



Client: Welsh Government



Agricultural Land Classification & Soil Handling Strategy

Proposed extension to Longlands Quarry

Date: August 2020



ADAS GENERAL NOTES

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK ADAS Ltd.

EXECUTIVE SUMMARY

An Agricultural Land Classification and Soil Resource survey was undertaken on 7 ha of land at Longlands Quarry near Bridgend, Glamorgan. The work was carried out by ADAS on behalf of the Welsh Government. The site is proposed for an extension to the existing Longlands Quarry.

The 'Predictive Agricultural Land Classification Map' produced for the Welsh Government in 2017 and updated in 2019 classified the site as Subgrade 3a. The survey for this report concludes that the agricultural component of this site application includes Subgrade 3a and Subgrade 3b. Land is placed in Subgrade 3a either as a result of soil depth or a workability limitation due to the combination of the medium silty clay loam topsoil texture and the number of field capacity days. Land is placed in Subgrade 3b where there is a workability limitation due to the combination of the heavy silty clay loam topsoil texture and the number of field capacity days.

The soil survey shows that there are two Soil Units in the agricultural area of the land. Soil stripping recommendations are given based on these findings.

CONTENTS

1	INTRODUCTION	1
2	METHODOLOGY	2
2.1	Agricultural Land Classification System	2
2.2	Desk Study.....	2
2.3	Field Work	2
3	BASELINE GEOLOGY, SOILS AND LAND USE	3
3.1	Geology	3
3.2	Soils – Published information	3
3.3	Soils - Survey Findings	4
3.4	Current land use.....	4
3.5	Previous Agricultural Land Classification (ALC) surveys.....	4
4	CONSIDERATIONS FOR THE ALLOCATION OF ALC GRADES	5
4.1	Climate	5
4.2	Site limitations	5
4.3	Soil and interactive limitations	6
4.4	Summary of Main Limitations on ALC Grading	7
4.5	Land Quality	7
4.6	Summary of ALC grades within the survey area	8
5	SOIL PHYSICAL CHARACTERISTICS	9
5.1	Introduction	9
5.2	Soils Present	9
6	SOIL STRIPPING.....	11
6.1	Proposed Works.....	11
6.2	Soil Stripping	11
7	SOIL NUTRIENT STATUS.....	12

Appendices

APPENDIX 1: DISTRIBUTION OF ALC GRADES

APPENDIX 2: LOCATION OF SOIL AUGER BORINGS AND SOIL PROFILE PITS

APPENDIX 3: SOIL RESOURCE PLAN

APPENDIX 4: DESCRIPTION OF SOIL PROFILE PITS

APPENDIX 5: DESCRIPTION OF INDIVIDUAL SOIL AUGER BORINGS

APPENDIX 6: DESCRIPTION OF ALC GRADES AND SUBGRADE

APPENDIX 7: LABORATORY ANALYSIS

APPENDIX 8: PHOTOGRAPHS

1 INTRODUCTION

ADAS was instructed by Welsh Government to undertake an Agricultural Land Classification (ALC) plus a Soil Physical Characteristics survey of 7.6 ha at Longlands Quarry, near Bridgend. The land is proposed as an extension to the adjacent working Longlands Quarry. The information from this report will help inform the planning authorities as part of the Statutory Mineral Planning Application.

The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can operate in one or more of four principal ways and may affect:

- the range of crops which can be grown;
- the level of yield;
- the consistency of yield; and
- the cost of producing the crop.

The ALC system gives considerable weight to flexibility of cropping, whether actual or potential. The ability of some land to produce consistently high yields of a somewhat narrower range of crops is also taken into account.

The principal physical factors influencing agricultural production are climate, site (including relief) and soil. By assessing these factors, it is possible to assign land into one of five land classification grades, Grade 1 land being the highest quality and Grade 5 the lowest quality land. Grade 3 is subdivided into Subgrades 3a and 3b, to identify good quality agricultural land from moderate quality land (see Appendix 5 for a description of the grades used in the ALC system). By considering site specific climate, site and soil factors the land can be classified into 1 of 5 agricultural grades or certain non-agricultural grades, the results of which are detailed in Sections 4.4 and 4.5.

The Government policy within the document 'Planning Policy Wales', (PPW) 2018, affords more protection to the 'Best and Most Versatile' land, which is defined in the policy as ALC Grades 1-3a (see Appendix 5 for description of grades).

2 METHODOLOGY

2.1 Agricultural Land Classification System

The system published by Ministry of Agriculture Fisheries and Food (MAFF) [now Department of Environment Food and Rural Affairs (Defra)] in 1988¹ was used to assess Agricultural Land quality. This requires a desk study to review published information followed by fieldwork.

2.2 Desk Study

A desk study of published geological, soils and climatic information for the Scheme was undertaken using reference material held by ADAS and publicly available information from the British Geological Survey (BGS) and the Land Information System (LandIS) operated by Cranfield University before detailed field work was carried out to study soil and site limitations.

2.3 Field Work

A field survey was undertaken on 3rd and 4th August 2020, using a hand held auger and spade to a maximum depth of 1 m, at a density of at least one observation per hectare. A total of 7 auger borings and 3 soil pits were examined. A supplementary auger boring (8) was examined close to the southern boundary of the extension area. Additional information on soil depth and stone content was recorded across parts of the site. Where it was not possible to auger to below 200 mm at auger borings 1 and 5 a spade was used to remove the topsoil and the profile examined. Auger boring descriptions are given in *Appendix 5* and pit descriptions are shown in *Appendix 4* and their location are shown on the plan at *Appendix 2*. Photographs of the soil profiles and land type are shown in *Appendix 8*.

At each auger point, topsoil samples (0-250 mm depth) were taken for analysis of particle size distribution (psd), organic matter (by loss on ignition), pH, available phosphorus, potassium, and magnesium. In addition, at each pit, subsoil samples were taken for particle size distribution (psd), organic matter (by loss on ignition). The results of these analyses are shown in *Appendix 7*.

