma10 |
| Ia11 | 7 | 7 | 6 | 6 | | | Ia11 | Ia11 |
| Ia12 | 4 | 4 | 3 | 3 | | | | Ia12new=Ia12+Ma12+Kp12 |
| Ik10 | 4 | 4 | 4 | 4 | | | | Ik10new=Ik10+Tk10+Bo10 |
| Ik11 | 1 | 1 | 1 | 1 | | | | Ik11new=Ik11+Bo11 |
| Ik20 | 0 | 0 | 0 | 0 | | | | Ik20new=Bo20+Wo20 |
| Ik21 | 1 | 1 | 1 | 1 | | | | Ik21new=Ik21+Bo21 |
| Ka10 | 6 | 6 | 5 | 5 | | | Ka10 | Ka10 |
| Ka20 | 4 | 4 | 2 | 2 | | | | Ka20new=Ka20+Ka10 |
| Kd10 | 1 | 1 | 1 | 1 | | | | Kd10new=Kd10+Kd11 |
| Kd11 | 15 | 15 | 11 | 11 | | Kd11 | Kd11 | Kd11 |
| Kd12 | 4 | 4 | 4 | 4 | | | | Kd12new=Kd12+Kd11 |
| Kd13 | 4 | 4 | 4 | 4 | | | | Kd13new=Kd13+Kd14 |
| Kd14 | 11 | 11 | 8 | 8 | | Kd14 | Kd14 | Kd14 |
| Kd15 | 0 | 0 | 0 | 0 | | | | Kd14 |
| Kd16 | 3 | 3 | 3 | 3 | | | | Kd16new=Kd16+Kd17 |
| Kd17 | 5 | 5 | 4 | 4 | | | Kd17 | Kd17 |
| Kd18 | 3 | 3 | 3 | 3 | | | | Kd18new=Kd18+Kd17 |
| Kd19 | 7 | 7 | 7 | 7 | | | Kd19 | Kd19 |
| Kd20 | 1 | 1 | 1 | 1 | | | | Kd20new=Kd20+Kd21+Kd22 |
| Kd21 | 2 | 2 | 2 | 2 | | | | Kd20new |
| Kd22 | 4 | 4 | 4 | 4 | | | | Kd22new=Kd22+Kd21 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Kp10 | 6 | 6 | 5 | 5 | | | Kp10 | Kp10 |
| Kp11 | 2 | 2 | 2 | 2 | | | | Kp11new=Ia11+Ma11 |
| Kp12 | 2 | 2 | 2 | 2 | | | | Kp12new=Kp12+Ma12+Ia12 |
| Lo10 | 0 | 0 | 0 | 0 | | | | Wa10new |
| Lo11 | 4 | 4 | 4 | 4 | | | | Lo11new=Lo11+Lo21 |
| Lo12 | 1 | 1 | 1 | 1 | | | | Lo12new=Lo12+Cf12+Lo22 |
| Lo13 | 4 | 4 | 4 | 4 | | | | Lo13new=Lo13+Cf13 |
| Lo20 | 8 | 8 | 7 | 7 | | | Lo20 | Lo20 |
| Lo21 | 20 | 20 | 18 | 18 | Lo21 | Lo21 | Lo21 | Lo21 |
| Lo22 | 15 | 15 | 14 | 14 | | Lo22 | Lo22 | Lo22 |
| Lo30 | 2 | 2 | 2 | 2 | | | | Lo30new=Lo30+Cf30+Lo20 |
| Lo31 | 1 | 1 | 1 | 1 | | | | Lo31new=Lo31+Cf31+Lo21 |
| Lo32 | 0 | 0 | 0 | 0 | | | | Lo32new=Cf32+Lo22 |
| Lt10 | 2 | 2 | 2 | 2 | | | | Vf11 |
| Lt11 | 0 | 0 | 0 | 0 | | | | Lt11new=Vf11+Lo11 |
| Lt12 | 0 | 0 | 0 | 0 | | | | Lt12new=Vf11+Cf12 |
| Lt13 | 0 | 0 | 0 | 0 | | | | Lt13new=Hh13+Vf14 |
| Lt14 | 0 | 0 | 0 | 0 | | | | Lt14new=Hh11+Vf14 |
| Lt15 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Lt20 | 0 | 0 | 0 | 0 | | | | Lo20 |
| Lt21 | 0 | 0 | 0 | 0 | | | | Lo21 |
| Lt22 | 0 | 0 | 0 | 0 | | | | Lo22 |
| Lt23 | 0 | 0 | 0 | 0 | | | | Lt24new |
| Lt24 | 0 | 0 | 0 | 0 | | | | Lt24new=Hh11+Vf14 |
| Lt25 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Ma10 | 6 | 6 | 6 | 6 | | | | Ma10 |
| Ma11 | 2 | 2 | 2 | 2 | | | | Ma11new=Ma11+Ia11 |
| Ma12 | 1 | 1 | 0 | 0 | | | | Ma12new=Ma12+Ia12+Kp12 |
| Ms10 | 81 | 81 | 0 | 0 | Ms10 | Ms10 | Ms10 | Ms10 |
| Ms11 | 0 | 0 | 0 | 0 | | | | Ms11new=Ms12+Ms14+Ms10 |
| Ms12 | 3 | 3 | 0 | 0 | | | | Ms11new |
| Ms13 | 0 | 0 | 0 | 0 | | | | Ms11new |
| Ms14 | 2 | 2 | 0 | 0 | | | | Ms14new=Ms14+Ms12+Ms10 |
| Ms20 | 2 | 2 | 0 | 0 | | | | Ms20new=Ms20+Ms22 |
| Ms21 | 0 | 0 | 0 | 0 | | | | Ms20new |
| Ms22 | 11 | 11 | 0 | 0 | | Ms22 | Ms22 | Ms22 |
| Ms23 | 0 | 0 | 0 | 0 | | | | Ms20new |
| Ms24 | 2 | 2 | 2 | 2 | | | | Ms20new |
| Mw10 | 1 | 1 | 0 | 0 | | | | Mw10new=Mw10+My10+Ik10 |
| Mw11 | 0 | 0 | 0 | 0 | | | | My11 |
| Mw20 | 0 | 0 | 0 | 0 | | | | Bo20new |
| Mw21 | 0 | 0 | 0 | 0 | | | | Mw21new=Ik21+Bo21 |
| My10 | 2 | 2 | 1 | 1 | | | | Mw10new |
| My11 | 5 | 5 | 4 | 4 | | | My11 | My11 |
| My20 | 0 | 0 | 0 | 0 | | | | Bo20new |
| My21 | 0 | 0 | 0 | 0 | | | | My21new=Ik21+Bo21 |
| No10 | 6 | 6 | 4 | 4 | | | No10 | No10 |
| No11 | 3 | 3 | 2 | 2 | | | | No11new=No11+Ma11 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Oa10 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Oa11 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Oa12 | 0 | 0 | 0 | 0 | | | | Cv11new |
| Oa13 | 0 | 0 | 0 | 0 | | | | Oa13new=Oa33+Oa14+Cv14+Hu14 |
| Oa14 | 2 | 2 | 1 | 1 | | | | Oa14new=Oa14+Cv14+Hu14 |
| Oa15 | 0 | 0 | 0 | 0 | | | | Oa14new |
| Oa16 | 9 | 9 | 6 | 6 | | | Oa16 | Oa16 |
| Oa17 | 5 | 5 | 4 | 4 | | | Oa17 | Oa17 |
| Oa20 | 0 | 0 | 0 | 0 | | | | Oa20new=Oa21+Cv20+Cv21 |
| Oa21 | 1 | 1 | 0 | 0 | | | | Oa21new=Oa21+Cv21 |
| Oa22 | 0 | 0 | 0 | 0 | | | | Oa22new=Oa21+Cv21+Hu21 |
| Oa23 | 1 | 1 | 1 | 1 | | | | Oa23new=Oa23+Oa24 |
| Oa24 | 9 | 9 | 7 | 7 | | | Oa24 | Oa24 |
| Oa25 | 0 | 0 | 0 | 0 | | | | Oa24 |
| Oa26 | 40 | 40 | 34 | 34 | Oa26 | Oa26 | Oa26 | Oa26 |
| Oa27 | 13 | 13 | 9 | 9 | | Oa27 | Oa27 | Oa27 |
| Oa30 | 0 | 0 | 0 | 0 | | | | Cv30new |
| Oa31 | 0 | 0 | 0 | 0 | | | | Cv31 |
| Oa32 | 0 | 0 | 0 | 0 | | | | Cv32new |
| Oa33 | 2 | 2 | 2 | 2 | | | | Oa33new=Oa33+Oa34 |
| Oa34 | 10 | 10 | 7 | 7 | | Oa34 | Oa34 | Oa34 |
| Oa35 | 0 | 0 | 0 | 0 | | | | Oa34 |
| Oa36 | 18 | 18 | 17 | 17 | | Oa36 | Oa36 | Oa36 |
| Oa37 | 3 | 3 | 3 | 3 | | | | Oa37new=Oa37+Cv37 |
| Oa40 | 0 | 0 | 0 | 0 | | | | Cv30new |
| Oa41 | 1 | 1 | 1 | 1 | | | | Cv31 |
| Oa42 | 0 | 0 | 0 | 0 | | | | Cv32new |
| Oa43 | 1 | 1 | 1 | 1 | | | | Oa43new=Oa43+Oa44 |
| Oa44 | 13 | 13 | 10 | 10 | | Oa44 | Oa44 | Oa44 |
| Oa45 | 0 | 0 | 0 | 0 | | | | Oa44 |
| Oa46 | 35 | 35 | 34 | 34 | Oa46 | Oa46 | Oa46 | Oa46 |
| Oa47 | 9 | 9 | 10 | 9 | | | Oa47 | Oa47 |
| Pn10 | 0 | 0 | 0 | 0 | | | | Pn10new=Cv11+Pn21+Cv20 |
| Pn11 | 0 | 0 | 0 | 0 | | | | Pn11new=Cv11+Av11 |
| Pn12 | 0 | 0 | 0 | 0 | | | | Pn12new=Pn21+Cv11 |
| Pn13 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Pn14 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Pn15 | 0 | 0 | 0 | 0 | | | | Cv14 |
| Pn16 | 0 | 0 | 0 | 0 | | | | Cv16 |
| Pn17 | 1 | 1 | 1 | 1 | | | | Pn17new=Pn17+Cv17 |
| Pn20 | 0 | 0 | 0 | 0 | | | | Pn20new=Pn21+Cv20 |
| Pn21 | 4 | 4 | 3 | 3 | | | | Pn21new=Pn21+Cv21 |
| Pn22 | 0 | 0 | 0 | 0 | | | | Pn22new=Pn21+Cv22 |
| Pn23 | 1 | 1 | 1 | 1 | | | | Pn23new=Pn23+Pn24+Cv23+Cv24 |
| Pn24 | 2 | 2 | 2 | 2 | | | | Pn24new=Pn24+Pn23+Cv24 |
| Pn25 | 0 | 0 | 0 | 0 | | | | Pn24new |
| Pn26 | 0 | 0 | 0 | 0 | | | | Cv26 |
| Pn27 | 2 | 2 | 2 | 2 | | | | Pn27new=Pn27+Cv27 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Pn30 | 0 | 0 | 0 | 0 | | | | Pn30new=Pn31+Cv30 |
| Pn31 | 4 | 4 | 4 | 4 | | | | Pn31new=Pn31+Cv31 |
| Pn32 | 0 | 0 | 0 | 0 | | | | Pn32new=Pn31+Cv32 |
| Pn33 | 0 | 0 | 0 | 0 | | | | Pn34 |
| Pn34 | 12 | 12 | 12 | 12 | | Pn34 | Pn34 | Pn34 |
| Pn35 | 0 | 0 | 0 | 0 | | | | Pn34 |
| Pn36 | 9 | 9 | 9 | 9 | | | Pn36 | Pn36 |
| Pn37 | 5 | 5 | 4 | 4 | | | Pn37 | Pn37 |
| Rg10 | 2 | 2 | 2 | 2 | | | | Rg10new=Rg10+Ar10 |
| Rg20 | 6 | 6 | 5 | 5 | | | Rg20 | Rg20 |
| Sd10 | 0 | 0 | 0 | 0 | | | | Oa16 |
