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Little Langford, Steeple Langford

Agricultural Land Classification

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Resource Planning Team
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AGRICULTURAL LAND CLASSIFICATION SURVEY AND STATEMENT OF SITE PHYSICAL CHARACTERISTICS

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AGRICULTURAL LAND CLASSIFICATION SURVEY AND STATEMENT OF SITE PHYSICAL CHARACTERISTICS

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 19.3 ha of land between Little Langford and the A36 near Steeple Langford. Field survey was based on 17 auger borings and 2 soil profile pits, and was completed in March 1998. During the survey 1 sample was 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 Wiltshire Minerals Plan.

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 4, 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. At the time of survey the land cover was permanent grass for grazing.

SUMMARY

5. 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: Little Langford

Grade	Area (ha)	% Surveyed Area (19.3 ha)
3b	19.3	100
Total site area	19.3	-

6. None of the site has been mapped as best and most versatile. The whole of the site has been mapped as Subgrade 3b with either a moderate wetness limitation, due to poor drainage and high groundwater levels, or a moderate flood limitation.

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: Little Langford

Grid Reference		SU 045 371	SU 047 370
Altitude (m)		65	65
Accumulated Temperature (day °C)		1480	1480
Average Annual Rainfall (mm)		731	730
Overall Climatic Grade		1	1
Field Capacity Days		169	170
Moisture deficit (mm):	Wheat	109	109
	Potatoes	102	102

RELIEF

10. Altitude ranges from 63 metres near the eastern end of the site to 65 metres across the rest of the site which is level with no limitation due to gradient.

11. Although the site is subject to winter flooding or surface ponding this is unlikely to cause a limitation that is worse than Subgrade 3b. The remains of an abandoned water meadow system are also found across the site but at a density that would not cause a primary limitation to cultivation.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1976) as being all alluvium (loam and marl) with valley gravels shown to the north and south. During the current survey the soil types that were found indicated that the valley gravels might be more extensive.

13. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983) as being from the Frome Association. These are described as being shallow calcareous and non-calcareous loamy soils over flint gravel affected by

groundwater. There may be small areas of peat and a risk of flooding. This was entirely borne out by the current survey.

AGRICULTURAL LAND CLASSIFICATION

14. 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 3b

15. The whole of the site has been mapped as Subgrade 3b with a moderate limitation due to wetness and or flooding. The profiles are variable across the site due to abrupt lateral changes in the thickness of the alluvium (SSEW, 1984) with areas of mineral and organic subsoils being found and a large variation in the depth at which the valley gravel is encountered. Typically the topsoils are silty clays, confirmed by PSD, with clay, silty clay and organic clay subsoils that tend to be gleyed and are slowly permeable. These profiles were assessed as Wetness Class IV (see Appendix II).

15. In some small areas where there is no apparent slowly permeable layer the profiles have still been mapped as Subgrade 3b due to the high groundwater levels and the prospect of winter flooding. The groundwater was assessed as leading to Wetness Class IV. A few isolated parts of the site may be Wetness Class V due to groundwater which would give a severe limitation, Grade 4 but these could not be mapped at this level of survey.

16. Beneath the clayey subsoils, at varying depths across the site, the flinty river gravels are found. These tend to be in either a clayey or coarse sandy loam matrix and consist of 40 - 70 % hard rock as shown by Pits 1 and 2. Even where the profiles are shallow over the gravel there is no primary limitation due to drought.

SOIL RESOURCES

17. The site consists of variable soil types, which were impractical to distinguish and have been amalgamated as one Soil Unit on the attached map of soil resources. This is not a soil stripping map but is intended to illustrate the soil resources available for restoration. Topsoil and subsoil volumes for the Soil Unit are shown in Table 3.

Soil Unit I

18. This unit covers the whole of the site, 19.3 ha, although there is variability in the depth at which the gravel is found and areas of organic subsoils have also been included.

19. The topsoils were uniformly calcareous silty clay and were a dark greyish brown, 10YR42. Consistency was friable with moderately developed fine and medium sub-angular blocky structures as at Pits 1 and 2. The stone content was assessed as being up to 5 % hard rock, mainly larger than 2 cm. There are small areas that have organic topsoil textures but these were too isolated to be mapped at this level of survey.

20. The upper subsoils include organic clay, silty clay and clay horizons that are grey and greyish brown, typically 10YR41, 51 and 52. They were virtually stonefree except for the occasional transition horizon above the gravel. Pits 2 and 3 showed these horizons to be firm with moderately developed coarse prismatic structures or friable where they have organic textures. They tend to be gleyed having common or many distinct fine ochreous mottles and having poor porosity are slowly permeable layers.

21. The lower subsoils contain calcareous river gravel. They tend to be white and slightly grey, 2.5Y71 and 81, and light brownish grey, 10YR62 and 51. Few distinct fine ochreous mottles were seen in places. Due to the high stone contents, estimated as 40-70 % hard rock, and the high groundwater levels the structure could not be assessed.

