READING AGRICULTURAL CONSULTANTS

October 2024

Mostyn Estates Limited

Agricultural Land Classification and Soil Resources

at

Land off Queen's Road, Llandudno

Beechwood Court,
Long Toll, Woodcote,
RG8 0RR

01491 684 233
www.reading-ag.com

1 Introduction

1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Mostyn Estates Limited to investigate the Agricultural Land Classification (ALC) and soil resources of land off Queen's Road, Llandudno, by means of a detailed survey of soil and site characteristics.

1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land[1].

1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site conditions and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.

1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use. Grade 2 is very good quality agricultural land, with minor limitations which affect crop yield, cultivations or harvesting. Grade 3 land has moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield, and is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grade 4 land is poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. Grade 5 is very poor quality land, with very severe limitations which restrict use to permanent pasture or rough grazing.

1.5 Land which is classified as Grades 1, 2 and 3a is defined in paragraph 3.58 of Planning Policy Wales[2] as the best and most versatile (BMV) agricultural land.

1.6 Natural Resources Wales with the Welsh Government has published a Predictive ALC Map for Wales[3]. The map is designed on a 50m grid. Criteria including climate, slope, soil wetness, droughtiness and stone contents have been considered and used to determine the most likely

[1] **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land*. MAFF Publications.

[2] **Welsh Government (2024).** Planning Policy Wales, Edition 12, February 2024 https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf

[3] **Welsh Government (2024).** *DataMapWales.* https://datamap.gov.wales/maps/new#/

limitation to agricultural land quality within each grid square. The map predicts this site to be of Grade 2 quality.

1.7 However, as explained by the Welsh Government's Frequently Asked Questions on ALC [4], the only way to accurately determine the agricultural grade of land is by a detailed field survey in accordance with the current ALC guidelines. This survey follows the established methodology and guidelines for carrying out ALC surveys.

2 Site and climatic conditions

General features, land form and drainage

2.1 The site extends to approximately 4.4ha, comprising agricultural land either side of Fferm Lane. Queen's Road is to the north-west and Wormhout Way (A470) to the south-west. Residential properties off Maes Berllan bound the site to the north, other agricultural land is to the north-east and south.

2.2 The topography is characterised by a north-facing slope between altitudes of around 15m and 26m above Ordnance Datum (AOD). Drainage is facilitated by the slope and by a watercourse along the eastern and northern boundaries.

2.3 DataMapWales[3] shows no significant risk of flooding from rivers at the site. There is a risk of flooding from surface water and small watercourses along the northern and eastern boundaries.

Agro-climatic conditions

2.4 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 25m AOD and are given in Table 1. The climate at the site is mild with moderate to moderately large moisture deficits. The number of Field Capacity Days (FCD) is large and is unfavourable for providing opportunities for agricultural field work. There is however no overriding climatic limitation to the ALC.

[4] **Welsh Government (2020).** *Agricultural Land Classification, Frequently Asked Questions.* https://gov.wales/sites/default/files/publications/2020-06/agricultural-land-classification-frequently-asked-questions.pdf

Table 1: Local agro-climatic conditions

Parameter	Measurement
Grid Ref	SH 79400 80700
Altitude	25m AOD
Average Annual Rainfall	780mm
Accumulated Temperatures >0°C	1,448 day°
Field Capacity Days	183 days
Average Moisture Deficit, wheat	102mm
Average Moisture Deficit, potatoes	92mm

Soil parent material and soil type

2.5 The bedrock geology mapped by the British Geological Survey[5] forms a very complex series of units. In descending age order:

- Lower, Middle and Upper Crafnant Formations of the Snowdon Volcanic Group – in the north of the land parcel west of Fferm Lane, comprising tuff and tuffite with subsidiary mudstone, sandstone and siltstone;
- Nod Glas Formation – in the north to centre of the land parcel west of Fferm Lane, comprising black, coal-like mudstone;
- Llandovery Rocks - in the north of the land parcel east of Fferm Lane, comprising formations of mudstone;
- Denbigh Grits Formation – in the centre of the land parcel east of Fferm Lane, comprising an alternation of sandstone, grey and dark grey siltstone and mudstone (striped beds) and disturbed beds; and

2.6 Superficial deposits of diamicton overlie the bedrock across the site and can include a range of poorly sorted material ranging in size from clay to boulders.

