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Boringdon, Plymouth
Agricultural Land Classification

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Resource Planning Team
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BORINGDON, PLYMOUTH
AGRICULTURAL LAND CLASSIFICATION SURVEY

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BORINGDON, PLYMOUTH

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 423 ha of land at Boringdon, Plymouth. Field survey was based on 132 auger borings and 6 soil profile pits, and was completed in December 1998. During the survey 12 samples were analysed for particle size distribution (PSD).
2. The survey was conducted by the Resource Planning Team of FRCA Western Region on behalf of MAFF in its statutory role in the preparation of the Plymouth Unitary Plan.
3. Information on climate, geology and soils, and from previous ALC surveys was considered and is presented in the relevant section. The published regional ALC map (MAFF 1977) shows the site at a reconnaissance scale as Grade 3. The site had previously been surveyed as part of the 1975 Plymouth survey (ADAS 1975) which shows mainly Subgrade 3b and Subgrade 3a with some Subgrade 3c, but to criteria for classification which have been superseded, whereas the current survey area uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF, 1988) and supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.
4. Neighbouring areas at Woodford, Boringdon Park East and Boringdon Park West (All ADAS 1993) were surveyed in 1993 to the revised guidelines and found mainly Subgrade 3b limited by gradient and restricted workability. This relates well to the current survey.
5. At the time of the current survey land cover was mainly cereals, oilseed rape, linseed, fallow, permanent pasture, ley pasture and fallow.
6. Other land not surveyed included a golf course, woodland, Marsh Mills China Clay works, residential areas, farm tracks and farm buildings. Agricultural land not surveyed was an area already designated as a golf course extension (planning permission granted).

SUMMARY

7. The distribution of ALC grades is shown on the accompanying 1:20 000 scale ALC map. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas. Areas are summarised in the Table 1.

Table 1: Distribution of ALC grades: Boringdon, Plymouth

Grade	Area (ha)	% Surveyed Area (247 ha)
3a	44	18
3b	187	76
4	13	5
5	3	1
Agricultural land not surveyed	19	
Other land	157	
Total site area	423	

8. This shows that 18 % of the area was found to be best and most versatile Subgrade 3a limited mainly by restricted workability where below 225 FCDays. The rest of the area was mainly Subgrade 3b limited also by restricted workability above 225 FCDays and gradient, with small areas of Grades 4 and 5 limited by gradient and wetness.

CLIMATE

9. Estimates of climatic variables for this site were derived from the published agricultural climate dataset "Climatological Data for Agricultural Land Classification" (Meteorological Office, 1989) using standard interpolation procedures. Data for key points around the site are given in Table 2 below.

10. Since the ALC grade of land is determined by the most limiting factor present, overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions. Parameters used for assessing overall climate are accumulated temperature, a measure of relative warmth and average annual rainfall, a measure of overall wetness. The results shown in Table 2 indicate that there is an overall climatic limitation which limits the higher ground over the majority of the site (roughly above the 55m contour) to Grade 2, but this proved not to be a primary limitation.

11. Climatic variables also affect ALC grade through interactions with soil conditions. The most important interactive variables are Field Capacity Days (FCD) which are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes, which are compared with the moisture available in each profile in assessing soil droughtiness limitations. These are described in later sections. A critical boundary of 225 FCDays was found roughly below 40m to the west and below 20 metres in the east of the site so that only small areas of the lower ground on the site fall below 225 FCDays.

Table 2: Climatic Interpolations: Boringdon, Plymouth

Grid Reference	SX 538 582	SX 519 577	SX 520 581
Altitude (m)	60	6	45
Accumulated Temperature (day °C)	1556	1618	1573
Average Annual Rainfall (mm)	1205	1069	1135
Overall Climatic Grade	2	1	1
Field Capacity Days	238	216	226
Moisture deficit (mm):			
Wheat	87	100	92
Potatoes	75	92	82

RELIEF

12. Altitude ranges from 6 metres just west of the Shearwood Plantation to 111 metres on the hill east of Plymbridge Road. Much of the area surveyed was found to have gentle and moderate slopes which are not limiting, but steeper slopes in the valleys running through the site limit the land to Subgrade 3b, Grade 4 and even Grade 5.

