Soil Environment Services Ltd

AGRICULTURAL LAND CLASSIFICATION

Allesley/Kerseley
Coventry

Soil Environment Services Ltd
August 2008

Our Ref: ALCRep/CC/2 **Date: 4th August 2008**

Client:

Coventry City Council
Council House
Earl Street
Coventry,
CV1 5RR

AGRICULTURAL LAND CLASSIFICATION

A report prepared on behalf of ***Soil Environment Services*** by:

Mike Palmer BSc MSc
Environmental Consultant

Checked by:

Dr Robin S Davies BSc PhD MISoilSci CSci PGC *Contaminated Land Management*
Chartered Scientist

4th August 2008

INSTITUTE OF PROFESSIONAL SOIL SCIENTISTS

Soil Environment Services
Agricultural Land Classification, Contaminated Land
Risk Assessment, Mineral Extraction Soil Planning
The Nanotechnology Centre, Herschel Building, Kings Rd, Newcastle upon Tyne NE1 7RU
Tel: 0191 243 0686 Fax: 0191 222 3528 Email: rd@soilenvironmentservices.co.uk
www.soilenvironmentservices.co.uk

CONTENTS

1. INTRODUCTION

1.1 An Agricultural Land Classification survey (ALC)[1,2] was carried out on land in Allesley and Kerseley parishes in the north west of Coventry from the 11th to 18th June 2008. The surveyed area is subdivided into three adjoining areas, designated A, B and C. In this report Area B is further subdivided into Area B north and Area B South for the purposes of landscape description (See Drawing ALC/1 and 2).

1.2 The soil survey consisted of hand auger borings to a depth of 1.2 m (where possible), to examine soil properties using standard methods[3]. Free survey techniques* at an approximate sample density of one investigation per 5 ha were used to identify soil changes which may affect land quality. Pits were excavated to a depth of 1.2 metre to establish subsoil structural conditions where required. This data was used to map the principle soil types for determining the ALC grade. Soil mapping is presented in Drawing ALC/1.

1.3 Met. Office climatological data[4] was used to determine the overriding site limitation and for interaction with soil parameters (Appendix A).

1.4 Gradient was measured using a sighting clinometer.

1.5 Flood risk was estimated based on topography and proximity to watercourses. Flood risk was only considered a limiting factor in isolated zones along streams, and grading is based on assessment of local topography, and Environment Agency flood risk data.

1.6 Other factors used for ALC grading, but which give no limitation at this site, are not discussed.

1.7 The above information was cross referenced with British Geological Survey information, previous soil surveys[5] and the national 1:250 000 series ALC survey to produce an ALC map. ALC grade units were then determined and mapped for this site, and are presented in Drawing ALC/2.

* Free survey involves the location of soil sample points on the basis of changes in topography, geology and soil type using field evidence in conjunction with aerial imagery, geological maps and previous soil survey data.

Agricultural land is classified into the following categories according to the 1988 guidelines[1]:

Table 1 Description of ALC Grades and Subgrades[1]

Grade	Description
1	**Excellent quality agricultural land** with no or very minor limitations to agricultural use.
2	**Very good quality agricultural land** with minor limitations which affect crop yield, cultivation or harvesting.
3a	**Good quality agricultural land** capable of producing moderate to high yields of a narrow range of arable crops or moderate yields of a wider range of crops.
3b	**Moderate quality agricultural land** capable of producing moderate yields of a narrow range of crops or lower yields of a wider range of crops.
4	**Poor quality agricultural land** with severe limitations which significantly restrict the range of crops and/or level of yields.
5	**Very poor quality agricultural land** with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

2. BASELINE CONDITIONS AND LAND QUALITY

2.1 Agriculture

Arable rotation (mainly cereals) and permanent pasture are both common land uses in this area. There are also large areas of land sublet as horse paddocks.

2.2 Climate and Flooding

2.2.1 Climate

The climatological data estimated for Hawkes End (located at approximately the geographic centre of the surveyed area) were determined by interpolation of the climatic dataset (Table 1) Climate is non- limiting to agriculture (Grade 1).