2.7 The Soil Survey of England and Wales soil association mapping[6] (1:250,000 scale) shows most of the site as the Cegin association, bordering on East Keswick 3 association soils to the east.

2.8 The Cegin soils have loamy and clayey textures with slowly permeable, coarsely structured and often compact subsoils. Where the FCD regime is shorter than 200 days, as at the site, the soils are typically in Wetness Class (WC) IV.

[5] **British Geological Survey (2024).** *Geology Viewer https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/*

[6] **Soil Survey of England and Wales (1984).** *Soils of Wales* (1:250,000), Sheet 2

2.9 The contrasting East Keswick 3 association is characterised by brown earths in deep, well drained, slightly stony loamy drift. Some component soils have limestone within 80cm depth. All of the main soils are well drained (WC I)[7].

3 Agricultural land quality

Soil survey methods

3.1 Four soil profiles were examined using an Edelman (Dutch) auger at an observation density of one per hectare in accordance with the established recommendations for ALC surveys[4]. One observation pit was also excavated to examine subsoil structures. The locations of observations are shown on Figure RAC/10492b/1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:

- soil texture;
- stone content;
- colour (including localised mottling);
- consistency;
- structural condition;
- free carbonate; and
- depth.

3.2 One topsoil sample was submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.

3.3 Soil Wetness Class (WC) was determined from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of FCD at the location.

3.4 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops, wheat

[7] **Rudeforth et al (1984).** *Soils and Their Use in Wales.* Soil Survey of England and Wales Bulletin 11, Harpenden.

and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

Agricultural land classification and site limitations

3.5 Assessment of land quality has been carried out according to the revised ALC guidelines[1]. Soil profiles have been described according to Hodgson[8] which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines. The auger profiles are described in Appendix 2 and the pit in Appendix 3, along with photographs of the site.

3.6 The main limitation to agricultural land quality is wetness which is heavily influenced by the climatic conditions of the site. The site is classified as Grade 2 and Subgrade 3a.

3.7 The topsoil is dark brown (7.5YR3/3 in the Munsell soil colour charts[9]) medium clay loam which has an average depth of 38cm. The topsoil is slightly stony, non-calcareous and has a weakly developed, fine subangular blocky structure. Many fibrous roots and common earthworms were observed throughout the topsoil.

3.8 The upper subsoil is medium or heavy clay loam and is reddish brown or brown (5YR4/3 or 7.5YR4/3 or 10YR4/3), slightly stony, non-calcareous and has a weak medium subangular blocky structure.

3.9 Most of the profiles were observed to pass to clay lower subsoil from depths of between 75cm and 80cm. The clay is dark reddish brown or reddish brown (2.5YR3/3, 5YR3/4 or 5YR4/3) and is occasionally mottled. The structure is weakly developed and medium prismatic with <0.5% biopores larger than 0.5mm diameter, and is slowly permeable.

3.10 The soil profiles are in WC I or II depending on the depth to the slowly permeable clay. Profiles in WC I are limited by workability to Grade 2. Profiles in WC II are limited by wetness to Subgrade 3a.

3.11 The areas of each ALC grade at the site are given in Table 2 and their distribution is shown in Figure RAC/10492b/2.

[8] **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook.* Soil Survey Technical Monograph No. 5, Silsoe.