GEOLOGY AND SOILS

13. The underlying geology of the site is shown on the published geology map (IGS, 1974) as mainly Upper Devonian Weard-Efford Grit with small areas of igneous Schalsteins, Tuffs etc (around borings 169, 170 and 184) and alluvium in the valley bottoms. The current ALC survey found parent materials and soils derived from the slate material of the Weard-Efford Grit to be variable in stone content and depth to bedrock.

14. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW 1983) as Manod association across the north west of the site and Denbigh 1 association across the south west of the site, split diagonally from Nicholl's Farm in the north-east to Marsh Mill China Clay Works to the south-west. The Manod association is described as well drained fine loamy or fine silty soils over rock, with shallow soils and bare rock locally. Denbigh 1 association comprises well drained fine loamy and fine silty soils over rock with some similar soils having slowly permeable subsoils and slight seasonal waterlogging. These descriptions were entirely borne out by the current survey, although there was some variation with stone content and depth.

AGRICULTURAL LAND CLASSIFICATION

15. The distribution of ALC grades found by the current survey is shown on the accompanying 1:20 000 scale map and areas are summarised in Table 1. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas.

Subgrade 3a

16. Firstly there is an area of Subgrade 3a land mapped above the 225 FCDay boundary. This area was found to be mainly limited by restricted workability with medium clay loam topsoils (confirmed by PSD results) at Wetness Class I (see Appendix II). Typical profiles are illustrated by Pits 3 and 4, described with other survey data in Appendix III.

17. The other areas of 3a land lie below the 225 FCDays boundary. The area between the River Plym and the dismantled tramway was found to have medium silty clay loam topsoils over heavy silty clay loam (often gleyed) upper subsoils with silty clay lower subsoils which were found to be gleyed and slowly permeable. These were assessed as Wetness Class III, wetness Subgrade 3a.

18. North of the Shearwood Plantation the soils are mapped as Subgrade 3a due to a number of different limitations. ASP 128 is Subgrade 3a on droughtiness due to a greater stone content, whereas ASP 145 showed signs of wetness and was gleyed from 40 cm, even though the topsoil was medium clay loam this still restricts it to Wetness Class II, also Subgrade 3a.

19. Isolated borings (ASPs 127, 146 and 147) were assessed as Wetness Class I, Grade 2 but were included within the area shown as Subgrade 3a as they do not form a significant mapping unit.

20. The PSD results from the previous survey (Woodford 1993) helped define the boundary between the Subgrade 3a and 3b land west of Plymbridge Road as did the 225 FCDay boundary along the edge of the Marsh Mills China Clay works.

Subgrade 3b

21. Most of the area shown as Subgrade 3b lies above the 225 FCDay boundary and was found to be mainly limited by restricted workability with heavy clay loam or clay topsoils at Wetness Class I but with considerable variation in stone content and depth to bedrock. These are illustrated by Pits 1, 2, 5 and 6.

22. Other areas shown as Subgrade 3b were found to be primarily limited by gradient with slopes of 8-11 degrees. Where soil profiles were examined they were found to be similar to those described above.

23. Isolated borings assessed as Grade 4 with severe wetness limitation are included within the area shown as Subgrade 3b as they do not form a significant mapping unit.

Grade 4

24. The Grade 4 land is mainly limited by gradient, with slopes of 11 to 19 degrees.

Grade 5

25. West of Elfordleigh Wood the heavy clay loam topsoils and slowly permeable clay subsoils were found to be gleyed from the surface and were assessed as Wetness Class IV wetness Grade 5.

26. The area of Grade 5 shown to the west of Binicliff Wood was found to be limited by gradient, with slopes of around 20 degrees.