| Sd11 | 4 | 4 | 3 | 3 | | | | Sd11new=Sd11+Oa5 |
| Sd12 | 7 | 7 | 7 | 7 | | | Sd12 | Sd12 |
| Sd20 | 2 | 2 | 1 | 1 | | | | Sd20new=Sd20+Oa16 |
| Sd21 | 5 | 5 | 4 | 4 | | | Sd21 | Sd21 |
| Sd22 | 6 | 6 | 4 | 4 | | | Sd22 | Sd22 |
| Sd30 | 0 | 0 | 0 | 0 | | | | Oa26 |
| Sd31 | 1 | 1 | 1 | 1 | | | | Sd31new=Sd31+Oa27 |
| Sd32 | 0 | 0 | 0 | 0 | | | | Sd32new=Oa27+Hu38 |
| Sp10 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Sp11 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Sp12 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Sp13 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Sp14 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Sp15 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Sp20 | 0 | 0 | 0 | 0 | | | | Sp21new |
| Sp21 | 1 | 1 | 1 | 1 | | | | Sp21new=Sp21+Ct21 |
| Sp22 | 0 | 0 | 0 | 0 | | | | Sp21new |
| Sp23 | 0 | 0 | 0 | 0 | | | | Sp23new=Ct23+Vf14 |
| Sp24 | 0 | 0 | 0 | 0 | | | | Sp24new=Ct23+Vf24+Vf14 |
| Sp25 | 0 | 0 | 0 | 0 | | | | Sp24new |
| Ss10 | 0 | 0 | 0 | 0 | | | | Ss10new=Ss11+Va10 |
| Ss11 | 1 | 1 | 1 | 1 | | | | Ss11new=Ss11+Va11 |
| Ss12 | 0 | 0 | 0 | 0 | | | | Ss12new=Va12+Sw12 |
| Ss13 | 1 | 1 | 1 | 1 | | | | Ss14 |
| Ss14 | 5 | 5 | 4 | 4 | | | Ss14 | Ss14 |
| Ss15 | 0 | 0 | 0 | 0 | | | | Ss14 |
| Ss16 | 6 | 6 | 5 | 5 | | | Ss16 | Ss16 |
| Ss17 | 0 | 0 | 0 | 0 | | | | Oa17 |
| Ss20 | 0 | 0 | 0 | 0 | | | | Ss21 |
| Ss21 | 5 | 5 | 5 | 5 | | | Ss21 | Ss21 |
| Ss22 | 0 | 0 | 0 | 0 | | | | Ss21 |
| Ss23 | 2 | 2 | 2 | 2 | | | | Ss23new=ss23+Ss24 |
| Ss24 | 12 | 12 | 8 | 8 | | Ss24 | Ss24 | Ss24 |
| Ss25 | 0 | 0 | 0 | 0 | | | | Ss24 |
| Ss26 | 17 | 17 | 13 | 13 | | Ss26 | Ss26 | Ss26 |
| Ss27 | 0 | 0 | 0 | 0 | | | | Oa27 |
| Sw10 | 9 | 9 | 6 | 6 | | | Sw10 | Sw10 |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Sw11 | 12 | 12 | 12 | 12 | | Sw11 | Sw11 | Sw11 |
| Sw12 | 9 | 9 | 9 | 9 | | | Sw12 | Sw12 |
| Sw20 | 1 | 1 | 1 | 1 | | | | Sw20new=Sw20+Va20 |
| Sw21 | 4 | 4 | 4 | 4 | | | | Sw21new=Sw21+Va21 |
| Sw22 | 1 | 1 | 1 | 1 | | | | Sw22new=Sw22+Va22 |
| Sw30 | 15 | 15 | 9 | 9 | | Sw30 | Sw30 | Sw30 |
| Sw31 | 12 | 12 | 11 | 11 | | Sw31 | Sw31 | Sw31 |
| Sw32 | 6 | 6 | 6 | 6 | | | Sw32 | Sw32 |
| Sw40 | 1 | 1 | 1 | 1 | | | | Sw40new=Sw40+Va40 |
| Sw41 | 0 | 0 | 0 | 0 | | | | Va41 |
| Sw42 | 1 | 1 | 1 | 1 | | | | Sw42new=Sw42+Va42 |
| Tk10 | 1 | 1 | 1 | 1 | | | | Tk10new=Tk10+Ik10+Bo10 |
| Tk11 | 0 | 0 | 0 | 0 | | | | Tk11new=Ik11+Bo11 |
| Tk20 | 0 | 0 | 0 | 0 | | | | Tk20new=Bo20+Bo10 |
| Tk21 | 0 | 0 | 0 | 0 | | | | Tk21new=Ik21+Bo21 |
| Va10 | 5 | 5 | 5 | 5 | | | Va10 | Va10 |
| Va11 | 9 | 9 | 9 | 9 | | | Va11 | Va11 |
| Va12 | 3 | 3 | 3 | 3 | | | | Va12new=Va12+Sw12 |
| Va20 | 5 | 5 | 4 | 4 | | | Va20 | Va20 |
| Va21 | 13 | 13 | 13 | 13 | | Va21 | Va21 | Va21 |
| Va22 | 4 | 4 | 5 | 5 | | | | Va22new=Va22+Sw22+Va42 |
| Va30 | 7 | 7 | 5 | 5 | | | Va30 | Va30 |
| Va31 | 16 | 16 | 16 | 16 | | Va31 | Va31 | Va31 |
| Va32 | 6 | 6 | 6 | 6 | | | Va32 | Va32 |
| Va40 | 7 | 7 | 6 | 6 | | | Va40 | Va40 |
| Va41 | 9 | 9 | 8 | 8 | | | Va41 | Va41 |
| Va42 | 3 | 3 | 3 | 3 | | | | Va42new=Va42+Sw42+Va22 |
| Vf10 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Vf11 | 3 | 3 | 1 | 1 | | | | Vf11new=Vf11+Lt10 |
| Vf12 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Vf13 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf14 | 9 | 9 | 7 | 7 | | | Vf14 | Vf14 |
| Vf15 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf20 | 0 | 0 | 0 | 0 | | | | Vf21new |
| Vf21 | 0 | 0 | 0 | 0 | | | | Vf21new=Ct21+Sp21+Vf11 |
| Vf22 | 0 | 0 | 0 | 0 | | | | Vf21new |
| Vf23 | 0 | 0 | 0 | 0 | | | | Vf24new |
| Vf24 | 1 | 1 | 1 | 1 | | | | Vf24new=Vf24+Ct23+Hh11 |
| Vf25 | 0 | 0 | 0 | 0 | | | | Vf24new |
| Vf30 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Vf31 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Vf32 | 0 | 0 | 0 | 0 | | | | Vf11new |
| Vf33 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf34 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf35 | 0 | 0 | 0 | 0 | | | | Vf14 |
| Vf40 | 0 | 0 | 0 | 0 | | | | Vf21new |
| Vf41 | 0 | 0 | 0 | 0 | | | | Vf21new |
| Vf42 | 0 | 0 | 0 | 0 | | | | Vf21new |

| Soil series | TOPSOIL HORIZON # locations with carbon | | SUBSOIL HORIZON # locations with carbon | | LEVELS OF ASSURANCE / CONFIDENCE | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Density | % | Density | **Level 1:** > 20 samples | **Level 2** :> 10 samples | **Level 3:**> 5 samples | **Level 4:** single or multiple associations |
| Vf43 | 0 | 0 | 0 | 0 | | | | Vf24new |
| Vf44 | 0 | 0 | 0 | 0 | | | | Vf24new |
| Vf45 | 0 | 0 | 0 | 0 | | | | Vf24new |
| Wa10 | 1 | 1 | 0 | 0 | | | | Wa10new=Wa10+Cf10 |
| Wa11 | 0 | 0 | 0 | 0 | | | | Cf11 |
| Wa12 | 0 | 0 | 0 | 0 | | | | Cf12 |
| Wa13 | 0 | 0 | 0 | 0 | | | | Lo13new |
| Wa20 | 0 | 0 | 0 | 0 | | | | Cf20new |
| Wa21 | 10 | 10 | 4 | 4 | | Wa21 | Wa21 | Wa21 |
| Wa22 | 0 | 0 | 0 | 0 | | | | Cf22new |
| Wa30 | 0 | 0 | 0 | 0 | | | | Lo30new |
| Wa31 | 0 | 0 | 0 | 0 | | | | Lo31new |
| Wa32 | 0 | 0 | 0 | 0 | | | | Lo32new |
| We10 | 0 | 0 | 0 | 0 | | | | We10new=Cv11+Cv20+Cv21+Av21+Av31 |
| We11 | 0 | 0 | 0 | 0 | | | | We11new=Cv14+Cv23+Bv24 |
| We12 | 2 | 2 | 2 | 2 | | | | We12new=We12+Av16 |
| We13 | 34 | 34 | 35 | 35 | We13 | We13 | We13 | We13 |
| We20 | 0 | 0 | 0 | 0 | | | | We20new=Av21+Av31 |
| We21 | 5 | 5 | 4 | 4 | | | | We21 |
| We22 | 28 | 28 | 26 | 26 | We22 | We22 | We22 | We22 |
| We30 | 0 | 0 | 0 | 0 | | | | We30new=Av32+Cv11+Cv22+Av21+Av35 |
| We31 | 0 | 0 | 0 | 0 | | | | We31new=Av35+Av24+Cv14 |
| We32 | 1 | 1 | 1 | 1 | | | | We32new=We32+Av16 |
| Wo10 | 2 | 2 | 2 | 2 | | | | Wo10new=Wo10+Bo10 |
| Wo11 | 5 | 5 | 5 | 5 | | | Wo11 | Wo11 |
| Wo20 | 1 | 1 | 1 | 1 | | | | Wo20new=Wo20+Bo30+Bo20+Bo10 |
| Wo21 | 1 | 1 | 2 | 2 | | | | Wo21new=Wo21+Bo21 |

# APPENDIX 4: MEDIAN VALUES OF CARBON PERCENTAGES AND STOCKS FOR THE TOPSOIL AND SUBSOIL UNDER NATURAL VEGETATION AND AGRICULTURAL LAND USES

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | Carbon density in topsoil ($T/m^3$) | Carbon % (by weight) in topsoil | Carbon density in topsoil ($T/m^3$) | Carbon % (by weight) in subsoil | Carbon density in topsoil ($T/m^3$) | Carbon % (by weight) in topsoil | Carbon density in topsoil ($T/m^3$) | Carbon % (by weight) in subsoil |
| Ar10 | 0,0218 | 1,81 | 0,0126 | 1,07 | 0,0104 | 0,82 | 0,0100 | 0,78 |
