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Ministry of
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PROPOSED THORNTREE
OPENCAST COAL SITE
LAND TO THE NORTH OF HEATHER
LEICESTERSHIRE
Agricultural Land Classification
&
Statement of Physical Characteristics
January 1997

Resource Planning Team
Huntingdon Statutory Group
ADAS Cambridge

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AGRICULTURAL LAND CLASSIFICATION REPORT INCLUDING STATEMENT OF PHYSICAL CHARACTERISTICS

PROPOSED THORNTREE OPENCAST COAL SITE LAND TO THE NORTH OF HEATHER, LEICESTERSHIRE

Introduction

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) and Soil Resource survey of 199.5ha of land to the north of the village of Heather, Leicestershire. The site is bounded to the southeast by a minor road from Heather to Ravenstone with the remainder of the eastern boundary comprising Blower Brook. The village of Normanton le Heath is located to the west of the site, with the road from Heather to Packington adjacent to the southwestern boundary. To the north of the site are areas of woodland. In addition a narrow strip of land is included within the application boundary joining the northeastern edge of the site to the road from Ravenstone to Ashby-de-la-Zouch.

2. The survey was commissioned by the Ministry of Agriculture, Fisheries and Food (MAFF) Land Use Planning Unit, Cambridge in connection with a proposed planning application for an opencast coal extraction site.

3. The work was conducted by members of the Resource Planning Team in the Huntingdon Statutory Group in ADAS. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.

4. At the time of survey the majority of the land was under winter cereals, with smaller areas of grass ley and winter rape. Included within the site boundary are two areas of newly planted woodland together with a further 4 small areas of more mature woodland. At the southeast of the site are the farm buildings of Thorntree Farm.

Summary

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10 000 it is accurate at this scale but any enlargement would be misleading.

6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1.

Table 1: Area of grades and other land

Grade/Other land	Area (hectares)	% Total site area	% Surveyed Area
2	43.4	21.7	22.7
3a	92.9	46.6	48.6
3b	55.0	27.6	28.7
Other Land	8.2	4.1	-
Total surveyed area	191.3		100
Total site area	199.5	100	-

7. The fieldwork was conducted at an average density of 1 boring per hectare. A total of 205 borings and 9 soil pits was described.

8. The main limitation associated with the southern end of the site is a minor droughtiness restriction due to the low moisture holding capacity of the sandy soils which are prevalent in this area. On the more loamy soils in this area, where droughtiness is not a limitation the land is also restricted to Grade 2 due to a climatic limitation. Over the majority of the remainder of the site, wetness is the overriding limitation, due to slowly permeable clayey layers within the soil profile. Land in this area is principally Subgrade 3a or 3b depending on the depth to the underlying clay and hence the severity of the wetness limitation. Included within this area are occasional profiles of Grade 2 quality where the underlying clay is either absent or occurs deeply within the soil profile.

Factors Influencing ALC Grade

Climate

9. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

10. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5km grid datasets using the standard interpolation procedures (Met. Office, 1989).

Table 2: Climatic and altitude data

Factor	Units	Values	Values	Values
Grid reference	N/A	SK 391 135	SK 387 129	SK 388 119
Altitude	m, AOD	130	140	140
Accumulated Temperature	day°C (Jan-June)	1321	1309	1310
Average Annual Rainfall	mm	683	687	685
Field Capacity Days	days	159	158	158
Moisture Deficit, Wheat	mm	94	93	93
Moisture Deficit, Potatoes	mm	81	79	80

11. The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

12. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (AT0, January to June), as a measure of the relative warmth of a locality.

13. The combination of rainfall and temperature on this site means that the site straddles the Grade 1 and 2 climatic limitation boundary, with the higher land to the south and west of the site having a slight climatic limitation restricting the land in this area to Grade 2 at best.