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FRCA Bristol
15 March 1999

REFERENCES

ADAS RESOURCE PLANNING TEAM, (1994) *Agricultural Land Classification Survey of South Hams, Hemerdon* Scale 1: 10 000, Reference 90/94, FRCA Bristol.

ADAS RESOURCE PLANNING TEAM, (1993) *Agricultural Land Classification Survey of Woodford, Plymouth* Scale 1: 10 000, Reference 20/93, FRCA Bristol.

ADAS RESOURCE PLANNING TEAM, (1993) *Agricultural Land Classification Survey of Boringdon Park West, Plymouth* Scale 1: 10 000, Reference 60/93, FRCA Bristol.

ADAS RESOURCE PLANNING TEAM, (1993) *Agricultural Land Classification Survey of Boringdon Park East, Plymouth* Scale 1: 10 000, Reference 61/93, FRCA Bristol.

ADAS RESOURCE PLANNING TEAM, (1985) *Agricultural Land Classification Survey of Hemerdon Minerals* Scale 1: 10 000, Reference 20/93, FRCA Bristol.

ADAS RESOURCE PLANNING TEAM, (1975) *Agricultural Land Classification Survey of Plymouth* Scale 1: 5 000, Reference DV 62, FRCA Bristol

INSTITUTE OF GEOLOGICAL SCIENCES (1974.) Sheet No 349, *Ivybridge 1:50 000 Drift* edition. IGS, London.

HODGSON, J M (Ed) (1997) *Soil Survey Field Handbook*. Soil Survey Technical Monograph No 5, Silsoe.

MAFF (1977) 1:250 000 series *Agricultural Land Classification, South West Region*. MAFF Publications, Alnwick.

MAFF (1988) *Agricultural Land Classification of England and Wales. Revised Guidelines and Criteria for grading the quality of agricultural land*. MAFF Publications, Alnwick.

METEOROLOGICAL OFFICE (1989) *Climatological Data for Agricultural Land Classification*. Meteorological Office, Bracknell.

SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 5, *Soils of SW England*, 1:250 000 scale. SSEW, Harpenden.

SOIL SURVEY OF ENGLAND AND WALES (1984) *Soils and Their Use in SW England*, Bulletin No 14. SSEW, Harpenden.

APPENDIX I

DESCRIPTION OF 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 include 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 and horticultural crops can usually be grown but on some land in the 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.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where 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 level of yields. It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yields of which are variable. In most 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 very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Source: MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick.

Grade 5 - very poor quality agricultural land

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

Source: MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick.

APPENDIX II

DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile.

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years.

Wetness Class 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 not wet within 40 cm depth for more than 30 days in most years.

Wetness Class 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 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 and 90 days in most years.

Wetness Class IV

The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years or, if there is no slowly permeable layer within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years.

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years.

Notes: The number of days specified is not necessarily a continuous period.

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

Source: Hodgson, J M (Ed) (1997) Soil Survey Field Handbook. Soil Survey Technical Monograph No 5, Silsoe.

APPENDIX III

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1997).

1. Terms used on computer database, in order of occurrence.

GRID REF: National 100 km grid square and 8 figure grid reference.

LAND USE: At the time of survey

WHT:	Wheat	SBT:	Sugar Beet	HTH:	Heathland
BAR:	Barley	BRA:	Brassicas	BOG:	Bog or Marsh
OAT:	Oats	FCD:	Fodder Crops	DCW:	Deciduous Wood
CER:	Cereals	FRT:	Soft and Top Fruit	CFW:	Coniferous Woodland
MZE:	Maize	HRT:	Horticultural Crops	PLO:	Ploughed
OSR:	Oilseed Rape	LEY:	Ley Grass	FLW:	Fallow (inc. Set aside)
POT:	Potatoes	PGR:	Permanent Pasture	SAS:	Set Aside (where known)
LIN:	Linseed	RGR:	Rough Grazing	OTH:	Other
BEN:	Field Beans	SCR:	Scrub		

GRDNT: Gradient as estimated or measured by hand-held optical clinometer.