The soil information gathered for the auger borings and pits along with climatic data was then used to allocate an ALC grade to the auger boring or pit location based on the criteria set out in the publication Agricultural Land Classification of England and Wales, Revised Guidelines and criteria for grading the quality of agricultural land, MAFF 1988 (now a Natural England/Defra publication). Reference is made to the following sections, appendices, tables and figures in the Guidelines:

- Climate: Section 3, 3.1, Figure 1 Grade according to climate
- Gradient: Section 3, 3.2, Table 1 Grade according to gradient

¹ Agricultural Land Classification of England and Wales, Revised guidelines and criteria for grading the quality of agricultural land, MAFF 1988 (now a Natural England/Defra publication)

- Soil depth: Section 3, 3.3, Table 4 Grade according to soil depth
- Stoniness: Section 3, 3.3, Table 5 Grade according to stoniness
- Soil wetness: Section 3, 3.4, Table 6 Grade according to soil wetness – mineral soils, Table 7 Grade according to soil wetness – organic mineral and peaty soils taking account of the soil texture (0-250 mm depth), soil wetness class (WC) and the climatic regime (Field Capacity Days). WC is determined by reference to Figures 7 and 8, Tables 12 and 13 in Appendix 3 of the Defra ALC guidelines using soil structure and Munsell soil colour information determined from the field work and Field Capacity Days figure (FCD) from the desk study. Soil wetness expresses the extent to which excess water imposes restrictions on crop growth, workability and cultivations.
- Droughtiness: Section 3, 3.4, Table 8 Grade according to droughtiness with Moisture Balance limits calculated using the methodology set out in Appendix 4 and data in Table 14 Estimation of available water (%) from texture class, horizon and structural conditions and Table 15 Available water in stones and rocks (%). The moisture deficits (MD) are part of the climatic data obtained from the desk study and are required for use in conjunction with the crop adjusted available water capacity (AP) to calculate the moisture balances (MBs) which determine the ALC droughtiness grade. Soil droughtiness reflects the degree to which a shortage of soil water influences the range of crops that may be grown and the level of yield which may be achieved.
- The overall ALC grade for the location is determined by the most limiting factor present.

3 BASELINE GEOLOGY, SOILS AND LAND USE

3.1 Geology

The 1:50,000 British Geological Survey map² shows the basal geology of much of the site as Friars Point Limestone Formation, a sedimentary rock laid down about 345-459 M years ago in the Carboniferous Period. These rocks were formed in shallow carbonate seas. In the eastern part of the site the basal geology is shown as Blue Lias Formation (Shell Limestone), a sedimentary rock laid down about 191-199 M years ago in the Jurassic Period. These rocks are formed in shallow lime-mud seas. No surface deposits are recorded.

3.2 Soils – Published information

Soils across the survey have been mapped, by the Soil Survey of England and Wales³, as Malham 2 Association. The characteristics of the Soil Association are summarised below:

Malham 2 Soil Association

These soils have developed over limestone, shallow in places especially on crests with bare rock locally. The Association consists of soils which are silty soils over limestone (Malham Series, accounting for 70% of the Association). The soils are well drained falling into

² <http://www.bgs.ac.uk/data/mapViewers/>

³ Soil Survey of England and Wales (1984) Soils and their use in Wales.

Wetness Class (WC) I. The soils have a stoneless topsoil over a stoneless or slightly stony (6-15%) subsoil. The soils on this site conformed to this general description.

3.3 Soils - Survey Findings

The site survey carried out by ADAS identified two soil types as described below:

Soil Type 1: Heavy soils

These soils cover the northern part of the site. They have a brown or dark brown heavy silty clay loam topsoil to 200-300 mm depth and overlie an upper subsoil of brown or dark brown heavy silty clay loam to 300-400 mm. Below 400 mm there is either a brown or reddish brown heavy silty clay loam or silty clay lower subsoil to 600-800 mm onto limestone rock. In places the topsoil overlies limestone rock at 300 mm. The soil profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth (Wetness Class I).

Soil Type 2: Medium soils

These soils cover the southern part of the site. They have either a brown or dark brown medium silty clay loam topsoil to 300- 400 mm depth and overlie heavy silty clay loam or limestone rock. The soil profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth (Wetness Class I). In places the soil depth to limestone rock is 300 mm.

3.4 Current land use

At the time of the survey the agricultural land was under a forage crop of swedes and re-growth of the previous year's wheat crop with grass weed undergrowth.

3.5 Previous Agricultural Land Classification (ALC) surveys

The Welsh Government's Predictive Agricultural Land Classification Map⁴ show the proposed quarry extension is within an area mapped as Subgrade 3a. There are no detailed surveys in the immediate vicinity.

⁴ [Http://lle.gov.wales/map/alc](http://lle.gov.wales/map/alc)

4 CONSIDERATIONS FOR THE ALLOCATION OF ALC GRADES

4.1 Climate

The climatic variables have been interpolated from grid point data surrounding locations around the survey area, as follows:

Table 1: Climatic variables

Grid Reference	SS930770 (Mid point of site)
Altitude (m)	60
Accumulated Temperature (day °C)	1494
Average Annual Rainfall (mm)	1191
Overall Climatic Grade	2
Field Capacity Days	237
Moisture deficit (mm): Wheat	71
Moisture deficit (mm): Potatoes	56

The sites lies to the south of Bridgend and about 4 miles inland from the South Wales coast. The area has a relatively moist and mild climate. Accumulated Temperature (January–June), a measure of the relative warmth of the area, is 1494°C and the average annual rainfall is 1191 mm.

The combination of the Accumulated Temperature and Average Annual rainfall result in a climatic limitation such that the site cannot be graded higher than Grade 2.

4.2 Site limitations

Gradient

The land lies at an altitude of around 70 m AOD close to the southern boundary of the site falling to about 50 m AOD close to the B4524 road. The land is gently sloping and gradients are less 7°. The grade criteria for gradient are given in Table 1 'Grade according to gradient' (ALC Guidelines). Gradient is not considered to be a limitation at this site.

Flooding

The Flood Risk Map for Wales⁵ shows no risk that the site will suffer surface flooding.

⁵ <https://www.naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/>

Flood risk does not affect the grading of the site.

4.3 Soil and interactive limitations

Soil depth

The depth of the soil overlying consolidated limestone is generally between 550 mm and 800 mm. There are parts of the site (the north western part and part of the southern field) where the depth of the soil to the consolidated rock is 300 mm, the lower soil depth limit for Subgrade 3a. Other parts of the site meet the soil depth limits for Grade 2 or Grade 1. Table 4 in the ALC guidelines gives the 'Grade according to soil depth' criteria.

Stoniness

Stones in the top 250 mm of the soil profile (usually the topsoil) can act as an impediment to cultivation, harvesting and crop growth. The ALC guidelines gives grade limits according to stone size in Table 5 'Grade according to stoniness'. The topsoil stone content was examined at three soil pits. The stone content for stones larger than 20 mm was between 2% to 10% and for stones larger than 60 mm was between 1% and 4%. The topsoil stone content meets the limits for Grade 2 or above. It is noted that across the site there were occasional large stones (>150 mm in length) lying on the surface in places, which could be hand picked.

Soil texture

Particle size distribution (PSD) by laboratory analysis for topsoil samples across the survey area confirmed 2 field observations of medium silty clay loam (clay content <27%) and reported 5 field observations of medium silty clay as heavy clay loam (clay content 27%-31%). The heavy silty clay loam subsoil (clay content <35%) observed in the field was reported as a silty clay (clay content 38%).