Table 1
Climatological information

Factor	Units	Value
Altitude AOD	m	130
Accumulated temperature	day°C (Jan-June)	1380
Average Annual Rainfall	mm	705
Field Capacity Days	days	158
Moisture Deficit Wheat	mm	93
Moisture Deficit Potatoes	mm	79

2.2.2 Flood risk

Other than in very isolated locations the area is free from limitations resulting from recurrent flooding. The areas where flood risk was judged to occur were isolated narrow stream valleys where topographic, soil morphological and wetness indicators showed frequent flooding to be likely. In these areas the flooding likelihood in winter is sufficiently high to limit the use of land to grassland (summer grazing) and land is classed as Grade 4.

2.3 Soil Types

Six soil Types were identified within the survey area. Soil Types 5 and 6 were locally occurring (less than 5 hectares) soils formed in alluvium of variable age and texture. Due to the semi-detailed nature of this survey, only a general description of soil properties and topographic occurrence is given for these soil Types. A summary of the features of soil Types 1-4 is detailed in Table 2.

Table 2. Soil type profile descriptions

Profile description	Soil types				
	1	**2**	**3**	**4**	
Horizon1 (topsoil)	0-30 Reddish brown (2.5YR 4/3) slightly stony clay loam; medium subangular blocky structure.	0-25 Dark reddish brown (5YR 3/4) slightly stony sandy loam; medium granular structure	0-25 Dark brown (5YR 3/2) slightly or moderately stony sandy clay loam or clay loam; medium to coarse subangular blocky structure	0-20 Reddish brown (2.5YR 4/4) slightly stony sandy loam; weak medium granular structure.	
Horizon 2 (subsoil 1)	30-50 Reddish brown 2.5YR 4/4) slightly stony clay loam; slightly mottled; medium prismatic or angular blocky structure.	25-45 Reddish brown (2.5YR 4/4) slightly stony sandy loam; weak medium sunangular blocky or granular structure	25 – 45 Light grey (10YR 7/2) moderately or very stony clay loam with brown mottles (7.5YR 5/8). Medium subangular blocky structure	20-65 Red (2.5YR 5/6) slightly stony loamy sand; weak medium granular or single grain structure	
Horizon 3 (subsoil 2)		45-60 Red (2.5YR 4/6) weathered structureless sandstone (sandy loam texture)	45-65 Reddish yellow moderately stony clay (7.5YR 6/8) with pinkish grey ped faces (7.5YR 7/2). Coarse angular blocky structure.		
Horizon 4 Lower subsoil or Drift.	50-100+ Red (2.5YR5/6) slightly stony clay; coarse prismatic or massive structure.	60-100 Soft weathered sandstone rock (sandy loam texture)	65-100+ Red (10R) moderately stony clay. Weak coarse prismatic or massive structure	65-120+ Red () slightly stony loamy sand; single grain (structureless)	

Soil Type 1

This soil corresponds closely to the Whimple Series previously reported in the area[5], and occurs mainly in the north around Keresely (Area A), although isolated patches are found elsewhere. The soils are formed over mudstones where drift geology is absent, and are of fine loamy over clayey texture. The soils are only slightly stony and occur on level or gently sloping terrain, these factors presenting no significant limitations to agriculture. The soils are deep and of medium to fine texture with few stones, making them non-droughty for both wheat and potatoes.

The main limitation of these soils is **wetness** which limits available safe working days for agriculture, especially during the spring work period[5]. The soils display red or reddish colours with slight subsoil mottling indicative of slight waterlogging as a result of slowly permeable subsoils. Natural structure within the underlying mudstone allows some downward percolation and the wetness limitation is relatively moderate (Wetness Class 3/2) given the local climate. However, the fine textured nature of the topsoil makes these soils very susceptible to structural damage by cultivation when wet.

The most frequently occurring soils are ALC **Grade 3b**, being suited to the growth of crops, but with moderate restrictions due to soil wetness. These soils are relatively uniform, although drainage is improved and/or topsoil texture is sandier and less susceptible to cultivation damage where mudstones are interbedded with thin layers of sandstone, and soils are classified as **Grade 3a.**

Photo 1: Soil Type 1 (see Drawing ALC/1 for pit location)

Soil Type 2

These soils are formed from red sandstones and correspond to the Bromsgrove Series soils previously reported in the area[5]. They occur in several bands, particularly prominent in areas A and C, chiefly found on ridges where drift cover is absent, the higher ground being formed by more resistant sandstone. The soils are freely drained (Wetness Class 1) and of sandy loam texture, and are generally deep (greater then 60 cm).