| Ar11 | 0,0210 | 1,65 | 0,0096 | 0,78 | 0,0104 | 0,82 | 0,0096 | 0,78 |
| Ar12 | 0,0215 | 1,65 | 0,0096 | 0,78 | 0,0104 | 0,82 | 0,0096 | 0,78 |
| Ar20 | 0,0157 | 1,25 | 0,0088 | 0,70 | 0,0175 | 1,26 | 0,0110 | 0,86 |
| Ar21 | 0,0151 | 1,17 | 0,0088 | 0,70 | 0,0184 | 1,32 | 0,0110 | 0,88 |
| Ar22 | 0,0151 | 1,17 | 0,0088 | 0,70 | 0,0184 | 1,32 | 0,0110 | 0,88 |
| Ar30 | 0,0257 | 2,00 | 0,0163 | 1,21 | 0,0137 | 1,06 | 0,0209 | 1,49 |
| Ar31 | 0,0273 | 3,08 | 0,0163 | 1,21 | 0,0137 | 1,06 | 0,0209 | 1,49 |
| Ar32 | 0,0273 | 3,08 | 0,0163 | 1,21 | 0,0137 | 1,06 | 0,0209 | 1,49 |
| Ar40 | 0,0142 | 1,54 | 0,0091 | 0,70 | 0,0094 | 0,80 | 0,0062 | 0,50 |
| Ar41 | 0,0139 | 1,41 | 0,0086 | 0,70 | 0,0094 | 0,80 | 0,0062 | 0,50 |
| Ar42 | 0,0140 | 1,50 | 0,0086 | 0,70 | 0,0094 | 0,80 | 0,0062 | 0,50 |
| Av10 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Av11 | 0,0073 | 0,45 | 0,0039 | 0,23 | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Av12 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0029 | 0,17 |
| Av13 | 0,0125 | 0,75 | 0,0056 | 0,34 | 0,0061 | 0,36 | 0,0029 | 0,17 |
| Av14 | 0,0128 | 0,77 | 0,0081 | 0,50 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Av15 | 0,0101 | 0,62 | 0,0054 | 0,32 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Av16 | 0,0175 | 1,15 | 0,0056 | 0,38 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Av17 | 0,0294 | 2,40 | 0,0090 | 0,55 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Av20 | 0,0072 | 0,43 | 0,0032 | 0,19 | 0,0061 | 0,36 | 0,0042 | 0,25 |
| Av21 | 0,0075 | 0,45 | 0,0045 | 0,27 | 0,0061 | 0,36 | 0,0034 | 0,20 |
| Av22 | 0,0028 | 1,22 | 0,0018 | 0,11 | 0,0103 | 0,63 | 0,0035 | 0,22 |
| Av23 | 0,0077 | 0,89 | 0,0028 | 0,17 | 0,0076 | 0,46 | 0,0035 | 0,21 |
| Av24 | 0,0184 | 1,12 | 0,0060 | 0,42 | 0,0044 | 0,26 | 0,0017 | 0,10 |
| Av25 | 0,0174 | 1,00 | 0,0049 | 0,37 | 0,0130 | 0,79 | 0,0035 | 0,21 |
| Av26 | 0,0111 | 0,70 | 0,0046 | 0,30 | 0,0142 | 0,88 | 0,0058 | 0,38 |
| Av27 | 0,0203 | 1,25 | 0,0050 | 0,37 | 0,0168 | 1,10 | 0,0066 | 0,46 |
| Av30 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0049 | 0,29 | 0,0024 | 0,14 |
| Av31 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0049 | 0,29 | 0,0024 | 0,14 |
| Av32 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0047 | 0,28 | 0,0038 | 0,23 |
| Av33 | 0,0066 | 0,40 | 0,0047 | 0,30 | 0,0047 | 0,28 | 0,0038 | 0,23 |
| Av34 | 0,0091 | 0,55 | 0,0030 | 0,19 | 0,0047 | 0,28 | 0,0038 | 0,23 |
| Av35 | 0,0088 | 0,53 | 0,0032 | 0,20 | 0,0180 | 1,18 | 0,0083 | 0,59 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Av36 | 0,0104 | 0,66 | 0,0045 | 0,30 | 0,0051 | 0,31 | 0,0051 | 0,33 |
| Av37 | 0,0142 | 0,99 | 0,0057 | 0,40 | 0,0284 | 1,89 | 0,0141 | 1,09 |
| Bo10 | 0,0341 | 2,30 | 0,0149 | 1,11 | 0,0363 | 2,40 | 0,0153 | 1,11 |
| Bo11 | 0,0348 | 2,76 | 0,0150 | 1,16 | 0,0371 | 2,66 | 0,0114 | 0,92 |
| Bo20 | 0,0163 | 1,20 | 0,0042 | 0,28 | 0,0327 | 2,22 | 0,0153 | 1,11 |
| Bo21 | 0,0177 | 1,27 | 0,0062 | 0,51 | 0,0200 | 1,46 | 0,0078 | 0,56 |
| Bo30 | 0,0280 | 2,27 | 0,0067 | 0,47 | 0,0191 | 1,36 | 0,0079 | 0,60 |
| Bo31 | 0,0328 | 2,64 | 0,0130 | 1,01 | 0,0053 | 0,31 | 0,0026 | 0,16 |
| Bo40 | 0,0143 | 1,20 | 0,0048 | 0,30 | 0,0284 | 1,89 | 0,0141 | 1,09 |
| Bo41 | 0,0174 | 1,36 | 0,0055 | 0,44 | 0,0185 | 1,36 | 0,0092 | 0,60 |
| Bv10 | 0,0074 | 0,59 | 0,0039 | 0,23 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Bv11 | 0,0073 | 0,45 | 0,0039 | 0,23 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Bv12 | 0,0073 | 0,45 | 0,0039 | 0,23 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Bv13 | 0,0125 | 0,75 | 0,0056 | 0,34 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Bv14 | 0,0125 | 0,75 | 0,0081 | 0,50 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Bv15 | 0,0101 | 0,62 | 0,0054 | 0,32 | 0,0157 | 1,01 | 0,0050 | 0,34 |
| Bv16 | 0,0184 | 1,19 | 0,0056 | 0,38 | 0,0293 | 2,07 | 0,0088 | 0,66 |
| Bv17 | 0,0338 | 2,60 | 0,0100 | 0,63 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Bv20 | 0,0074 | 0,44 | 0,0035 | 0,21 | 0,0060 | 0,36 | 0,0038 | 0,23 |
| Bv21 | 0,0074 | 0,44 | 0,0035 | 0,21 | 0,0061 | 0,36 | 0,0034 | 0,20 |
| Bv22 | 0,0066 | 0,43 | 0,0022 | 0,13 | 0,0103 | 0,63 | 0,0035 | 0,22 |
| Bv23 | 0,0077 | 0,98 | 0,0028 | 0,17 | 0,0060 | 0,36 | 0,0037 | 0,23 |
| Bv24 | 0,0174 | 1,00 | 0,0055 | 0,37 | 0,0044 | 0,26 | 0,0017 | 0,10 |
| Bv25 | 0,0100 | 0,60 | 0,0038 | 0,23 | 0,0132 | 0,85 | 0,0066 | 0,46 |
| Bv26 | 0,0115 | 0,74 | 0,0046 | 0,31 | 0,0121 | 0,79 | 0,0073 | 0,49 |
| Bv27 | 0,0222 | 1,40 | 0,0050 | 0,37 | 0,0132 | 0,85 | 0,0066 | 0,46 |
| Bv30 | 0,0067 | 0,46 | 0,0017 | 0,10 | 0,0039 | 0,23 | 0,0017 | 0,10 |
| Bv31 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0049 | 0,29 | 0,0024 | 0,14 |
| Bv32 | 0,0061 | 0,36 | 0,0032 | 0,20 | 0,0047 | 0,28 | 0,0038 | 0,23 |
| Bv33 | 0,0222 | 1,40 | 0,0050 | 0,37 | 0,0033 | 0,20 | 0,0037 | 0,23 |
| Bv34 | 0,0169 | 1,01 | 0,0049 | 0,30 | 0,0033 | 0,20 | 0,0037 | 0,23 |
| Bv35 | 0,0222 | 1,40 | 0,0050 | 0,37 | 0,0040 | 0,24 | 0,0039 | 0,24 |
| Bv36 | 0,0081 | 0,50 | 0,0047 | 0,30 | 0,0055 | 0,33 | 0,0051 | 0,34 |
| Bv37 | 0,0155 | 1,00 | 0,0058 | 0,40 | 0,0177 | 1,15 | 0,0083 | 0,60 |
| Cf10 | 0,0136 | 0,92 | 0,0031 | 0,18 | 0,0124 | 0,73 | 0,0047 | 0,28 |
| Cf11 | 0,0123 | 0,80 | 0,0062 | 0,38 | 0,0118 | 0,71 | 0,0056 | 0,38 |
| Cf12 | 0,0195 | 1,37 | 0,0109 | 0,68 | 0,0203 | 1,29 | 0,0102 | 0,64 |
| Cf13 | 0,0203 | 1,30 | 0,0143 | 1,02 | 0,0124 | 0,75 | 0,0063 | 0,47 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Cf20 | 0,0100 | 0,60 | 0,0029 | 0,17 | 0,0044 | 0,26 | 0,0025 | 0,15 |
| Cf21 | 0,0158 | 1,19 | 0,0071 | 0,45 | 0,0105 | 0,64 | 0,0049 | 0,32 |
| Cf22 | 0,0207 | 1,40 | 0,0135 | 0,90 | 0,0109 | 0,69 | 0,0050 | 0,33 |
| Cf30 | 0,0100 | 0,60 | 0,0034 | 0,20 | 0,0133 | 0,80 | 0,0053 | 0,31 |
| Cf31 | 0,0108 | 0,65 | 0,0047 | 0,28 | 0,0118 | 0,71 | 0,0056 | 0,38 |
| Cf32 | 0,0219 | 1,52 | 0,0135 | 0,90 | 0,0149 | 0,91 | 0,0057 | 0,36 |
| Ch10 | 0,2906 | 13,3 | 0,2752 | 6,26 | 0,0886 | 7,05 | 0,0178 | 1,41 |
| Ch11 | 0,3020 | 11,5 | 0,2752 | 6,26 | 0,0886 | 7,05 | 0,0178 | 1,41 |
| Ch20 | 0,1105 | 9,20 | 0,0383 | 1,05 | 0,0886 | 7,05 | 0,0178 | 1,41 |
| Ch21 | 0,1350 | 9,28 | 0,0383 | 1,05 | 0,0886 | 7,05 | 0,0178 | 1,41 |