GLEY, SPL: Depth in centimetres to gleying or slowly permeable layer.

AP (WHEAT/POTS): Crop-adjusted available water capacity.

MB (WHEAT/POTS): Moisture Balance. (Crop adjusted AP - crop potential MD)

DRT: Best grade according to soil droughtiness.

If any of the following factors are considered significant, 'Y' will be entered in the relevant column.

MREL:	Microrelief limitation	FLOOD:	Flood risk	EROSN:	Soil erosion risk
EXP:	Exposure limitation	FROST:	Frost prone	DIST:	Disturbed land
CHEM:	Chemical limitation				

LIMIT: The main limitation to land quality: The following abbreviations are used.

OC:	Overall Climate	AE:	Aspect	EX:	Exposure
FR:	Frost Risk	GR:	Gradient	MR:	Microrelief
FL:	Flood Risk	TX:	Topsoil Texture	DP:	Soil Depth

CH: Chemical	WE: Wetness	WK: Workability
DR: Drought	ER: Erosion Risk	WD: Soil Wetness/Droughtiness
ST: Topsoil Stoniness		

TEXTURE: Soil texture classes are denoted by the following abbreviations:-

S: Sand	LS: Loamy Sand	SL: Sandy Loam
SZL: Sandy Silt Loam	CL: Clay Loam	ZCL: Silty Clay Loam
ZL: Silt Loam	SCL: Sandy Clay Loam	C: Clay
SC: Sandy clay	ZC: Silty clay	OL: Organic Loam
P: Peat	SP: Sandy Peat	LP: Loamy Peat
PL: Peaty Loam	PS: Peaty Sand	MZ: Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes:-

F: Fine (more than 66% of the sand less than 0.2mm)
M: Medium (less than 66% fine sand and less than 33% coarse sand)
C: Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content: **M:** Medium (< 27% clay) **H:** heavy (27 - 35% clay)

MOTTLE COL: Mottle colour using Munsell notation.

MOTTLE ABUN: Mottle abundance, expressed as a percentage of the matrix or surface described.

F: few <2% **C:** common 2 - 20% **M:** many 20 - 40% **VM:** very many 40%+

MOTTLE CONT: Mottle contrast

F: faint - indistinct mottles, evident only on close inspection
D: distinct - mottles are readily seen
P: Prominent - mottling is conspicuous and one of the outstanding features of the horizon.

PED. COL: Ped face colour using Munsell notation.

GLEYS: If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

STONE LITH: Stone Lithology - One of the following is used.

HR: All hard rocks and stones	SLST: Soft oolitic or dolimitic limestone
CH: Chalk	FSST: Soft, fine grained sandstone
ZR: Soft, argillaceous, or silty rocks	GH: Gravel with non-porous (hard) stones
MSST: Soft, medium grained sandstone	GS: Gravel with porous (soft) stones

SI: Soft weathered igneous or metamorphic rock

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm.

STRUCT: The degree of development, size and shape of soil pedes are described using the following notation

<u>Degree of development</u>	WA: Weakly developed Adherent	WK: Weakly developed
	MD: Moderately developed	ST: Strongly developed
<u>Ped size</u>	F: Fine	M: Medium
	C: Coarse	VC: Very coarse
<u>Ped Shape</u>	S: Single grain	M: Massive
	GR: Granular	AB: Angular blocky
	SAB: Sub-angular blocky	PR: Prismatic
	PL: Platy	

CONSIST: Soil consistence is described using the following notation:

L: Loose	VF: Very Friable	FR: Friable	FM: Firm
VM: Very firm	EM: Extremely firm	EH: Extremely Hard	

SUBS STR: Subsoil structural condition recorded for the purpose of calculating profile droughtiness: **G:** Good **M:** Moderate **P:** Poor

POR: Soil porosity. If a soil horizon has poor porosity with less than 0.5% biopores >0.5mm, a 'Y' will appear in this column.