The main limitation for agriculture of these soils is a slight **droughtiness** for both wheat and potatoes, which downgrades this land to **Grade 2** (see Appendix A). However these soils are among the best agricultural soils in the region.

While the majority of this soil Type is **Grade 2**, it displays a slight degree of variability; in the Kerseley area (area A), **shallower** soils with higher **stone content** were found on steeper slopes at Hounds Hill (ref), downgraded to **Grade 3a**. A small area immediately south of the A45 (Area C) is also downgraded to **Grade 3a**, being affected by an artificially increased topsoil **stone content** as a result of incorporation of road construction material. Elsewhere variability is generally insufficient to affect ALC grade. However, in some areas less sandy textures occur, associated either with thinly interbedded mudstones within the sandstones, or with thin glacial drift deposits. The less sandy texture makes these soils less droughty and may affect the ALC grading. However they are not extensive and are not mapped in this semi-detailed survey.

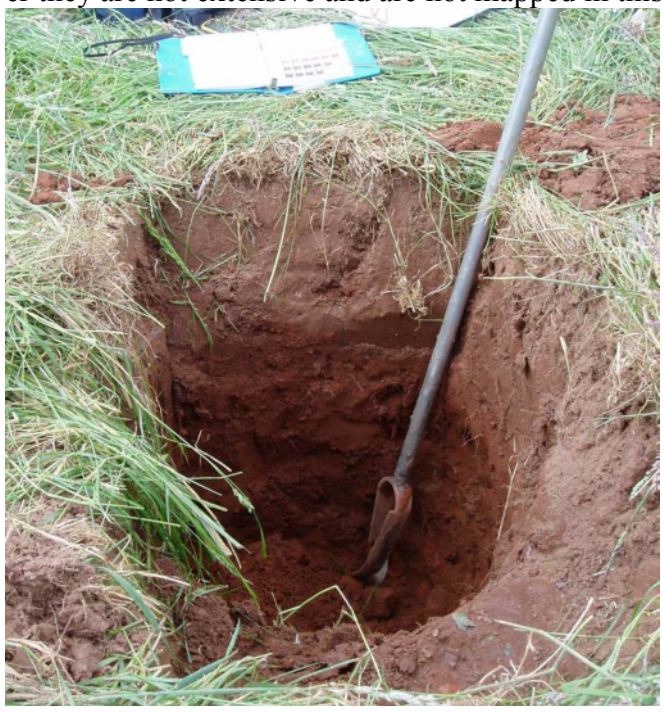

Photo 2: Soil Type 2 (see Drawing ALC/1 For pit location)

Soil Type 3

These soils are formed in deep glacial till, and the most commonly occurring profile matches the description of the Salop Series previously mapped in the area[5]. They occur throughout the surveyed area, but are very limited in the area around Keresley (area A). The soils are reddish and fine loamy over clay similar to soil Type 1, but are distinguishable by more impeded natural drainage (mottles and grey colours in the subsoil above 40cm) and a mixed stone lithology.

The major limitation to agriculture in these soils is **wetness**, with **stoniness** an equal limitation locally. Waterlogging due to slow subsoil permeability limits safe machinery access to land, particularly during the spring work period[5]. However when effective artificial drainage is installed, the soils are better drained (Wetness Class 3) and suitable for arable cropping[5].

Although of similar texture to soil Type 1, the topsoil has a higher sand content and generally a slightly lower clay content, making these soils less susceptible to cultivation damage when wet. This is sufficient to improve the classification of this land to **Grade 3a**, particularly on moderate slopes and water shedding sites, and where the till begins to thin and is underlain by sandstone. This grading is consistent across the surveyed area other than in localised depressions where the clay content of the topsoil is higher and land is classed as **Grade 3b.** However, texture may vary locally within mapping units.

Generally stoniness is also sufficient to downgrade this land to **Grade 3a**, although there are also small areas (particularly where till thins) where stoniness may present a greater limitation (**Grade 3b**). However, accurate mapping of these more subtle differences in soil quality would require a more intensive survey (e.g. 1 survey point per hectare) than was possible during this investigation.

