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APPENDIX ES15.1

AGRICULTURAL AND SOIL IMPACT ASSESSMENT

Environmental Statement: Agricultural Land Quality and Soil Resources Impact Assessment

East Northants Resource Management Facility, Kings Cliffe, Northamptonshire

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APPENDICES

Appendix 1: Agricultural Land Classification: Land to the West of East Northamptonshire Resource Management Facility, Kings Cliffe, Northamptonshire (C645, Issue 4, 20/10/2020)

NON TECHNICAL SUMMARY

This impact assessment and soil resource strategy (SRS) was commissioned by Augean South Ltd to assess the likely significant environmental effects of the proposed western extension to the East Northants Resource Management Facility (ENRMF), henceforth referred to as 'the Proposed Scheme' (see Section 1.3 below), on agricultural land quality and soil resources. The location and extent of 'the Study Area' is shown on **Figure 1** in **Appendix 1**.

The Planning Inspectorate has determined that the Proposed Scheme requires an Environmental Impact Assessment (EIA) and determined what information should be included in the Environmental Statement (ES) including specific guidance and agricultural land quality and soils. (Case ReferenceWS010005, August 2020). This report forms part of the ES which accompanies the application for the Development Consent Order.

An assessment of agricultural land quality, involving a detailed Agricultural Land Classification (ALC) survey of the Study Area, has been undertaken to determine the quality of agricultural land affected by the Proposed Scheme. The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales, October 1988 ('the ALC Guidelines').

British Geological Survey (BGS) information (1:50,000) indicates the Study Area is mainly underlain by the Rutland Formation (Argillaceous Rocks With Subordinate Sandstone And Limestone), with smaller areas of Lower Lincolnshire Limestone Member (Limestone) and Blisworth Limestone Formation (Limestone). Most of the bedrock is not covered by superficial deposits, yet the southern region is covered by Till, Mid Pleistocene (Diamicton). As described by the SSEW, the Ragdale Association consists of clayey Ragdale series pelo-stagnogley soils that are seasonally waterlogged (Wetness Class III and IV). The Evesham 1 Association consists of calcareous clays that are seasonally waterlogged when undrained (Wetness Class III).

The ALC/SRS survey determined that the quality of agricultural land within the Study Area is predominantly limited by soil wetness to Subgrade 3b (i.e., 19.8 ha). Some shallow soils developed over limestone in the north of the Study Area are limited by soil droughtiness to Subgrade 3a (i.e., 5.9 ha). The remainder is classed as non-agricultural. An ALC map of agricultural land within the Study Area is given as **Figure 2** in **Appendix 1**.

The findings of the ALC survey as the Study Area concurs with a MAFF Post 1988 ALC survey of agricultural land surrounding Kings Cliffe, which also determined a mixture of Subgrade 3a and 3b (see Section 4.0 of **Appendix 1**).

There will be a permanent loss of approximately 5.9ha of Subgrade 3a agricultural land and approximately 19.8 ha of agricultural land in ALC Subgrade 3b as a result of the Proposed Scheme is assessed as being **permanent, moderate adverse impact which is significant**.

In line with current EU and UK Government thinking, the quality and quantity of soil resources (topsoil and subsoil) available for reuse at the site should be identified and safeguarded in the Soil Resource Strategy (SRS) set out in Section 5.0, following the approach of DEFRA's Construction Code of Practice for the Sustainable Management of Soil (2009). By protecting soil resources in this way, the significance of **the residual effect of the Proposed Development on soil resources would be negligible**.

1 INTRODUCTION

1.1 Background

1.1.1 This impact assessment was commissioned by Augean South Limited to assess the likely significant environmental effects of the proposed western extension of the East Northants Resource Management Facility (ENRMF), henceforth referred to as 'the Proposed Scheme' (see Section 1.3 below), on agricultural land quality and soil resources. The location and extent of 'the Study Area' is shown on **Figure 1** in **Appendix 1**.

1.1.2 The Planning Inspectorate has determined that the Proposed Scheme requires an Environmental Impact Assessment (EIA) and determined what information should be included in the Environmental Statement (ES) including specific guidance and agricultural land quality and soils. (Case ReferenceWS010005, August 2020). This report forms part of the ES which accompanies the planning application.

1.2 Statement of Expertise

1.2.1 Robert Askew is the author of this report and the soil scientist who carried out a Soil Resource Survey (SRS) and Agricultural Land Classification as part of this assessment. Robert is a Chartered Scientist (CSci) and a Fellow (F.I. Soil Sci) of the British Society of Soil Science (BSSS). Robert is a Registered Environmental Impact Assessment (EIA) Practitioner with the Institute of Environmental Management and Assessment (IEMA). He has over thirty years of experience in environmental research and consultancy. As an Expert Witness in agriculture and land use, Robert has given evidence at numerous public inquiries; including Town and Country Planning Act (1990) local plan inquiries, 1925 Allotment Act inquiries and Section 78 appeals. Robert is currently Topic Lead for Agriculture, Forestry and Soil for HS2 Phase 2B (Crewe to Manchester), and has recently managed Agricultural Land Classification (ALC) and Soil Resource Surveys as part of Highways England's Lower Thames Crossing (LTC) highway scheme. Robert has given evidence on soil and ALC at the All Party Parliamentary Group (APPG) on Agroecology at the Palace of Westminster.

1.2.2 Robert is highly experienced in land quality assessments, especially ALC, as well as general soil surveying and evaluation. He routinely prepares soil management strategies and advises upon the sustainable use of soil resources on construction and mineral sites. Robert meets the requirements of the BSSS Professional Competency Standard (PCS) scheme for ALC (see BSSS PCS Document 2 '*Agricultural Land Classification of England and Wales*')[1]. The BSSS Scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).

[1] British Society of Soil Science. Professional Competency Scheme Document 2 'Agricultural Land Classification of England and Wales'. Available online @ https://www.soils.org.uk/sites/default/files/events/flyers/ipss-competency-doc2.pdf Last accessed July 2021

1.3 Scope of Agricultural Impact Assessment

1.3.1 This report assesses the potential impacts and associated likely effects of the Proposed Scheme in respect of agricultural land quality and soil resources which are directly affected. It describes the relevant legislation and policy context; the methods used for assessment and details of the criteria used to determine significance; the baseline conditions at and surrounding the Study Area; the potential impacts and effects as a result of constructing and operating the Proposed Scheme; any mitigation or control measures required to reduce or eliminate adverse effects; and the subsequent residual effects and likely significant effects associated with the Proposed Scheme.

1.4 Summary of Proposed Scheme

1.4.1 This section of the report summarises the key aspects of the Proposed Scheme with regard to this assessment of agricultural land and soil resources. As described in a detailed description of the Proposed Scheme in the proposed development section of the ES, the existing ENRMF site comprises an active hazardous waste and low level radioactive waste landfill site including completed and partially restored landfill areas together with a waste treatment and recovery facility. The Proposed Scheme comprises a western extension of the existing ENRMF. The proposal includes the construction of new landfill void to the west of the currently consented hazardous waste and low level radioactive waste landfill area and the alteration of the restoration profile and the timescale for completion of the existing landfill site in order to integrate the final landscape of the existing site with the western extension. The application includes an increase in the consented throughput of waste to the waste treatment and recovery facility and an increase in the total waste input rate to the site. In order to construct the western extension void it will be necessary to win and work minerals including the extraction of soils, overburden and clay. The soils and some clay will be retained on site for use in site restoration and the construction of the low permeability engineered liner and capping layers. The remaining materials will be exported off site. The application includes the alteration of the operational period of the current site activities and the western extension to approximately 2046.

1.5 Assessment Methodology

1.5.1 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF)[2] 'Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October, 1988 (henceforth referred to as the 'the ALC Guidelines').

1.5.2 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 ALC

[2] The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

system divides agricultural land into five grades (Grade 1 '*Excellent*' to Grade 5 '*Very Poor*'), with Grade 3 subdivided into Subgrade 3a '*Good*' and Subgrade 3b '*Moderate*'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the '*best and most versatile*' category in Paragraph 170 and 171 of the National Planning Policy Framework (NPPF) revised in February 2019. Further details of the ALC system and national planning policy implications are set out by Natural England in Technical Information Note 049[3].

1.5.3 A detailed ALC survey of agricultural land within the Study Area was carried out in December 2018. This involved examination of the soil's physical properties at 28 locations on agricultural land, as shown on **Figure 1, Appendix 1**. The sample locations were located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary. The soil profile was examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 5 cm diameter Dutch (Edleman) soil auger. One soil pit, i.e., Pit 1, was excavated by hand with a spade in order to examine certain soil physical properties, such as stone content and the structural condition of the subsoil, more closely. The soil profile at each auger-bore and pit location was described using the 'Soil Survey Field Handbook: Describing and Sampling Soil Profiles' (Ed. J.M. Hodgson, Cranfield University, 1997).

1.5 Structure of the Remainder of this Impact Assessment Report

1.6.1 The remainder of this report is structured as follows:

- Section 2 - Impact Assessment Methodology;
- Section 3 – Baseline Information: Agricultural Land Quality and Soils;
- Section 4 – Impact Assessment;
- Section 5 – Mitigation; and
- Section 6 – Residual Effects.

[3] Natural England (December, 2012). 'Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)'. Available online @ http://publications.naturalengland.org.uk/publication/35012 Last accessed July 2021

2 IMPACT ASSESSMENT METHODOLOGY

2.1 Legislation and Policy

2.1.1 Soil is a key component of the environment, alongside air and water. Having produced Directives to protect air and water, the European Union (EU) is considering a European-wide policy for soil protection. Accordingly, the United Kingdom (UK) Government has included within the National Planning Policy Framework (see below) policy regarding the sustainable use of soil resources and development of agricultural land. Following amendments to the EU Environmental Impact Assessment (EIA) Directive in 2014, likely significant effects on 'land' is required to be assessed under the EIA Regulations in 2017. The legislative framework for this assessment of soil and agriculture is summarised as follows:

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

2.2 National Planning Policy Framework (NPPF) July 2021

2.2.1 National planning policy guidance on development involving agricultural land is set out in National Planning Policy Framework (NPPF), which was revised on the 20th July 2021. The NPPF aims to provide a simplified planning framework which sets out the Government's economic, environmental and social planning policies for England. The NPPF includes policy guidance on '*Conserving and Enhancing the Natural Environment*' (Section 15). Paragraph 174 (a and b) (page 49) are of relevance to this assessment of agricultural land quality and soil and state that:

'174…Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;…'

2.2.4 Paragraph 175 of the NPPF (2021) goes on to describe that:

'175. Plan should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework[58] …'

2.2.2 Footnote number 58 states that:

'[53] Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.'

2.2.3 Paragraph 210(h) of the NPPF (2021) refers to high quality restoration and aftercare of mineral sites as follows:

'Planning policies should:

h) 'ensure that worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and that high quality restoration and aftercare of mineral sites takes place.'

2.3 National Planning Practice Guidance (NPPG), March 2014

2.3.1 The National Planning Practice Guidance (NPPG)[4], March 2014, is a web-based resource which brings together planning guidance on various topics into one place. The following paragraphs set out in the NPPG (2014) are relevant to soil and agricultural land quality, respectively, as follows:

'Paragraph 025: The National Planning Policy Framework states that the planning system should protect and enhance valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important 'ecosystem services', for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution. As part of the Government's 'Safeguarding our Soils' strategy, Defra has published a code of practice on the sustainable use of soils on construction sites, which may be helpful in development design and setting planning conditions' [see 'Best Practice Guidance' below]*;* and

'Paragraph 026: The National Planning Policy Framework expects local planning authorities to take into account the economic and other benefits of the best and most versatile agricultural land (see NPPF above).'