IMP: If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

SPL: Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

CALC: If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a 'Y' will appear in this column.

2. Additional terms and abbreviations used mainly in soil pit descriptions.

STONE ASSESSMENT:

VIS: Visual	S: Sieve	D: Displacement
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MOTTLE SIZE:

EF: Extremely fine <1mm	M: Medium 5-15mm
VF: Very fine 1-2mm>	C: Coarse >15mm
F: Fine 2-5mm	

MOTTLE COLOUR: May be described by Munsell notation or as ochreous (OM) or grey (GM).

ROOT CHANNELS: In topsoil the presence of 'rusty root channels' should also be noted.

MANGANESE CONCRETIONS: Assessed by volume

N: None	M: Many	20-40%
F: Few <2%	VM: Very Many	>40%
C: Common 2-20%		

POROSITY:

P: Poor - less than 0.5% biopores at least 0.5mm in diameter
G: Good - more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE:

The number of roots per 100cm ² :		Very Fine and Fine	Medium and Coarse
F: Few		1-10	1 or 2
C: Common		10.25	2 - 5
M: Many		25-200	>5
A: Abundant		>200	

ROOT SIZE

VF: Very fine <1mm	M: Medium 2 - 5mm
F: Fine 1-2mm	C: Coarse >5mm

HORIZON BOUNDARY DISTINCTNESS:

Sharp: <0.5cm	Gradual: 6 - 13cm
Abrupt: 0.5 - 2.5cm	Diffuse: >13cm
Clear: 2.5 - 6cm	

HORIZON BOUNDARY FORM: Smooth, wavy, irregular or broken.*

* See Soil Survey Field Handbook (Hodgson, 1997) for details.

SITE NAME Boringdon		PROFILE NO. Pit 1 (ASP 78)	SLOPE AND ASPECT 3° NW		LAND USE Cereal	Av Rainfall: 1205 mm ATO: 1556 day °C		PARENT MATERIAL Upper Devonian Weard-Efford Grit					
JOB NO. 57.98		DATE 16/12/98	GRID REFERENCE SX 5320 5833		DESCRIBED BY GN/PB		FC Days: 238 Climatic Grade: 1 Exposure Grade: 1		PSD SAMPLES TAKEN TS 0-25 cm: C*HCL (S34:Z30:C36%)				

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	25	C	7.5YR43	2% > 2 cm (s) 18% < 2 cm (s+d) 20% HR	0	0	-	-	-	-	FVF	-	Abrupt Smooth
2	45	C	10YR46	25% > 2 cm (s) 19% < 2 cm (s+d) 44% HR	0	0	Too stony	-	(M)	(G)	FVF	-	Gradual Smooth
3	80+	ZC	10YR64	35% > 2 cm (s) 29% < 2 cm (s+d) 64% ZR	FDMO 7.5YR56 within stone	Few stains on stones	Too stony	-	(M)	(G)	None	-	-

Profile Gleyed From: Not gleyed

Slowly Permeable

Horizon From: No SPL

Wetness Class: 1

Wetness Grade: 3b

Available Water Wheat: 104 mm

Potatoes: 82 mm

Moisture Deficit Wheat: 87 mm

Potatoes: 75 mm

Moisture Balance Wheat: +17 mm

Potatoes: +7 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Workability

Remarks: Pit probed to 100 cm.
Appearance of bedrock erratic within pit face.