Soil Type 4

This soil is not previously mapped in the area, but occurs in two isolated patches associated with coarse-textured glaciofluvial deposits to the west of Hawkes End. The soils are deep sandy loams or loamy sands and are freely drained. In terms of agricultural limitations they are similar to soil Type 2 and are included in the same ALC mapping unit.

As with soil Type 2, these soils are deep and freely drained. The minor limitations of these soils are **droughtiness** (See Appendix A) and slight **stoniness,** both of which are sufficient to downgrade this land to **Grade 2**.

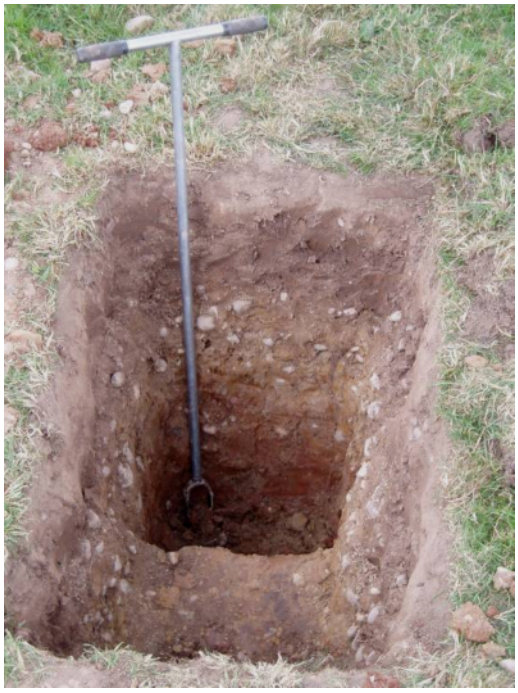

Photo 3 : Soil Type 3 (see Drawing ALC/1 for pit location)

Photo 4: Soil Type 4 exposed in ditch cutting (see Drawing ALC/1 for location)

Soil Type 5

These soils occur in very isolated patches associated with recent stream alluvium and older glacial alluvial deposits. They consist of deep stoneless or slightly stony medium textured loam soils formed in red alluvium. These soils may constitute the highest quality land in the area (**Grade 1**) being slightly less droughty than soil Type 2. However, land areas of this soil type are small (less than 5 ha) and represented in soil mapping (Drawing ALC/1) only in one field in area A, in this case included in the same ALC unit (**Grade 2**) as the adjacent area of soil Type 2.

Soil Type 6 (not mapped)

These soils occur in small alluvial valley floors. They are affected by shallow groundwater and are formed in alluvium of varying texture. As with soil type 5 they are not extensive. This land is more limited by flood risks (**Grade 4**) than by soil/wetness limitations and consequently detailed soil description was not deemed necessary.

3. AGRICULTURAL LAND CLASSIFICATION

3.1. National 1:250 000 map grading

The MAFF 1:250000 national map[7] classifies areas A and B (Keresley to Allesley) as **Grade 3.** The Eastern Green area (area C) is mapped as **grade 2.**

3.2. Current grading

Table 3 Site ALC gradings and limitations

Grade	Area (ha)	Main (other) limitations
1	0	
2	210.8	Droughtiness (stone content)
3a	386.9	Wetness (depth, stone content)
3b	91.4	Wetness
4	14.8	Flooding
5	0	
Urban	82.8	
Non-agricultural	86.2	
Agricultural buildings	7.3	
Total	880.2	

Note grade 1 land may occur in small patches (smaller than minimum survey density of 1 sample per 5 hectares)

ALC grades for the Allesley/Keresley area are mapped in Drawing ALC/2.

3.3 Description of areas (A, B and C)

Area A (Keresley)

The topography of the area consists of an elongate ridge along which the B4098 road runs north west to south east, and a parallel ridge which forms Hounds Hill in the north. Hall Brook flows at the base of the small valley between these two elevated areas, before turning in an easterly direction along a valley in the south of the area. In the south west of the area the land is relatively level and low lying. The elevated land is formed from more resistant sandstone, and has sandy loam soils (soil Type 2). The rest of the area (lower lying) consists of mudstones with soil Type 2. The area is free from drift cover other than a small area in the south west where till deposits occur (soil Type 3).