2.4 Hazardous Waste NPS (2013)

2.4.1 The Hazardous Waste National Polocy Statement (2013) includes paragraphs 5.10.6 and 5.10.13 which state (*inter alia*) that:

'5.10.6 *Applicants should take into account the economic and other benefits of the best and most versatile agricultural land (defined as grades 1, 2 and 3a of the Agricultural Land Classification). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land (grades 3b, 4 and 5) in preference to that of higher quality. Applicants should also identify any effects and seek to*

[4] National Planning Practice Guide (March, 2014). Available online @ https://www.gov.uk/government/collections/planning-practice-guidance Last accessed July 2021

minimise impacts on soil quality taking into account any mitigation measures proposed. Where possible, facilities should be developed on previously developed (brownfield) sites…'

'5.10.13 *The Secretary of State should ensure that justification is provided where applicants site their scheme on the best and most versatile agricultural land. The Secretary of State should give little weight to the loss of agricultural land in grades 3b, 4 and 5, except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environment or local economy. The Secretary of State should also take account of any loss of high quality soil include the value of peat for biodiversity and carbon store, as well as taking account of whether the proposal gives rise to any soil contamination….'*

2.5 Local Plan Policies

2.5.1 The Northamptonshire Minerals and Waste Local Plan (July 2017) includes Policy 24 which states *inter alia* that **'***The restoration of minerals and waste sites should meet the following requirements (where appropriate):… sites previously comprising high-grade agricultural land or good-quality forestry use should be restored to the original land use and coupled with a secondary after-use objective'.*

2.5.2 Relevant local plan policy is contained in the East Northamptonshire Local Plan adopted in 1996. The local plan contains policy AG1 regards development on agricultural land:

'*Policy AG1*

Planning permission will not normally be granted for proposals involving the use of the best and most versatile agricultural land (Grades 1, 2 and 3a), unless there is no other site suitable for the development.'

2.5.3 The third bullet of Policy 24 in the Northamptonshire Minerals and Waste Local Plan (Adopted July, 2017) states that

'*Policy 24: Restoration and after use*

…sites previously comprising high-grade agricultural land or good-quality forestry use should be restored to the original land use and coupled with a secondary after-use objective…'

2.5.4 There are no specific policies regarding the best and most versatile agricultural land in the(i) North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016, or (ii) The Rural North, Oundle and Thrapston Plan, July 2011. Therefore, consideration should be given to the relevant national and Development Plan guidance and policy set out above.

2.6 Best Practice Guidance

2.6.1 The Department for Environment, Food and Rural Affairs (Defra) has published '*Safeguarding our Soils – A Strategy for England*' (24th September 2009). The Soil Strategy was published in tandem with a '*Code of Practice for the Sustainable Use of Soils on Construction Sites*'[5].

2.6.2 Best practice for the handling of soil is set out in MAFF (2000) '*Good Practice Guide for Handling Soils*' (Sheets 1 to 4 are of main relevance to this assessment)[6].

2.6.3 Best practice for the restoration of agricultural land is set out in DEFRA (1999) '*Guidance for Successful Reclamation of Mineral and Waste Sites*'[7].

2.7 Significance Matrix

2.7.1 As described IEMA's EIA Guidelines (2004)[8], '*…the assessment of significance is based on the characteristics (or magnitude) of the impact and the sensitivity of the receptor…*'

2.7.2 The significance of the predicted impacts, which may be Beneficial (positive) or Adverse (negative), agricultural land quality and soil resources can be assessed as either 'Major', 'Moderate', 'Minor' or 'Negligible' according to the magnitude of the effect and sensitivity of the receptor, as set out in the Impact Assessment Matrix (IAM) given as Table 2.1.

Table 2.1: Impact Assessment Matrix – Agricultural Land Quality and Soil Resources

Magnitude of Effect	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Very Low**
Very High	Major	Major	Moderate	Minor	Negligible
High	Major*/Moderate	Major*/Moderate	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Minor	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible	Negligible

*Where total of Grades 1, 2 and 3a is 20ha or more

[5] Department for Environment, Food and Rural Affairs (DEFRA) (September, 2009). Code of Construction Practice for the Sustainable Use of Soil on Construction Sites. Available online @ https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites Last accessed July 2021

[6] Ministry of Agriculture, Fisheries and Food (MAFF) (2000) '*Good Practice Guide for Handling Soils*' (Sheets 1 to 4). Available online @ http://webarchive.nationalarchives.gov.uk/20090306103114/http:/www.defra.gov.uk/farm/environment/land-use/soilguid/index.htm Last accessed July 2021

[7] Department for Environment, Food and Rural Affairs (DEFRA) (August, 2004). Guidance for Successful Reclamation of Mineral and Waste Sites. http://webarchive.nationalarchives.gov.uk/20090306103114/http:/www.defra.gov.uk/farm/environment/land-use/reclamation/guidance-full.pdf Last accessed July 2021

[8] Institute of Environmental Management and Assessment (IEMA') (2004) 'Guidelines for Environmental Impact Assessment'

2.8 Magnitude of Effect

I. Agricultural Land Quality

2.8.1 The magnitude of the predicted impact on agricultural land quality is assessed as 'High', 'Medium', 'Low' or 'Very Low' following the criteria given in Table 2.2 below.

Table 2.2: Impact Magnitude for Agricultural Land

Impact Magnitude	Definition
Very High	Gives rise to an irreversible and permanent (>25 year) long term loss of more than 20 ha agricultural land of that grade or predicted long term reduction in ALC grade on more than 20 ha agricultural land of that grade (see Note 1).
High	Gives rise to an irreversible and permanent (>25 year) long term loss of between 5 and 20 ha of agricultural land of that grade, or predicted long term reduction in ALC grade on between 5 and 20 ha of agricultural land of that grade.
Medium	Development is 5 ha or more and temporary (< 25 years), or potentially 'reversible' such as soft uses that could be returned relatively easily back to agricultural land. Some adverse on-site impacts anticipated e.g., reduced yields, increased management inputs but recovery predicted in the short to medium term (within 5-10 years, see Note 2) following end of use without permanent reduction in ALC grade provided appropriate mitigation is in place.
Low	Affects < 5ha of agricultural land or with short term effects with no material reduction in ALC grade, or development with short-term effects.
Very Low	Non-agricultural land

Note 1: Magnitude assessments reflect the national agricultural interest embodied in the BMV consultation threshold under the Town and Country Planning (Development Management Procedure) (England) Order 2015 (20ha); and at the lower magnitude (5ha) follows the applicable thresholds and criteria of EIA Regulations 2017, Schedule 2 (10)(b). and threshold for agricultural permitted development rights.

Note 2: Based on 5 year aftercare period for minerals development, to allow soil structure to develop post soil disturbance.

II. Soil Resources

2.8.2 The magnitude of the predicted impact on soil resources may be assessed as 'High', 'Medium', 'Low' or 'Very Low' following the criteria given in Table 2.3 below.

Table 2.3: Magnitude of Impact - Soil Resources

Magnitude of Impact	Soil Resources
High	**50,000 m^3 of soil or more**

Table 2.3: Magnitude of Impact - Soil Resources	
Magnitude of Impact	**Soil Resources**
	Based on soil resources within 20.0 ha (200,000 m^2) of land area or more, with an average 0.25m (25 cm) layer of soil (topsoil or subsoil) (see **Note 1**)
Medium	**25,000 m^3 to 49,999 m^3 of soil** Based on soil resources within 10.0 ha to 19.9 ha (100,000 m^2 to 199,999 m^2) of land area, with an average 0.25m (25 cm) layer of soil (topsoil or subsoil).
Low	**12,500 m^3 to 24,999 m^3 of soil** Based on soil resources within 5.0 ha to 9.9 ha (50,000 m^2 to 99,999 m^2) of land area, with an average 0.25m (25 cm) layer of soil (topsoil or subsoil) (see **Note 2**)
Very Low	**12,999 m^3 or less** Based on soil resources within 4.9 ha or less (49,999 m^2 or less) of land area, with an average 0.25m (25 cm) layer of soil (topsoil or subsoil).
Note 1: Magnitude assessments reflect the national agricultural interest embodied in the BMV consultation threshold under the Town and Country Planning (Development Management Procedure) (England) Order 2015 (20ha); and at the lower magnitude (5ha) follows the applicable thresholds and criteria of EIA Regulations 2017, Schedule 2 (10)(b). and threshold for agricultural permitted development rights.	

2.9 Sensitivity of Receptors

I. Agricultural Land Quality

2.9.1 For the purpose of this assessment, the sensitivity of agricultural land receptors is assessed as 'Very High', 'High', 'Medium', 'Low' or 'Very Low' following the criteria given in Table 2.4 below.

Table 2.4: Receptor Sensitivity - Agricultural Land Quality	
Value	**Receptors**
Very High	ALC Grade 1 (Excellent Quality) or Grade 2 (Very Good Quality)
High	ALC Subgrade 3a (Good Quality)
Medium	ALC Subgrade 3b (Moderate Quality)
Low	ALC Grade 4 (Poor Quality) and Grade 5 (Very Poor Quality)
Very Low	Previously developed land in 'hard uses' with little potential to return to agriculture

II. Soil Resources

2.9.2 For the purpose of this assessment, the sensitivity of agricultural receptors is assessed as 'High', 'Medium', 'Low' or 'Very Low' following the criteria given in Table 2.5 below.

Table 2.5: Receptor Sensitivity - Soil Resources

Value	Receptors
High	Soil types with low resilience to structural damage when being handled: heavy soils with >27% clay content: heavy silty clay loam (HZCL), heavy clay loam (HCL), sandy clay (SC), silty clay (ZC), clay (C); where average annual rainfall is 700mm or greater.
Medium	Soil types with moderate resilience to structural damage when being handled: - Light textured soils: sand (S), loamy sand (LS), sandy loam (SL), sandy silt loam (SZL); where average annual rainfall is more than 1000mm; - Medium textured soils with <27% clay content: silt loam, medium silty clay loam (MZCL), medium clay loam (MCL), sandy clay loam (SCL); where average annual rainfall is 1000mm or greater; Heavy soils with >27% clay content: heavy silty clay loam (HZCL), heavy clay loam (HCL), sandy clay (SC), silty clay (ZC), clay (C); where average annual rainfall is less than 700mm.
Low	Soil types with high resilience to structural damage when being handled: Light textured soils: sand (S), loamy sand (LS), sandy loam (SL), sandy silt loam (SZL); where average annual rainfall is less than 1000mm.
Very Low	Soil types unsuitable for reuse in restoring agricultural land, reuse in residential gardens, reuse in landscaping schemes, or reuse in ecological schemes, etc. For example, Made Ground/contaminated land.

3 BASELINE INFORMATION: AGRICULTURAL LAND QUALITY AND SOILS

3.1 Background

3.1.1 This section of the agricultural impact assessment provides baseline conditions within the Study Area in terms of agricultural land quality and soils.

3.1.2 As described in Section 1.4 'Assessment Methodology', a detailed Agricultural Land Classification (ALC) and Soil Resource Survey (SRS) and was carried out on agricultural land at the Study Area in December 2018. Details of the ALC/SRS, including a log of the 28 soil profiles examined (see Figure 1), and a description of a soil pit (Pit 1), are given in **Appendix 1**. This section provides a summary of the baseline conditions.