SITE NAME		PROFILE NO.	SLOPE AND ASPECT		LAND USE		Av Rainfall: 1205mm		PARENT MATERIAL			
Boringdon		Pit 2 (ASP 10)	5° NW		Cereal		ATO: 1556 day °C		Upper Devonian Weard-Efford Grit			
JOB NO.		DATE	GRID REFERENCE		DESCRIBED BY		FC Days: 238		PSD SAMPLES TAKEN			
57.98		16/12/98	SX 5325 5895		PB/GN		Climatic Grade: 2		TS 0-25 cm C: (S27: Z36: C37%)			
							Exposure Grade: 1					

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	25	C	10YR44	13% > 2 cm (s) 16% < 2 cm (s+d) 29% HR	0	0	-	-	-	-	CF, VF	-	Clear Smooth
2	43	HCL	10YR46,54	45% > 2 cm (s) 19% < 2 cm (s+d) 64% HR	0	0	Too stony	-	(M)	(G)	FF, VF	-	Grad Smooth
3	90	C	10YR64	50% > 2 cm (s) 20% < 2 cm (s+d) 70%	0	0	Too stony	-	(M)	(G)	FVF	-	

Profile Gleyed From: Not gleyed	Available Water	Wheat: 67 mm	Final ALC Grade: 3b
Slowly Permeable Horizon From: No SPL		Potatoes: 59 mm	Main Limiting Factor(s): Workability
Wetness Class: I	Moisture Deficit	Wheat: 87 mm	
Wetness Grade: 3b		Potatoes: 75 mm	
	Moisture Balance	Wheat: -20 mm	Remarks:
		Potatoes: -16 mm	
	Droughtiness Grade: 3a	(Calculated to 120 cm)	

SITE NAME Boringdon		PROFILE NO. Pit 3 (Asp 113)	SLOPE AND ASPECT 3° SW		LAND USE Cereal		Av Rainfall: 1205 mm ATO: 1556 day °C FC Days: 238 Climatic Grade: 2 Exposure Grade: 1		PARENT MATERIAL Upper Devonian Weard-Efford Grit			
JOB NO. 57.98		DATE 17.12.98	GRID REFERENCE SX 5241 5811		DESCRIBED BY PB/GN		PSD SAMPLES TAKEN TS 0-25cm MCL (S35:Z44:C21%)					

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	24	MCL	7.5YR43	1% >2cm (s) 22% <2cm (s+d) 23% HR, ZR	0	0	-	-	-	-	FF,VF	-	Sharp Smooth
2	45	C	7.5YR46	20% >2 cm (s) 23% <2 cm (s+d) 43% HR	0	0	Too stony	-	(M)	(G)	FVF	-	Grad Smooth
3	80+	ZC	10YR63	14% >2 cm (s) 48% <2cm (s+d) 62% ZR	0	0	Too stony	-	(M)	(G)	0	-	

Profile Gleyed From: Not gleyed

Slowly Permeable

Horizon From: No SPL

Wetness Class: I

Wetness Grade: 3a

Available Water Wheat: 94 mm

Potatoes: 84 mm

Moisture Deficit Wheat: 87 mm

Potatoes: 75 mm

Moisture Balance Wheat: +7 mm

Potatoes: +9 mm

Droughtiness Grade: 2 (Calculated to 100 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Workability

Remarks: *H3 62% ZR but much of balance is rock flour and flakes

SITE NAME		PROFILE NO.	SLOPE AND ASPECT	LAND USE	Av Rainfall: 1205 mm	PARENT MATERIAL
Boringdon		Pit 4 (ASP 160)	4 ° N	PGR	ATO: 1556 day °C	Upper Devonian Weard-Efford Grit
JOB NO.		DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 238	PSD SAMPLES TAKEN
57.98		16/12/98	SX 5438 5783	GMN/PB	Climatic Grade: 2	Topsoil 0-25 cm MCL (S26: Z53: C21%)
Exposure Grade: 1						

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	26	MCL	10YR44	1% >2cm (s) 13% <2 cm (s+d) 14% HR	0	0	-	-	-	-	MF,VF	-	Clear Smooth
2	45	HCL	10YR46	5% >2cm (s) 30% <.2cm (s+d) 35% HR	0	0	WKFSAB	FR	G	G	CF,VF	-	Grad Smooth
3	85+	ZC	10YR74	12% >2cm (s) 40% < 2 cm (s+d) 52% ZR, HR	0	0	Too stony	-	(M)	(G)	FVF	-	