Site

14. The site is located on the western side of a small valley down which flows the Blower Brook. The land therefore generally slopes gently toward the east, becoming relatively flat on the eastern side in the valley bottom. The altitude of the site ranges from approximately 140 m AOD on the western side to 120 m AOD in the valley bottom. Gradients on the site are typically gentle, ranging from approximately 1-5° and consequently relief does not impose any limitation to the farming of the area.

Geology and soils

15. The published 1:50,000 scale solid and drift geology map for the area (Geol Surv. 1982) shows the area to be underlain by a complex pattern of Triassic and Carboniferous sandstones and mudstones with areas of boulder clay and sands and gravels superimposed. The majority of the site comprises mainly the Mercia mudstones and Bromsgrove sandstones with boulder clays mapped on the western and southwestern parts of the site. Sands and gravels are shown to occur at the southern end of the site. The Westphalian sandstones are mapped on the eastern side of the site and this is overlain by alluvium along the lower lying land adjacent to Blower Brook.

16. An area of former opencast workings is shown over part of the site. This is the area of the former Blowers Brook Opencast Site which was worked between 1954 and 1958. Evidence of disturbed soil profiles was noted during the current survey on the lower lying land over the southeastern part of the site.

17. The 1:250,000 scale reconnaissance soil survey map for the area (SSEW, 1983) shows soils of the Bromsgrove association occupying the majority of the northern part of the site. These soils are described as well to moderately well drained reddish coarse loamy soils overlying soft Triassic and Carboniferous sandstones but included are fine loamy soils developed on the frequent inclusions of mudstone. Over the southern part of the site soils of the Wick 1 association have been mapped. These soils are typically well drained coarse loamy brown earths and brown sands locally overlying gravel. To the extreme west of the site, a narrow band of the Hodnet association has been mapped which comprises reddish fine and coarse loamy soils developed on interbedded mudstones, siltstones and sandstones. These soils typically have slowly permeable subsoil horizons and are susceptible to periodic

waterlogging. A small area of Salwick association has been mapped in the valley bottom at the south east of the site and these are described as fine loamy soils developed in reddish till and glaciofluvial drift, with slight seasonal waterlogging. This area however correlates with the area of the former opencast area referred to above.

18. During the current, more detailed survey work five soil types have been identified, which correlate broadly with the soils described above, although the proportions of the various soils differ markedly. This however is to be expected due to the complex nature of the underlying geology.

Soil Type I (described in more detail in Appendix III)

19. These soils have been mapped at the extreme southern end of the site and comprise deep coarse loamy over sandy soils developed in the sands and gravels. The soils typically have a dark brown medium sandy loam topsoil with 3-5% small and medium rounded quartzite pebbles, overlying a brown medium sandy loam upper subsoil with 8-10% pebbles. Below 50/60 cm depth the soil typically becomes coarser textured and more stony, having a loamy medium sand or medium sand texture. Included within this unit are soils which are sandy loam to depth. All the soils however are free draining Wetness Class I (see Appendix II).

Soil Type II (described in more detail in Appendix III)

20. Soil Type II has been mapped immediately to the north of Soil Type I and also in a small area on the higher land to the north west of the site. These soils are typically slightly heavier textured than those described above and have a dark brown sandy clay loam, medium sandy loam or sandy silt loam topsoil with 3-5% small and medium rounded quartzite pebbles. The upper subsoil is typically a slightly or moderately stony medium sandy loam or sandy clay loam with a coarse subangular blocky structure, which in several profiles shows signs of faint ochreous mottles and manganese concretions. Below 80 cm depth a reddish brown faintly mottled sandy clay is encountered which is slowly permeable, however this horizon is not always present within 120 cm depth. The soils have been classified as Wetness Class I or II depending on the presence of the slowly permeable sandy clay material.

Soil Type III (described in more detail in Appendix III)

21. Soil Type III comprises soils developed in slightly chalky boulder clay and have been mapped in two locations on the site although individual profiles were found in other parts of the site principally within Soil Type V. These soils typically have a dark brown or dark greyish brown medium or heavy clay loam topsoil with few small and medium hard stones. The upper subsoil comprises a non calcareous, yellowish brown heavy clay loam or clay with common distinct ochreous mottles and a coarse or very coarse angular blocky structure. Below approximately 40/60 cm depth the soil becomes a strongly calcareous, greyish brown clay with common ochreous mottles and grey patches and common small and medium rounded chalk stones and occasional sandstone fragments. The structure is typically coarse or very coarse angular blocky. These soils are assessed as Wetness Class III or IV.