Table 3: Soil Resources: Little Langford

Map Unit	Depth, cm	Area, ha	Texture	Stones %	Volume, m^3
Topsoil					
I	0-25	19.3	ZC/OC	0-5 HR	48 250
				Total Topsoil	48 250 m^3
Subsoil					
I	25-45	19.3	OC/ZC/C	0-10 HR	38 600
	45-120	19.3	ZC/OC &	0 &	144 750
			SC/C (Gravel)	40-70 HR	
				Total Subsoil	183 350 m3

22. Depths and volumes quoted should be treated with caution due to soil variability. Soil resources may extend below 120 cm.

RESTORATION

23. The site is an alluvial valley bottom consisting of calcareous alluvial gley soils and which suffers from a high groundwater level especially during the winter months. This means that restoration to agriculture would be impracticable if the land level is to be made lower by the extraction of gravel. Another problem is that if restoration was undertaken then the clayey subsoil would inevitably become slowly permeable layers.

24. A more realistic afteruse would probably be to leave the site as open water with some landscaping for use as a waterfowl reserve similar to the adjacent abandoned workings.

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April 1998

REFERENCES

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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 (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.

GLEY: 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

Degree of development	**WA:**	Weakly developed Adherent	**WK:**	Weakly developed
	MD:	Moderately developed	**ST:**	Strongly developed
Ped size	**F:**	Fine	**M:**	Medium
	C:	Coarse	**VC:**	Very coarse
Ped Shape	**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, 1997) for details.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Little Langford	Pit 2 (Asp 9)	Level	Permanent Grass	Av Rainfall: 734 mm ATO: 1480 day °C	Alluvium/river gravels
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 170 Climatic Grade: 1 Exposure Grade: 1	SOIL SAMPLE REFERENCES
3/98	4/3/98	SU 0450 3690	HLJ		None

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	ZC	10YR42	1% HR (Vis)	None	None	MDMSAB	Friable	Good	Good	CF & VF	Slightly Calcareous	Clear Smooth
2	50	ZC	10YR51,52	0% (Vis)	CDFO (7.5YR56)	None	MDCPR	Firm	Poor	Poor	CVF	Slightly Calcareous	Abrupt Smooth
3	71	OC	7.5YR32	0% (Vis)	FDFO (7.5YR58)	None	MDCPR*[1]	Friable	Moderate	Poor*[2]	CVF	Calcareous	Clear Smooth
4	120	SC	2.5Y71	60% >2cm (s) 9% <2cm (s&d) 69% HR Total	None	None	-	-	Moderate*[3]	Good	FVF	Very Calcareous	-

Profile Gleyed From: 26 cm

Depth to Slowly Permeable Horizon: 26 - 71cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 123 mm

Potatoes: 119 mm

Moisture Deficit Wheat: 109 mm

Potatoes: 102 mm

Moisture Balance Wheat: 14 mm

Potatoes: 17 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: Gravel is hard limestone
Hard rock in H1 is flint
*[1] some angular blocky
*[2] only just low porosity
*[3] too wet to assess structure

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Little Langford	Pit 1 (Asp 9)	Level	Permanent Grass	Av Rainfall: 734 mm ATO: 1480 day °C	Alluvium/river gravels
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 170 Climatic Grade: 1 Exposure Grade: 1	SOIL SAMPLE REFERENCES
3/98	4/3/98	SU 0480 3700	HLJ		T/S 0-25 cm: ZC (S9; Z51; C40)

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	18	ZC	10YR42	2% HR (s&d)	None	None	MDFSAB	Friable	Good	Good	MF & VF	Slightly Calcareous	Clear Smooth
2	36	ZC	10YR41,51	0% (Vis)	FFFO (10YR56)	None	MDCSAB	Friable	Moderate	Good	CF & VF	Slightly Calcareous	Clear Smooth
3	54	ZC	2.5Y51	0% (Vis)	CDFO (10YR58)	None	MDCPR	Firm	Poor	Poor	CF & VF	Slightly Calcareous	Clear Smooth
4	61	OC	7.5YR32	0% (Vis)	FDFO (7.5YR56)	None	MDCPR	Friable	Moderate	Poor	FF & VF	Slightly Calcareous	Gradual Smooth
5	90	ZC	10YR51	6% >2cm (s) 12% <2cm (s&d) 18% HR Total	None	None	MDCSAB	Friable	Moderate	Poor	FVF	Calcareous	Clear Wavy
6	120	C	2.5Y81	15% >2cm (s) 40% <2cm (s&d) 55% HR Total	None	None	-	-	Moderate*[1]	Good*[2]	FVF	Very Calcareous	-

Profile Gleyed From: 36 cm

Depth to Slowly Permeable Horizon: 36 - 90 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	119 mm
	Potatoes:	106 mm
Moisture Deficit	Wheat:	109 mm
	Potatoes:	102 mm
Moisture Balance	Wheat:	10 mm
	Potatoes:	4 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: *[1] too wet to assess structure
*[2] due to stones
Groundwater coming in below H4