[9] **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

Table 2: Agricultural Land Classification

Grade	Description	Hectares	%
Grade 2	Very good quality	1.6	36
Subgrade 3a	Good quality	2.6	59
Non-agricultural		0.2	5
Total		4.4	100

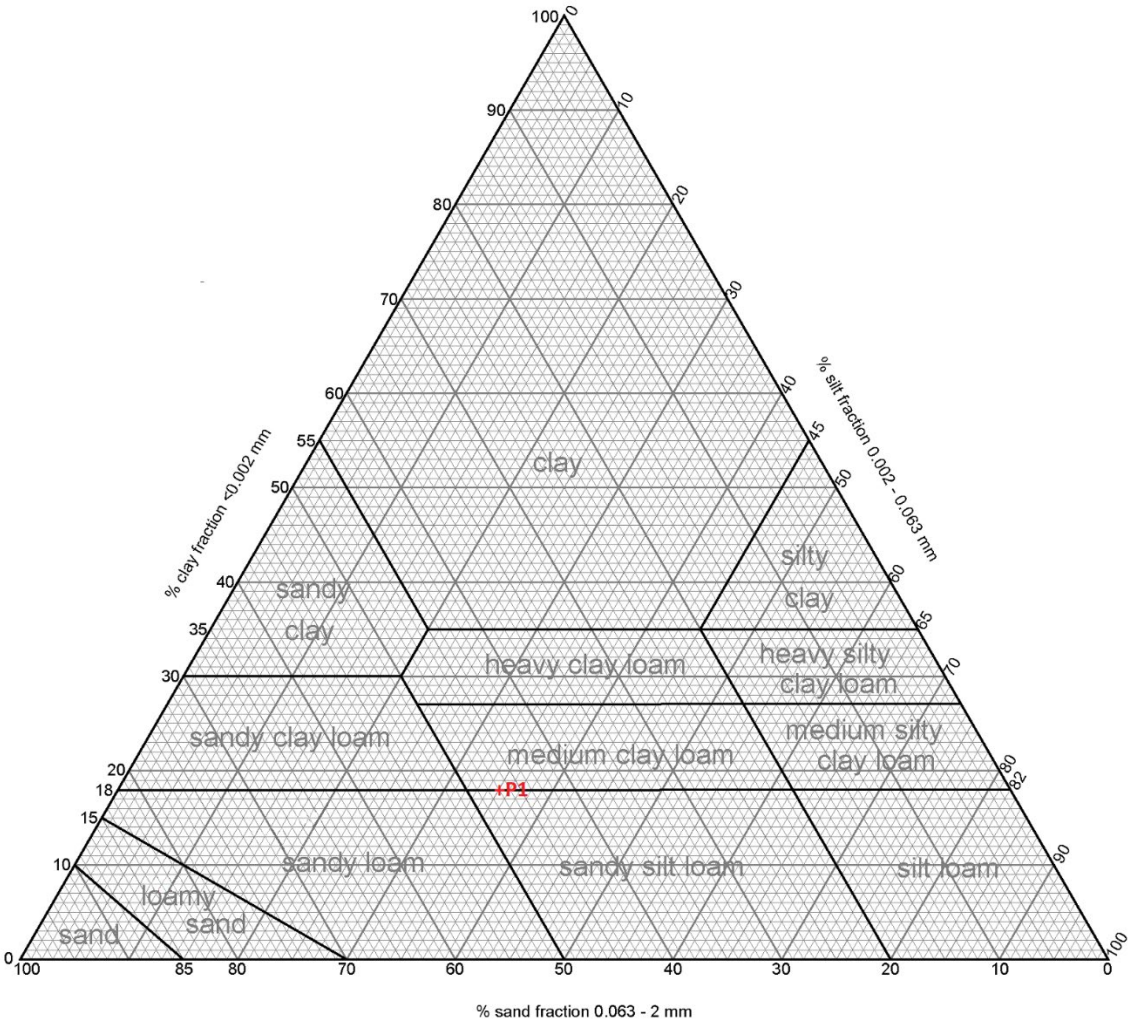
Appendix 1: Laboratory Data

Determinand	Pit 1	Units
Sand 2.00-0.063 mm	47	% w/w
Silt 0.063-0.002 mm	35	% w/w
Clay <0.002 mm	18	% w/w
Organic Matter	4.3	% w/w
Texture	Medium Clay Loam/Sandy Silt Loam	