Soil Type IV (described in more detail in Appendix III)

22. These soils comprise fine loamy over clayey soils developed in the red or grey clays. Two soil pits were dug in this unit to identify any differences in the soils apart from colour. Topsoil textures are typically medium or heavy clay loam and contain few small and medium hard stones. Below the topsoil both the grey and red soils have a clay texture and coarse prismatic structure. The grey soils have many prominent ochreous mottles and few manganese concretions whilst the red soils show only very faint mottling, but common manganese staining especially on ped faces. The red clays are generally stoneless whilst the grey clays may contain a few sandstone fragments. Both variants have been assessed as Wetness Class IV. Contained within the unit are soil profiles with both red and grey clays in the subsoil horizons.

Soil Type V (described in more detail in Appendix III)

23. Soil Type V has been mapped extensively over the central and northern parts of the site and principally comprises fine loamy soils overlying clay at depth. Soil profiles within this unit are very variable and the mapping unit contains occasional deep sandy profiles similar to Soil Type II together with soils containing large fragments of highly weathered sandstone, or sandy lenses. The soils may be brown or reddish, with the underlying clay being either red or grey. This mapping unit has been divided into a moderately deep and moderately shallow phase depending on the depth to the underlying slowly permeable clay.

Soil Type Va - moderately shallow phase.

24. The soils of the moderately shallow phase comprise fine loamy soils overlying slowly permeable clay within 55 cm depth. These soils typically have a dark brown or dark reddish brown medium clay loam or sandy clay loam topsoil approximately 30 cm thick overlying a reddish brown or greyish brown sandy clay loam, medium clay loam or heavy clay loam upper subsoil, which typically has a coarse subangular blocky structure and common rounded quartzite pebbles. Below 40/55 cm depth the lower subsoil is typically a reddish or greyish clay or sandy clay, with a coarse or very coarse prismatic structure. The reddish clays show common manganese staining, with very faint or no evidence of mottling, whilst the grey clays have distinct ochreous mottling. As with Soil Type IV, both grey and red clays were occasionally found in the same profile. These soils have been assessed as Wetness Class III.

Soil Type Vb - moderately deep phase.

25. The soils of the moderately deep phase comprise fine loamy soils overlying slowly permeable reddish or greyish clay between 55 and 80 cm depth. The soils are basically the same as for Soil Type Va, with the difference being the depth to the underlying clay. The soils have a slight or moderate wetness limitation and are assessed as Wetness Class II or III.

Agricultural Land Classification

26. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 2.

27. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix III..

Grade 2

28. Four areas of Grade 2, very good quality agricultural land, have been mapped over the southern and western parts of the site. These areas correlate with the free draining soils of Soil Types I and II and the better drained variants of Soil Type Vb. The sandy soils of Soil Type I have a minor droughtiness limitation and moisture balance calculations indicate that in this area of moderately low soil moisture deficits, these soils will be slightly droughty for the deeper rooting crops. In the case of the deeper more loamy soils of Soil Type II, the higher available water capacities mean that these soils are not susceptible to drought stress and due to their free draining nature do not have a wetness limitation. However because of the climatic parameters that are prevalent in the area, such land cannot be better than Grade 2 due to a climatic limitation. The areas of Grade 2 on the western side of the site which correlate with Soil Type Vb are restricted to this grade due to a minor wetness and workability limitation. These soils have been assessed as Wetness Class II and have medium clay loam or sandy clay loam topsoil textures and are therefore susceptible to structural damage if trafficked and cultivated during the wetter periods of the year.