| Ct10 | 0,0068 | 0,93 | 0,0027 | 0,15 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Ct11 | 0,0085 | 0,91 | 0,0034 | 0,20 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Ct12 | 0,0136 | 0,89 | 0,0041 | 0,25 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Ct13 | 0,0165 | 1,20 | 0,0076 | 0,50 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Ct14 | 0,0175 | 1,21 | 0,0091 | 0,59 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Ct15 | 0,0175 | 1,21 | 0,0091 | 0,59 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Ct20 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,18 |
| Ct21 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,19 |
| Ct22 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,18 |
| Ct23 | 0,0084 | 0,53 | 0,0028 | 0,17 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Ct24 | 0,0084 | 0,53 | 0,0028 | 0,17 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Ct25 | 0,0084 | 0,53 | 0,0028 | 0,17 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Cv10 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Cv11 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Cv12 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0029 | 0,17 |
| Cv13 | 0,0113 | 0,69 | 0,0056 | 0,34 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Cv14 | 0,0128 | 0,77 | 0,0081 | 0,50 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Cv15 | 0,0125 | 0,75 | 0,0069 | 0,42 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Cv16 | 0,0269 | 1,77 | 0,0086 | 0,56 | 0,0188 | 1,20 | 0,0097 | 0,65 |
| Cv17 | 0,0387 | 2,95 | 0,0102 | 0,84 | 0,0405 | 2,70 | 0,0088 | 0,65 |
| Cv18 | 0,0386 | 3,29 | 0,0133 | 1,04 | 0,0263 | 2,00 | 0,0086 | 0,70 |
| Cv20 | 0,0072 | 0,43 | 0,0032 | 0,19 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Cv21 | 0,0072 | 0,43 | 0,0032 | 0,19 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Cv22 | 0,0069 | 0,44 | 0,0019 | 0,11 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Cv23 | 0,0077 | 0,80 | 0,0028 | 0,17 | 0,0060 | 0,36 | 0,0038 | 0,23 |
| Cv24 | 0,0119 | 0,70 | 0,0021 | 0,15 | 0,0056 | 0,34 | 0,0039 | 0,24 |
| Cv25 | 0,0119 | 0,70 | 0,0028 | 0,20 | 0,0056 | 0,34 | 0,0039 | 0,24 |
| Cv26 | 0,0197 | 1,39 | 0,0073 | 0,50 | 0,0163 | 1,00 | 0,0060 | 0,39 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Cv27 | 0,0205 | 1,32 | 0,0082 | 0,57 | 0,0201 | 1,40 | 0,0095 | 0,71 |
| Cv28 | 0,0318 | 2,49 | 0,0117 | 0,91 | 0,0249 | 1,89 | 0,0101 | 0,84 |
| Cv30 | 0,0067 | 0,46 | 0,0017 | 0,10 | 0,0049 | 0,29 | 0,0025 | 0,15 |
| Cv31 | 0,0061 | 0,36 | 0,0032 | 0,20 | 0,0049 | 0,29 | 0,0026 | 0,15 |
| Cv32 | 0,0061 | 0,36 | 0,0032 | 0,20 | 0,0050 | 0,29 | 0,0026 | 0,15 |
| Cv33 | 0,0034 | 0,20 | 0,0017 | 0,10 | 0,0065 | 0,39 | 0,0032 | 0,20 |
| Cv34 | 0,0093 | 0,57 | 0,0037 | 0,23 | 0,0065 | 0,39 | 0,0035 | 0,22 |
| Cv35 | 0,0122 | 0,73 | 0,0083 | 0,51 | 0,0065 | 0,39 | 0,0035 | 0,22 |
| Cv36 | 0,0131 | 0,89 | 0,0061 | 0,40 | 0,0089 | 0,55 | 0,0065 | 0,44 |
| Cv37 | 0,0127 | 0,80 | 0,0046 | 0,33 | 0,0141 | 1,00 | 0,0085 | 0,60 |
| Cv38 | 0,0216 | 1,63 | 0,0081 | 0,70 | 0,0210 | 1,47 | 0,0103 | 0,82 |
| Cv40 | 0,0068 | 0,40 | 0,0026 | 0,16 | 0,0049 | 0,29 | 0,0025 | 0,15 |
| Cv41 | 0,0059 | 0,35 | 0,0022 | 0,13 | 0,0049 | 0,29 | 0,0026 | 0,15 |
| Cv42 | 0,0051 | 0,30 | 0,0024 | 0,14 | 0,0050 | 0,29 | 0,0026 | 0,15 |
| Cv43 | 0,0033 | 0,25 | 0,0020 | 0,12 | 0,0065 | 0,39 | 0,0032 | 0,20 |
| Cv44 | 0,0094 | 0,57 | 0,0042 | 0,26 | 0,0065 | 0,39 | 0,0035 | 0,22 |
| Cv45 | 0,0125 | 0,76 | 0,0086 | 0,53 | 0,0065 | 0,39 | 0,0035 | 0,22 |
| Cv46 | 0,0062 | 0,40 | 0,0044 | 0,28 | 0,0089 | 0,55 | 0,0065 | 0,44 |
| Cv47 | 0,0127 | 0,80 | 0,0046 | 0,33 | 0,0141 | 1,00 | 0,0085 | 0,60 |
| Cv48 | 0,0214 | 1,58 | 0,0081 | 0,70 | 0,0210 | 1,47 | 0,0103 | 0,82 |
| Du10 | 0,0106 | 0,70 | 0,0059 | 0,40 | 0,0135 | 0,87 | 0,0060 | 0,38 |
| Es10 | 0,0068 | 0,50 | 0,0017 | 0,10 | 0,0088 | 0,52 | 0,0026 | 0,16 |
| Es11 | 0,0080 | 0,50 | 0,0026 | 0,15 | 0,0088 | 0,52 | 0,0027 | 0,16 |
| Es12 | 0,0091 | 0,62 | 0,0031 | 0,18 | 0,0126 | 0,76 | 0,0023 | 0,14 |
| Es13 | 0,0093 | 0,60 | 0,0041 | 0,27 | 0,0195 | 1,20 | 0,0058 | 0,38 |
| Es14 | 0,0102 | 0,67 | 0,0039 | 0,27 | 0,0152 | 0,94 | 0,0052 | 0,35 |
| Es15 | 0,0148 | 1,12 | 0,0049 | 0,35 | 0,0134 | 0,82 | 0,0053 | 0,35 |
| Es16 | 0,0172 | 1,09 | 0,0092 | 0,64 | 0,0199 | 1,28 | 0,0083 | 0,56 |
| Es17 | 0,0142 | 0,93 | 0,0070 | 0,56 | 0,0133 | 0,81 | 0,0061 | 0,47 |
| Es20 | 0,0081 | 0,51 | 0,0050 | 0,33 | 0,0083 | 0,49 | 0,0032 | 0,21 |
| Es21 | 0,0102 | 0,61 | 0,0038 | 0,24 | 0,0083 | 0,49 | 0,0032 | 0,21 |
| Es22 | 0,0118 | 0,71 | 0,0034 | 0,20 | 0,0051 | 0,30 | 0,0031 | 0,20 |
| Es30 | 0,0071 | 0,46 | 0,0025 | 0,15 | 0,0096 | 0,57 | 0,0037 | 0,24 |
| Es31 | 0,0085 | 0,53 | 0,0031 | 0,18 | 0,0096 | 0,57 | 0,0037 | 0,24 |
| Es32 | 0,0080 | 0,50 | 0,0029 | 0,17 | 0,0096 | 0,57 | 0,0037 | 0,24 |
| Es33 | 0,0081 | 0,59 | 0,0042 | 0,30 | 0,0134 | 0,81 | 0,0056 | 0,39 |
| Es34 | 0,0098 | 0,60 | 0,0045 | 0,33 | 0,0170 | 1,04 | 0,0049 | 0,34 |
| Es35 | 0,0148 | 1,15 | 0,0043 | 0,30 | 0,0206 | 1,27 | 0,0060 | 0,42 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Es36 | 0,0127 | 0,80 | 0,0058 | 0,40 | 0,0167 | 1,08 | 0,0094 | 0,61 |
| Es37 | 0,0144 | 0,91 | 0,0079 | 0,54 | 0,0093 | 0,59 | 0,0035 | 0,29 |
| Es40 | 0,0081 | 0,50 | 0,0049 | 0,31 | 0,0077 | 0,45 | 0,0031 | 0,20 |
| Es41 | 0,0052 | 0,41 | 0,0031 | 0,20 | 0,0077 | 0,45 | 0,0031 | 0,20 |
| Es42 | 0,0052 | 0,41 | 0,0029 | 0,20 | 0,0077 | 0,45 | 0,0031 | 0,20 |
| Fw10 | 0,0033 | 0,68 | 0,0017 | 0,10 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw11 | 0,0057 | 0,36 | 0,0033 | 0,18 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw12 | 0,0055 | 0,36 | 0,0031 | 0,18 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw20 | 0,0074 | 0,44 | 0,0017 | 0,10 | 0,0048 | 0,28 | 0,0027 | 0,16 |
| Fw21 | 0,0026 | 0,20 | 0,0045 | 0,27 | 0,0048 | 0,28 | 0,0028 | 0,16 |
| Fw22 | 0,0034 | 0,25 | 0,0032 | 0,19 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw30 | 0,0033 | 0,68 | 0,0017 | 0,10 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw31 | 0,0242 | 1,44 | 0,0017 | 0,10 | 0,0048 | 0,28 | 0,0025 | 0,15 |
| Fw32 | 0,0051 | 0,40 | 0,0017 | 0,10 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw40 | 0,0074 | 0,50 | 0,0017 | 0,10 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw41 | 0,0051 | 0,44 | 0,0039 | 0,23 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Fw42 | 0,0216 | 1,27 | 0,0017 | 0,10 | 0,0045 | 0,27 | 0,0027 | 0,16 |