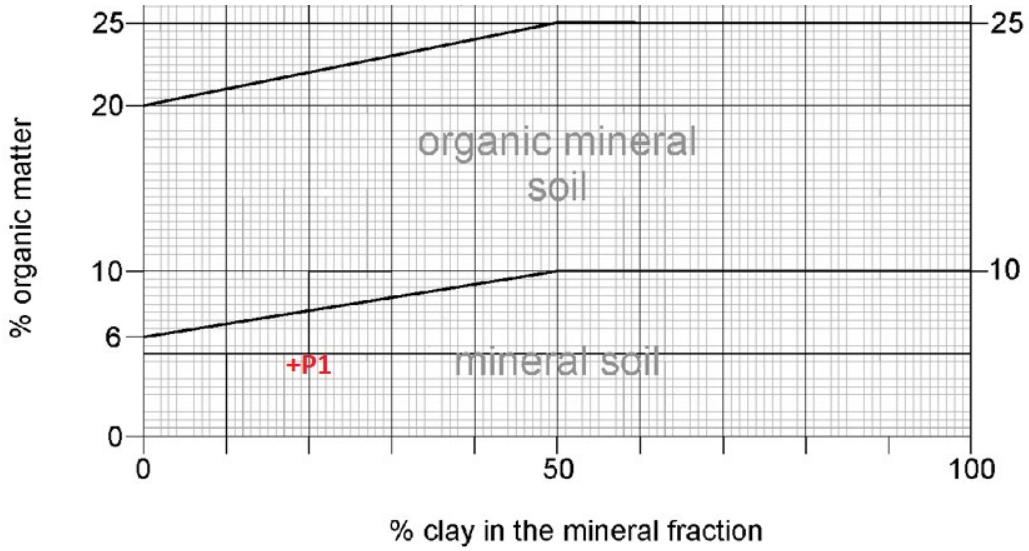
Determinand	Pit 1	Units
Soil pH	7.2	
Phosphorus (P)	6.4	mg/l (av)
Potassium (K)	37.0	mg/l (av)
Magnesium (Mg)	115	mg/l (av)

Determinand	Pit 1	Units
Phosphorus (P)	0	ADAS Index
Potassium (K)	0	ADAS Index
Magnesium (Mg)	3	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness calculations are made according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types		
%	TAv	EAv
hard	1	0.5
.		

Climate Data	
MDwheat	102
MDpotato	92
FCD	183

Wetness Class Guidelines	*II*	*III*	*IV*	*V*
SPL within 80cm, gleying within 40cm	>77cm	49-77cm	<49cm	
SPL within 80cm, gleying at 40-70cm	>65cm	<65cm		
No SPL but gleying within 40cm	coarse subsoil	*I*	other cases	*II*

hard flint & pebble

Maximum depth of auger penetration is underlined

Site No.		Depth cm		Texture	$CaCO_3$	Colour	Mottle colour	abund-ance	stone% hard	stone% .	Struct-ure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T	0	38	mCL		7.5YR3/3			8		-	63	63	n	n	*II*	3a	**3a**	WE
		38	40	mCL		7.5YR4/3			3			3	3	n	n				
		40	60	mCL		5YR4/3			3			25	31	n	n				
		60	78	hCL		10YR5/3	Och	com	3		poor	12	12	y	n				
		78	90	C		5YR3/4	Mn	com	3		poor	8	0	n	y				
		90	120	C							poor	21	0	n	y				
											Total	**133**	**109**						
											MB	31	17						
									Droughtiness grade (DR)			1	1						
2	T	0	38	mCL		7.5YR3/3			8			63	63	n	n	*I*	2	**2**	WE
		38	60	mCL		5YR4/3	Mn	few	3			28	34	n	n				
		60	70	hCL		5YR4/3			3			10	16	n	n				
		70	80	hCL		5YR4/3			3			10	0	n	n				
		80	120	C					3		poor	27	0	n	y				
											Total	**138**	**113**						
											MB	36	21						
									Droughtiness grade (DR)			1	1						
3	T	0	38	mCL		7.5YR3/3			8			63	63	n	n	*I*	2	**2**	WE
		38	55	mCL		7.5YR4/3	Mn	few	3			28	34	n	n				
		55	70	hCL		5YR4/3	Och	com	3			10	16	n	n				

