M5 Junction 10 Improvements Scheme

Environmental Statement

Appendix 10.4 Agricultural Land Classification Survey

TR010063 - APP 6.15

Regulation 5 (2) (a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

December 2023

Gloucestershire COUNTY COUNCIL

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Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

6.15 Environmental Statement

Appendix 10.4 Agricultural Land Classification Survey

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/6.15
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	December 2023	DCO Application

Contents

Tables

Figures

1. Introduction

1.1.1. This report is based on an Agricultural Land Classification (ALC) survey carried out within the Project Control Framework (PCF) Stage 2 options' boundary (Option 2) in December 2020. The aim was to assign ALC Grades and identify areas of Best and Most Versatile (BMV) land (described in Section 5.1) for permanent land take required for the proposed West Cheltenham Link Road (the Link Road) and associated attenuation basins. This is in response to Design Manual for Roads and Bridges (DMRB) LA109[1], Geology and Soils paragraph 3.6.1, which states that a soil resource and/or ALC survey should be undertaken to inform the baseline scenario and assessment conclusions, where data is incomplete or unavailable.

1.1.2. The extent of likely BMV land for the whole Scheme was included in the PCF 2 Scoping Report[2] and Preliminary Environmental Assessment of Options Report[3] to inform the comparison of Scheme Options, but this ALC survey report containing soil profile data and actual ALC Grades is intended for use to inform the Preliminary Environmental Information Report (PEIR)[4] and PCF 3. The ALC Grades identified by the ALC survey are displayed in Appendix A. The estimated BMV land required for the Link Road and associated attenuation basins is provided in Table 5-1.

1.1.3. Some land in other areas of the Scheme have already been surveyed for ALC for strategic planning purposes (available on the DEFRA MAGIC online database[5]) and the results of these are included in the PEIR. The extent of temporary land take and flood compensation area is not confirmed but are likely to be placed in areas that have not been surveyed, therefore there may be a requirement to return to the area to carry out further ALC surveys.

1.1.4. The soil information gathered during the survey has also been interpreted to provide an indicative/outline Soil Handling and Management Plan and to describe the potential of the soil for the possible uses of surplus soil generated by construction.

[1] Highways England (2019). DMRB LA 109: Geology and Soils. Accessed on 8th June 2021 from https://www.standardsforhighways.co.uk/dmrb/search/adca4c7d-4037-4907-b633-76eaed30b9c0
[2] Atkins (2020). M5 Junction 10 Improvements. Scoping Report. Document Reference: GCCM5J10-ATK-EGT-ZZ-FN-LM-000001
[3] Atkins (2019). M5 Junction 10 Improvements. Preliminary Environmental Assessment of Options Report. Document Reference: GCCM5J10-ATK-EGN-XX-RP-LM-000002
[4] Atkins (2021). M5 Junction 10 Improvements. Preliminary Environmental Information Report. Document Reference: GCCM5J10-ATK-EGN-ZZ-RP-LM-000001
[5] DEFRA, Multi-Agency Geographic Information for the Countryside (MAGIC), www.magic.gov.uk [accessed August 2021]

2. The Scheme

2.1.1. M5 Junction 10 is located 6.5 km to the north-west of Cheltenham and 12 km to the north-east of Gloucester. The location of M5 Junction 10 is shown in Figure 2-1.

