8FCS 3212 15/89

WHEAL BUSY, CHACEWATER, CORNWALL

Agricultural Land Classification

REPORT OF SURVEY

1. Introduction

In August 1989 a detailed Agricultural Land Classification (ALC) survey was carried out over 270 hectares at Wheal Busy, Chacewater, six miles west of Truro in Cornwall. The area was surveyed in response to an ad hoc planning application which included a leisure and industrial complex with provision for a European airport. The majority of the site lies to the east of the A30 and to the south of the main Truro/Penzance railway line and is centred around the now derelict mining land at Wheal Busy; four smaller, discrete areas lie to the north and west separated by the railway and the trunk road.

The fieldwork was conducted by members of the Resource Planning Group at an approximate auger sampling density of one boring per hectare. A total of 156 borings and 4 soil pits were examined.

The ALC provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on its use for agriculture. The distribution of grades is detailed below and illustrated on the accompanying ALC map at a scale of 1:10,000. The information is accurate at the scale shown, but any enlargement of the map would be misleading.

The central section of the application area, around Wheal Busy, was surveyed in 1986 in response to a previous planning application. Fieldwork was conducted under the Original ALC guidelines and mapped at 1:5,000 scale. This area has not been re-surveyed fully but has been re-assessed under the Revised Guidelines (see the ALC section for details of charges).

Table 1: Distribution of ALC Grades

Grade	Area (ha)	% of Survey Area	% of Agricultural Area
2	3	1.1	1.6
3A	62	22.9	32.8
3B	120	44.3	63.5
4	4	1.5	2.1
Non- Agric	7	2.6	100%
Woodland	9	3.3	
Urban	66	24.3	
	271 ha	100%	

2. Climate

Estimates of important climatic variables were obtained for four representative sites by interpolation from a 5 km grid database in order to assess any overall climatic limitation. The results are detailed in Table 2 below. The important parameters for assessing any overall climatic limitation are accumulated temperature (a measure of the relative warmth of a locality) and average annual rainfall (a measure of overall wetness). At none of the points is there an overall climatic limitation.

Table 2: Climatic Interpolations

Grid Reference:	SW725445	SW735438	SW745446	SW736453
Height (m):	110	90	110	120
Accumulated Temperature (°days):	1523	1546	1523	1522
Average Annual Rainfall (mm):	1144	1143	1155	1150
Field Capacity (Days):	222	222	224	223
Moisture Deficit, Wheat (mm):	83	85	82	82
Moisture Deficit, Potatoes (mm):	70	73	69	69

The local climatic factor of exposure was noted over part of the site and produces a restriction on the potential quality of the land. The crest tops and their associated south-west facing slopes are open to the effects of the prevailing south-west winds. Clear evidence of these winds is seen in the windpruning of individual trees and hedgerow vegetation in these areas. As a result, the land is not suitable for the growing of the more demanding horticultural crops and is restricted to sub-grade 3A at best.

3. Agricultural Land Classification

The geology varies little over the site, with the soils developed over a mix of sandstone and slate.

The important ALC factors in addition to exposure are workability (related to topsoil texture and soil wetness) droughtiness (related to soil depth, stoniness and rooting depths).

Grade 2: a small map unit of this grade has been identified around Salem. Part of this area had been identified in the 1986 survey; the present survey confirmed this grade and mapped an extension to it on land on the opposite side of the Chacewater Road. There is a variation in soil depth which makes grade 2 appropriate for these clay loam topsoils which exhibit increasing clay content with depth but no clear evidence of soil wetness.

Sub-grade 3A: land immediately north and south of the mine spoil areas around Wheal Busy is placed within this grade together with a small block west of Kitbartley Farm (730448) and much of the detached application area

west of the A30. Three soil pits describe the range of soils and limitations associated with this grade. Pit No.1 on the 3A soils south of Wheal Busy reveals the typical sequence from medium clay loam topsoil through an upper subsoil horizon of heavy clay loam into a lower horizon of clay (although when augering it is often difficult to penetrate into the lower subsoil). The soils exhibit no clear evidence of impeded drainage (the clay is quite porous) but suffer from a restricted rooting depth; hard rock and compact soil are encountered below 60 cm and produce a slight droughtiness risk.

Pit 2 near Blackwater describes soils with clear evidence of gleying in the top 40 cms. This is caused by the coarse platy structure of the clay subsoil, but the latter is porous and does not qualify as a slowly permeable layer. The soils are therefore placed in Wetness Class III.

Exposure is the main factor at Pit 3 at Kitbartley where the clay subsoils again show no clear evidence of wetness but also restrict rooting depth below 60 cm.

Two of the three areas mapped as Grade 2 in the 1986 have been regraded under the Revised Guidance and placed in sub-grade 3A. The southern of these areas suffers from a wetness limitation in the subsoil (gleyed, but no SPL) and is placed in Wetness Class 2; in the northern area an evident exposure risk downgrades to 3A (and soil depth is variable).