Soil Erosion

The incidence of soil erosion is determined by interactions between weather, soil type, topography and vegetative cover characteristics. The effects of soil erosion on land quality are not considered to be a limiting factor.

Soil Wetness and workability

The soil is generally well drained with no evidence of the typical characteristics of a slowly permeable layer within 800 mm of the surface and no gleyed subsoil within 700 mm. The soils fall into WC I. The combination of a medium silty clay loam topsoil or heavy clay loam topsoil and Field Capacity Days figure of 237 limits the site to Subgrade 3a or Subgrade 3b respectively.

Soil droughtiness

The moisture deficits are 71 mm for winter wheat and 56 mm for potatoes. The moisture balance limits place much of the site in Subgrade 3a or higher.

4.4 Summary of Main Limitations on ALC Grading

The main factors affecting land quality are:

- The depth of soil limiting the land to Subgrade 3a
- The combination of topsoil texture and Field Capacity Days figure affecting the workability of the soil limiting the land to either Subgrade 3a or Subgrade 3b

4.5 Land Quality

The distribution of agricultural land quality across the site is shown in Appendix 1. A description of ALC grades and subgrades is shown in Appendix 6.

Grade 1

No land has been placed in this grade.

Grade 2

No land has been placed in this grade.

Subgrade 3a

This Subgrade has been mapped across 3.35 ha (55.9%) of the agricultural area within the survey area. It includes profiles in soil type 2. Type 2 soils have a medium silty clay topsoil overlying heavy silty clay loam subsoil to a depth of 600mm or limestone rock at 300mm. There is no evidence of gleying within 700 mm depth or presence of a slowly permeable layer within 800 mm depth in the profiles. The soils are placed in WC I. The medium silty clay loam topsoil texture in combination with the Field Capacity Days figure of 237 limit the land to Subgrade 3a because of a workability limitation. Also soil depth is a limitation. Where there is limestone rock present at 300 mm the land is placed in Subgrade 3a, as the soil depth limitation for Subgrade 3a is 300 mm.

Subgrade 3a is land of good quality and capable of 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 and grass.

Subgrade 3b

This Subgrade has been mapped across 4.25ha (44.1%) of the agricultural area within the survey area. It includes profiles in soil type 1. The topsoil has either a brown or dark brown heavy silty clay loam topsoil to 200-300 mm depth and overlies an upper subsoil of brown or dark brown heavy silty clay loam to 300-400 mm. Below 400 mm there is either a brown or reddish brown heavy silty clay loam or silty clay lower subsoil to 600-800 mm onto limestone rock. The soil profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth. The soils are placed in WC I. The heavy silty clay loam topsoil texture in combination with the Field Capacity Days figure of 237 limit the land to Subgrade 3b because of a workability limitation.

Subgrade 3b is land of moderate quality and 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

No land has been placed in this grade.

Grade 5

No land has been placed in this grade.

Non-agricultural land

No land has been placed in this grade.

4.6 Summary of ALC grades within the survey area

A summary of the ALC grade distribution for the survey area is shown in Table 2.

A map showing the distribution of ALC grades is shown at Appendix 1, auger borings and profile pit locations are shown on the plan at Appendix 2. Soil profile pits are described at Appendix 4 and individual soil auger details given at Appendix 5. Appendix 6 provides more detail on the ALC system and the results of laboratory analysis for topsoil particle size distribution are shown at Appendix 7.

Table 2: Summary of Agricultural Land Classification grades across the survey site

Grade	Area (ha)	% of Total Area
1	-	-
2	-	-
3a	3.35	44.1
3b	4.25	55.9
4	-	-
5	-	-
Non-agricultural land	-	-
Total	7.6	100

5 SOIL PHYSICAL CHARACTERISTICS

5.1 Introduction

Defra provides guidance⁶ on soil handling on construction sites to ensure that soils are maintained in as good a condition as is possible during the development and landscaping of a site. This section provides the basis for a soil handling strategy for the site based on the results of the detailed survey. It is designed to keep the different soil horizons separate.

5.2 Soils Present

On the proposed extension site soils were found to be fairly uniform in soil texture, varying in depth to the limestone. For the purposes of soil stripping, storage and reuse they can be considered as two units. The location of these units are shown on the plan at Appendix 3.

Unit 1

This unit accounts for 44.1% of the site. It covers the northern part of the site. The topsoil ranges in thickness from 300- 350 mm, with an average thickness of around 300 mm and has a heavy silty clay loam texture. It is stoneless to very slightly stony, with stone content by volume of 4%. Below this to a depth of approximately 350- 400 mm lies an upper subsoil of heavy clay loam and a lower subsoil of silty clay ranging in thickness from 200 mm-300 mm. In the eastern field silty clay was present between depth of 700 mm and 800 mm. The subsoil stone content by volume was less than 5% (stoneless to very slightly stony).

Unit 2

This unit accounts for 55.9% of the site. The soils in the unit have a medium silty clay loam texture overlying either limestone between 300 mm and 350 mm or an upper subsoil of medium silty clay loam of 100-150mm thickness and a lower subsoil of heavy silty clay loam of 200 mm thickness. The stone content by volume is 8-10% (slightly stony).

A summary of the soil types is given below in Table 3 and full details are given in Appendix 3.

⁶ Defra, 2009. Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Accessed at

<https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites>

Table 3: Summary of soils on site

Bottom Depth of horizon (mm)	Texture	Stones
Unit 1		
300	Dark brown or brown heavy silty clay loam	4% angular limestone
400	Dark brown or brown heavy silty clay loam	1% angular limestone
600	Brown or reddish brown silty clay	1% angular limestone
	Limestone rock	
Unit 2		
300	Dark brown medium silty clay loam	10% angular limestone
300-600	Limestone rock or brown heavy clay loam	

6 SOIL STRIPPING

6.1 Proposed Works

The Site Layout and Phasing Plans, drawn up by consultants David Jarvis Associates (drawing no. 181025/01v1, 181025/02v1, 181025/03v1), show that the quarry extension works will be split into two phases. A screening bund 2 m wide will be created along the northern and eastern perimeter of the quarry. A 'primary' access road – a two lane haul road, approximately 15m wide, will be created around the northern and eastern perimeter of the quarry within the screen bund. A covering of 2 m thick will be placed on the quarry

6.2 Soil Stripping

Prior to stripping topsoil any arable crops should be harvested and any grass/vegetation should be cut to less than 100 mm and removed from the soil surface - to help reduce anaerobic conditions in the soil stores.

The aim should be to preserve the soils on site and keep topsoils and subsoils separate at all stages. Topsoil should not be stripped from areas to be used for topsoil bunds but topsoil should be stripped from the areas to be used for subsoil storage.

Soils should only be handled when they are sufficiently dry to prevent compaction of the underlying soil; typically when the soils are below the plastic limit and not within 24hrs of significant rainfall (i.e. >10mm in 24hrs) so that the soils have a full day of drying.

