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**Trevethan Farm
Padstow**

**Agricultural Land Classification
September 1996**

Resource Planning Team
Taunton Statutory Group
ADAS Bristol

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Ministry of Agriculture, Fisheries and Food
Land Use Planning Unit



TREVETHAN FARM, PADSTOW
AGRICULTURAL LAND CLASSIFICATION SURVEY

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TREVETHAN FARM, PADSTOW

AGRICULTURAL LAND CLASSIFICATION SURVEY

SUMMARY

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 2.7 ha of land at Trevethan Farm, Padstow. Field survey was based on 5 auger borings and 2 soil profile pits, and was completed in September 1996.
2. The survey was conducted by the Resource Planning Team of ADAS Taunton Statutory Group on behalf of MAFF Land Use Planning Unit in its statutory role in connection with an application to the North Cornwall District Council for a supermarket development.
3. Information on climate, geology and soils, and from previous ALC surveys was considered and is presented in the relevant section. Apart from the published regional ALC map (MAFF, 1977), which shows the site at a reconnaissance scale as Grade 3, the site had not been surveyed previously. However, the current survey 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. The land to the east of the site was surveyed in February 1996 (ADAS 1996) which showed similar soils to be Subgrade 3a except where a gradient limitation downgraded the land to Subgrade 3b. The main limitation to soils was identified as droughtiness.
5. At the time of survey land cover was grassland. The owner reports that this site experiences significant urban fringe problems. The track to the farm passes through the site.
6. The distribution of ALC grades is shown on the accompanying 1:10 000 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: Trevethan Farm, Padstow

Grade	Area (ha)	% Surveyed Area (2.6 ha)
3a	2.6	100
Other land	0.1	
Total site area	2.7	

6. All of the agricultural land is mapped as 'best and most versatile', Subgrade 3a, with a moderate workability limitation.

TREVETHAN FARM, PADSTOW

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 27 ha of land at Trevethan Farm, Padstow. Field survey was based on 5 auger borings and 2 soil profile pits, and was completed in September 1996.
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CLIMATE

7. 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.

8. 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 no overall climatic limitation.

9. 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.

Table 2: Climatic Interpolations: Trevethan Farm, Padstow

Grid Reference	SW 913 748
Altitude (m)	55
Accumulated Temperature (day °C)	1568
Average Annual Rainfall (mm)	898
Overall Climatic Grade	1
Field Capacity Days	179
Moisture deficit (mm): Wheat	98
Potatoes	89

RELIEF

10. Altitude ranges from 45 metres in the south to 56 metres at Grenville Road with the site moderately sloping in the south and gently sloping elsewhere.

GEOLOGY AND SOILS

11. The underlying geology of the site is shown on the published geology map (IGS, 1976) as Devonian grey slates. The survey found soils developed over weathered slate.

12. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983) as Powys Association, which are described as well-drained loamy soils over rock. The soils found during the survey were typical of this association.

AGRICULTURAL LAND CLASSIFICATION

13. The distribution of ALC grades found by the current survey is shown on the accompanying 1:10 000 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

14. The site is mapped as Subgrade 3a. The soils showed no evidence of prolonged waterlogging and are assessed as Wetness Class I (see Appendix II). The combination of Wetness Class and topsoil texture means that the site is limited to Subgrade 3a by workability. The heavy clay loam topsoils overlie stony subsoils which were impenetrable to the auger. A soil profile pit (Pit 1) showed that total silty stones increased from 10% in the topsoil to 68% below 46 cm. The droughtiness calculation for this pit is borderline Grade 2/3a. With the likely variability of the horizon stone contents and the proximity of the lower subsoil stone content to 70%, Subgrade 3a is considered representative in terms of drought limitation. A second pit was dug to 40 cm on the slightly raised area, nearer the main road, which showed the soil to be not significantly different to Pit 1 in terms of stone content (visual assessment).

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September 1996

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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.

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 (In preparation) Soil Survey Field Handbook, Revised Edition.

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, 1974).

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 peds are described using the following notation

<u>Degree of development</u>	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 this column.

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

STONE ASSESSMENT:

VIS: Visual **S:** Sieve **D:** Displacement

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%		

STRUCTURE: Ped Development *

WA: Weakly adherent	M: Moderately developed
W: Weakly developed	S: Strongly developed

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, 1974) for details.

SITE NAME Trevethan Farm, Padstow		PROFILE NO. Pit 1	SLOPE AND ASPECT 4° SE	LAND USE PGR	Av Rainfall: 898 mm ATO: 1568 day °C	PARENT MATERIAL Grey Slates
JOB NO. 30/96		DATE 3/9/96	GRID REFERENCE SW 9145 7470	DESCRIBED BY GMS	FC Days: 179 Climatic Grade: 1 Exposure Grade: -	SOIL SAMPLE REFERENCES -

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	30	HCL	10YR42	< 1% > 2 cm ZR 9% > 2 mm ZR 10% ZR Total (S+D)	None	None	-	-	-	-	MVF	-	Clear smooth
2	46	HCL	10YR43	27% > 2 mm ZR (S+D)	None	None	WMSAB	Friable	Good	Good	MVF		Clear smooth
3	80+	HCL	10YR43	40% > 2cm ZR 28% > 2mm ZR 68% ZR Total (S+D) Bedded shale at an angle with soil between Less soil from 60 cm	None	None	Platy or subangular between slates		Mod	Good	CVF to 60cm then FVF		