3.2 Agricultural Land Classification

3.2.1 British Geological Survey (BGS) information (1:50,000) indicates the Study Area is mainly underlain by the Rutland Formation (Argillaceous Rocks With Subordinate Sandstone And Limestone), with smaller areas of Lower Lincolnshire Limestone Member (Limestone) and Blisworth Limestone Formation (Limestone). Most of the bedrock is not covered by superficial deposits, yet the southern region is covered by Till, Mid Pleistocene (Diamicton). As described by the SSEW, the Ragdale Association consists of clayey Ragdale series pelo-stagnogley soils that are seasonally waterlogged (Wetness Class III and IV). The Evesham 1 Association consists of calcareous clays that are seasonally waterlogged when undrained (Wetness Class III).

3.2.2 The ALC/SRS survey determined that the quality of agricultural land within the proposed western extension of the ENRMF is predominantly limited by soil wetness to Subgrade 3b (i.e., 19.8 ha). Some shallow soils developed over limestone in the north of the proposed western extension are limited by soil droughtiness to Subgrade 3a (i.e., 5.9 ha). The remainder is classed as non-agricultural. An ALC map of agricultural land within the Study Area is given as **Figure 2** in **Appendix 1**.

3.2.3 The findings of the ALC of the proposed western extension of the ENRMF concurs with a MAFF Post 1988 ALC survey of agricultural land surrounding Kings Cliffe, which also determined a mixture of Subgrade 3a and 3b (see Section 4.0 of **Appendix 1**).

3.2.4 The area and proportion of agricultural land in each ALC grade, and the sensitivity of the agricultural land quality receptor, is summarised in Table 3.1 below.

Table 3.1: Agricultural Land Classification – Proposed Western Extension to the Extisting ENRMF, Kings Cliffe, Northants		
ALC Grade	**Total (Ha)**	**Total (% of Study Area)**
Grade 1 (Excellent) – Very High Sensitivity	0	0
Grade 2 (Very Good) – Very High Sensitivity	0	0
Subgrade 3a (Good) – High Sensitivity	5.9	22.5
Best and Most Versatile (BMV), i.e., ALC Grade 1, 2 and Subgrade 3a	*5.9*	*22.5*
Subgrade 3b (Moderate) – Moderate Sensitivity	19.8	75.6
Grade 4 (Poor) – Low Sensitivity	0	0
Grade 5 (Very Poor) – Low Sensitivity	0	0
Other Land / Non-agricultural (including the parcel of woodland) – Very Low Sensitivity	0.5	1.9
Total	**26.2**	**100.0**

3.3 Soil Resource Survey (SRS)

3.3.1 Details of the SRS, including a log of the 28 soil profiles examined (see Figure 1), and a description of a soil pit (Pit 1), are given in **Appendix 1**.

3.3.2 The depth of topsoil (heavy clay loam) in the Subgrade 3a area (see above and **Figure 2**, **Appendix 1**) is approximately 30cm below ground level. Below the layer of topsoil, the depth of recoverable subsoil (calcareous clay) above the limestone rock is approximately 25cm, i.e., the layer 30cm-55cm below ground level. Following Table 2.5, the sensitivity of the calcareous heavy clay loam in the Subgrade 3a unit is high.

3.3.3 The depth of the clay topsoil in the Subgrade 3b area (see above and **Figure 2**, **Appendix 1**) is approximately 25cm below ground level. Below the layer of topsoil (clay), the depth of recoverable upper subsoil (clay) is approximately 30cm, i.e., the layer 25cm-50cm below ground level. The lower subsoil (clay) extends between 50cm-120cm below ground level. Following Table 2.5, the sensitivity of the calcareous heavy clay loam in the Subgrade 3a unit is high.

3.3.4 For purposes of soil stripping, the range of heavy clay loam and clay topsoils on agricultural land at the western extension area which is available for stripping, storage and re-use in the restoration scheme, is all assessed as being of high sensitivity. All the topsoil may thus be regarded as a single unit for stripping. Likewise, all the clay subsoil (i.e., high sensitivity) on agricultural land within the Study Area may be stripped as a single unit.

4 IMPACT ASSESSMENT

4.1 Evaluation

4.1.1 The main likely significant environmental effects of the Proposed Scheme on agricultural land quality and soil receptors are:

(i) Loss of agricultural land, particularly the 'best and most versatile' (BMV) agricultural land, i.e., ALC Grades 1, 2 and Subgrade 3a (see NPPF, Section 2.0); and

(ii) Reduction in the quality and quantity of soil resources within the Study Area which are available for land restoration following mineral extraction.

4.1.2 The method used to assess 'significance' is set out in Section 2.0. The magnitude of impact on agricultural land quality is described in Table 2.2, and the magnitude of impact on soil resources is set out in 2.3. The sensitivity of agricultural land quality is set out in Table 2.4 and the sensitivity of soil receptors is described in Table 2.5.

4.2 Potential Effects

I. Agricultural Land Quality

4.2.1 From the baseline information given in Section 3.0, the Proposed Scheme will potentially adversely affect approximately 5.9ha of agricultural land in ALC Subgrade 3a (high sensitivity). Therefore, a total of 5.9ha (high magnitude) of best and most versatile (BMV) agricultural land (high sensitivity) will be affected by the Proposed Scheme. The significance of the effect of the Proposed Scheme on BMV agricultural land is assessed as being **permanent, moderate adverse – which is significant**. As per Table 2.1, the significance of the effect is moderate, as less than 20ha of BMV agricultural land is affected.

4.2.2 In addition, the Proposed Scheme will potentially adversely affect approximately 19.8 ha (high magnitude) of agricultural land in ALC Subgrade 3b (moderate sensitivity). The significance of this effect is assessed as being **permanent, moderate adverse – which is significant**.

4.2.3 There is approximately 0.5 ha (very high magnitude) of other/non-agricultural land (very low sensitivity) within the proposed western extension area, i.e., woodland. The significance of the effect of the Proposed Scheme on other/non-agricultural land is assessed as being **negligible – which is not significant** in agricultural land quality terms.

II. Soil Resources

4.2.4 As described in Section 1.4, the Proposed Scheme involves stripping the soil and overburden in the western extension area (which equates to the majority of the agricultural land surveyed during the ALC survey) and excavating the mineral beneath to create a void. The void will be

infilled and capped with a clay cap. Therefore, all of the topsoil (which may be regarded as a single unit for soil stripping purposes – see Section 3.3) will be stripped from ground level to a depth of 25cm (250mmm), i.e., the minimum depth of topsoil on the agricultural land within the proposed western extension. A 25cm layer of upper subsoil, i.e., the layer of soil immediately beneath the topsoil, will also be stripped from the agricultural land within the proposed western extension. The stripped soil will be stockpiled and reused in land restoration once landfilling and capping is complete.

4.2.5 From the magnitude criteria set out in Table 2.3, and the sensitivity of receptors set out in Table 2.5, the significance of the temporary effect of the Proposed Scheme on topsoil and subsoil resources from existing agricultural land within the Study Area is assessed in Table 4.1, prior to the implementation of mitigation measures.

Table 4.1: Impact Assessment – Soil Type 1 (agricultural land)

Area of Soil Type (ha and m^2)	Approximate volume (m^3) (magnitude of impact)	Sensitivity of soil receptor	Significance prior to the implementation of mitigation measures
Total Volume of Topsoil			
25.7ha or 257,000 m^2	Thickness of topsoil layer = 0.25m x 257,000m^2 = **64,250m^3** (no bulking factor) (high magnitude)	Heavy clay loam and clay topsoil (high sensitivity)	**Temporary, Major Adverse – Significant** (prior to mitigation)
Total Volume of Type 1 Subsoil			
25.7ha or 257,000 m^2	Thickness of subsoil layer = 0.25m x 257,000m^2 = **64,250m^3** (no bulking factor) (high magnitude)	Clay topsoil (high sensitivity)	**Temporary, Major Adverse – Significant** prior to mitigation)

4.3 Potential Effects – Post Mineral Extraction and Land Restoration

4.3.1 It is predicted that, once minerals have been extracted and the land has been restored as per Proposed Restoration Scheme, there will be no further significant effects on agricultural land quality and soil receptors.

5 MITIGATION

5.1 Background

5.1.1 This section provides mitigation measures to avoid, reduce or offset the adverse effects of the Proposed Scheme.

5.2 Agricultural Land Quality

5.2.1 As part of the Proposed Scheme, it is proposed to restore land within the site to a mixture of grassland and woodland for biodiversity and nature conservation purposes, as shown on the Restoration Concept Scheme. None of the original agricultural land will be returned to its former agricultural productivity, but all of the soil will be used for land restoration on site. Soil from the Subgrade 3a land in the northern part of the western extension area is a calcareous, heavy clay loam which will be husbanded for reuse in the areas of calcareous grassland as part of the restoration scheme.

5.3 Soil Resource Strategy (SRS)

5.3.1 Proposed mitigation with regard to the safeguarding and reuse of soil resources within the Study Area in a sustainable manner is described below.

I. General Requirements for Soil Handling

5.3.2 The quality and quantity of soil resources (topsoil and subsoil) within the Study Area shall be maintained by following the approach of the DEFRA 'Code of Practice for the Sustainable Management and Use of Soil on Construction Sites' (Defra, September 2009) (available online @ https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites).

5.3.3 All soil and soil forming materials shall be handled in accordance with MAFF's Good Practice Guide for Handling Soil, Sheets 1 – 4 (handling soil using backacters and dumptrucks). As per: http://www.defra.gov.uk/farm/environment/land-use/soilguid/index.htm.

5.3.4 All soil shall only be moved when in a dry and friable condition. For all soil types, no soil handling should proceed during and shortly after significant rainfall, and/or when there are any puddles on the soil surface.

5.3.5 Throughout the period of working, restoration and Aftercare, the operator shall take all reasonable steps to ensure that drainage from areas adjoining the Study Area is not impaired or rendered less efficient by the permitted operations.

5.3.6 Any oil, fuel, lubricant, paint or solvent within the Study Area shall be so stored as to prevent such material from contaminating topsoil, subsoil, soil forming material, or reaching any watercourse.

II. Ground Preparation

5.3.7 Prior to stripping agricultural topsoil, all above-ground vegetation should be cleared off site, so that the amount of vegetation within the topsoil strip is minimised (this is to minimise the amount of anaerobic decomposition of vegetation / organic matter that will occur within the topsoil stockpiles).

III. Soil Stripping

5.3.8 Before any part of the Study Area is excavated or traversed by heavy vehicles or machinery or is built upon, or used for the stacking of topsoil, subsoil or overburden, or as a machinery dump or plant yard, or for the construction of a road, all available topsoil and subsoil shall be stripped from that part.

IV. Soil Storage

5.3.9 Bunds for the storage of soils shall conform to the following criteria:

(i) Topsoil and subsoil (referred to as overburden) shall be stored separately.

(ii) Where continuous bunds are used, dissimilar soils shall be separated by a third material, previously agreed in writing with the Mineral Planning Authority (MPA).

(iii) topsoil bunds shall not exceed 3m in height and subsoil bunds shall not exceed 5m in height.

(iv) Materials shall be stored like upon like, so that topsoil shall be stripped from beneath subsoil bunds, and subsoil from beneath overburden bunds.

(v) All storage bunds containing soils which are intended to remain in situ for more than 6 months or over the winter period are to be grassed over and weed control and other necessary maintenance carried out to the satisfaction of the MPA. The seed mixture and the application rates are to be agreed with the MPA in writing no less than one month before it is expected to complete the formation of the storage bunds.

(vi) All topsoil, subsoil, and soil forming material shall be retained within the Study Area.