Soil unit 1

The topsoil should be stripped to its full depth, i.e. 300 mm. The underlying subsoil should be stripped to the depth limestone rock is reached if limestone is within 600 mm of the existing soil surface or where limestone is deeper to a maximum depth of 600 mm from the existing soil surface and be stored separately from the topsoil.

Soil unit 2

The topsoil should be stripped down to 300 mm depth and stored separately or with topsoil from other parts of the site. Where there are upper and lower subsoil present these should be stripped separately and stored separately from the topsoil.

Table 4: Soil Stripping Depths

Soil type	Depth (mm) of stripping	Soil to be stored in Bund type
Unit 1 topsoil (heavy silty clay loam texture)	300 mm	1
upper/lower subsoil	600 mm from existing current surface i.e. a 300 mm layer 600 mm from existing current surface i.e. a 200mm layer or limestone rock after the topsoil has been stripped	2
Unit 2 topsoil (medium silty clay loam texture)	300mm	3
upper/lower subsoil	600mm from existing current surface i.e. a 300 mm layer or to depth of limestone if reach at a shallower depth.	2

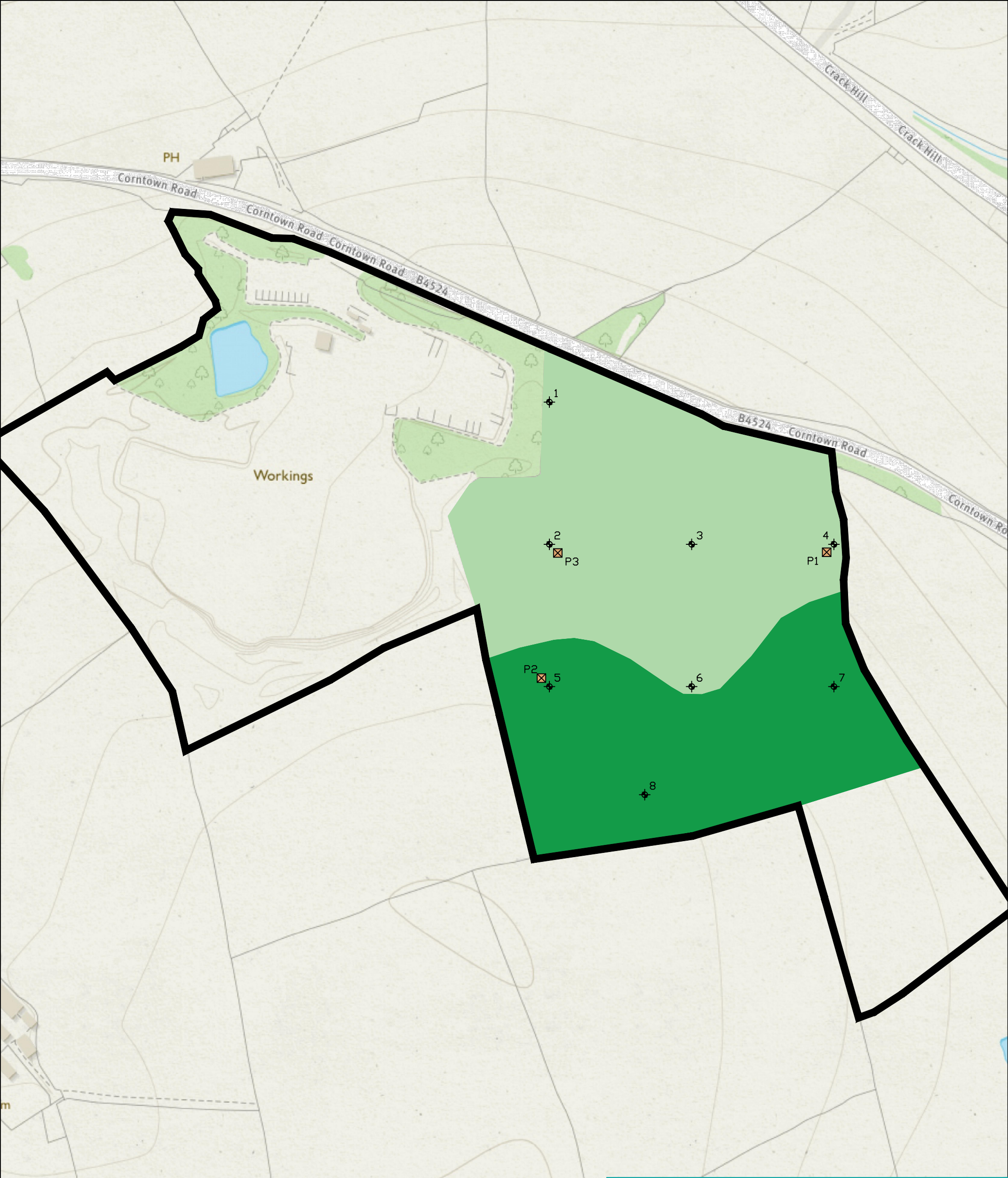
7 SOIL NUTRIENT STATUS

The chemical analyses of topsoil from seven auger points are shown below and in Appendix 4. As the stripped soils will be stored for some years, it is recommended that the soils be sampled and analysed again when taken out of store.

Auger boring	pH	Phosphorus (P) mg/l (Index)	Potassium (K) mg/l (Index)	Magnesium (Mg) mg/l (Index)	Organic Matter (LOI) %
1	8.0	15.8 (2)	99 (1)	102 (3)	7.0
2	7.9	7.2 (0)	75 (1)	154 (3)	6.7
3	7.6	10.2 (1)	31 (0)	142 (3)	7.5
4	7.5	6.2 (0)	42 (0)	169 (3)	7.7
5	7.6	6.8 (0)	61 (1)	347 (5)	8.8
6	7.4	6.8 (0)	84 (1)	233 (4)	8.0
7	7.5	9.0 (1)	80 (1)	277 (5)	8.2

APPENDIX 1 - Distribution of ALC Grades

(See following pages)



ALC Grade

- | | |
|---|------------------------|
|  | 1 |
|  | 2 |
|  | 3a |
|  | 3b |
|  | 4 |
|  | 5 |
|  | Urban / Farm buildings |
|  | Non Agric / Woodland |