Sub-grade 3B: the majority of the agricultural land in the survey area has been placed in this grade. The 3B land occupies the crest tops and their steeper slopes. Augering reveals that it is not possible to penetrate these soils more than 30 cm deep (typically 20-25 cm) as a result of the presence of hard angular quartz stones (2-6 cm in size) in the topsoil and throughout the soil profile. Pit No 4 is typical of these soils and yet it reveals that they do <u>not</u> suffer from either a depth or stoniness limitation that would be significant enough to downgrade to 3B. Topsoil stone contents are less than 10% and increase significantly below 30 cm (to 50% stone). As a result this restricts root penetration (no roots evident below 45 cm) and available water in the profile, these soils are borderline 3A/3B on droughtiness alone. The presence of the stony layer mixed with compacted clay produces evidence of gleying in the top 40 cm. The topsoils are often heavy clay loams and must be placed in 3B for Wetness Class III at the prevailing Field Capacity level (222 days). The soils in these locations are therefore believed to be too variable to be placed any higher than 3A. The land is primarily suited to grass production and any deep ploughing would significantly increase the stone content in the top 25 cm.

Much of the 3B land on the eastern fringe is downgraded as a result of locally steep gradients.

One area of grade 4 land mapped as such in 1986 has been regraded and placed in sub-grade 3B. The soils are similar to the 3B soils described above and suffer from an additional micro-relief limitation which is no worse than 3B.

Grade 4: two areas of Grade 4 have been mapped in the east of the site. An area of Grade 4 wetness has been identified in the north along part of the stream margin in this area. Much of the floodplain of this stream is actually classified as non-agricultural.

Urban: all of the Wheal Busy mine workings are placed in this category. This land use is considered to be a "hard" type which offers little potential for a return to agriculture.

All farmhouses and agricultural buildings have been mapped as urban. No attempt has been made to map a separate category of agricultural buildings as the function of many of the scattered farmhouses was often unclear.

[RPG-24]SJ

JB

Wheal Busy, Chacewater, Cornwall

SOIL PIT DESCRIPTIONS

Pit No 1

Topsoil : 0-18
Medium Clay Loam (towards HCL)
10YR42
2% hard stone <2 cm
few distinct ochreous mottles

Subsoil 1 : 18-32
Heavy Clay Loam
10YR42/52
5% hard stone >2 mm
No evidence of wetness
Some ochreous weathering colours

Subsoil 2 : 32-61
Clay
7.4YR64 and 10YR66 (strong weathering colours)
5% hard stone > 2 mm
No evidence of wetness
Fine to Medium Angular Blocky; Moderately Developed;
Friable (ie Average Subsoil Structural Conditions)
Porosity good (> 0.5%, >0.5 mm)
Roots evident to 58 cm, but stop at this depth

+ 61 cm : Compacted soil and less weathered rock (high percentage). Could not be penetrated below this depth.

The AP calculation is stopped at 58 cm

AP Wheat = 87 mm MD Wheat = 85 mm MB Wheat = + 2 mm

Grade according to droughtiness = 3A

Pit No 2

Topsoil : 0-28 cm
Medium Clay Loam (towards HCL); HCL at base of horizon
10YR42
cdo & gm
Stone-free

Subsoil : 28-65+ cm
Clay, freshly weathered
5Y71
Common ochreous colours (possible mottling or weathering)
5-10% hard quartz stones (>2 cm)
Roots penetrate easily
Coarse platy structure; moderately developed; fiable to firm (ie Poor structural conditions)
Porosity good (>0.5%, >0.5 mm)

Wetness Class = 3

ALC Grade = 3A (for WC3, MCL topsoil and 223 FC Days)

Pit No 3

Topsoil : 0- 15/19 cm
Heavy Clay Loam
10YR43
2-5% hard stone >2 cm; sieve
Few rusty roots

Subsoil : 19-60+ cm
Clay
7.5YR56 (an ochreous colour but no clear evidence of wetness; weathering colour)
10-15% hard stone >2 mm; visual
Structure below 35 cm is difficult to assess because of the intimate mix of stone and soil; towards Coarse-Medium Sub-angular Blocky, Weakly developed, Friable.

(ie borderline good to moderate structure)
porosity and root penetration good.

Into 5YR44 from 48 cm with more small stones and less weathered, mor compact soil matrix. No roots evident below 55 cm.

Pit dug to 60 cm; not able to auger below through stones.
No SPL assumed in top 80 cm.

AP Wheat = 78 mm MD Wheat = 82 mm MB Wheat = - 4 mm (Taking the worst scenario root penetration below 55cm

Evident exposure risk limits the site to no better than 3A (ie not suitable for the demanding horticultural crops).

ALC Grade = 3A

Pit No 4

Stoniness Assessment : Stone 2-6 cm = 8% (hard quartz)

Topsoil : 0-16 cm
Heavy Clay Loam
10YR64 (Pale)
Rusty Roots and cdom
Approx 10% stone 2 mm- 2 cm

Subsoil 1 : 16-30 cm
Clay
5YR64/74
Approx 25% hard stone >2 mm; visual
porosity good; few roots in this zone
No clear evidence of wetness

Subsoil 2 : 30-45 cm
Clay
7.4YR66
Approx 50% hard stone >2 mm; visual
No clear evidence of wetness
Difficult to assess structure with this high stone content.
Non SPL but perhaps Average conditions (the soil matrix is compact and roots appear to stop at 45 cm).

The soil is gleyed <40 cm; WC III and HCL = 3B
Evident exposure risk limits the site to no better than 3A (ie not suitable for the more demanding horticultural crops).

AP Wheat = 59 mm (taking the worst position of no root penetration below 45 cm)
= - 23 cm (borderline 3B/3A on drought)

ALC = 3B