6 RESIDUAL EFFECTS

6.1 Residual Effects

6.1.1 This section assesses significant residual effects of the Proposed Scheme on agricultural land quality and soil resources, once mitigation measures set out in Section 5.0 are implemented.

6.2 Agricultural Land Quality

6.2.1 The significance of the residual effect of the Proposed Scheme on approximately 5.9ha of Subgrade 3a agricultural land is assessed as being **permanent, moderate adverse – which is significant**. As per Table 2.1, the significance of the effect is moderate, as less than 20ha of BMV agricultural land is affected.

6.2.2 In addition, the Proposed Scheme would adversely affect approximately 19.8 ha (high magnitude) of agricultural land in ALC Subgrade 3b (moderate sensitivity). The significance of this residual effect is assessed as being **permanent, moderate adverse – which is significant**.

6.3 Soil Resources

6.3.1 In line with current EU and UK Government thinking, the quality and quantity of soil resources (topsoil and subsoil) available for reuse at the site should be identified and safeguarded in the Soil Resource Strategy (SRS) set out in Section 5.0, following the approach of DEFRA's Construction Code of Practice for the Sustainable Management of Soil (2009).

6.3.2 By protecting soil resources in this way, the significance of the residual effect of the Proposed Development on soil resources would be **negligible**.

Appendix 1
Agricultural Land Classification: Land to the West of East Northamptonshire Resource Management Facility, Kings Cliffe, Northamptonshire (C645, Issue 4, 20/10/2020)

Agricultural Land Classification:

Land to the West of
East Northamptonshire Resource Management Facility,
Kings Cliffe, Northamptonshire

Prepared for:
MJCA

On Behalf of:
Augean South Ltd

Prepared by:
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Askew Land & Soil Limited

Date:
20th October 2020

Project Number:
C645

Contract/Proposal No:	C645
Issue:	4
Author:	Rob Askew
Date:	20th October 2020

Our interpretation of the site characteristics is based on available data made during our desktop study and soil survey. This desktop study and soil survey has assessed the characteristics of the Study Area in relation to the assessment of its Agricultural Land Classification. It should not be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of MJCA and Augean South Ltd. No warranty is provided to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon by a third party or is used in circumstances for which it was not originally intended.

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1 INTRODUCTION

1.1 Background

1.1.1 This report was commissioned by MJCA on behalf of Augean South Ltd to determine the quality of agricultural land to the west of the East Northamptonshire Resource Management Facility near Kings Cliffe, Northamptonshire, PE8 6XX ('the Study Area'). The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales (see 'Methodology' below).

1.1.2 The approximately 28.2 hectare (ha) Study Area is located to the northwest of Kings Cliffe, as shown on **Figure 1**. The approximate centre of the Study Area is located at British National Grid (BNG) reference TF 0031 0022.

1.2 Methodology

1.2.1 This report has been prepared by a Chartered Scientist (CSci), who is a Professional Member of the British Society of Soil Science (BSSS). The author meets the requirements of the BBSS Professional Competency Standard (PCS) scheme for ALC (see BSSS PCS Document 2 'Agricultural Land Classification of England and Wales', given as **Appendix A**). The BSSS PCS Standard scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA) (see Appendix A also).

1.2.2 This assessment is based upon the findings of a study of published information on climate, geology and soil, in combination with the findings of a detailed soil investigation carried out by the former Ministry of Agriculture, Fisheries and Food (MAFF)[1] in accordance with the national 'Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October, 1988 (henceforth referred to as the 'the ALC Guidelines').

1.2.3 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 ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the 'best and most versatile' category in Paragraph 170 and 171 of the National Planning Policy Framework (NPPF), as revised in February 2019. Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049[2]

[1] The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

[2] Natural England (December, 2012). 'Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)'. Available online @ http://publications.naturalengland.org.uk/publication/35012 Last accessed October 2020

1.3 Structure of the Remainder of this Report

1.3.1 The remainder of this report is structured as follows:

- Section 2 – Planning Policy Framework
- Section 3 – Agricultural Land Classification;
  - Climate;
  - Site (Gradient, Micro-relief, Risk of Flooding);
  - Soil (Geology, Soil Properties);
  - Interactive Limitations (Soil Droughtiness, Soil Wetness);
  - ALC Grading at the Study Area.
- Section 4 - ALC at the Study Area in a Wider Geographical Context;
- Section 5 – Summary and Conclusions

2 PLANNING POLICY FRAMEWORK

2.1 Background

2.1.1 This section of the report sets out the national and local planning framework in which to assess the opportunities and constraints to development at the Study Area in agricultural land quality terms.

2.2 National Planning Policy Statement (NPPF) February 2019

2.2.1 National planning policy guidance on development involving agricultural land is set out in National Planning Policy Framework (NPPF), which was revised on the 19th February 2019. The NPPF aims to provide a simplified planning framework which sets out the Government's economic, environmental and social planning policies for England. The NPPF includes policy guidance on '*Conserving and Enhancing the Natural Environment*' (Section 15). Paragraph 170 (a and b) (page 49) are of relevance to this assessment of agricultural land quality and soil and state that:

'170…Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;…' National planning *other benefits of the best and most versatile agricultural land, and of trees and woodland;…'*

2.2.2 Paragraph 171 of the NPPF (2019) goes on to describe that:

'171. Plan should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework[53] …'

2.2.3 Footnote number 53 states that:

'[53] Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.'

2.3 Development Plan Policy

2.3.1 The National Policy Statement for Hazardous Waste (June 2013) contains relevant policy at paragraphs 5.10.6 and 5.10.13 (inter alia), as follows:

'*5.10.6 Applicant should take into account the economic and other benefits of the best and most versatile agricultural land (defined as grades 1, 2 and 3a of the Agricultural Land Classification). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality (grades 3b, 4 and 5) in preference to that of a higher quality*'.

'*5.10.13 The Secretary of State should ensure that justification is provided where applicants site their scheme on best and most versatile agricultural land. The Secretary of State should give little weight to the loss of agricultural land in grades 3b, 4 and 5…*'

2.3.2 Relevant local plan policy is contained in the East Northamptonshire Local Plan adopted in 1996. The local plan contains policy AG1 regards development on agricultural land:

'*Policy AG1*

Planning permission will not normally be granted for proposals involving the use of the best and most versatile agricultural land (Grades 1, 2 and 3a), unless there is no other site suitable for the development.'

2.3.3 The third bullet of Policy 24 in the Northamptonshire Minerals and Waste Local Plan (Adopted July, 2017) states that

'*Policy 24: Restoration and after use*

…sites previously comprising high-grade agricultural land or good-quality forestry use should be restored to the original land use and coupled with a secondary after-use objective…'

2.3.4 There are no specific policies regarding the best and most versatile agricultural land in the(i) North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016, or (ii) The Rural North, Oundle and Thrapston Plan, July 2011. Therefore, consideration should be given to the relevant national and Development Plan guidance and policy set out above.

2.4 Best Practice Guidance

2.4.1 The Department for Environment, Food and Rural Affairs (Defra) has published '*Safeguarding our Soils – A Strategy for England*' (24th September 2009). The Soil Strategy was published in tandem with a '*Code of Practice for the Sustainable Use of Soils on Construction Sites*'. The Soil Strategy for England, which builds on Defra's '*Soil Action Plan for England (2004-2006)*, sets out an ambitious vision to protect and improve soil to meet an increased global demand for food and to help combat the adverse effects of climate change.

3 AGRICULTURAL LAND CLASSIFICATION

3.1 Background

3.1.1 This section of the report sets out the findings of the Agricultural Land Classification (ALC). It is based on a desktop study of relevant published information on climate, topography, geology and soil, in conjunction with a soil survey.

3.1.2 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- Climate;
- Site;
- Soil; and
- Interactive limitations.

3.1.3 These factors are considered in turn below.

3.2 Climate

3.2.1 Interpolated climate data relevant to the determination of the Agricultural Land Classification (ALC) grade of land at the Study Area is given in Table 3.1 below.

Table 3.1: ALC Climate Data

Climate Parameter	Data for TF 00312 00223
Average Altitude (m)	82
Average Annual Rainfall (mm)	607
Accumulated Temperature above 0˚C (January – June)	1368
Moisture Deficit (mm) Wheat	106
Moisture Deficit (mm) Potatoes	97
Field Capacity Days (FCD)	123
Grade According to Climate	1

3.2.2 With reference to Figure 1 '*Grade according to climate*' on page 6 of the ALC Guidelines, there is no overall climatic limitation to the quality of agricultural land at the Study Area. This means that agricultural land at the Study Area could be graded as ALC Grade 1 in overall climatic terms, in the absence of any other limiting factor, i.e. site, soil and/or interactive limitations.

3.2.3 Agricultural land at the Study Area is predicted to be at field capacity (i.e. near saturation point) for 123 days per year, mainly over the late autumn, winter and early spring. In combination with topsoil texture will cause an 'interactive limitations' to agricultural land quality at the Study Area, i.e. soil wetness and / or soil droughtiness (see below).

3.3 Study Area

3.3.1 As shown on the location plan given as **Figure 1**, the approximately 28.2 ha Study Area is located to the west of the existing East Northamptonshire Resource Management Facility to the northwest of Kings Cliffe, Northamptonshire. The approximate centre of the Study Area is located at British National Grid (BNG) reference TF 00312 00223.

3.3.2 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- Gradient;
- Micro-relief (i.e. complex change in slope angle over short distances); and
- Risk of flooding.

I. Gradient and Micro-Relief

3.3.3 The Study Area is broadly level at approximately 100 metres (m) Above Ordnance Datum (AOD) at the highest point in the northeast corner of the Study Area, and 82 metres mAOD at the lowest point in the centre of the Study Area. The quality of agricultural land is not limited by gradient (as per Table 1 of the ALC Guidelines, 1988), as the angle of slope does not exceed 7°. Likewise, the quality of agricultural land at the Study Area is not limited by micro-relief, i.e. complex changes in slope angle and direction over short distances.

II. Risk of Flooding

3.3.4 From the Government Flood Map for Planning website[3], the entire Study Area is located in Flood Zone 1, at low risk of flooding by rivers or the sea. However, there is insufficient data/records available to determine if the duration and frequency of flooding is limiting the quality of agricultural land in accordance the ALC Guidelines (1988).

3.4 Soil

I. Geology/Soil Parent Material

3.4.1 British Geological Survey (BGS) information available online[4] has been utilised to identify the Bedrock underlying the Study Area and any Superficial (Drift) Deposits over the Bedrock. This information helps to determine the parent material from which the soil has formed.

[3] Available online @ https://flood-map-for-planning.service.gov.uk/

[4] British Geological Survey 'Geology of Britain Viewer'. Available online @ http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html

3.4.2 The BGS information (1:50,000) indicates that Study Area is mainly underlain by Rutland Formation (argillaceous rocks with subordinate sandstone and limestone), with a small area in the south of the Study Area underlain by Lower Lincolnshire Limestone Member (limestone). A small area in the north is underlain by Blisworth Limestone Formation (limestone).

3.4.3 The BGS information (1:50,000) for superficial deposits indicates that the southern part of the Study Area is covered by Till, Mid Pleistocene (diamicton). There are no superficial deposits over the remainder of the Study Area.

II. Published Information on Soil

3.4.4 The Soil Survey of England and Wales (SSEW) soil map of Midland and Western England (Sheet 3) at a scale of 1:250,000 and accompanying Bulletin No. 10 'Soils and their Use in Midland and Western England' (J. M. Ragg *et al*, Harpenden, 1984) reports that agricultural land at the Study Area is covered by soils in the Ragdale Association, with soils in Evesham 1 Association in the east.