 Outline Planning Application Boundary

Client: Welsh Government

Project: Longlands Quarry

Drawing Title: ALC Grade Plan

Drawing No: 1010167(1)/01

Scale: 1/2500 @A3

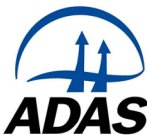
Drawn by: Tommy Farr

Date: 24.8.2020

Checked by: Darren Ingram

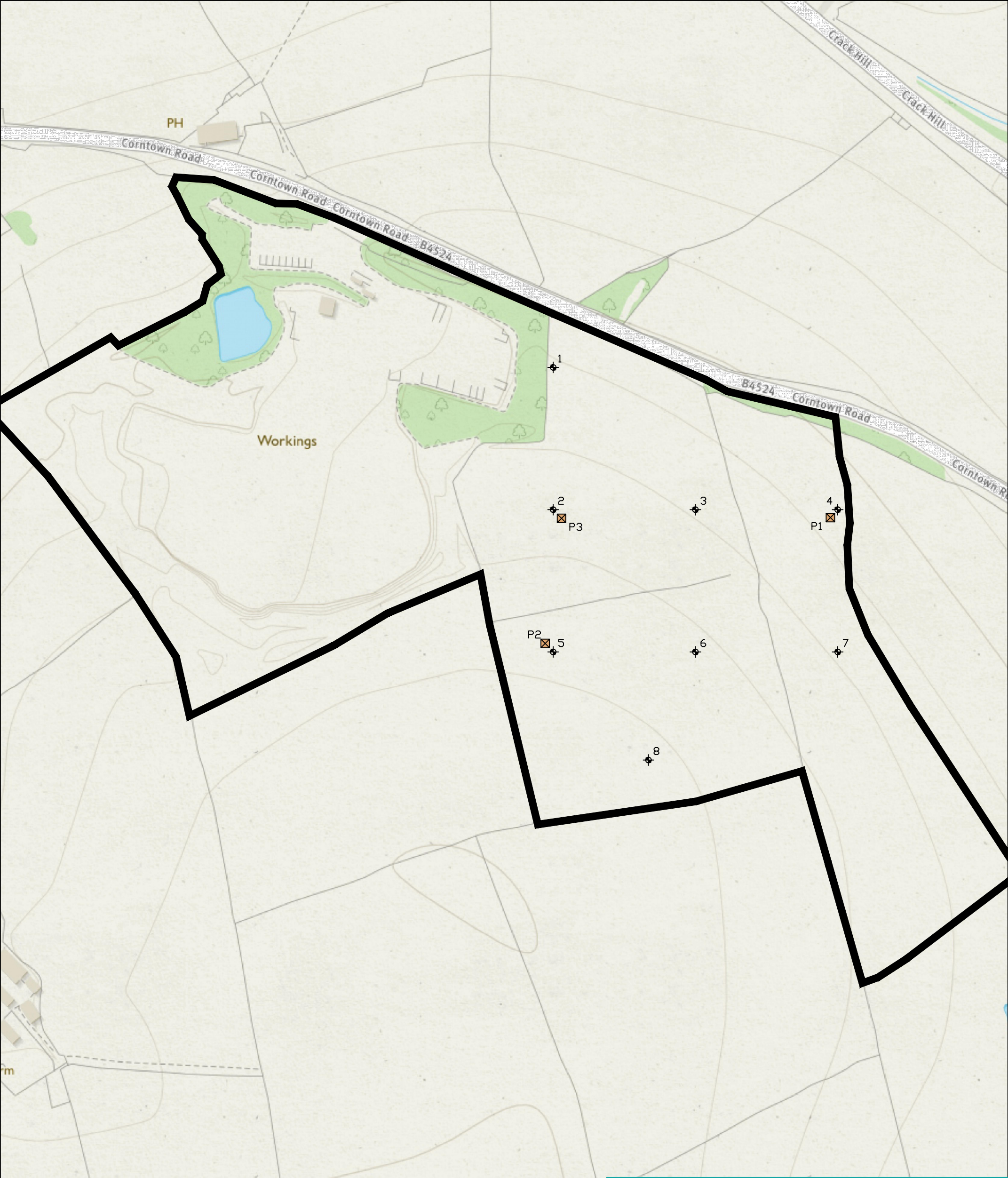
Date: 24.8.2020

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APPENDIX 2 - Location of soil auger borings and soil profile pits

(See following pages)



Auger survey location.

Outline Planning Application Boundary

Soil pit location.

1

2

3

4

5

6

7

8

P1

P2

P3

Client:

Welsh Government

Project:

Longlands Quarry

Drawing Title:

Soil auger boring & soil profile pit plan

Drawing No:

1010167(1)/02

Scale:

1/2500 @A3

Drawn by:

Tommy Farr

Checked by:

Darren Ingram

Date:

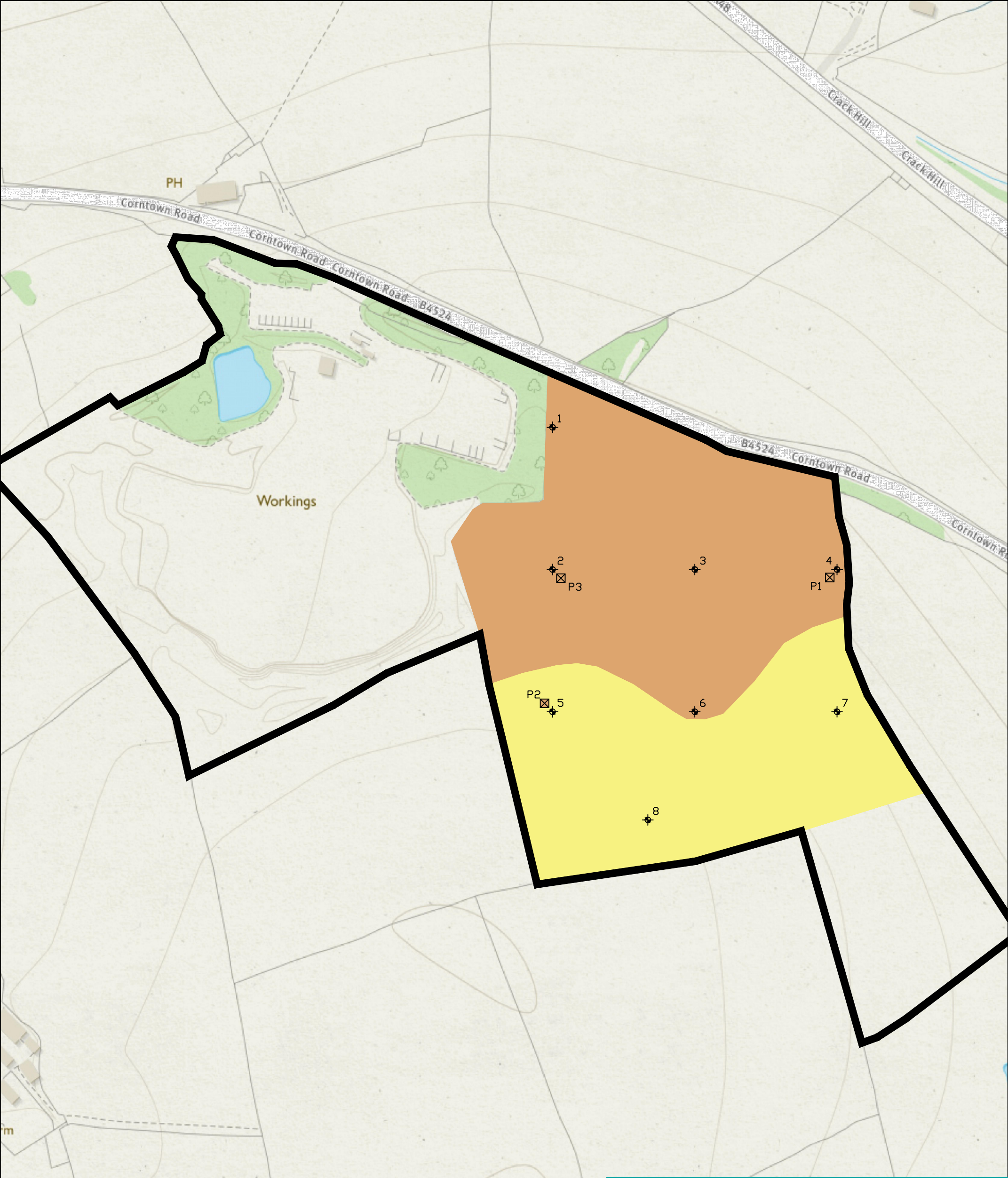
24.8.2020

Date:

24.8.2020

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APPENDIX 3 – Soil Resource Plan



ALC Grade

- 1
- 2

Outline Planning Application Boundary

Client: Welsh Government

Project: Longlands Quarry

Drawing Title: Soil Resource Plan

Drawing No: 1010167(1)/03

Scale: 1/2500 @A3

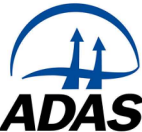
Drawn by: Tommy Farr

Date: 24.8.2020

Checked by: Darren Ingram

Date: 24.8.2020

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Tel. 01432 820444.



APPENDIX 4 - Description of soil profile pits

Pit 1 (auger boring 4) Grid Reference: 293100 177100					
Depth mm	Texture	Colour	Structure	Total Stones	Porosity
0-300	Heavy silty clay loam	7.5YR3/3 (dark brown)	Weakly developed medium subangular blocky	2%	-
300-400	Heavy silty clay loam	7.5YR4/4 (brown)	Weakly developed medium subangular blocky	1%	>0.5%
400-700	Heavy silty clay loam/silty clay	7.5YR4/3 (brown)	Moderately developed medium subangular blocky	1% (large stone below 600 mm)	>0.5%
700-800	Silty clay	7.5YR3/4 (dark brown)		(weathered limestone fragments)	
Soil Wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b Moisture Balance: Wheat +39 mm Potatoes +68 mm Droughtiness ALC grade :1 Main Limitation: Soil wetness ALC subgrade 3b					

Note - pit was dug to 700 mm and augered below 700 mm with silty clay present in the auger boring.

Pit 2 (near auger boring 5) Grid Reference: 292899 177014					
Depth mm	Texture	Colour	Structure	Total Stones	Porosity
0-300	Medium silty clay loam	7.5YR3/3 (dark brown)	Weakly developed fine subangular blocky	Total content:10% (%>20mm=10%; % >60 mm =6%)	-
300+	Limestone rock				
Soil Wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3a Moisture Balance: Wheat -19 mm Potatoes -4 mm Droughtiness ALC grade: 3a Soil depth: 300 mm ALC soil depth grade: 3a Note: depth to rock checked around pit and found to be 300 mm Main Limitation: Soil depth ALC subgrade 3a					

Pit 3 (auger boring 2) Grid Reference: 292899 177094					
Depth mm	Texture	Colour	Structure	Total Stones	Porosity
0-300	Heavy silty clay loam	7.5YR4/3 (brown)	Weakly developed medium subangular blocky	1%	-
300-450	Silty clay	7.5YR4/4 (brown)	Moderately developed medium angular blocky	1%	>0.5%
450+	Limestone rock				
Soil Wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b Moisture Balance: Wheat +11 mm Potatoes +26 mm Droughtiness ALC grade: 2 Soil depth: 450 mm ALC soil depth grade: 2 Main Limitation: Soil wetness ALC subgrade 3b					

APPENDIX 5 - Description of individual soil auger borings

Profile	Depth mm	Description
1	300	7.5YR4/3 (brown) heavy silty clay loam; stone content 2% (>2cm 2% >6cm 1%)
	Limestone rock	
Augered to 200 mm and spade excavated to 300 mm. (Field textured medium/heavy clay loam ;lab result clay content 31%) Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC wetness grade: 3b Moisture Balance: Wheat -15mm Potatoes 0 mm ALC droughtiness grade: 3a Soil depth : 300 mm ALC stoniness grade 3a Main limitation: Soil wetness ALC subgrade 3b (Grid reference: 292900 177200)		
Profile	Depth mm	Description
2	350	7.5YR4/3 (brown) heavy silty clay loam; stone content 3%
	550	5YR4/3 (reddish brown) heavy silty clay loam
	Limestone rock	
Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b Moisture Balance: Wheat +24 mm Potatoes +43 mm ALC droughtiness grade: 3a Soil depth : 550 mm ALC soil depth grade 2 Main limitation: Soil wetness ALC subgrade 3b (Grid reference: 292900 177200)		

Profile	Depth mm	Description
3	300	7.5YR4/3 (brown) heavy silty clay loam; stoneless
	400	5YR4/4 (reddish brown) medium silty clay loam
	600	5YR4/4 (reddish brown) heavy silty clay loam and occasional weathered limestone fragments
	Limestone rock	

Augered to 600 mm

Field textured as medium silty clay loam; lab result clay content 27%; borderline medium/heavy silty clay loam

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b

Moisture Balance: Wheat +30 mm Potatoes +52 mm ALC droughtiness grade: 1

Soil depth : 600 mm ALC soil depth grade 1

Main limitation: Soil wetness ALC subgrade 3b

(Grid reference: 293000 177100)

Profile	Depth mm	Description
4	300	7.5YR3/3 (dark brown) heavy silty clay loam; stone content 2 %
	400	7.5YR4/4 (brown) heavy silty clay loam stone content 1%
	700	7.5YR4/4 (brown) heavy silty clay loam
	800	7.5YR3/4 (dark brown) silty clay weathered limestone fragments

Augered to 800 mm Field texture medium silty clay loam; lab result 31% clay content

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b

Moisture Balance: Wheat +46 mm Potatoes +65 mm ALC droughtiness grade: 1

Soil depth : 800 mm ALC soil depth grade 1

Main limitation: Soil wetness ALC subgrade 3b

(Grid reference: 293100 177100)

Profile	Depth mm	Description
5	200	7.5YR3/3 (dark brown) medium silty clay loam; stone content 4 %(>20 mm 4% >60 mm 3%)
		Auger stopped