| Gc10 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Gc11 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Gc12 | N/A | 0,65 | N/A | N/A | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Gc13 | 0,0096 | 0,57 | 0,0033 | 0,20 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Gc14 | 0,0096 | 0,57 | 0,0033 | 0,20 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Gc15 | 0,0096 | 0,57 | 0,0033 | 0,20 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Gc16 | 0,0184 | 1,19 | 0,0056 | 0,40 | 0,0159 | 1,03 | 0,0067 | 0,46 |
| Gc17 | 0,0292 | 2,20 | 0,0090 | 0,55 | 0,0362 | 2,62 | 0,0088 | 0,65 |
| Gc20 | 0,0073 | 0,43 | 0,0025 | 0,15 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Gc21 | 0,0073 | 0,43 | 0,0025 | 0,15 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Gc22 | 0,0073 | 0,43 | 0,0025 | 0,15 | 0,0061 | 0,36 | 0,0033 | 0,20 |
| Gc23 | 0,0091 | 0,60 | 0,0050 | 0,30 | 0,0148 | 0,93 | 0,0045 | 0,27 |
| Gc24 | 0,0102 | 0,63 | 0,0052 | 0,32 | 0,0148 | 0,93 | 0,0045 | 0,27 |
| Gc25 | 0,0106 | 0,73 | 0,0045 | 0,32 | 0,0148 | 0,93 | 0,0045 | 0,27 |
| Gc26 | 0,0125 | 0,85 | 0,0032 | 0,20 | 0,0133 | 0,83 | 0,0058 | 0,38 |
| Gc27 | 0,0203 | 1,25 | 0,0050 | 0,37 | 0,0288 | 1,98 | 0,0106 | 0,76 |
| Gc30 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0044 | 0,26 | 0,0017 | 0,10 |
| Gc31 | 0,0049 | 0,29 | 0,0020 | 0,12 | 0,0049 | 0,29 | 0,0024 | 0,14 |
| Gc32 | 0,0051 | 0,30 | 0,0021 | 0,13 | 0,0045 | 0,27 | 0,0017 | 0,10 |
| Gc33 | 0,0066 | 0,40 | 0,0036 | 0,23 | 0,0045 | 0,27 | 0,0017 | 0,10 |
| Gc34 | 0,0100 | 0,61 | 0,0028 | 0,17 | 0,0046 | 0,28 | 0,0038 | 0,23 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil |
| Gc35 | 0,0115 | 0,70 | 0,0066 | 0,41 | 0,0066 | 0,39 | 0,0047 | 0,30 |
| Gc36 | 0,0104 | 0,66 | 0,0047 | 0,31 | 0,0051 | 0,31 | 0,0051 | 0,33 |
| Gc37 | 0,0142 | 0,99 | 0,0057 | 0,40 | 0,0180 | 1,18 | 0,0083 | 0,59 |
| Gf10 | 0,0422 | 2,95 | 0,0133 | 0,96 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Gf11 | 0,0422 | 2,95 | 0,0133 | 0,96 | 0,0223 | 1,66 | 0,0076 | 0,58 |
| Gf12 | 0,0404 | 3,00 | 0,0124 | 0,88 | 0,0217 | 1,50 | 0,0071 | 0,50 |
| Gf13 | 0,0440 | 3,54 | 0,0110 | 0,91 | 0,0140 | 1,00 | 0,0072 | 0,47 |
| Gf20 | 0,0051 | 0,61 | 0,0034 | 0,20 | 0,0055 | 0,34 | 0,0043 | 0,26 |
| Gf21 | 0,0521 | 3,63 | 0,0119 | 0,79 | 0,0117 | 0,74 | 0,0054 | 0,35 |
| Gf22 | 0,0411 | 3,10 | 0,0157 | 1,13 | 0,0199 | 1,38 | 0,0095 | 0,70 |
| Gf23 | 0,0322 | 2,50 | 0,0117 | 0,93 | 0,0227 | 1,69 | 0,0100 | 0,81 |
| Gf30 | 0,0082 | 0,48 | 0,0037 | 0,23 | 0,0055 | 0,33 | 0,0045 | 0,27 |
| Gf31 | 0,0111 | 0,70 | 0,0055 | 0,36 | 0,0085 | 0,54 | 0,0055 | 0,36 |
| Gf32 | 0,0173 | 1,17 | 0,0071 | 0,50 | 0,0140 | 0,96 | 0,0084 | 0,60 |
| Gf33 | 0,0216 | 1,63 | 0,0081 | 0,70 | 0,0226 | 1,69 | 0,0111 | 0,89 |
| Gs10 | 0,0104 | 0,61 | 0,0050 | 0,30 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs11 | 0,0104 | 0,61 | 0,0050 | 0,30 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs12 | 0,0086 | 0,51 | 0,0067 | 0,40 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs13 | 0,0114 | 0,82 | 0,0065 | 0,42 | 0,0115 | 0,70 | 0,0063 | 0,40 |
| Gs14 | 0,0123 | 0,76 | 0,0066 | 0,49 | 0,0101 | 0,62 | 0,0057 | 0,38 |
| Gs15 | 0,0101 | 0,63 | 0,0080 | 0,54 | 0,0101 | 0,62 | 0,0057 | 0,38 |
| Gs16 | 0,0205 | 1,59 | 0,0083 | 0,62 | 0,0159 | 1,10 | 0,0068 | 0,50 |
| Gs17 | 0,0249 | 1,57 | 0,0147 | 1,16 | 0,0266 | 1,74 | 0,0101 | 0,66 |
| Gs18 | 0,0237 | 1,60 | 0,0140 | 0,92 | 0,0257 | 1,66 | 0,0086 | 0,58 |
| Gs19 | 0,0299 | 2,16 | 0,0137 | 0,98 | 0,0186 | 1,35 | 0,0080 | 0,55 |
| Gs20 | 0,0102 | 0,60 | 0,0034 | 0,20 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs21 | 0,0102 | 0,60 | 0,0034 | 0,20 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs22 | 0,0102 | 0,60 | 0,0034 | 0,20 | 0,0096 | 0,57 | 0,0046 | 0,28 |
| Gs23 | 0,0050 | 0,30 | 0,0045 | 0,30 | 0,0115 | 0,70 | 0,0063 | 0,40 |
| Gs24 | 0,0170 | 1,04 | 0,0070 | 0,45 | 0,0101 | 0,62 | 0,0057 | 0,38 |
| Gs25 | 0,0147 | 0,91 | 0,0056 | 0,38 | 0,0101 | 0,62 | 0,0057 | 0,38 |
| Gs26 | 0,0077 | 0,50 | 0,0056 | 0,40 | 0,0159 | 1,10 | 0,0068 | 0,50 |
| Gs27 | 0,0173 | 1,14 | N/A | N/A | 0,0266 | 1,74 | 0,0101 | 0,66 |
| Gs28 | 0,0127 | 0,82 | 0,0080 | 0,50 | 0,0257 | 1,66 | 0,0086 | 0,58 |
| Gs29 | 0,0286 | 2,16 | 0,0137 | 0,98 | 0,0186 | 1,35 | 0,0080 | 0,55 |
| Hh10 | 0,0104 | 0,72 | 0,0037 | 0,22 | 0,0102 | 0,64 | 0,0050 | 0,33 |
| Hh11 | 0,0317 | 2,00 | 0,0235 | 1,44 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Hh20 | 0,0124 | 0,73 | 0,0040 | 0,24 | 0,0102 | 0,64 | 0,0050 | 0,33 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil |
| Hh21 | 0,0317 | 2,00 | 0,0235 | 1,44 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Hh30 | 0,0138 | 0,90 | 0,0050 | 0,30 | 0,0102 | 0,64 | 0,0050 | 0,33 |
| Hh31 | 0,0249 | 1,50 | 0,0196 | 1,22 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Hu10 | N/A | 0,65 | N/A | N/A | 0,0059 | 0,35 | 0,0025 | 0,15 |
| Hu11 | 0,0068 | 0,67 | N/A | N/A | 0,0059 | 0,35 | 0,0025 | 0,15 |
| Hu12 | N/A | 0,65 | N/A | N/A | 0,0059 | 0,35 | 0,0025 | 0,15 |
| Hu13 | 0,0084 | 0,52 | N/A | N/A | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Hu14 | 0,0084 | 0,52 | N/A | N/A | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Hu15 | 0,0084 | 0,52 | 0,0016 | 0,10 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Hu16 | 0,0238 | 1,57 | 0,0074 | 0,44 | 0,0131 | 0,90 | 0,0072 | 0,46 |
| Hu17 | 0,0302 | 2,40 | 0,0088 | 0,61 | 0,0229 | 1,70 | 0,0081 | 0,60 |
| Hu18 | 0,0394 | 3,20 | 0,0120 | 0,93 | 0,0254 | 1,97 | 0,0086 | 0,70 |
| Hu20 | 0,0017 | 0,75 | 0,0013 | 0,08 | 0,0059 | 0,35 | 0,0029 | 0,17 |
| Hu21 | 0,0041 | 0,42 | 0,0023 | 0,14 | 0,0059 | 0,35 | 0,0029 | 0,17 |
| Hu22 | 0,0041 | 0,42 | 0,0023 | 0,14 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Hu23 | 0,0082 | 0,48 | 0,0037 | 0,23 | 0,0055 | 0,34 | 0,0043 | 0,26 |
| Hu24 | 0,0082 | 0,48 | 0,0037 | 0,23 | 0,0055 | 0,33 | 0,0045 | 0,27 |
| Hu25 | 0,0050 | 0,30 | 0,0017 | 0,10 | 0,0055 | 0,33 | 0,0045 | 0,27 |
| Hu26 | 0,0133 | 1,03 | 0,0061 | 0,40 | 0,0116 | 0,72 | 0,0051 | 0,34 |
| Hu27 | 0,0242 | 1,75 | 0,0069 | 0,51 | 0,0196 | 1,34 | 0,0094 | 0,70 |
| Hu28 | 0,0318 | 2,49 | 0,0117 | 0,91 | 0,0249 | 1,89 | 0,0101 | 0,84 |
| Hu30 | 0,0021 | 0,13 | 0,0022 | 0,14 | 0,0051 | 0,31 | 0,0032 | 0,19 |