3.4.5 As described by the SSEW, the Ragdale Association consists of clayey Ragdale series pelo-stagnogley soils. The Ragdale soils are developed in till which has a grey clayey matrix containing chalk stones, and some lenses of fine loamy material. The dense, clayey slowly permeable subsoils restrict vertical water movement so Ragdale soils are seasonally waterlogged (Wetness Class III and IV) their water regimes varying with climate and the efficiency of drainage measures.

3.4.6 The Evesham 1 Association consists of calcareous clays of variable depth, differing in water regime according to the permeability of the substratum. They are found on Jurassic clays, particularly where they contain limestone bands, in Northamptonshire, Warwickshire, through Gloucestershire into Somerset, and in west Dorset. Evesham series, calcareous pelosols in clay shales, predominate. They are only slowly permeable, but well-developed structures in the topsoil and immediate subsurface horizon lessen the incidence of waterlogging. The soils are seasonally waterlogged when undrained (Wetness Class III).

III. Soil Survey

3.4.7 A log of the 28 soil profiles recorded on Study Area (see **Figure 1**) is given as **Appendix B**. A description of the soil pit (Soil Pit 1, **Figure 1**) is given as **Appendix C**.

3.4.8 The depth of topsoil (calcareous heavy clay loam) in the Subgrade 3a area (see below and Figure 2) is approximately 30cm below ground level. Below the layer of topsoil, the depth of recoverable subsoil (calcareous clay) above the limestone rock is approximately 25cm, i.e. the layer 30cm-55cm below ground level.

3.4.9 The depth of topsoil in the Subgrade 3b area (see below and Figure 2) is approximately 25cm below ground level. Below the layer of topsoil (clay), the depth of recoverable upper subsoil (clay) is approximately 30cm, i.e. the layer 25cm-50cm below ground level. The lower subsoil (clay) extends between 50cm-120cm below ground level.

3.5 Interactive Limitations

3.5.1 From the published information above, together with the findings of the detailed soil survey, it has been determined that the quality of agricultural land in the northern region of the Study Area is limited by soil droughtiness, where the soil profiles are developed over limestone. The clayey soil profiles over the remainder of the Study Area are limited by soil wetness.

I. Soil Droughtiness

3.5.2 As shown in the soil profile logs given as **Appendix B**, moisture balance (MB) calculations for the ALC reference crops (winter wheat and maincrop potatoes) have determined that soil profiles over limestone in the north of the Study Area, i.e. auger bore 1-4, Figure 1, have MB values of between -12mm and -17mm for wheat, and between 12mm and -1mm and for potatoes. The MB value for wheat limits the quality of agricultural land to Subgrade 3a (re Table 8 'Grade according to droughtiness' of the ALC Guidelines).

3.5.3 One auger bore (auger bore 5, Figure 1) has MB values of -29mm for wheat, and -16mm for potatoes. The MB value for wheat limits the quality of agricultural land to Subgrade 3b (re Table 8 'Grade according to droughtiness' of the ALC Guidelines).

II. Soil Wetness

3.5.4 From the ALC Guidelines, a soil wetness limitation exists where '*the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock*'. Agricultural land quality at the Study Area is limited by soil wetness as per Table 3.4 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines):

Table 3.4: ALC Grade According to Soil Wetness

Wetness Class	Texture of the Top 25 cm	<126 Field Capacity Days
III	Sandy Silt Loam/Sandy Loam	2
	Medium Silty Clay Loam/Medium Clay Loam*	3a
	Heavy Silty Clay Loam/Heavy Clay Loam**	**3b**
	Silty Clay/Clay	3b

Key
* <27% clay; and ** >27% clay

3.5.5 Soil profiles on Study Area with clay topsoil, i.e. auger bores 6 to 28, Figure 1, and which are placed in Wetness Class III, are limited by soil wetness to Grade 3b in this climate area (i.e. 123 field capacity days).

3.5 ALC Grading at the Study Area

3.5.1 The ALC survey has determined that the quality of agricultural land at the Study Area is predominantly limited by soil wetness to Subgrade 3b. Some shallow soils developed over limestone in the north of the Study Area are limited by soil droughtiness to Subgrade 3a. The area (ha) and proportion of land in each grade has been measured from **Figure 2** and reported in Table 3.2.

Table 3.5: Agricultural Land Classification – Kings Cliffe, Northamptonshire

ALC Grade	Area (Ha)	Area (%)
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	0	0
Subgrade 3a (Good)	5.9	20.9
Subgrade 3b (Moderate)	21.8	77.3
Grade 4 (Poor)	0	0
Grade 5 (Very Poor)	0	0
Other Land / Non-agricultural	0.5	1.8
Total	**28.2**	**100.0**

4 ALC AT THE STUDY AREA IN A WIDER GEOGRAPHICAL CONTEXT

4.1 Introduction

4.1.1 The aim of this section is to examine agricultural land quality at the Study Area in a national, regional, county and local context.

4.2 Pre-1988 ALC Information

4.2.1 During the 1960's and 1970's MAFF produced a series of maps to show the provisional ALC grade of agricultural land over the whole of England and Wales at a scale of 1:250,000. These provisional ALC maps are suitable for strategic land use planning only, i.e. they appropriate for land areas greater than 80 ha. The provisional MAFF ALC map of South West England (1:250,000, 1984) indicates that the quality of agricultural land at the Study Area is all Grade 3 (not differentiated between Subgrade 3a and Subgrade 3b) and non-agricultural land. The proportion of agricultural land in each of the ALC grades (derived from MAFF provisional or pre-1988 ALC information) in England, East Midlands Office Government Office, Northamptonshire County, and East Northamptonshire District is shown for comparison in Table 4.1 below.

Table 4.1: Provisional ALC – National, Regional and Local Context (Proportion of ALC Grades as % of Total Land Area)[5]

ALC Grade	England	East Midlands Office	Northamptonshire County	East Northamptonshire District
1 (excellent)	2.7	4.9	0.0	0.0
2 (very good)	14.2	18.5	8.4	9.8
3 (good to moderate)	48.2	56.7	81.4	80.0
4 (poor)	14.1	9.9	3.3	2.2
5 (very poor)	8.4	2.9	0.0	0.0
Non-Agricultural	5.0	2.8	2.9	6.0
Urban	7.3	4.3	3.9	2.1

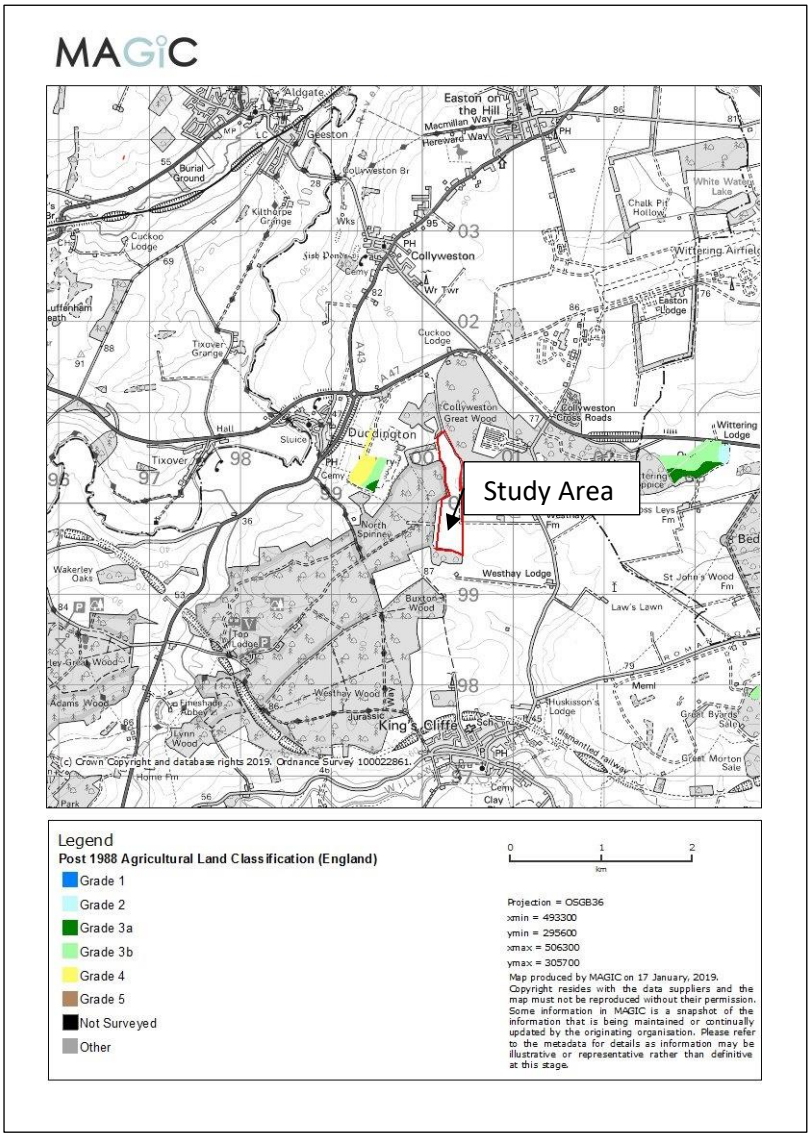
4.2.2 The provisional MAFF ALC information indicates that there is a high proportion of Grade 3 for Northamptonshire (i.e. 81.4%), the East Midlands region as a whole (i.e. 56.7%), and the East

[5] Ministry of Agriculture, Fisheries and Food, Land and Water Service, Technical Notes, Resource Planning (February 1983) 'Agricultural Land Classification of England and Wales – The Distribution of the Grades' (TN/RP/01 TFS 846)

Northamptonshire District (80.0%). Therefore, the predominance of Grade 3 at the Study Area is unsurprising, as Grade 3 agricultural land is widespread in the county.

4.3 Post-1988 ALC Information

4.3.1 The former MAFF has carried a post-1988 ALC survey of agricultural land surrounding Kings Cliffe. An extract from the Post 1988 Agricultural Land Classification map on MAGIC[6] is given below.



4.3.2 As shown from the post 1988 ALC survey carried out by MAFF above, there is Subgrade 3a and 3b to the east and west of the Study Area. Therefore, the presence of Subgrade 3a and 3b agricultural land within the Study Area is typical of the grade of land around Kings Cliffe.