Note: Augered to 200 mm in crop. Spade dug to 300 mm out of crop Grid Reference: 292899 177094. Field texture medium silty clay loam; lab result 24% clay content

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3a

Moisture Balance: Wheat -33 mm Potatoes -18 mm ALC droughtiness grade: 3b; where spade dug ALC droughtiness grade 3a

Soil depth : 200 mm; spade dug out of crop to 300 mm 3a

Main limitation: Soil depth ALC subgrade 3a

Profile	Depth mm	Description
6	300	7.5YR4/3 (brown) heavy silty clay loam; stone content 1%
	Limestone rock	

Augered to 300 mm Field texture medium silty clay loam; lab result 28% clay content

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3b

Moisture Balance: Wheat -14 mm Potatoes -1 mm ALC droughtiness grade: 3a

Soil depth : 300 mm ALC soil depth grade 3a

Main limitation: Soil wetness ALC subgrade 3b

(Grid reference: 293000 177000)

Profile	Depth mm	Description
7	300	7.5YR3/3 (dark brown) medium silty clay loam; stone content 4 %(>20 mm 4% >60 mm 3%)
	350	7.5YR4/3 (brown) medium silty clay loam
	Limestone rock	

Augered to 350 mm. Field texture medium silty clay loam; lab clay content 23%

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3a

Moisture Balance: Wheat -6 mm Potatoes +10 mm ALC droughtiness grade: 3a

Soil depth : 350 mm ALC soil depth grade 3a

Main limitation: Soil depth ALC subgrade 3a

(Grid reference: 293100 177000)

Profile	Depth mm	Description
8	300	7.5YR4/3 (brown) medium silty clay loam; stone content 1%
	400	7.5YR4/3 (brown) medium silty clay loam
	600	7.5YR4/3 (brown) heavy silty clay loam
	Limestone rock	

Augered to 600 mm; supplementary auger boring at top of gentle slope

Soil wetness: Profile has no slowly permeable layer within 800 mm depth and no gleyed subsoil within 700 mm depth: Wetness Class I ALC grade: 3a

Moisture Balance: Wheat +30 mm Potatoes +52 mm ALC soil droughtiness grade: 1

Soil depth : 600 mm ALC soil depth grade 1

Main limitation: Soil wetness ALC subgrade 3a

(Grid reference: 292967 1769240)

Additional Field Survey information

Soil depth auger point checks- **no spade excavation**

Grid Reference	Soil depth(mm)	Grade according to soil depth limitation
292939, 177226	300	3a
292989, 177188	430	3a
292961, 177162	200	3b
292981, 177166	500	2

Stoniness (content in top 250 mm)

Grid Reference	Stone content	Grade according to stoniness
292923, 177096	4% (>20 mm 4% >60 mm 2%)	1
292930, 177094	8% (>20 mm 8% >60 mm 4%)	2

APPENDIX 6 - Description of ALC Grades and Subgrade

The ALC Grades and Subgrades are described below in terms of the types of limitation which can occur, typical cropping range and the expected level and consistency of yield. In practice, the grades are defined by reference to the land's physical characteristics, for which the cut-offs are described in Section 3 of the 1988 MAFF (now Defra) ALC guidelines. The most productive and flexible land falls into Grades 1, 2 and Subgrade 3a and collectively comprises about one-third of the agricultural land in England and Wales. About half the land is either of moderate quality (Subgrade 3b) or poor quality (Grade 4). Although less significant on a national scale, such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor-quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

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 includes 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 on Grade 1 land.

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 (e.g. cereals and forage crops) the yields of which are variable. In moist 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 agriculture land

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

APPENDIX 7 – Laboratory Analysis



Contact : DARREN INGRAM
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HR1 3PG
Tel. : 01432 821025

K740

Please quote the above code for all enquiries

Client : 101067
LONGLANDS

Distributor : P69102DI0408

Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 74934/20

Date Received 06-Aug-20

Date Reported 11-Aug-20

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
522439/20	1	LONGLANDS 1 <i>No cropping details given</i>	8.0	2	1	3	15.8	99	102
522440/20	2	LONGLANDS 2 <i>No cropping details given</i>	7.9	0	1	3	7.2	75	154
522441/20	3	LONGLANDS 3 <i>No cropping details given</i>	7.6	1	0	3	10.2	31	142
522442/20	4	LONGLANDS 4 <i>No cropping details given</i>	7.5	0	0	3	6.2	42	169
522443/20	5	LONGLANDS 5 <i>No cropping details given</i>	7.6	0	1	5	6.8	61	347
522444/20	6	LONGLANDS 6 <i>No cropping details given</i>	7.4	0	1	4	6.8	84	233

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Gina Graham

On behalf of NRM Ltd

Date 11/08/20

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
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Contact : DARREN INGRAM
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Client : 101067
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Sample Matrix : Agricultural Soil

Laboratory Reference

Card Number 74934/20

Date Received 06-Aug-20

Date Reported 11-Aug-20

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
522445/20	7	LONGLANDS 7 <i>No cropping details given</i>	7.5	0	1	5	9.0	80	277

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.

The analytical methods used are as described in DEFRA Reference Book 427

The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Gina Graham On behalf of NRM Ltd Date 11/08/20

NRM Coopers Bridge, Braziers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www:** nrm.uk.com

MICRO NUTRIENT REPORT

DATE **11th August 2020**
 SAMPLES FROM **101067, LONGLANDS**

DARREN INGRAM
 RSK ADAS LTD
 PRESTON WYNNE
 HEREFORD
 HR1 3PG

Tel: 01432 821025

Reference: 74934/522439/20	Field Name: LONGLANDS 1	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		7.0	1	OM level	data not available for this crop			

Reference: 74934/522440/20	Field Name: LONGLANDS 2	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		6.7	1	OM level	data not available for this crop			

Reference: 74934/522441/20	Field Name: LONGLANDS 3	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		7.5	1	OM level	data not available for this crop			

Reference: 74934/522442/20	Field Name: LONGLANDS 4	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		7.7	1	OM level	data not available for this crop			

Reference: 74934/522443/20	Field Name: LONGLANDS 5	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		8.8	1	OM level	data not available for this crop			

Reference: 74934/522444/20	Field Name: LONGLANDS 6	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		8.0	1	OM level	data not available for this crop			

Reference: 74934/522445/20	Field Name: LONGLANDS 7	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %		8.2	1	OM level	data not available for this crop			

Notes (*)

- (1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.