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 3a

Available Water Wheat: 103 mm

Potatoes: 104 mm

Moisture Deficit Wheat: 98 mm

Potatoes: 89 mm

Moisture Balance Wheat: +5 mm

Potatoes: +15 mm

Droughtiness Grade: 2/3a (Calculated to 80 cm)

If >70% ZR used in H3,
MBW = -1, MBP = +9,
drought grade is 3a

Final ALC Grade: 3a

Main Limiting Factor(s): Workability

Remarks: Topsoils feel light but PSD for 5/96 showed texture to be HCL (28% clay). Within H3 patch of clay 2.5Y74 with few mottles. Pit 2 dug to 40 cm on slight ridge to see if shallower as possibly suggested by Mr Hagley but appeared to very similar to Pit 1 so would be no worse than 3a.

SAMPLE NO.	GRID REF	ASPECT USE	GRDNT	GLEYSPL	--WETNESS-- CLASS	GRADE	-WHEAT- AP	MB	-POTS- AP	MB	M.REL DRT	EROSN FLOOD	FROST EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SW91437474	PGR SE	05	000	1	3A	105	7	107	18	2				WK	3A	IMP 30X2
1P	SW91457470	PGR SE	04	000	1	3A	103	5	104	15	2				WK	3A	
2	SW91387476	PGR		000	1	3A	105	7	107	18	2				WK	3A	IMP 30
3	SW91357470	PGR SE	03	000	1	3A	108	10	110	21	2				WK	3A	IMP 40
4	SW91447465	PGR SE	06	000	1	3A	106	8	108	19	2				WK	3A	IMP 30
5	SW91437474	PGR SE	03	000	1	3A	106	8	108	19	2				WK	3A	IMP 30X2

SAMPLE NO.	GRID REF	ASPECT USE	GRDNT	GLEYSPL	--WETNESS-- CLASS	GRADE	-WHEAT- AP	-POTS- MB	M.REL DRT	EROSN FLOOD	FROST EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SW91487474	PGR SE	05	000	1	3A 105	7	107	18	2			WK	3A	IMP 30X2
1P	SW91457470	PGR SE	04	000	1	3A 103	5	104	15	2			WK	3A	
2	SW91387476	PGR		000	1	3A 105	7	107	18	2			WK	3A	IMP 30
3	SW91357470	PGR SE	03	000	1	3A 108	10	110	21	2			WK	3A	IMP 40
4	SW91447465	PGR SE	06	000	1	3A 106	8	108	19	2			WK	3A	IMP 30
5	SW91437474	PGR SE	03	000	1	3A 106	8	108	19	2			WK	3A	IMP 30X2

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES-----			PED		----STONES----			STRUCT/		SUBS		
				COL	ABUN	CONT	COL.	GLEYS	>2	>6	LITH	TOT	CONSIST	STR	POR	IMP
1	0-28	hcl	10YR42 00						1	0	ZR	10				
	28-80	hcl	10YR54 00						0	0	ZR	30			M	
1P	0-30	hcl	10YR42 00						1	0	ZR	10				
	30-46	hcl	10YR43 00						0	0	ZR	27	WMSAB	FR	G	
	46-80	hcl	10YR43 00						0	0	ZR	68			M	
2	0-28	hcl	10YR42 00						1	0	ZR	10				
	28-80	hcl	10YR54 00						0	0	ZR	30			M	
3	0-35	hcl	10YR42 00						1	0	ZR	10				
	35-80	hcl	10YR43 00						0	0	ZR	30			M	
4	0-30	hcl	10YR42 00						1	0	ZR	10				
	30-80	hcl	10YR54 00						0	0	ZR	30			M	
5	0-30	hcl	10YR42 00						1	0	ZR	10				
	30-80	hcl	10YR54 00						0	0	ZR	30			M	

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES-----			PED COL.	----STONES----			STRUCT/ CONSIST	SUBS					
				COL	ABUN	CONT		GLY	>2	>6		LITH	TOT	STR	POR	IMP	SPL
1	0-28	hcl	10YR42 00					1	0	ZR	10						
	28-80	hcl	10YR54 00					0	0	ZR	30			M			
1P	0-30	hcl	10YR42 00					1	0	ZR	10						
	30-46	hcl	10YR43 00					0	0	ZR	27	WMSAB	FR	G			
	46-80	hcl	10YR43 00					0	0	ZR	68			M			
2	0-28	hcl	10YR42 00					1	0	ZR	10						
	28-80	hcl	10YR54 00					0	0	ZR	30			M			
3	0-35	hcl	10YR42 00					1	0	ZR	10						
	35-80	hcl	10YR43 00					0	0	ZR	30			M			
4	0-30	hcl	10YR42 00					1	0	ZR	10						
	30-80	hcl	10YR54 00					0	0	ZR	30			M			
5	0-30	hcl	10YR42 00					1	0	ZR	10						
	30-80	hcl	10YR54 00					0	0	ZR	30			M			