		70	80	hCL	5YR4/3	Och	com	3		10	0	n	n				
		80	120	C				3	poor	27	0	n	y				
									Total	**138**	**113**						
									MB	36	21						
									Droughtiness grade (DR)	1	1						
4	T	0	38	mCL	7.5YR3/3			8		63	63	n	n	*II*	3a	**3a**	WE
		38	40	hCL	10YR4/3	Mn	few	3		3	3	n	n				
		40	50	hCL	7.5YR4/3	Och	com	3		16	16	n	n				
		50	60	hCL	7.5YR5/3	Och	many	3		10	16	y	n				
		60	75	hCL	7.5YR5/3	Och	many	3		15	16	y	n				
		75	110	C	2.5YR3/3	Och	many	3	poor	24	0	y	y				
		110	120	C				3	poor	7	**113**	y	y				
									Total	**137**	**112**						
									MB	35	20						
									Droughtiness grade (DR)	1	1						

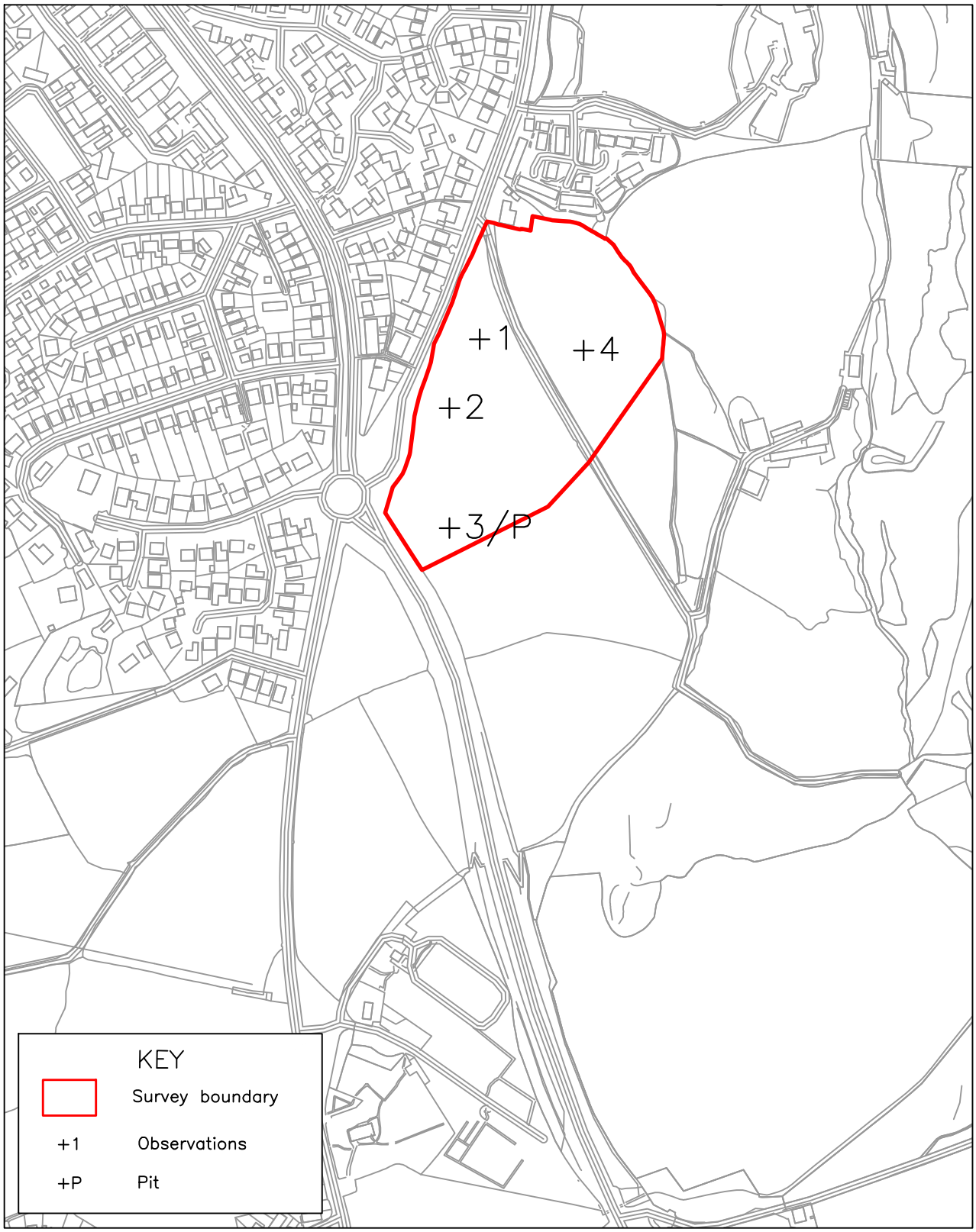
Appendix 3: Site Photographs and Pit Description