DATE 11th August 2020
SAMPLES FROM 101067, LONGLANDS

DARREN INGRAM
RSK ADAS LTD
PRESTON WYNNE
HEREFORD
HR1 3PG

SAMPLED BY P69102DI0408

Report reference 74934/20

Tel: 01432 821025
Fax:

Fertiliser Recommendations

The phosphate and potash recommendations shown below, are those required to replace the offtake and maintain target soil indices. The larger recommended applications for soils below target index will allow the soil to build up to this target index over a number of years. Not applying fertiliser to soils which are above target index will allow the soil to run down over a number of years to the target index.

The recommendation should be increased or decreased where yields are substantially more or less than that specified. The amount to apply can be calculated using the expected yield and values for the offtake of phosphate and potash per tonne of yield given in the RB209 9th edition.

All recommendations are given for the mid-point of each Index.

Where a soil analysis value (as given by the laboratory) is close to the range of an adjacent Index, the recommendation may be reduced or increased slightly taking account of the recommendation given for the adjacent Index. Small adjustments of less than 10 kg/ha are generally not justified.

Efficient use of P and K is most likely to be achieved on soils that are well structured and enable good rooting.

For visual evaluation of soil structure (VSS), a score on 1 or 2 would be considered adequate.

Don't forget to deduct nutrients applied as organic manures.

For Nitrogen recommendations please refer to the RB209 9th edition or seek advice from an FACTS qualified adviser.

Target Indices:

Arable, Forage, Grassland and Potato Crops: P Index 2, K Index 2-

(In rotations where most crops are Autumn-sown, soils are in good condition and P is applied annually, high index 1 can be an adequate target.)

Vegetables and Bulbs: P Index 3, K Index 2+

(If vegetables are only grown occasionally as part of an arable rotation, it would be most economic to target index 2 for arable and forage crops.)

Fruit Vines and Hops: P Index 2, K Index 2, Mg Index 2

(Note: Cider apples respond to K Index 3, Mg Index 3)

A lime recommendation is usually for a 20cm depth of cultivated soil or a 15cm depth of grassland soil. Where soil is acid below 20 cm and soils are ploughed for arable crops, a proportionately larger quantity of lime should be applied. However, if more than 10 t/ha is needed, half should be deeply cultivated into the soil and ploughed down, with the remainder applied to the surface and worked in.

For established grassland or other situations where there is no, or only minimal soil cultivation, no more than 7.5 t/ha of lime should be applied in one application.

In these situations, applications of lime change the pH below the surface very slowly. Consequently, the underlying soil should not be allowed to become too acidic because this will affect the root growth and thus limit nutrient and water uptake, which will adversely affect yield.

Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)	
LONGLANDS 1	Not Given / Not Given	Units/Acre			T/Ac	0	0
522439 /		Kg/Ha			Te/Ha	0	0
Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)	
LONGLANDS 2	Not Given / Not Given	Units/Acre			T/Ac	0	0
522440 /		Kg/Ha			Te/Ha	0	0
Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)	
LONGLANDS 3	Not Given / Not Given	Units/Acre			T/Ac	0	0
522441 /		Kg/Ha			Te/Ha	0	0
Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)	
LONGLANDS 4	Not Given / Not Given	Units/Acre			T/Ac	0	0
522442 /		Kg/Ha			Te/Ha	0	0
Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable)	(Grass)	
LONGLANDS 5	Not Given / Not Given	Units/Acre			T/Ac	0	0
522443 /		Kg/Ha			Te/Ha	0	0

Fertiliser recommendations are based on **AHDB RB209 (Ninth Edition)**. If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne. NRM is a UKAS accredited laboratory to ISO/IEC 17025

Report continued.....

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DATE 11th August 2020
SAMPLES FROM 101067, LONGLANDS

SAMPLED BY P69102DI0408

Report reference 74934/20

DARREN INGRAM
RSK ADAS LTD
PRESTON WYNNE
HEREFORD
HR1 3PG

Tel: 01432 821025
Fax:

Fertiliser Recommendations

Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable) (Grass)
LONGLANDS 6	Not Given / Not Given	Units/Acre			T/Ac 0 0
522444 /		Kg/Ha			Te/Ha 0 0

Field Name / Ref / Soil Type	Last Crop / Next Crop	P2O5	K2O	MgO	Lime (Arable) (Grass)
LONGLANDS 7	Not Given / Not Given	Units/Acre			T/Ac 0 0
522445 /		Kg/Ha			Te/Ha 0 0

Fertiliser recommendations are based on **AHDB RB209 (Ninth Edition)**. If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.
NRM is a UKAS accredited laboratory to ISO/IEC 17025



ANALYTICAL REPORT

Report Number	18505-20	K740	DARREN INGRAM	Client	DARREN INGRAM
Date Received	14-AUG-2020		RSK ADAS LTD		
Date Reported	21-AUG-2020		PRESTON WYNNE		
Project	101067 SOIL LATE REQUEST		HEREFORD		
Reference	DARREN INGRAM		HR1 3PG		
Order Number	P69102D10408				

Laboratory Reference		SOIL487222	SOIL487223	SOIL487224	SOIL487225	SOIL487226	SOIL487227	SOIL487228	SOIL487229		
Sample Reference		LONGLANDS 1	LONGLANDS 2	LONGLANDS 3	LONGLANDS 4	LONGLANDS 5	LONGLANDS 6	LONGLANDS 7	P3 SS		
Determinand	Unit	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Sand 2.00-0.063mm	% w/w	20	14	18	17	17	15	18	9		
Silt 0.063-0.002mm	% w/w	49	55	55	52	59	57	59	53		
Clay <0.002mm	% w/w	31	31	27	31	24	28	23	38		
Textural Class **		HCL/HZCL	HZCL	HZCL	HZCL	MZCL	HZCL	MZCL	ZC		

Notes	
Analysis Notes	The sample submitted was of adequate size to complete all analysis requested. The results as reported relate only to the item(s) submitted for testing. The results are presented on a dry matter basis unless otherwise stipulated.
Document Control	This test report shall not be reproduced, except in full, without the written approval of the laboratory.

Reported by	** Please see the attached document for the definition of textural classes. Myles Nicholson Natural Resource Management, a trading division of Cawood Scientific Ltd. Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS Tel: 01344 886338 Fax: 01344 890972 email: enquiries@nrm.uk.com
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ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

For the *sand*, *loamy sand*, *sandy loam* and *sandy silt loam* classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

vf	Very Fine (more than 2/3's of sand less than 0.106 mm)
f	Fine (more than 2/3's of sand less than 0.212 mm)
c	Coarse (more than 1/3 of sand greater than 0.6 mm)
m	Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam* classes according to clay content are indicated as follows:

M	medium (less than 27% clay)
H	heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

APPENDIX 8 – Photographs



Pit 1 (at auger boring 4)

Medium silty clay loam top soil depth to 300 mm

Pit excavated to 800 mm



Pit 2 (near auger boring 5)

Limestone rock at 300 mm



Pit 3 (at auger boring 2)

Limestone present at 400 mm depth



General view from Auger Boring 2 north to B4524 road