Subgrade 3a

29. Subgrade 3a, good quality agricultural land, has been mapped over the central and northern parts of the site and correlates with the soils included within Soil Types Va and less well drained profiles of Soil Type Vb. The principal limitation associated with this land is a moderate wetness and workability restriction due to drainage imperfections caused by the presence of slowly permeable subsoil horizons and the fine loamy topsoil textures. These properties combine to restrict the time that these soils can be safely trafficked and cultivated without causing structural damage. It should be noted however that due to the variability of Soil Type V referred to above, there will be small areas of better drained soils (Wetness Class I or II) within this mapping unit giving rise to a Grade 2 classification, but it was considered that these did not occur in sufficiently large enough areas to warrant separate delineation.

Subgrade 3b

30. The areas of Subgrade 3b, moderate quality agricultural land correlate with the poorly drained (Wetness Class IV) soils of Soil Types III and IV and include some of the low lying land mapped as Soil Type Vb in the area where former opencast working has taken place and the soils have been disturbed giving rise to soil variability. The soils which occur in these areas typically have medium or heavy clay loam topsoil textures overlying slowly permeable clay subsoil giving rise to a moderately severe wetness and workability limitation. Timing of cultivations, trafficking and stocking of these areas needs to be carefully controlled to prevent structural damage occurring to the soils giving rise to a moderately severe limitation restricting the land to Subgrade 3b. Included within the land mapped as Subgrade 3b is a small area on the northwestern edge of the site which comprises an area of disturbed land which was the site of the former Bulwell Barns farm buildings, which is now under permanent grass.

Other Land

31. A number of areas of Other Land have been mapped which comprise areas of woodland and also the farm buildings of Thorntree Farm

Soil Resources

32. A statement of soil physical characteristics is given in Appendix III. The thicknesses and the volumes given in Table 3 below should be treated with some caution due to the variability of the soils.

Table 3: Soil Resources

	Area (ha)	Thickness (cm)	Volume (m^3)
Soil Type I			
Topsoil	6.1	35	21350
Upper Subsoil	6.1	25	15250
Lower Subsoil	6.1	60	36600
Soil Type II			
Topsoil	28.7	33	94710
Upper Subsoil	28.7	50	143500
Lower Subsoil*	28.7	40	114800
Soil Type III			
Topsoil	15.4	30	46200
Upper Subsoil	15.4	20	30800
Lower Subsoil	15.4	70	107800
Soil Type IV			
Topsoil	42.9	30	128700
Subsoil	42.9	90	386100
Soil Type Va			
Topsoil	65.1	31	201810
Upper Subsoil	65.1	20	130200
Lower Subsoil	65.1	70	455700
Soil Type Vb			
Topsoil	40.8	32	130560
Upper Subsoil	40.8	40	163200
Lower Subsoil	40.8	50	204000

* *The lower subsoil is not always present in this mapping unit.*

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SOURCES OF REFERENCE

British Geological Survey (1982) *Sheet No.* 155, *Coalville (Solid and Drift Edition) 1:50,000 scale*.BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land*. MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification*. Met. Office: Bracknell.

Soil Survey of England and Wales (1983) *Sheet* 3, *Midland and Western England. 1:250,000 scale* SSEW: Harpenden.

Soil Survey of England and Wales (1984) *Soils and their use in Midland and Western England* SSEW: Harpenden

APPENDIX I

DESCRIPTIONS OF THE GRADES AND SUBGRADES

Grade 1: Excellent Quality Agricultural Land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2: Very Good Quality Agricultural Land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural or horticultural crops can usually be grown but on some land of this grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When more demanding crops are grown, yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a: Good Quality Agricultural Land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b: Moderate Quality Agricultural Land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass, or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4: Poor Quality Agricultural Land

Land with severe limitations which significantly restrict the range of crops and/or the level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5: Very Poor Quality Agricultural Land

Land with severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

SOIL WETNESS CLASSIFICATION

Definitions of Soil Wetness Classes

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six soil wetness classes are identified and are defined in the table below.