The area contains a significant proportion of high grade agricultural land (**Grade 2**) consisting of the soils formed over sandstone (Soil type 2). Other land falls into **Grade 3a** or **3b**. The Grade 3b land constitutes soils over mudstone (soil Type 1) in low lying areas where drainage is restricted and topsoils are finely textured (wetness limitation). Grade 3a land comprises better drained and coarser textured variants of soil Type 1 (wetness limitation), soils over sandstone (soil Type 2) on the steeper slopes around Hounds Hill, which are limited by depth and stoniness, and the small till-covered area in the south east (soil Type 3; wetness limitation).

Area B north (Keresley to Hawkes End)

The ridge which forms the boundary of area A slopes more gently on the western than the eastern side, and this side is covered by extensive till deposits (soil Type 3). On the upper ridge slopes these soils are stonier, slightly sandier in texture and slightly better drained, particularly to the north around Hollyfast Farm where areas free of drift cover also occur on the ridge crest (soil Type 2). On the lower ridge slopes the till becomes thicker and drainage is more restricted (soil Type 3). The till covered area extends westwards as far as Hawkes End and also includes the area around Brownshill Green south of the B4076.

To the west of Hawkes End an alluvial valley (feeding the River Sherbourne) occurs at the base of a long ridge flank. The upper ridge slopes are covered with till (soil Type 3) which thins and soils grade to soil Type 2 on the lower slopes. The valley narrow valley floor is affected by groundwater and subject to flooding (soil Type 6). The slopes to the west of the valley show a similar gradation from soil Type 2 to soil Type 3 as on the opposing slopes, although the till

remains thin and influenced by the underlying sandstone, consequently drainage restrictions are minor.

Most land within this area is classed as **Grade 3a** limited by **wetness** (mainly soil Type 3), with only isolated areas of Soil Type 2 (**Grade 2**) occurring where the till cover thins. However, locally Type 3 soils exhibit finer topsoil texture resulting in downgrading to **Grade 3b** (wetness limitation). A small area of **Grade 4** soils occurs along the alluvial valley floor west of Hawkes End with risk of **flooding** the major limitation.

Area B south (Hawkles End to Allesley)

In the east of this area (immediately west of the Sherbourne) a small zone of drift free mudstone occurs with Type 1 soils. Extensive till deposits occur in the west of the area (Soil Type 3). The till thins on the steeper sloping land in the north and west, grading to soil Type 2, which is mainly limited to isolated patches in this area. In the centre of the area, in fields south of Alton Hall Farmhouse, glaciofluvial deposits occur (Soil type 4), with associated areas of glacio-alluvial deposits (Soil Type 5).

Most of the land in this area is **Grade 3a** (wetness limitation), with areas of **Grade 2** land occurring where soils formed directly from sandstone occur (soil Type 2), as well as over the isolated areas of glaciofluvial deposits (soil Type 4). **Grade 3b** land limited by **wetness** occurs in low-lying areas in the north and west in soils formed over drift-free mudstone (soil Type 1).

Area C (Eastern Green)

The area consists of two ridges running roughly east to west separated by a stream valley. Both the ridges are formed from sandstone. The northerly ridge is free of drift cover other than in isolated patches (notably in the far west) and is characterised by soil Type 2. The southerly ridge is covered by till and soil Type 3 occurs. The till thins on the lower slopes of this ridge and the soils grade into soil type 2. Along the drainage line of the small stream between the two ridges a narrow band of groundwater affected soils (soil Type 6) occurs.

The area is roughly divided in land quality between land to the north and south of the drainage line between the two ridges. Land to the north largely consists of soils of Type 2, and is mainly ALC **Grade 2**. Small areas of **Grade 3a** land are found within the Grade 2 land area where wetness limitations occur associated with glacial till deposits, and along the northern boundary (adjoining the A45) where stoniness presents the major limitation (largely artificial stones derived from road construction material). Small areas of Grade 1 land also occur formed in

localised alluvial deposits. In the area south of the central drainage line, land is covered exclusively by till and comprises soil Type 3 exclusively. This land is classified as Grade 3a due to wetness limitations. Soils of Type 6 found along the narrow floor of the alluvial valley between the two ridges are classed as **Grade 4** due to **flood risk** limitation.