Site

Pit 1

Pit 1 – Grid ref SH79400 80850, grass, sheep grazing

0-35 cm	Medium clay loam/sandy silt loam, 10YR3/3, weakly developed, fine subangular blocky structure, many fibrous roots, common earthworms, topsoil stone content 5% >2cm 1%, >6cm 0% rounded hard stones
35-40 cm	Medium/heavy clay loam, 7.5YR5/3, weakly developed, medium subangular blocky, porosity >0.5% greater than 0.5mm diameter, friable, stone content 7% small rounded hard stones
40-55 cm	Medium clay loam, 7.5YR4/3, weakly developed, medium subangular blocky, porosity >0.5% greater than 0.5mm diameter, friable
55-70 cm	Heavy clay loam, 5YR4/3, weakly developed, medium/coarse subangular blocky, porosity >0.5% greater than 0.5mm diameter, firm, very slightly calcareous
70-75 cm	Heavy clay loam, 5YR4/3 (ped face 5YR5/2), weakly developed, medium prismatic, porosity <0.5% greater than 0.5mm diameter, common ochreous mottles, very firm



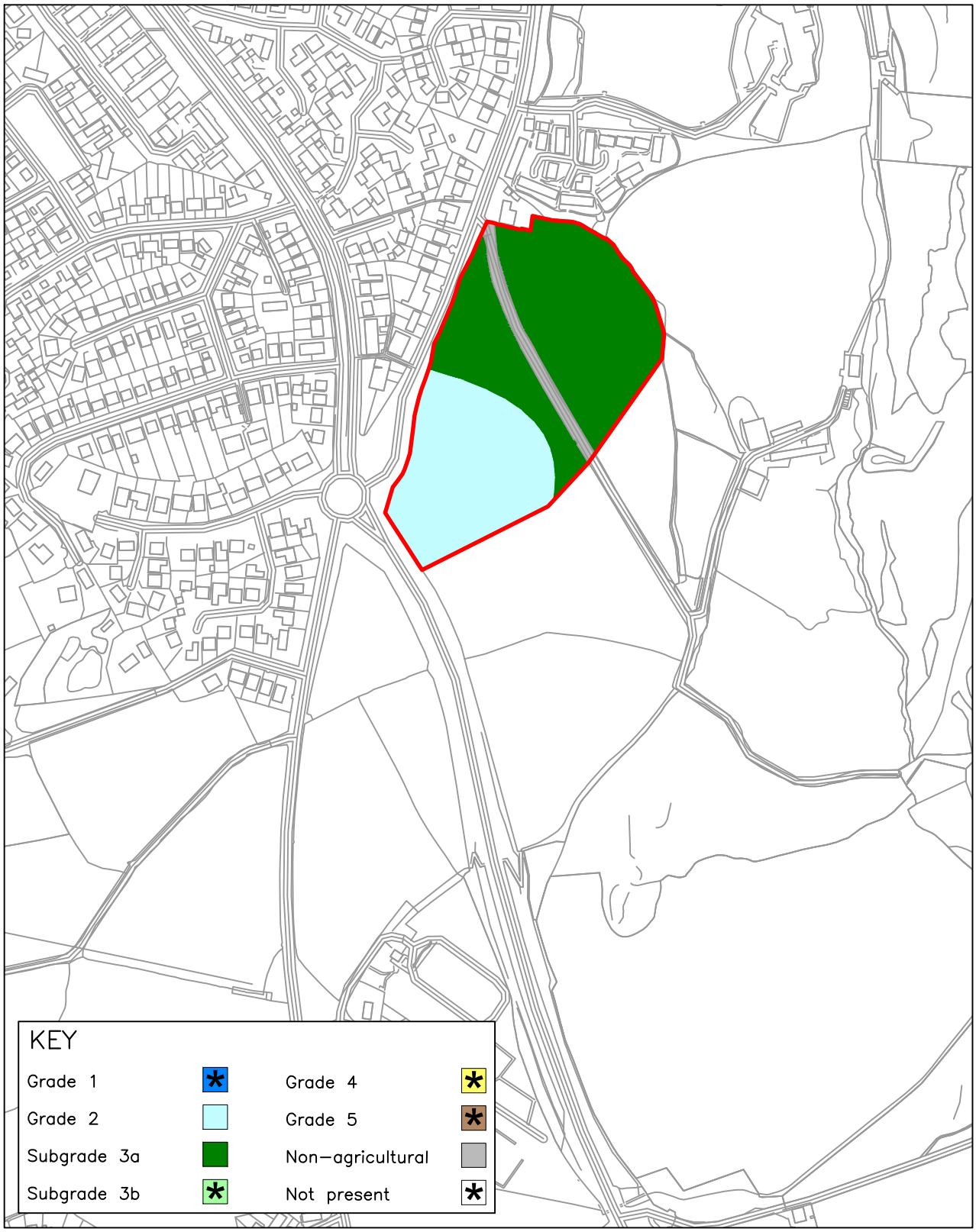
1:5,000

0 100m 200m

Drawing title OBSERVATION MAPPING	Ref. RAC/10492b/1	Rev. A			
Contract LAND OFF QUEENS ROAD, LLANDUDNO	Drawn by AGM	Checked by AIF			
	Scales 1:5,000@A4	Date 10/2024	A	RLB	21102024
			Rev.	Comment	Date

Reading Agricultural Consultants Ltd
Gate House
Beechwood Court
Long Toll
Woodcote
RG8 0RR
01491 684233
www.reading-ag.com

READING AGRICULTURAL CONSULTANTS



1:5,000

0 100m 200m

Drawing title AGRICULTURAL LAND CLASSIFICATION	Ref. RAC/10492b/2	Rev. A			
Contract LAND OFF QUEENS ROAD, LLANDUDNO	Drawn by AGM	Checked by AIF			
	Scales 1:5,000@A4	Date 10/2024	A	RLB	21102024
			Rev.	Comment	Date

Reading Agricultural Consultants Ltd
Gate House
Beechwood Court
Long Toll
Woodcote
RG8 0RR
01491 684233
www.reading-ag.com
READING AGRICULTURAL CONSULTANTS