| Hu31 | 0,0051 | 0,30 | 0,0019 | 0,11 | 0,0051 | 0,31 | 0,0032 | 0,19 |
| Hu32 | 0,0034 | 0,20 | 0,0017 | 0,10 | 0,0052 | 0,31 | 0,0036 | 0,22 |
| Hu33 | 0,0034 | 0,24 | 0,0032 | 0,20 | 0,0080 | 0,49 | 0,0032 | 0,20 |
| Hu34 | 0,0081 | 0,50 | 0,0038 | 0,23 | 0,0046 | 0,27 | 0,0036 | 0,22 |
| Hu35 | 0,0066 | 0,40 | 0,0033 | 0,20 | 0,0046 | 0,27 | 0,0036 | 0,22 |
| Hu36 | 0,0110 | 0,70 | 0,0055 | 0,36 | 0,0085 | 0,54 | 0,0055 | 0,36 |
| Hu37 | 0,0173 | 1,17 | 0,0071 | 0,50 | 0,0140 | 0,96 | 0,0084 | 0,60 |
| Hu38 | 0,0216 | 1,63 | 0,0081 | 0,70 | 0,0226 | 1,69 | 0,0111 | 0,89 |
| Hu40 | 0,0034 | 0,20 | 0,0017 | 0,10 | 0,0051 | 0,31 | 0,0032 | 0,19 |
| Hu41 | 0,0034 | 0,20 | 0,0017 | 0,10 | 0,0051 | 0,31 | 0,0032 | 0,19 |
| Hu42 | 0,0034 | 0,20 | 0,0025 | 0,15 | 0,0052 | 0,31 | 0,0036 | 0,22 |
| Hu43 | 0,0056 | 0,34 | 0,0043 | 0,27 | 0,0080 | 0,49 | 0,0032 | 0,20 |
| Hu44 | 0,0031 | 0,19 | 0,0019 | 0,12 | 0,0046 | 0,27 | 0,0036 | 0,22 |
| Hu45 | 0,0033 | 0,20 | 0,0017 | 0,10 | 0,0046 | 0,27 | 0,0036 | 0,22 |
| Hu46 | 0,0059 | 0,39 | 0,0041 | 0,26 | 0,0085 | 0,54 | 0,0055 | 0,36 |
| Hu47 | 0,0161 | 1,10 | 0,0070 | 0,50 | 0,0140 | 0,96 | 0,0084 | 0,60 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Hu48 | 0,0214 | 1,58 | 0,0081 | 0,70 | 0,0226 | 1,69 | 0,0111 | 0,89 |
| Ia10 | 0,0494 | 3,54 | 0,0242 | 1,61 | 0,0342 | 2,19 | 0,0089 | 0,60 |
| Ia11 | 0,0429 | 3,21 | 0,0114 | 0,86 | 0,0350 | 2,46 | 0,0115 | 0,81 |
| Ia12 | 0,0416 | 3,28 | 0,0106 | 0,84 | 0,0396 | 3,31 | 0,0152 | 1,27 |
| Ik10 | 0,0304 | 2,10 | 0,0199 | 1,28 | 0,0388 | 2,57 | 0,0164 | 1,13 |
| Ik11 | 0,0393 | 3,05 | 0,0250 | 1,83 | 0,0374 | 2,72 | 0,0118 | 0,93 |
| Ik20 | 0,0133 | 0,90 | 0,0070 | 0,46 | 0,0172 | 1,13 | 0,0047 | 0,34 |
| Ik21 | 0,0180 | 1,27 | 0,0062 | 0,51 | 0,0185 | 1,36 | 0,0077 | 0,56 |
| Ka10 | 0,0246 | 1,70 | 0,0080 | 0,60 | 0,0317 | 2,08 | 0,0250 | 1,86 |
| Ka20 | 0,0140 | 1,08 | 0,0049 | 0,35 | 0,0161 | 1,07 | 0,0085 | 0,63 |
| Kd10 | 0,0068 | 0,50 | 0,0017 | 0,10 | 0,0077 | 0,45 | 0,0026 | 0,16 |
| Kd11 | 0,0080 | 0,50 | 0,0026 | 0,15 | 0,0080 | 0,47 | 0,0027 | 0,16 |
| Kd12 | 0,0091 | 0,62 | 0,0031 | 0,18 | 0,0080 | 0,47 | 0,0026 | 0,16 |
| Kd13 | 0,0107 | 0,65 | 0,0049 | 0,31 | 0,0139 | 0,90 | 0,0047 | 0,29 |
| Kd14 | 0,0156 | 1,07 | 0,0059 | 0,40 | 0,0135 | 0,81 | 0,0052 | 0,34 |
| Kd15 | 0,0148 | 1,15 | 0,0043 | 0,27 | 0,0135 | 0,81 | 0,0052 | 0,34 |
| Kd16 | 0,0148 | 1,10 | 0,0065 | 0,49 | 0,0144 | 0,92 | 0,0090 | 0,60 |
| Kd17 | 0,0233 | 1,55 | 0,0074 | 0,50 | 0,0167 | 1,08 | 0,0094 | 0,61 |
| Kd18 | 0,0285 | 1,90 | 0,0080 | 0,58 | 0,0187 | 1,19 | 0,0083 | 0,56 |
| Kd19 | 0,0177 | 1,17 | 0,0071 | 0,53 | 0,0050 | 0,30 | 0,0034 | 0,25 |
| Kd20 | 0,0074 | 0,50 | 0,0039 | 0,25 | 0,0068 | 0,40 | 0,0031 | 0,20 |
| Kd21 | 0,0074 | 0,50 | 0,0030 | 0,20 | 0,0068 | 0,40 | 0,0031 | 0,20 |
| Kd22 | 0,0050 | 0,51 | 0,0027 | 0,18 | 0,0059 | 0,35 | 0,0031 | 0,20 |
| Kp10 | 0,0623 | 3,90 | 0,0143 | 0,94 | 0,0587 | 3,88 | 0,0310 | 2,06 |
| Kp11 | 0,0413 | 3,06 | 0,0102 | 0,81 | 0,0350 | 2,46 | 0,0122 | 0,87 |
| Kp12 | 0,0438 | 3,70 | 0,0094 | 0,79 | 0,0396 | 3,31 | 0,0152 | 1,27 |
| Lo10 | 0,0108 | 0,67 | 0,0025 | 0,16 | 0,0116 | 0,69 | 0,0047 | 0,28 |
| Lo11 | 0,0105 | 0,70 | 0,0032 | 0,20 | 0,0085 | 0,52 | 0,0039 | 0,24 |
| Lo12 | 0,0139 | 1,00 | 0,0034 | 0,22 | 0,0154 | 0,95 | 0,0056 | 0,36 |
| Lo13 | 0,0129 | 1,20 | 0,0035 | 0,24 | 0,0124 | 0,75 | 0,0063 | 0,47 |
| Lo20 | 0,0086 | 0,54 | 0,0032 | 0,19 | 0,0055 | 0,33 | 0,0022 | 0,13 |
| Lo21 | 0,0134 | 0,81 | 0,0045 | 0,29 | 0,0105 | 0,64 | 0,0049 | 0,32 |
| Lo22 | 0,0143 | 0,90 | 0,0059 | 0,44 | 0,0095 | 0,59 | 0,0050 | 0,32 |
| Lo30 | 0,0083 | 0,60 | 0,0034 | 0,20 | 0,0072 | 0,42 | 0,0025 | 0,15 |
| Lo31 | 0,0122 | 0,75 | 0,0057 | 0,34 | 0,0107 | 0,65 | 0,0054 | 0,33 |
| Lo32 | 0,0212 | 1,45 | 0,0107 | 0,75 | 0,0102 | 0,64 | 0,0050 | 0,33 |
| Lt10 | 0,0084 | 0,61 | 0,0034 | 0,20 | 0,0088 | 0,52 | 0,0013 | 0,08 |
| Lt11 | 0,0104 | 0,72 | 0,0041 | 0,25 | 0,0083 | 0,50 | 0,0027 | 0,20 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in topsoil | Carbon density in topsoil (T/m³) | Carbon % (by weight) in subsoil |
| Lt12 | 0,0124 | 0,81 | 0,0049 | 0,29 | 0,0196 | 1,21 | 0,0092 | 0,59 |
| Lt13 | 0,0317 | 2,00 | 0,0235 | 1,44 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Lt14 | 0,0249 | 1,50 | 0,0187 | 1,13 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Lt15 | 0,0248 | 1,50 | 0,0158 | 1,00 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Lt20 | 0,0084 | 0,61 | 0,0034 | 0,20 | 0,0055 | 0,33 | 0,0022 | 0,13 |
| Lt21 | 0,0104 | 0,72 | 0,0041 | 0,25 | 0,0105 | 0,64 | 0,0049 | 0,32 |
| Lt22 | 0,0124 | 0,81 | 0,0049 | 0,29 | 0,0095 | 0,59 | 0,0050 | 0,32 |
| Lt23 | 0,0317 | 2,00 | 0,0235 | 1,44 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Lt24 | 0,0249 | 1,50 | 0,0187 | 1,13 | 0,0187 | 1,18 | 0,0060 | 0,42 |
| Lt25 | 0,0248 | 1,50 | 0,0158 | 1,00 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Ma10 | 0,0389 | 2,63 | 0,0188 | 1,17 | 0,0329 | 2,13 | 0,0087 | 0,59 |
| Ma11 | 0,0385 | 2,77 | 0,0165 | 1,15 | 0,0350 | 2,46 | 0,0122 | 0,87 |
| Ma12 | 0,0436 | 3,54 | N/A | N/A | 0,0396 | 3,31 | 0,0152 | 1,27 |
| Ms10 | 0,0128 | 0,84 | 0,0101 | 0,62 | 0,0198 | 1,22 | N/A | N/A |
| Ms11 | 0,0120 | 0,79 | 0,0066 | 0,40 | 0,0197 | 1,22 | N/A | N/A |
| Ms12 | 0,0134 | 0,83 | 0,0066 | 0,40 | 0,0197 | 1,22 | N/A | N/A |
| Ms13 | 0,0064 | 0,39 | N/A | N/A | 0,0197 | 1,22 | N/A | N/A |
| Ms14 | 0,0064 | 0,39 | N/A | N/A | 0,0197 | 1,22 | N/A | N/A |
| Ms20 | 0,0078 | 0,59 | 0,0028 | 0,20 | 0,0198 | 1,26 | N/A | N/A |
| Ms21 | 0,0125 | 0,78 | 0,0054 | 0,33 | 0,0198 | 1,26 | N/A | N/A |
| Ms22 | 0,0125 | 0,78 | 0,0054 | 0,33 | 0,0274 | 1,68 | N/A | N/A |
| Ms23 | 0,0125 | 0,78 | 0,0054 | 0,33 | 0,0198 | 1,26 | N/A | N/A |
| Ms24 | 0,0061 | 0,36 | N/A | N/A | 0,0198 | 1,26 | N/A | N/A |
| Mw10 | 0,0453 | 3,25 | 0,0065 | 0,40 | 0,0396 | 2,60 | 0,0188 | 1,23 |
| Mw11 | 0,0383 | 2,85 | 0,0132 | 0,80 | 0,0411 | 3,20 | 0,0090 | 0,60 |
| Mw20 | 0,0328 | 2,16 | 0,0100 | 0,68 | 0,0396 | 2,60 | 0,0188 | 1,23 |
| Mw21 | 0,0248 | 1,78 | 0,0154 | 1,12 | 0,0185 | 1,36 | 0,0077 | 0,56 |
| My10 | 0,0325 | 2,40 | 0,0098 | 0,65 | 0,0396 | 2,60 | 0,0188 | 1,23 |
| My11 | 0,0364 | 2,81 | 0,0144 | 1,06 | 0,0411 | 3,20 | 0,0090 | 0,60 |
| My20 | 0,0328 | 2,16 | 0,0100 | 0,68 | 0,0185 | 1,36 | 0,0077 | 0,56 |