DRAWING ALC/1

Survey locations and soil types

DRAWING ALC/2

Agricultural Land Classification Grades

APPENDIX A

Climatological data for

Agricultural Land Classification

Droughtiness (moisture balance) determination for each soil type and restored profile

Moisture availability data for each texture from MAFF ALC Guidelines 1996

Moisture Balance (MB) = AP - MD for wheat and potatoes (adjusted for stones)

	Horizon	Type 1 texture	Type 1 water	Type 2 texture	Type 2 water	Type 3 texture	Type 3 water
TAvt - Topsoil water available (mm)		cl	17.50	sl	13.80	cl	15.60
LTt - Topsoil thickness (cm)			30.00		25.00		25.00
TAvs - Subsoil total available	1	cl	14.65	sl	13.80	cl	13.20
	2	c	12.75	sl	15.60	c	10.50
	3		0.00		0.00	c	11.35
EAvs -	1	cl	9.75	sl	10.10	cl	8.20
Subsoil (SS) easily available	2	c	6.90	sl	10.10	c	6.10
	3		0.25		0.00	c	6.10
LT50 -	1	cl	20.00	sl	20.00	cl	20.00
Thickness ss layers to 50cm	2		0.00		0.00	c	5.00
	3		0.00		0.00		0.00
LT120 -	1		0.00	sl	0.00	c	15.00
Thickness ss layers 50 to 120cm	2	c	70.00	sl	50.00	c	35.00
	3		0.00		0.00		0.00
LT0 -	1	cl	20.00	sl	35.00	cl	20.00
Thickness ss layers to 70cm	2	c	20.00	sl	5.00	c	20.00
	3		0.00		0.00	c	5.00
Total profile thickness for soil type cm			120		100		100.00

SOIL Droughtiness (moisture balance) results

Type 1

		Grade
Results		
AP wheat =	130.1	
Moisture balance wheat =	35.2	1
AP potatoes =	111.1	
Moisture balance potatoes =	28.2	1

Type 2

Results		
AP wheat =	112.6	
Moisture balance wheat =	17.7	2
AP potatoes =	89.7	
Moisture balance potatoes =	6.8	2

Type 3

Results		
AP wheat =	104.3	
Moisture balance wheat =	9.4	2
AP potatoes =	91.8	
Moisture balance potatoes =	8.9	2

Notes

ALC Grade	Moisture Balance Limits wheat	potatoes
1	30	10
2	5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

Droughtiness (moisture balance) determination for each soil type and restored profile

Moisture availability data for each texture from MAFF ALC Guidelines 1996

Moisture Balance (MB) = AP - MD for wheat and potatoes (adjusted for stones)

Horizon		Type 4 texture	water
TAvt - Topsoil water available (mm)		sl	17.00
LTt - Topsoil thickness (cm)			20.00
TAvs - Subsoil total available	1	ls	8.90
	2	ls	8.90
	3		0.00
EAvs -	1	ls	5.90
Subsoil (SS) easily available	2	ls	5.90
	3		0.00
LT50 -	1	ls	30.00
Thickness ss layers to 50cm	2		0.00
	3		0.00
LT120 -	1		15.00
Thickness ss layers 50 to 120cm	2	ls	55.00
	3		0.00
LT0 -	1	ls	45.00
Thickness ss layers to 70cm	2	ls	5.00
	3		0.00
Total profile thickness for soil type cm			120

SOIL Droughtiness (moisture balance) results

Type 4

Results		Grade
AP wheat =	102.0	
Moisture balance wheat =	7.1	2
AP potatoes =	78.5	
Moisture balance potatoes =	-4.4	2

Notes

ALC Grade	Moisture Balance Limits wheat	potatoes
1	30	10
2	5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

INFORMATION SOURCES

1. ***Agricultural Land Classification of England and Wales***. Guidance and criteria for grading the quality of agricultural land. MAFF. 1988

2. ***Agricultural Land Classification of England and Wales***. Guidance and criteria for grading the quality of agricultural land. Second Revision MAFF. DRAFT May 1996

3. ***Soil Survey Field Handbook.*** Technical Monograph No.5. Soil Survey of England and Wales. 1976.

4. ***Climatological Data for Agricultural Land Classification***, The Met. Office 1989

5. ***Soils and their Use in Midland and Western England.*** Soil Survey of England and Wales, Harpenden 1984.

6. ***Soil Map of England and Wales:*** Sheet 3. Soil Survey and Land Research Centre, Silsoe 1997

7. ***Agricultural Land Classification Map*** 1:250 000. North MAFF 1983