[6] Multi Agency Geographic Information for the Countryside. Post 1988 Agricultural Land Classification. Available online @ www.MAGIC.gov.uk

5 SUMMARY AND CONCLUSIONS

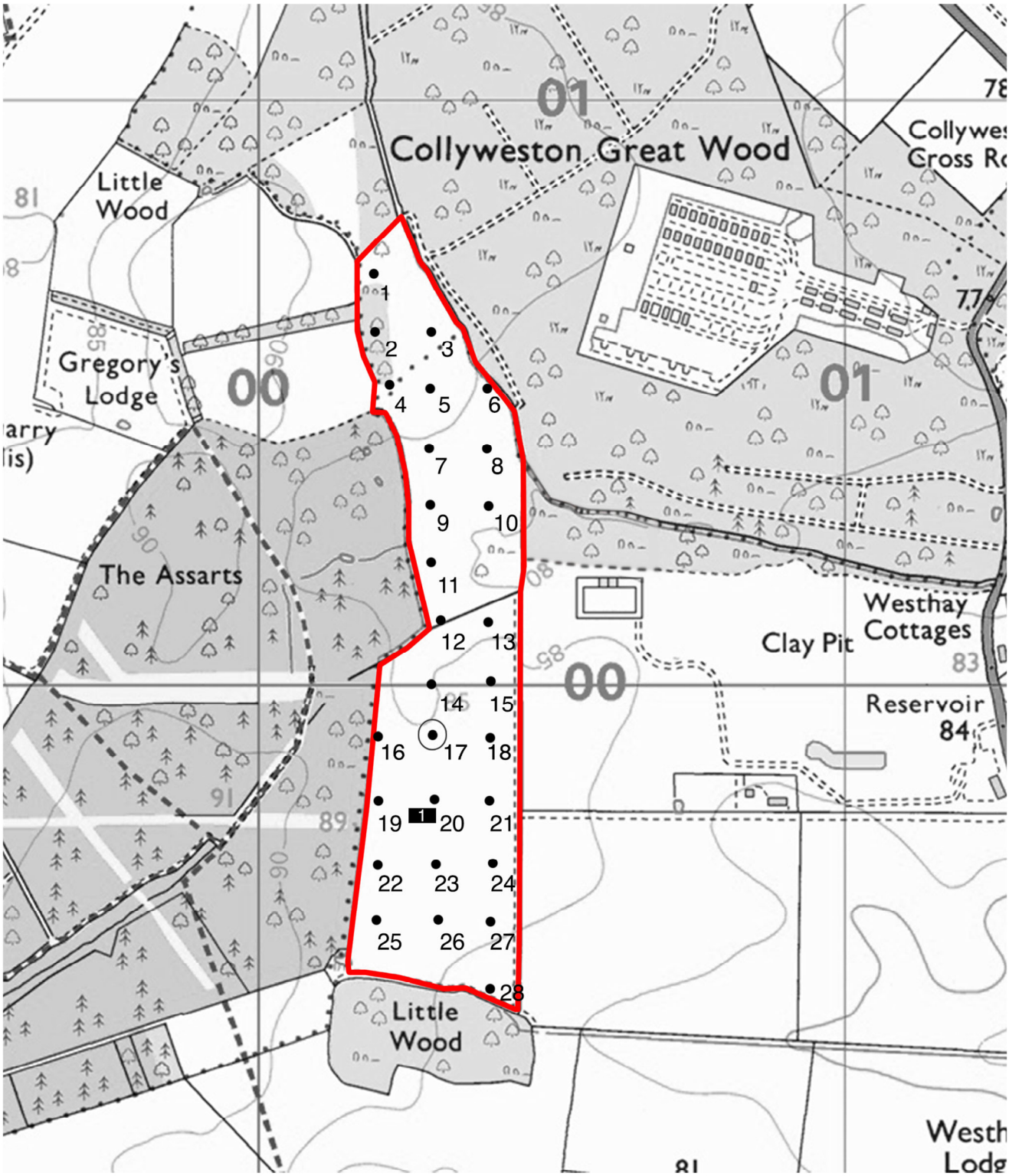
5.1.1 This report was commissioned by MJCA/Augean South Ltd to determine the quality of agricultural land to the West of the East Northamptonshire Resource Management Facility near Kings Cliffe, Northamptonshire, PE8 6XX ('the Study Area'). The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales.

5.1.2 British Geological Survey (BGS) information (1:50,000) indicates that Study Area is mainly underlain by the Rutland Formation (Argillaceous Rocks With Subordinate Sandstone And Limestone), with smaller areas of Lower Lincolnshire Limestone Member (Limestone) and Blisworth Limestone Formation (Limestone). Most of the bedrock is not covered by superficial deposits, yet the southern region is covered by Till, Mid Pleistocene (Diamicton). As described by the SSEW, the Ragdale Association consists of clayey Ragdale series pelo-stagnogley soils that are seasonally waterlogged (Wetness Class III and IV). The Evesham 1 Association consists of calcareous clays that are seasonally waterlogged when undrained (Wetness Class III).

5.1.3 The ALC survey has determined that the quality of agricultural land at the Study Area is predominantly limited by soil wetness to Subgrade 3b (i.e. 21.8 ha or 77.3%). Some shallow soils developed over limestone in the north of the Study Area are limited by soil droughtiness to Subgrade 3a (i.e. 5.9 ha or 20.9%). The remainder is classed as non-agricultural. This concurs with a MAFF Post 1988 ALC survey of agricultural land surrounding Kings Cliffe, which also determined a mixture of Subgrade 3a and 3b.

5.1.4 The provisional MAFF ALC information indicates that there is a high proportion of Grade 3 for the East Northamptonshire District (80.0%). Therefore, the predominance of Grade 3 at the Study Area is unsurprising, as Grade 3 agricultural land is widespread in the county. Therefore, the predominance of Subgrade 3b with a smaller proportion of Subgrade 3a at the Study Area is unsurprising, as it is widespread in the District.

Figures



Study Area

Auger location

Topsoil Sample

Soil Pit

N

Client

Augean South Ltd

Project No C645
Dwg. No 01
Scale NTS
Date 14/10/20
Drawn By ELA

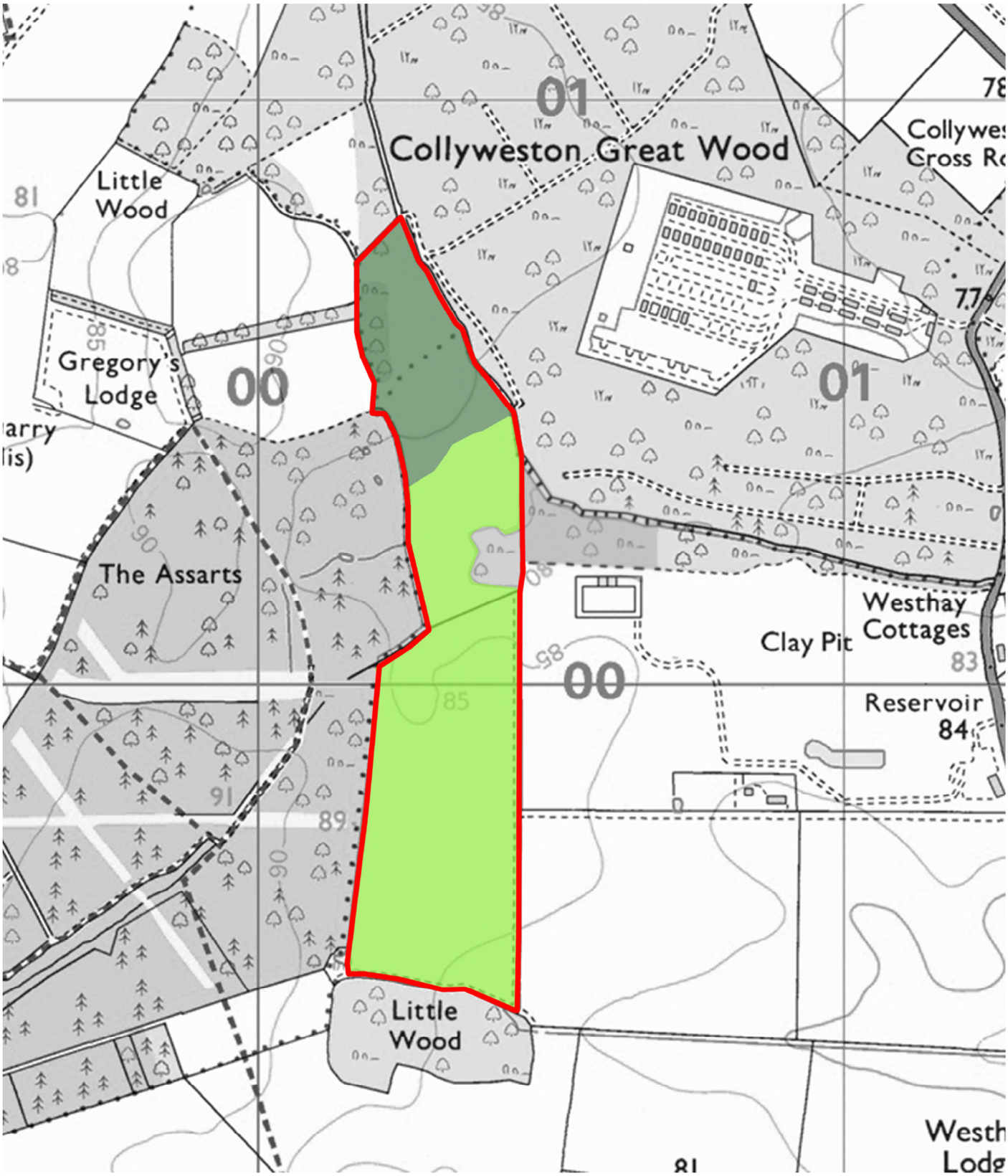
Figure 1

Sample Locations

Project Name

ENRMF Western Extension

R W Askew BSc(Hons) MISoilSci MSc CSCi
The Old Stables, Upexe, Exeter, EX5 5ND
Tel: 07753 227 224
Email: rw.askew@btinternet.com



ALC Grade

- Grade 1
- Grade 2
- Subgrade 3a
- Subgrade 3b
- Grade 4
- Grade 5
- Other land

Study Area

N

Client

Augean South Ltd

Project No C645
Dwg. No 01
Scale NTS
Date 14/10/20
Drawn By ELA

Figure 2:

Agricultural Land Classification

Project Name

ENRMF Western Extension

R W Askew BSc(Hons) MISoilSci MSc CSCi
The Old Stables, Upexe, Exeter, EX5 5ND
Tel: 07753 227 224
Email: rw.askew@btinternet.com

Appendix A:
IPSS Professional Competency Scheme Doc. 2 – Agricultural Land Classification

DOCUMENT 2

Agricultural Land Classification (England and Wales)

Background

The evaluation of land for its agricultural potential in England and Wales[1] is accomplished by application of the Agricultural Land Classification[2] (ALC). Professional competence in Agricultural Land Classification builds upon foundation skills in field soil investigation, description and interpretation (IPSS PCSS Document 1). This system of professional competence is based upon a detailed written procedures document developed by the Farming and Rural Conservation Agency[3].

Qualifications

Professional soil scientists with competence in Agricultural Land Classification will have graduated in a relevant science subject. They will also have a number of years of relevant field experience and will have, or be adequately qualified for, membership of a relevant professional body such as the Institute of Professional Soil Scientists.

Minimum competencies

Skills and Knowledge:

These are described under a number of subheadings that relate to different tasks. A professionally competent contractor should have the skills and knowledge identified under the **General heading** and **all other headings that are relevant** to the tasks required.