| My21 | 0,0248 | 1,78 | 0,0154 | 1,12 | 0,0185 | 1,36 | 0,0077 | 0,56 |
| No10 | 0,0404 | 2,90 | 0,0212 | 1,30 | 0,0414 | 2,75 | 0,0250 | 1,66 |
| No11 | 0,0432 | 3,35 | 0,0511 | 3,51 | 0,0506 | 3,74 | 0,0128 | 0,93 |
| Oa10 | 0,0071 | 0,42 | 0,0088 | 0,52 | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Oa11 | 0,0071 | 0,42 | 0,0088 | 0,52 | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Oa12 | 0,0078 | 0,46 | 0,0084 | 0,50 | 0,0061 | 0,36 | 0,0025 | 0,15 |
| Oa13 | 0,0071 | 0,43 | 0,0062 | 0,39 | 0,0063 | 0,38 | 0,0033 | 0,20 |
| Oa14 | 0,0122 | 0,76 | 0,0040 | 0,25 | 0,0063 | 0,38 | 0,0033 | 0,20 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Oa15 | 0,0122 | 0,76 | 0,0078 | 0,48 | 0,0063 | 0,38 | 0,0033 | 0,20 |
| Oa16 | 0,0105 | 0,68 | 0,0048 | 0,31 | 0,0159 | 1,01 | 0,0079 | 0,53 |
| Oa17 | 0,0139 | 0,94 | 0,0054 | 0,41 | 0,0095 | 0,65 | 0,0047 | 0,36 |
| Oa20 | 0,0050 | 0,30 | 0,0147 | 0,87 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Oa21 | 0,0050 | 0,30 | 0,0147 | 0,87 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Oa22 | 0,0050 | 0,30 | 0,0147 | 0,87 | 0,0061 | 0,36 | 0,0032 | 0,19 |
| Oa23 | 0,0079 | 0,47 | 0,0048 | 0,30 | 0,0089 | 0,55 | 0,0038 | 0,24 |
| Oa24 | 0,0069 | 0,43 | 0,0054 | 0,33 | 0,0113 | 0,69 | 0,0041 | 0,25 |
| Oa25 | 0,0069 | 0,42 | 0,0052 | 0,32 | 0,0113 | 0,69 | 0,0041 | 0,25 |
| Oa26 | 0,0104 | 0,67 | 0,0065 | 0,42 | 0,0122 | 0,80 | 0,0060 | 0,40 |
| Oa27 | 0,0112 | 0,74 | 0,0047 | 0,32 | 0,0151 | 0,98 | 0,0083 | 0,61 |
| Oa30 | 0,0071 | 0,42 | 0,0088 | 0,52 | 0,0049 | 0,29 | 0,0025 | 0,15 |
| Oa31 | 0,0066 | 0,39 | 0,0084 | 0,50 | 0,0049 | 0,29 | 0,0026 | 0,15 |
| Oa32 | 0,0068 | 0,41 | 0,0081 | 0,48 | 0,0050 | 0,29 | 0,0026 | 0,15 |
| Oa33 | 0,0076 | 0,47 | 0,0064 | 0,39 | 0,0090 | 0,55 | 0,0100 | 0,60 |
| Oa34 | 0,0115 | 0,72 | 0,0055 | 0,34 | 0,0093 | 0,57 | 0,0100 | 0,60 |
| Oa35 | 0,0128 | 0,79 | 0,0060 | 0,37 | 0,0093 | 0,57 | 0,0100 | 0,60 |
| Oa36 | 0,0165 | 1,13 | 0,0091 | 0,60 | 0,0134 | 0,85 | 0,0112 | 0,73 |
| Oa37 | 0,0182 | 1,32 | 0,0111 | 0,82 | 0,0160 | 1,06 | 0,0074 | 0,59 |
| Oa40 | 0,0079 | 0,47 | 0,0062 | 0,37 | 0,0049 | 0,29 | 0,0025 | 0,15 |
| Oa41 | 0,0079 | 0,47 | 0,0062 | 0,37 | 0,0049 | 0,29 | 0,0026 | 0,15 |
| Oa42 | 0,0079 | 0,47 | 0,0062 | 0,37 | 0,0050 | 0,29 | 0,0026 | 0,15 |
| Oa43 | 0,0066 | 0,45 | 0,0042 | 0,25 | 0,0130 | 0,80 | 0,0044 | 0,27 |
| Oa44 | 0,0119 | 0,74 | 0,0069 | 0,42 | 0,0131 | 0,80 | 0,0042 | 0,26 |
| Oa45 | 0,0110 | 0,68 | 0,0065 | 0,39 | 0,0131 | 0,80 | 0,0042 | 0,26 |
| Oa46 | 0,0120 | 0,76 | 0,0060 | 0,39 | 0,0116 | 0,76 | 0,0062 | 0,40 |
| Oa47 | 0,0131 | 0,89 | 0,0066 | 0,51 | 0,0193 | 1,31 | 0,0106 | 0,69 |
| Pn10 | N/A | 0,65 | N/A | N/A | 0,0046 | 0,27 | 0,0024 | 0,14 |
| Pn11 | N/A | 0,65 | N/A | N/A | 0,0052 | 0,31 | 0,0022 | 0,13 |
| Pn12 | N/A | 0,65 | N/A | N/A | 0,0046 | 0,27 | 0,0024 | 0,14 |
| Pn13 | 0,0113 | 0,69 | 0,0056 | 0,34 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Pn14 | 0,0128 | 0,77 | 0,0081 | 0,50 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Pn15 | 0,0128 | 0,77 | 0,0069 | 0,42 | 0,0051 | 0,30 | 0,0028 | 0,17 |
| Pn16 | 0,0262 | 1,72 | 0,0086 | 0,56 | 0,0188 | 1,20 | 0,0097 | 0,65 |
| Pn17 | 0,0387 | 2,95 | 0,0096 | 0,80 | 0,0376 | 2,63 | 0,0100 | 0,74 |
| Pn20 | 0,0072 | 0,43 | 0,0032 | 0,19 | 0,0046 | 0,27 | 0,0028 | 0,18 |
| Pn21 | 0,0072 | 0,43 | 0,0032 | 0,19 | 0,0058 | 0,34 | 0,0030 | 0,19 |
| Pn22 | 0,0052 | 0,69 | 0,0011 | 0,07 | 0,0053 | 0,31 | 0,0030 | 0,19 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Pn23 | 0,0077 | 0,89 | 0,0028 | 0,17 | 0,0102 | 0,61 | 0,0039 | 0,24 |
| Pn24 | 0,0138 | 0,89 | 0,0092 | 0,57 | 0,0077 | 0,46 | 0,0041 | 0,25 |
| Pn25 | 0,0138 | 1,02 | 0,0092 | 0,57 | 0,0077 | 0,46 | 0,0041 | 0,25 |
| Pn26 | 0,0200 | 1,40 | 0,0073 | 0,50 | 0,0163 | 1,00 | 0,0060 | 0,39 |
| Pn27 | 0,0205 | 1,32 | 0,0082 | 0,57 | 0,0315 | 2,20 | 0,0114 | 0,80 |
| Pn30 | 0,0071 | 0,42 | 0,0027 | 0,16 | 0,0034 | 0,20 | 0,0017 | 0,10 |
| Pn31 | 0,0071 | 0,42 | 0,0027 | 0,16 | 0,0048 | 0,29 | 0,0023 | 0,14 |
| Pn32 | 0,0071 | 0,42 | 0,0027 | 0,16 | 0,0047 | 0,28 | 0,0017 | 0,10 |
| Pn33 | 0,0089 | 0,53 | 0,0027 | 0,16 | 0,0067 | 0,41 | 0,0044 | 0,29 |
| Pn34 | 0,0173 | 1,04 | N/A | N/A | 0,0067 | 0,41 | 0,0044 | 0,29 |
| Pn35 | 0,0089 | 0,53 | 0,0027 | 0,16 | 0,0067 | 0,41 | 0,0044 | 0,29 |
| Pn36 | 0,0167 | 1,04 | 0,0065 | 0,42 | 0,0105 | 0,64 | 0,0057 | 0,36 |
| Pn37 | 0,0121 | 0,79 | 0,0051 | 0,36 | 0,0182 | 1,19 | 0,0073 | 0,55 |
| Rg10 | 0,0243 | 1,81 | 0,0074 | 0,59 | 0,0104 | 0,90 | 0,0090 | 0,74 |
| Rg20 | 0,0163 | 1,26 | 0,0044 | 0,31 | 0,0168 | 1,34 | 0,0051 | 0,41 |
| Sd10 | 0,0150 | 2,10 | 0,0130 | 0,88 | 0,0159 | 1,01 | 0,0079 | 0,53 |
| Sd11 | 0,0263 | 1,94 | 0,0186 | 1,38 | 0,0175 | 1,23 | 0,0073 | 0,50 |
| Sd12 | 0,0326 | 2,59 | 0,0085 | 0,75 | 0,0247 | 1,98 | 0,0090 | 0,70 |
| Sd20 | 0,0104 | 0,79 | 0,0060 | 0,40 | 0,0159 | 1,01 | 0,0062 | 0,43 |
| Sd21 | 0,0199 | 1,43 | 0,0084 | 0,66 | 0,0217 | 1,60 | 0,0076 | 0,56 |
| Sd22 | 0,0262 | 2,10 | 0,0123 | 0,97 | 0,0194 | 1,55 | 0,0110 | 0,87 |
| Sd30 | 0,0064 | 0,40 | 0,0046 | 0,30 | 0,0122 | 0,80 | 0,0060 | 0,40 |
| Sd31 | 0,0091 | 0,60 | 0,0051 | 0,37 | 0,0149 | 0,98 | 0,0074 | 0,53 |
| Sd32 | 0,0226 | 1,63 | 0,0081 | 0,70 | 0,0168 | 1,08 | 0,0083 | 0,65 |
| Sp10 | 0,0068 | 0,93 | 0,0027 | 0,15 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Sp11 | 0,0085 | 0,91 | 0,0034 | 0,20 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Sp12 | 0,0136 | 0,89 | 0,0041 | 0,25 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Sp13 | 0,0165 | 1,20 | 0,0076 | 0,50 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Sp14 | 0,0165 | 1,20 | 0,0076 | 0,50 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Sp15 | 0,0165 | 1,20 | 0,0076 | 0,50 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Sp20 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,18 |
| Sp21 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,18 |
| Sp22 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0138 | 0,83 | 0,0029 | 0,18 |
| Sp23 | 0,0060 | 0,35 | 0,0017 | 0,10 | 0,0156 | 1,00 | 0,0056 | 0,38 |
| Sp24 | 0,0077 | 0,53 | 0,0032 | 0,19 | 0,0137 | 0,83 | 0,0060 | 0,38 |
| Sp25 | 0,0051 | 0,45 | 0,0218 | 1,36 | 0,0137 | 0,83 | 0,0060 | 0,38 |
| Ss10 | 0,0034 | 0,20 | 0,0030 | 0,19 | 0,0189 | 1,23 | 0,0083 | 0,55 |