Wetness Class	*Duration of waterlogging*[1]
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years.[2]
II	The soil profile is wet within 70 cm depth for 31-90 days in most years **or**, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but only wet within 40 cm depth for 30 days in most years.
III	The soil profile is wet within 70 cm depth for 91-180 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31-90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not wet within 40 cm depth for more than 210 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

Assessment of Wetness Class

Soils have been allocated to wetness classes by the interpretation of soil profile characteristics and climatic factors using the methodology described in *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

[1] The number of days is not necessarily a continuous period.

[2] 'In most years' is defined as more than 10 out of 20 years.

APPENDIX III

STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE I

Topsoil	Texture	medium sandy loam
	Colour	7.5YR4/3
	Stone	3-5% small & medium quartzite pebbles
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	35 cm
	Boundary	abrupt smooth
Upper Subsoil	Texture	medium sandy loam/loamy medium sand
	Colour	7.5YR4/5
	Mottles	none
	Concretions	none
	Stone	5-10% mainly small & medium rounded quartzite pebbles
	Structure	weak medium and coarse subangular blocky
	Consistence	friable
	Structural condition	good
	Pores	>0.5%
	Roots	common fine and very fine
	$CaCO_3$	non calcareous
	Depth	50/60 cm
	Boundary	gradual smooth
Lower subsoil	Texture	loamy medium sand/medium sand
	Colour	5YR4/6
	Mottles	none
	Concretions	none
	Stone	10-15% small & medium rounded quartzite pebbles
	Structure	very weak medium subangular blocky or single grain
	Consistence	very friable
	Structural condition	moderate
	Pores	>0.5%
	Roots	few fine and very fine
	$CaCO_3$	non calcareous
	Depth	120 cm

SOIL TYPE II

Topsoil	Texture	sandy clay loam/medium sandy loam/medium sandy silt loam
	Colour	7.5YR4/3 and 10YR4/3
	Stone	3-5% small & medium rounded quartzite pebbles
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	33 cm
	Boundary	abrupt smooth
Upper Subsoil	Texture	sandy clay loam/medium sandy loam
	Colour	2.5Y5/4
	Mottles	few faint 10YR5/6 in some profiles
	Concretions	few/common Mn in some profiles
	Stone	5-15% small & medium rounded quartzite pebbles
	Structure	weak coarse subangular blocky
	Consistence	friable
	Structural condition	good/moderate
	Pores	>0.5%
	Roots	common fine and very fine
	$CaCO_3$	non calcareous
	Depth	80 cm
	Boundary	abrupt smooth
Lower subsoil*	Texture	clay/sandy clay
	Colour	5YR4/6
	Mottles	common 5YR5/6&5/8
	Concretions	common Mn
	Stone	5-10% quartzite pebbles and sandstone fragments
	Structure	weak very coarse prismatic
	Consistence	very firm
	Structural condition	poor
	Pores	<0.5%
	Roots	few fine and very fine
	$CaCO_3$	non calcareous
	Depth	120 cm

* The lower subsoil is not always present in this mapping unit.

SOIL TYPE III

Topsoil	Texture	medium/heavy clay loam
	Colour	10YR4/3
	Stone	5% small & medium rounded quartzite and few angular sandstone
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	30 cm
	Boundary	abrupt smooth
Upper Subsoil	Texture	heavy clay loam/clay
	Colour	10YR5/3 and 5/2 ped faces
	Mottles	common/many 10YR5/6
	Concretions	few Mn
	Stone	5% small & medium rounded quartzite and few angular sandstone
	Structure	moderate coarse and very coarse angular blocky
	Consistence	firm
	Structural condition	poor
	Pores	<0.5%
	Roots	common fine and very fine
	$CaCO_3$	non calcareous
	Depth	40/60 cm
	Boundary	clear smooth
Lower subsoil	Texture	clay
	Colour	7.5YR5/4 and 2.5Y6/1
	Mottles	common 7.5YR5/6,
	Concretions	none
	Stone	5-10% small & medium rounded chalk and few medium subangular sandstone
	Structure	moderate coarse angular blocky
	Consistence	firm
	Structural condition	poor
	Pores	<0.5
	Roots	common fine and very fine
	$CaCO_3$	calcareous
	Depth	120 cm