General

1. A general knowledge and understanding of natural soil development and of world, European and national soil taxonomy
2. A detailed knowledge and understanding of the Agricultural Land Classification system relevant to the site and of the classification of land according to the current published Guidelines and other documents[1,2,] and the ability to apply it accurately and consistently in the classification of an area of land

[1] Similar systems are employed in Scotland and Northern Ireland

[2] ALC Revised Guidelines and Criteria for the Grading the Quality of Agricultural Land (MAFF, 1988) and Climatological Datasets for ALC (Met. Office, 1989)

[3] A former Executive Agency of the Ministry of Agriculture , Fisheries and Food (now Defra)

DOCUMENT 2

Agricultural Land classification (England and Wales)

Institute of Professional Soil Scientists

3. An awareness and knowledge of existing published and unpublished, paper-based and digital ALC information and sources
4. A knowledge of paper and digital topographic, geology and soil maps, mineral assessment reports and memoirs and other technical sources of reference; and of their role in ALC work
5. An understanding of map scales and of the Ordnance Survey National Grid
6. The ability to investigate, sample, describe and interpret soils in the field in a consistent manner and to professional standards (IPSS PCSS Document 1)
7. Knowledge of relevant European and national regulations and policies including national and local land use planning policy and guidance, and soil protection policy
8. The ability to effectively communicate soil information in a simple and relevant form to developers, planners and other relevant professionals with clear statements as to the reliability and certainty of the results
9. The ability to write accurate, concise reports in clear English and in line with best practice examples of ALC survey that communicate the relevant information to all relevant communicants
10. An awareness of the importance of systems of quality assurance and control in all aspects of professional work

Preparations prior to field survey

1. The ability to compile background site physical data (e.g. relief, geology, soils, climate, flood-risk, exposure and grade from published and unpublished sources) and understanding of the limitations of the data obtained
2. An understanding of scale and of how different survey sampling densities may impact on the certainty of results obtained. A knowledge of how to tailor survey density appropriately to the requirements of the client, and understanding of the limitations that might impose
3. The ability to compute gradients from map contours
4. A thorough knowledge of climatic data interpolation procedures (and any available associated bespoke computer software), and the ability to obtain representative site values
5. An understanding of soil maps, the concepts of soil associations and soil series and their limitations as a background to ALC grading
6. A knowledge of GPS and data logger technology and its uses and limitations for field survey work
7. A knowledge and understanding of relevant Health and Safety legislation requirements for work in the field
8. An understanding of basic biosecurity requirements and any animal or plant health restrictions which may be in force

Field survey for Agricultural Land Classification

1. The ability to determine, lay out and work to a relevant sampling strategy
2. Competency in the Foundation Skills (field soil investigation, sampling, description and interpretation) as per IPSS PCSS Document 1
3. The ability to accurately and consistently apply the ALC system to soil and other data collected during the field survey

Reporting

1. The knowledge and ability to compile an ALC map from background information and data collected during the field survey
2. The ability to write an ALC survey report according to an agreed format
3. Understanding of the principles of quality assurance and the ability to apply these as required by the client
4. The ability to convey the findings of the survey verbally such that they are understood by the client

SUPPORTING ORGANISATIONS

The following organisations have given their support to the Institute of Professional Soil Scientist's Working with Soils Professional Competency Initiative:

iPSS
Institute of Professional Soil Scientists

'Defra welcomes initiatives, such as the IPSS Working with Soils Competency Statements, that aim to improve the quality of professional soils advice'

ADAS

afbi Agri-Food and Biosciences Institute

AHDB Agriculture & Horticulture Development Board

AICC Association of Independent Crop Consultants

National Parks Britain's breathing spaces
Parciau Cenedlaethol Prydain
Ile i enaid gael llonydd
Pàircean Nàiseanta na h-Alba
Àiteachan anaiachadh bhreatainn

BALI British Association of Landscape Industries

BIAC

CEH Centre for Ecology & Hydrology
Natural Environment Research Council

CIWEM

The co-operative farms

CPRE Campaign to Protect Rural England
Standing up for your countryside

Cresswell
a Hyder Consulting group company

Earthcare Technical

Asiantaeth yr Amgylchedd Cymru
Environment Agency Wales

ENPAA English National Park Authorities Association

FWAG Farming & Wildlife Advisory Group

Comisiwn Coedwigaeth Cymru
Forestry Commission Wales

Game & Wildlife Conservation Trust

Greenvale AP
Natural choice for fresh potatoes

IAgrE

iema
Institute of Environmental Management & Assessment

The James Hutton Institute

Landscape Institute
Inspiring great places

Land Research Associates

defra
Department for Environment Food and Rural Affairs

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LEAF – Linking Environment and Farming – Integrated Farm Management
NIAB TAG
NFU
National Trust
Natural England
Produce World – Growing Trust
Rothamsted Research
Royal Agricultural College
Royal Agricultural Society of England
SAC
Sainsbury's
Salmon & Trout Association
SEPA – Scottish Environment Protection Agency
Society of Biology
Soil Association
SNIFFER – Scotland & Northern Ireland Forum for Environmental Research
The Scottish Government
the Science council
The Wildlife Trusts
Tim O'Hare Associates – Soil & Landscape Consultancy
TOPSOIL – The Sustainable Choice from British Sugar
Unilever
Llywodraeth Cymru – Welsh Assembly Government
Waitrose
WRAP – Working together for a world without waste

Appendix B:
Soil Profile Logs

Project Number	Project Name	Parcel
C645	Hazardous Waste Landfill, Northamptonshire	Application Area

Date of Survey	Survey Type	Surveyor(s)	Company
05/12/2018	ALC	AR	Askew Land & Soil Limited

Weather	Relief	Land use and vegetation
Dry, Sunny	Level	LEY (Ley Grass)

Grid Reference	Postcode	Altitude	Area
TF00310022	PE93QH	82	21

MAFF prov	MAFF detailed	Flooding
Grade 3/Non-Agric.	None	Flood Zone 1

AAR	AT0	MDw	MDp	FCD	Climate grade
607	1368	106	97	123	1

Bedrock	Superficial deposits
Rutland /Lower Linc. /Blisworth Formation	Till Mid Pleistocene/None

Soil association(s) 1:250,000	Detailed soil information
Ragdale/Evesham 1	None

Revision Number	Date Revised
2	28/01/2019

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TF 00200 00700	500200	300700	91	≤7		LEY	0	30	30	10YR4/4						HCL - Clay	10	5	0	SLST - Soft oolitic or dolomitic limestones								MC - Moderately ca	-12	12	3a	WC I	2	Droughtiness			3a
								30	70	40	10YR6/6					No	C - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
2	TF 00200 00600	500200	300600	91	≤7		LEY	0	30	30	10YR4/3						HCL - Clay	10	4	0	SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcarec	-16	-3	3a	WC I	2	Droughtiness			3a
								30	50	20	10YR4/4					No	HCL - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	SC - Slig	No	No								
								50	50	0	10YR7/4					No	MSL - Me	50			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
								50	70	20						None	MSL - Me	70			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
3	TF 00300 00600	500300	300600	100	≤7		LEY	0	30	30	10YR4/3						HCL - Clay	20	15	11	SLST - Soft oolitic or dolomitic limestones								MC - Moderately ca	-17	-5	3a	WC I	2	Droughtiness			3a
								30	45	15	10YR4/4					No	C - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Mc	No	No								
								45	55	10	10YR7/6					No	SCL - San	20			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
								55	75	20						None	SCL - San	70			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
4	TF 00220 00500	500220	300500	91	≤7		LEY	0	30	30	10YR4/3						HCL - Clay	10	6	0	SLST - Soft oolitic or dolomitic limestones								MC - Moderately ca	-12	-1	3a	WC I	2	Droughtiness			3a
								30	50	20	10YR5/4					No	C - Clay	10			SLST - Soft oolitic or dolomitic limestones							Moderate	MC - Mc	No	No								
								50	55	5	10YR7/4					No	MSL - Me	30			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
								55	75	20						None	MSL - Me	70			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
5	TF 00300 00500	500300	300500	88	≤7		LEY	0	28	28	10YR4/3						MCL - Cla	18	5	0	SLST - Soft oolitic or dolomitic limestones								VC - Very calcareous	-29	-16	3b	WC I	1	Droughtiness			3b
								28	45	17	10YR7/6					No	MCL - Cla	25			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No	No								
								45	65	20						None	MCL - Cla	70			SLST - Soft oolitic or dolomitic limestones							Moderate	VC - Ver	No									
6	TF 00400 00500	500400	300500	88	≤7		LEY	0	28	28	10YR4/2						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na								SC - Slightly calcarec	18	4	2	WC III	3a	Wetness			3a
								28	40	12	2.5Y5/3	CD - Cı	10YR5/6	CD - Cı	2.5Y6/1	Yes	C - Clay	0										Poor	MC - Moderate	Yes									
								40	120	80	2.5Y6/2	FD - Fe	10YR5/6			Yes	C - Clay	0										Poor	SC - Slightly cal	Yes									
7	TF 00300 00400	500300	300400	88	≤7		LEY	0	30	30	10YR4/3						C - Clay	12	8	5	SLST - Soft oolitic or dolomitic limestones								SC - Slightly calcarec	15	1	2	WC III	3a	Wetness			3a
								30	65	35	2.5Y5/2	CP - Cı	7.5YR5/6			Yes	C - Clay	0										Poor	SC - Slightly cal	Yes									
								65	120	55	5Y5/1	CD - Cı	10YR5/6			Yes	C - Clay	1			SLST - Soft oolitic or dolomitic limestones							Poor	MC - Moderate	Yes									
8	TF 00400 00400	500400	300400	88	≤7		LEY	0	25	25	2.5Y4/2						C - Clay												NON - Non-calcareo	18	4	2	WC III	3b	Wetness			3b
								25	46	21	5Y5/3	FF - Fe	5Y6/1			Yes	C - Clay											Poor	NON - Non-cal	Yes									
								46	120	74	5Y5/1					Yes	C - Clay											Poor	NON - Non-cal	Yes									
9	TF 00300 00300	500300	300300	82	≤7		LEY	0	28	28	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na								NON - Non-calcareo	18	4	2	WC III	3b	Wetness			3b
								28	60	32	2.5Y5/3	CP - Cı	7.5YR5/6	CD - Cı	2.5Y5/1	Yes	C - Clay	0										Poor	NON - Non-cal	Yes									
								60	120	60	2.5Y7/1	CP - Cı	10YR5/6			Yes	C - Clay	0										Poor	NON - Non-cal	Yes									
10	TF 00400 00300	500400	300300	82	≤7		LEY	0	28	28	10YR4/2	CD - Cı	7.5YR4/6				C - Clay												NON - Non-calcareo	19	5	2	WC III	3b	Wetness			3b
								28	50	22	2.5Y6/1	MP - M	10YR5/8			Yes	C - Clay											Poor	NON - Non-cal	Yes									
								50	120	70	5Y6/1	CP - Cı	10YR5/8			Yes	C - Clay											Poor	NON - Non-cal	Yes									
11	TF 00300 00200	500300	300200	87	≤7		LEY	0	25	25	10YR4/3						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na								NON - Non-calcareo	17	3	2	WC III	3b	Wetness			3b
								25	65	40	2.5Y5/3	MP - M	7.5YR5/6	CD - Cı	5Y5/1	Yes	C - Clay	0										Poor	NON - Non-cal	Yes									
								65	120	55	5Y6/1	CP - Cı	10YR5/6			Yes	C - Clay	0										Poor	MC - Moderate	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
12	TF 00300	00100	500300	300100	88	≤7		LEY	0	25	25	10YR4/2					C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			16	3	2	WC III	3b	Wetness			3b
									25	35	10	10YR4/3				No	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Moderate	NON - N	No								
									35	55	20	2.5Y5/3	FP - Fe	7.5YR5/8	CD - Cı	5Y6/1	Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	NON - N	No	Yes							
									55	120	65	2.5Y5/3	MP - N	5YR5/8			Yes	C - Clay	5			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor		No	Yes							
13	TF 00400	00100	500400	300100	87	≤7		LEY	0	20	20	10YR4/2					C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			16	2	2	WC III	3b	Wetness			3b
									20	55	35	2.5Y5/3	CD - Cı	10YR5/6	CD - Cı	2.5Y5/1	Yes	C - Clay	0							Poor	NON - Non-cal		Yes							
									55	120	65	2.5Y5/3	CD - Cı	5Y5/1	CF - Cc	2.5Y5/6	Yes	C - Clay	0							Poor	NON - Non-cal		Yes							
14	TF 00300	00000	500300	300000	88	≤7		LEY	0	20	20	10YR4/3					C - Clay	5	4	3	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			14	0	2	WC III	3b	Wetness			3b
									20	60	40	2.5Y6/1	CP - Cı	7.5YR5/6			Yes	C - Clay	0							Poor	NON - Non-cal		Yes							
									60	120	60	5Y5/1	CD - Cı	10YR5/6			Yes	C - Clay	0							Poor	SC - Slightly cal		Yes							
15	TF 00400	00000	500400	300000	87	≤7		LEY	0	26	26	10YR4/2					C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			20	6	2	WC III	3b	Wetness			3b
									26	35	9	2.5Y4/3					No	C - Clay	0							Moderate	VSC - Ve	No	No							
									35	50	15	2.5Y5/3	CD - Cı	10YR5/6	CD - Cı	2.5Y6/1	Yes	C - Clay	0							Poor	SC - Slig	No	Yes							
									50	120	70	5Y7/2	FD - Fe	10YR5/6			Yes	C - Clay	0							Poor	MC - Mo	No	Yes							
16	TL 00200	99900	500200	299900	88	≤7		LEY	0	20	20	10YR4/2					C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			15	1	2	WC III	3b	Wetness			3b
									20	55	35	2.5Y5/3	CP - Cı	7.5YR5/8	CD - Cı	5Y5/1	Yes	C - Clay	0							Poor	NON - Non-cal		Yes							
									55	120	65	2.5Y5/3	CF - Cc	10YR5/6	CD - Cı	5Y6/1	Yes	C - Clay	1			CH - Chalk or chalk stones				Poor	SC - Slightly cal		Yes							
17	TL 00300	99900	500300	299900	88	≤7		LEY	0	28	28	10YR4/2					C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			18	4	2	WC III	3b	Wetness			3b
									28	50	22	2.5Y5/3	CD - Cı	10YR5/6	CD - Cı	5Y6/1	Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	NON - Non-cal		Yes							
									50	120	70	5Y6/1	CD - Cı	7.5YR4/6			Yes	C - Clay	1			CH - Chalk or chalk stones				Poor	MC - Moderate		Yes							
18	TL 00400	99900	500400	299900	87	≤7		LEY	0	25	25	10YR4/2					C - Clay	5	4	3	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			15	1	2	WC III	3b	Wetness			3b
									25	60	35	5Y6/1	MP - N	7.5YR5/8			Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	NON - Non-cal		Yes							
									60	120	60	5Y5/1	MD - N	7.5YR4/6			Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	SC - Slightly cal		Yes							
19	TL 00200	99800	500200	299800	91	≤7		LEY	0	26	26	10YR4/2					C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			17	3	2	WC III	3b	Wetness			3b
									26	55	29	2.5Y6/3	CP - Cı	7.5YR5/6			Yes	C - Clay	0							Poor	NON - N	Yes	Yes							
									55	120	65	5Y5/1	CD - Cı	10YR5/6			Yes	C - Clay	1			CH - Chalk or chalk stones				Poor	NON - Non-cal		Yes							
20	TL 00300	99800	500300	299800	91	≤7		LEY	0	28	28	10YR4/2					C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			18	4	2	WC III	3b	Wetness			3b
									28	50	22	2.5Y5/3	MP - N	7.5YR5/6			Yes	C - Clay	0							Poor	NON - N	Yes	Yes							
									50	120	70	5Y5/1	CD - Cı	10YR4/6			Yes	C - Clay	1			CH - Chalk or chalk stones				Poor	SC - Slightly cal		Yes							
21	TL 00400	99800	500400	299800	89	≤7		LEY	0	25	25	10YR4/2					C - Clay	5	4	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			16	2	2	WC III	3b	Wetness			3b
									25	60	35	2.5Y5/3	CP - Cı	7.5YR5/6	CD - Cı	2.5Y6/1	Yes	C - Clay	0							Poor	NON - Non-cal		Yes							
									60	120	60	5Y5/1	CD - Cı	10YR5/6			Yes	C - Clay	0.5			CH - Chalk or chalk stones				Poor	SC - Slightly cal		Yes							
22	TL 00200	99700	500200	299700	91	≤7		LEY	0	26	26	10YR4/2					C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			18	4	2	WC III	3b	Wetness			3b