| Ss11 | 0,0038 | 0,23 | 0,0039 | 0,23 | 0,0108 | 0,78 | 0,0068 | 0,49 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Ss12 | 0,0038 | 0,23 | 0,0039 | 0,23 | 0,0171 | 1,15 | 0,0086 | 0,72 |
| Ss13 | 0,0058 | 0,36 | 0,0046 | 0,32 | 0,0101 | 0,63 | 0,0061 | 0,42 |
| Ss14 | 0,0080 | 0,48 | 0,0075 | 0,49 | 0,0101 | 0,63 | 0,0061 | 0,42 |
| Ss15 | 0,0113 | 0,70 | 0,0066 | 0,49 | 0,0101 | 0,63 | 0,0061 | 0,42 |
| Ss16 | 0,0109 | 0,70 | 0,0056 | 0,40 | 0,0097 | 0,61 | 0,0041 | 0,36 |
| Ss17 | 0,0139 | 0,94 | 0,0054 | 0,41 | 0,0095 | 0,65 | 0,0047 | 0,36 |
| Ss20 | 0,0062 | 0,37 | 0,0080 | 0,49 | 0,0035 | 0,21 | 0,0052 | 0,34 |
| Ss21 | 0,0062 | 0,37 | 0,0080 | 0,49 | 0,0035 | 0,21 | 0,0052 | 0,34 |
| Ss22 | 0,0066 | 0,39 | 0,0079 | 0,48 | 0,0035 | 0,21 | 0,0052 | 0,34 |
| Ss23 | 0,0078 | 0,48 | 0,0042 | 0,29 | 0,0077 | 0,49 | 0,0073 | 0,49 |
| Ss24 | 0,0096 | 0,60 | 0,0062 | 0,43 | 0,0091 | 0,56 | 0,0085 | 0,57 |
| Ss25 | 0,0102 | 0,62 | 0,0078 | 0,54 | 0,0091 | 0,56 | 0,0085 | 0,57 |
| Ss26 | 0,0140 | 0,90 | 0,0064 | 0,49 | 0,0177 | 1,13 | 0,0096 | 0,71 |
| Ss27 | 0,0266 | 1,77 | 0,0086 | 0,64 | 0,0151 | 0,98 | 0,0083 | 0,61 |
| Sw10 | 0,0132 | 0,87 | 0,0098 | 0,67 | 0,0083 | 0,51 | 0,0082 | 0,54 |
| Sw11 | 0,0129 | 0,84 | 0,0086 | 0,62 | 0,0148 | 0,96 | 0,0077 | 0,57 |
| Sw12 | 0,0162 | 1,10 | 0,0098 | 0,80 | 0,0176 | 1,20 | 0,0087 | 0,73 |
| Sw20 | 0,0073 | 0,45 | 0,0057 | 0,38 | 0,0111 | 0,70 | 0,0058 | 0,41 |
| Sw21 | 0,0116 | 0,72 | 0,0083 | 0,60 | 0,0117 | 0,78 | 0,0056 | 0,41 |
| Sw22 | 0,0180 | 1,18 | 0,0090 | 0,76 | 0,0166 | 1,20 | 0,0078 | 0,61 |
| Sw30 | 0,0157 | 1.00 | 0,0094 | 0,63 | 0,0162 | 1.00 | 0,0065 | 0,43 |
| Sw31 | 0,0150 | 1,06 | 0,0102 | 0,74 | 0,0103 | 0,66 | 0,0069 | 0,52 |
| Sw32 | 0,0149 | 1,03 | 0,0100 | 0,75 | 0,0113 | 0,72 | 0,0070 | 0,57 |
| Sw40 | 0,0129 | 0,79 | 0,0068 | 0,46 | 0,0126 | 0,80 | 0,0078 | 0,51 |
| Sw41 | 0,0158 | 1,05 | 0,0076 | 0,54 | 0,0107 | 0,72 | 0,0061 | 0,43 |
| Sw42 | 0,0139 | 0,99 | 0,0078 | 0,64 | 0,0132 | 0,82 | 0,0101 | 0,83 |
| Tk10 | 0,0316 | 2,16 | 0,0200 | 1,42 | 0,0388 | 2,57 | 0,0164 | 1,13 |
| Tk11 | 0,0393 | 3,05 | 0,0250 | 1,83 | 0,0374 | 2,72 | 0,0118 | 0,93 |
| Tk20 | 0,0133 | 0,90 | 0,0070 | 0,46 | 0,0327 | 2,22 | 0,0153 | 1,11 |
| Tk21 | 0,0178 | 1,27 | 0,0063 | 0,50 | 0,0185 | 1,36 | 0,0077 | 0,56 |
| Va10 | 0,0157 | 1,07 | 0,0064 | 0,41 | 0,0219 | 1,41 | 0,0093 | 0,62 |
| Va11 | 0,0119 | 0,85 | 0,0072 | 0,54 | 0,0117 | 0,83 | 0,0079 | 0,58 |
| Va12 | 0,0171 | 1,11 | 0,0088 | 0,74 | 0,0171 | 1,15 | 0,0086 | 0,72 |
| Va20 | 0,0101 | 0,73 | 0,0046 | 0,30 | 0,0110 | 0,70 | 0,0045 | 0,29 |
| Va21 | 0,0122 | 0,80 | 0,0055 | 0,40 | 0,0110 | 0,76 | 0,0055 | 0,39 |
| Va22 | 0,0133 | 0,91 | 0,0072 | 0,58 | 0,0163 | 1,02 | 0,0085 | 0,63 |
| Va30 | 0,0161 | 1,16 | 0,0083 | 0,54 | 0,0094 | 0,58 | 0,0094 | 0,61 |
| Va31 | 0,0180 | 1,30 | 0,0092 | 0,69 | 0,0180 | 1,16 | 0,0107 | 0,78 |

| Soil series with carbon sample information | Median values calculated from samples with natural vegetation | | | | Median values calculated from samples with agricultural land uses | | | |
|---|---|---|---|---|---|---|---|---|
| | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in topsoil** | **Carbon density in topsoil (T/m³)** | **Carbon % (by weight) in subsoil** |
| Va32 | 0,0115 | 0,85 | 0,0073 | 0,60 | 0,0178 | 1,16 | 0,0099 | 0,80 |
| Va40 | 0,0139 | 0,90 | 0,0069 | 0,47 | 0,0140 | 0,90 | 0,0080 | 0,54 |
| Va41 | 0,0118 | 0,79 | 0,0053 | 0,40 | 0,0107 | 0,72 | 0,0061 | 0,43 |
| Va42 | 0,0110 | 0,77 | 0,0067 | 0,55 | 0,0163 | 1,02 | 0,0071 | 0,60 |
| Vf10 | 0,0060 | 0,35 | 0,0018 | 0,11 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf11 | 0,0057 | 0,34 | 0,0017 | 0,10 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf12 | 0,0060 | 0,35 | 0,0018 | 0,11 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf13 | 0,0175 | 1,21 | 0,0091 | 0,59 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf14 | 0,0175 | 1,12 | 0,0091 | 0,59 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf15 | 0,0175 | 1,12 | 0,0091 | 0,59 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf20 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf21 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf22 | 0,0048 | 0,28 | 0,0030 | 0,19 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf23 | 0,0195 | 1,50 | 0,0137 | 0,94 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Vf24 | 0,0051 | 0,30 | 0,0313 | 1,89 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Vf25 | 0,0051 | 0,45 | 0,0218 | 1,36 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Vf30 | 0,0060 | 0,35 | 0,0018 | 0,11 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf31 | 0,0054 | 0,32 | 0,0017 | 0,10 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf32 | 0,0071 | 0,46 | 0,0033 | 0,20 | 0,0088 | 0,52 | 0,0026 | 0,15 |
| Vf33 | 0,0230 | 1,30 | 0,0106 | 0,68 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf34 | 0,0161 | 1,02 | 0,0076 | 0,50 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf35 | 0,0128 | 0,79 | 0,0060 | 0,37 | 0,0175 | 1,16 | 0,0060 | 0,38 |
| Vf40 | 0,0050 | 0,29 | 0,0036 | 0,23 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf41 | 0,0050 | 0,29 | 0,0036 | 0,23 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf42 | 0,0050 | 0,29 | 0,0039 | 0,23 | 0,0113 | 0,68 | 0,0023 | 0,15 |
| Vf43 | 0,0195 | 1,50 | 0,0137 | 0,94 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Vf44 | 0,0051 | 0,30 | 0,0313 | 1,89 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Vf45 | 0,0051 | 0,45 | 0,0218 | 1,36 | 0,0132 | 0,80 | 0,0069 | 0,46 |
| Wa10 | 0,0049 | 0,30 | 0,0029 | 0,18 | 0,0116 | 0,69 | 0,0047 | 0,28 |
| Wa11 | 0,0081 | 0,70 | 0,0062 | 0,41 | 0,0118 | 0,71 | 0,0056 | 0,38 |
| Wa12 | 0,0144 | 0,91 | 0,0093 | 0,61 | 0,0203 | 1,29 | 0,0102 | 0,64 |
| Wa13 | 0,0129 | 1,20 | 0,0035 | 0,24 | 0,0124 | 0,75 | 0,0063 | 0,47 |
| Wa20 | 0,0090 | 0,56 | 0,0032 | 0,19 | 0,0044 | 0,26 | 0,0025 | 0,15 |
| Wa21 | 0,0085 | 0,52 | 0,0032 | 0,20 | 0,0104 | 0,63 | 0,0062 | 0,38 |
| Wa22 | 0,0140 | 0,90 | 0,0050 | 0,37 | 0,0109 | 0,69 | 0,0050 | 0,33 |
| Wa30 | 0,0080 | 0,56 | 0,0034 | 0,20 | 0,0072 | 0,42 | 0,0025 | 0,15 |
| Wa31 | 0,0085 | 0,52 | 0,0045 | 0,28 | 0,0107 | 0,65 | 0,0054 | 0,33 |
| Wa32 | 0,0139 | 1,28 | 0,0043 | 0,28 | 0,0102 | 0,64 | 0,0050 | 0,33 |