SOIL TYPE IV

Topsoil	Texture	medium/heavy clay loam
	Colour	10YR4/3, 7.5YR4/3 and 5YR4/3
	Stone	1-5% small & medium rounded quartzite pebbles
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	30 cm
	Boundary	abrupt smooth
Upper Subsoil	Texture	clay
	Colour	2.5YR4/4 & 5/4 or 2.5Y6/3 &6/1
	Mottles	common/many 10YR5/8 in grey soils
	Concretions	common Mn stains in red soils
	Stone	1-3% small & medium rounded quartzite and few angular sandstone, stoneless in red clay
	Structure	moderate/strong coarse and very coarse prismatic
	Consistence	very firm
	Structural condition	poor
	Pores	<0.5%
	Roots	common fine and very fine mainly down ped faces
	$CaCO_3$	non calcareous
	Depth	120 cm

SOIL TYPE Va

Topsoil	Texture	medium clay loam/sandy clay loam
	Colour	7.5YR4/3 and 5YR4/3
	Stone	3-5% small & medium rounded quartzite and few angular sandstone
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	31 cm
	Boundary	clear smooth
Upper Subsoil	Texture	medium/heavy clay loam/sandy clay loam
	Colour	10YR5/3, 7.5YR5/3, 5YR4/6
	Mottles	few/common 10YR5/6 &7.5YR5/6
	Concretions	few Mn stains
	Stone	5-10% small & medium rounded quartzite and few angular sandstone
	Structure	weak/moderate coarse subangular blocky
	Consistence	firm
	Structural condition	moderate
	Pores	>0.5%
	Roots	common fine and very fine
	$CaCO_3$	non calcareous
	Depth	40/55 cm
	Boundary	abrupt smooth
Lower subsoil	Texture	clay/sandy clay
	Colour	2.5YR3/4,5YR4/6 2.5Y6/3
	Mottles	common 7.5YR5/6,
	Concretions	common Mn stains in red clay
	Stone	0-5% small & medium rounded quartzite and few medium weathered sandstone
	Structure	weak/moderate coarse prismatic
	Consistence	firm/very firm
	Structural condition	poor
	Pores	<0.5
	Roots	few fine and very fine
	$CaCO_3$	non calcareous
	Depth	120 cm

SOIL TYPE Vb

Topsoil	Texture	medium clay loam/sandy clay loam
	Colour	7.5YR4/3 and 5YR4/3
	Stone	3-5% small & medium rounded quartzite and few angular sandstone
	Roots	many fine and very fine
	$CaCO_3$	non calcareous
	Depth	32 cm
	Boundary	clear smooth
Upper Subsoil	Texture	medium/heavy clay loam/sandy clay loam
	Colour	10YR5/3, 7.5YR5/3, 5YR4/6
	Mottles	*few/common* 10YR5/6 &7.5YR5/6
	Concretions	few Mn stains
	Stone	5-10% small & medium rounded quartzite and few angular sandstone
	Structure	weak/moderate coarse subangular blocky
	Consistence	firm
	Structural condition	moderate
	Pores	>0.5%
	Roots	common fine and very fine
	$CaCO_3$	non calcareous
	Depth	55/80 cm
	Boundary	abrupt smooth
Lower subsoil	Texture	clay/sandy clay
	Colour	2.5YR3/4,5YR4/6 2.5Y6/3
	Mottles	common 7.5YR5/6,
	Concretions	common Mn stains in red clay
	Stone	0-5% small & medium rounded quartzite and few medium weathered sandstone
	Structure	weak/moderate coarse prismatic
	Consistence	firm/very firm
	Structural condition	poor
	Pores	<0.5
	Roots	few fine and very fine
	$CaCO_3$	non calcareous
	Depth	120 cm