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
								26	60	34	2.5Y5/2	MP - M	7.5YR5/6			Yes	C - Clay	0											Poor	NON - Non-calc		Yes								
								60	120	60	2.5Y6/2	MD - M	10YR5/6			Yes	C - Clay	1			CH - Chalk or chalk stones								Poor	MC - Moderate		Yes								
23	TL 00300	99700	500300	299700	91	≤7		LEY	0	22	22	10YR4/2						C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			16	2	2	WC III	3b	Wetness			3b
								22	60	38	2.5Y5/2	MP - M	7.5YR5/6			Yes	C - Clay	0											Poor	NON - Non-calc		Yes								
								60	120	60	2.5Y6/1	CP - Cc	10YR5/6			Yes	C - Clay	0.5			CH - Chalk or chalk stones								Poor	SC - Slightly cal		Yes								
24	TL 00400	99700	500400	299700	89	≤7		LEY	0	28	28	10YR4/2						C - Clay	4			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			12	0	2	WC III	3b	Wetness			3b
								28	45	17	2.5Y5/3	CP - Cc	7.5YR5/6			Yes	C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	NON - Non-calc		Yes								
								45	120	75	2.5Y5/3	CD - Cc	10YR5/6			Yes	C - Clay	10			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	SC - Slightly cal		Yes								
25	TL 00200	99600	500200	299600	91	≤7		LEY	0	28	28	10YR4/2						C - Clay	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			18	4	2	WC III	3b	Wetness			3b
								28	65	37	2.5Y5/1	MP - M	7.5YR5/6			Yes	C - Clay	1			HR - All hard rocks or stones (i.e. those which cannot be scratched with							Poor	NON - Non-calc		Yes								
								65	120	55	5Y5/1	MD - M	10YR4/6			Yes	C - Clay	1			CH - Chalk or chalk stones								Poor	SC - Slightly cal		Yes								
26	TL 00300	99600	500300	299600	91	≤7		LEY	0	30	30	10YR4/2						C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			19	5	2	WC III	3b	Wetness			3b
								30	60	30	2.5Y5/3	CP - Cc	7.5YR5/6	CD - Cc	2.5Y6/1	Yes	C - Clay	0											Poor	NON - Non-calc		Yes								
								60	120	60	2.5Y6/1	CP - Cc	10YR5/6			Yes	C - Clay	0.5			CH - Chalk or chalk stones								Poor	SC - Slightly cal		Yes								
27	TL 00400	99600	500400	299600	86	≤7		LEY	0	28	28	10YR4/3						C - Clay	3			HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			20	6	2	WC III	3b	Wetness			3b
								28	35	7	10YR4/4					No	C - Clay	0											Moderate	NON - N	No	No								
								35	60	25	2.5Y5/3	MP - M	7.5YR5/6	CD - Cc	2.5Y5/1	Yes	C - Clay	0											Poor	SC - Slig	No	Yes								
								60	120	60	2.5Y5/3	CD - Cc	10YR5/6	CD - Cc	2.5Y5/1	Yes	C - Clay	1			CH - Chalk or chalk stones								Poor	MC - Mc	No	Yes								
28	TL 00400	99500	500400	299500	86	≤7		LEY	0	26	26	10YR4/2						C - Clay	4	3	2	HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger na							NON - Non-calcareo			16	2	2	WC III	3b	Wetness			3b
								26	55	29	2.5Y5/3	MP - M	7.5YR5/6			Yes	C - Clay	0											Poor	NON - Non-calc		Yes								
								55	120	65	2.5Y5/3	CD - Cc	10YR5/6	CD - Cc	2.5Y5/1	Yes	C - Clay	3			SLST - Soft oolitic or dolomitic limestones								Poor	VC - Very calca		Yes								
	END																																						

Mottle form
FF - Few Faint
FD - Few Distinct
FP - Few Prominent
CF - Common Faint
CD - Common Distinct
CP - Common Prominent
MF - Many Faint
MD - Many Distinct
MP - Many Prominent
VF - Very many Faint
VD - Very many Distinct
VP - Very many Prominent

Texture
C - Clay
CHK - Chalk
CS - Coarse Sand
CSL - Coarse sandy loam
CSZL - Coarse sandy silt loam
FP - Fibrous and semifibrous peats
FS - Fine Sand
FSL - Fine sandy loam
FSZL - Fine sandy silt loam
HCL - Clay loam (heavy)
HP - Humified peats
HZCL - Silty clay loam (heavy)
IMP - Impenetrable to roots
LCS - Loamy Coarse Sand
LFS - Loamy fine sand
LMS - Loamy medium sand
LP - Loamy peats
MCL - Clay loam (medium)
MS - Medium Sand
MSL - Medium sandy loam
MSZL - Medium sandy silt loam
MZ - Marine Light Silts
MZCL - Silty clay loam (medium)
OC - Organic clays
OL - Organic loams
OS - Organic sands
PL - Peaty loams
PS - Peaty sands
SC - Sandy clay
SCL - Sandy clay loam
SP - Sandy peats
ZC - Silty clay
ZL - Silt loam

Stone Type
CH - Chalk or chalk stones
FSST - Soft fine grained sandstones
GH - Gravel with non-porous (hard) stones
GS - Gravel with porous stones (mainly soft stone types listed above)
HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)
MSST - Soft, medium or coarse grained sandstones
SI - Soft 'weathered' igneous or metamorphic rocks or stones
SLST - Soft oolitic or dolomitic limestones
ZR - Soft, argillaceous or silty rocks or stones

Ped. Shape
SG - Single grain
GRA - Granular
SAB - Subangular Blocky
AB - Angular Blocky
PRIS - Prismatic
PLAT - Platy
MASS - Massive
NA - N/A

Subsoil Structure Condition
Not Applicable
Good
Moderate
Poor

Soil or Ped. Strength
Loose
Very friable
Friable
Firm
Very firm
Extremely firm
Extremely hard
N/A

Calcareousness
NON - Non-calcareous (<0.5% CaCO3)
VSC - Very slightly calcareous (0.5 - 1% CaCO3)
SC - Slightly calcareous (1 - 5% CaCO3)
MC - Moderately calcareous (5 - 10% CaCO3)
VC - Very calcareous (>10% CaCO3)

Ped. Size
VF - Very Fine
F - Fine
M - Medium
C - Coarse
VC - Very Coarse
NA - N/A

Degree of Ped. Development
W - Weak
M - Moderate
S - Strong
NA - Not applicable

Wetness Class
WC I
WC II
WC III
WC IV
WC V
WC VI

ALC Grades
1
2
3a
3b
4
5
Non-Ag

Gley
None
Gley
N/A

Appendix C:
Soil Pit Description

Project	Location	Date	Surveyor(s)	Company
C645	Duddington, Northants	21 Jan 2019	AR	Askew Land and Soil

Pit	WC	Grade	Limitation(s)	Notes
At AB 20	III	3b	WW	SS structure slightly adherent, peds only partly separating cleanly, hence weakly developed assessment. Gleyed ped faces, 2.5Y6/1 and 6/2

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation
TL	00299	99802		At AB 20	1o	NW	flat	firm seedbe	Prob Min-till	Winter beans	5o	clear	light	none

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		
1	0	28	Clay	10YR4/2								3		Hard rock			NC	None					clear	wavy		
2	28	55	Clay	2.5Y5/3					MPOM		7.5YR5/6	0					NC	None	Weak	Coarse	Angular blocky	Firm			<0.5	Yes