Profile Gleyed From: Not gleyed

Slowly Permeable Horizon From: No SPL

Wetness Class: I

Wetness Grade: 3a

Available Water Wheat: 118 mm

Potatoes: 96 mm

Moisture Deficit Wheat: 87 mm

Potatoes: 75 mm

Moisture Balance Wheat: 31 mm

Potatoes: 21 mm

Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Workability

Remarks: H3 52% ZR but much of balance is rock flour & flakes

SITE NAME		PROFILE NO.		SLOPE AND ASPECT		LAND USE		Av Rainfall: 1205 mm		PARENT MATERIAL		
Boringdon		Pit 5 (Asp 15)		2° NE		PGR		ATO: 1556 day °C		Upper Devonian Weard- Efford Grit		
JOB NO.		DATE		GRID REFERENCE		DESCRIBED BY		FC Days: 238		PSD SAMPLES TAKEN		
57.98		6/1/99		SX5401 5891		PB/GN		Climatic Grade: 2		Topsoil 0-25 cm HCL/C (S32:Z34: C34%)		
Exposure Grade: 1												

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness; Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	20	HCL	10YR43	2%HR >2cm (s+v) 24% HR<2cm (s+d) 26% HR	0	0	-	-	-	-	MF,VF	-	Gradual Smooth
2	34	HCL	10YR43	10% HR>2 cm (s+v) 33% HR<2 cm (s+d) 43% HR	0	0	MDFSAB	FR	Good	Good	MF,VF	-	Gradual Smooth
3	52	C	10YR66	50% HR>2 cm (s+v)	0	0	WDMSAB	FR	-	-	CVF	-	Gradual Smooth
4	80+	C	5Y63	35% HR.>2 cm (s+v) 22% <2cm (s+d) 57% HR, FSST	0	0	Too stony	-	-	-	FVF	-	

Profile Gleyed From: Not gleyed

Slowly Permeable Horizon From: No SPL

Wetness Class: 1

Wetness Grade: 3b

Available Water Wheat: 82 mm

Potatoes: 78 mm

Moisture Deficit Wheat: 87 mm

Potatoes: 75 mm

Moisture Balance Wheat: -5 mm

Potatoes: 3 mm

Droughtiness Grade: 3a (Calculated to 100 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Workability

Remarks: Probed to 100 cm

SITE NAME		PROFILE NO.	SLOPE AND ASPECT		LAND USE		Av Rainfall: 1205 mm		PARENT MATERIAL			
Boringdon		Pit 6 (ASP 151)	2° W		Linseed		ATO: 1556 day °C		Upper Devonian Weard-Efford Grit			
JOB NO.		DATE	GRID REFERENCE		DESCRIBED BY		FC Days: 238		PSD SAMPLES TAKEN			
57.98		6.1.99	SX 5312 5784		PB/GN		Climatic Grade: 2		TS 0-25 cm HCL (S33:Z35: C32%)			
							Exposure Grade: 1					

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness; Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	25	HCL	10YR43	1% > 2 cm (s) 20% < 2 cm (s+d) 21% HR	0	0	-	-	-	-	CF, VF	-	Clear Smooth
2	42	C	10YR56	12% > 2 cm (s) 32% < 2 cm (s+d) 44% ZR	0	0	WKFSAB	FR	G	G	FVF	-	Clear Wavy
3	80+	C	25Y63	23% > 2 cm (s) 36% < 2 cm (s+d) 48% ZR	0	0	Too stony	-	(M)	(G)	FVF	-	

Profile Gleyed From: Not gleyed

Slowly Permeable

Horizon From: No SPL

Wetness Class: I

Wetness Grade: 3b

Available Water Wheat: 105 mm

Potatoes: 96 mm

Moisture Deficit Wheat: 87 mm

Potatoes: 75 mm

Moisture Balance Wheat: 18 mm

Potatoes: 21mm

Droughtiness Grade: 2 (Calculated to 100 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wk

Remarks: Pit dug to 80 cm, probed to 100 cm.