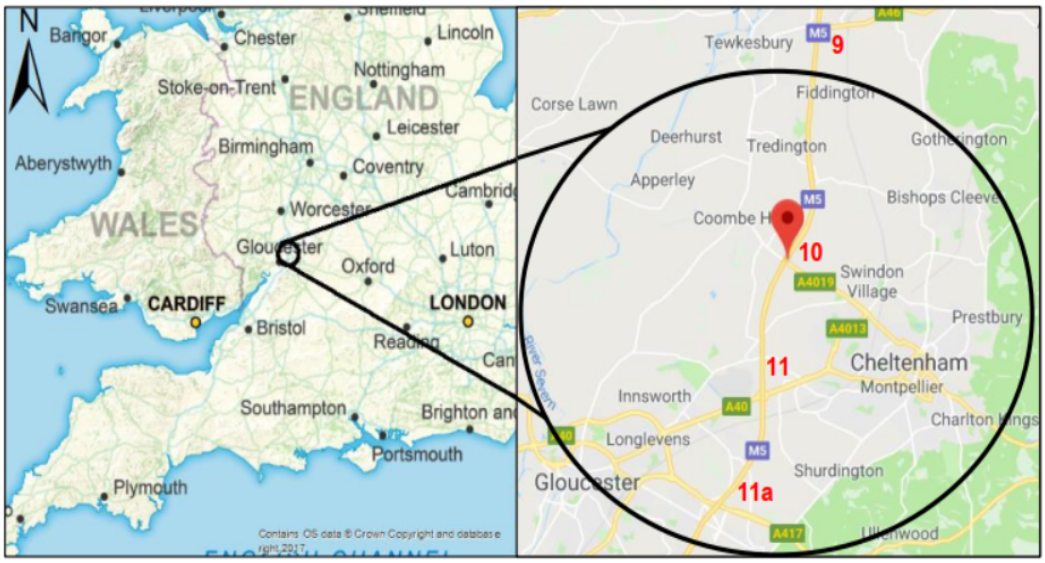


Figure 2-1 - Location of the Scheme

2.1.2. The infrastructure improvement elements that make up the Scheme are illustrated in Figure 2-2. The Link Road and attenuation basins (circled in blue on the figure) is the 2020 ALC survey study area.

Figure 2-2 - The Scheme. The blue oval highlights the study area of the ALC undertaken in 2020 Baseline data

Figure provided in Appendix A of this document.

2.2. Environmental setting

2.2.1. The area is predominantly rural, with the land-use being a combination of arable and grazing pasture. Traditional orchards are widespread and the area also contains important areas of lowland meadow and floodplain grazing marsh. The dominant arable and grassland habitats are interspersed with pockets of other terrestrial habitats, notably broadleaved and mixed plantation woodland, traditional orchards and unimproved and semi-improved neutral grassland.

2.2.2. Multiple watercourses cross the Scheme (notably the River Chelt, Leigh Brook and River Swilgate) running from east to west, which join the River Severn approximately 7.5 km downstream of the Scheme.

2.2.3. Review of the Environment Agency flood map[6] indicates that the area to the north of the A4019 and east of the M5 is affected by surface water and river flooding. Land just south of the A4019 and extending either side of the existing M5 Junction 10 is floodplain for the River Chelt and falls within Flood Zones 2 and 3, where medium and high probability of flooding is recognised. To the immediate north of the A4019 is the floodplain of the Leigh Brook. This is not included in Flood Zone 3 but is known to flood. There is also land in

[6] Environment Agency, Flood Risk Map for Planning, https://flood-map-for-planning.service.gov.uk/ [accessed August 2021]

Flood Zone 3 near Stoke Orchard, to the north-east of M5 Junction 10, associated with the River Swilgate and its tributary Dean Brook.

2.2.4. With reference to the Met. Office Climatological Data for ALC[7], the general climate of the area is typified by relatively mild winters and warm summers, with higher than UK average mean and maximum monthly temperatures. The long-term average monthly rainfall is lower than the UK average (based on 1981 – 2010 data), as are the average number of days in which heavy rainfall was experienced. In the future, it is projected that on average, the area is likely to experience hotter, drier summers and warmer, wetter winters. Alongside these changes in the average conditions, it is likely that climate change will increase the frequency and severity of extreme weather events such as heavy rainfall, storms and heatwaves. Climatological data associated with identifying the ALC Grade is presented in Table 2-1.

2.3. Published geology and soil information

Geology

2.3.1. The British Geological Survey (BGS) GeoIndex[8] indicates that superficial deposits of Cheltenham Sand and Gravel and Alluvium are present along the alignment of the existing watercourses, sections of the M5 and the A4019 between the M5 Junction 10 and Cheltenham. Charmouth Mudstone bedrock underlies the majority of the Scheme and study area, with the Rugby Limestone Member present in the south-west of the study area.

Soil

2.3.2. The only available published soil map for the study area is the 1:250,000 scale National Soil Map of England and Wales, Sheet 5, South West England[9], which illustrates the soil associations present in the region. The map displays soils of the Badsey 2 association present on the Cheltenham Sand and Gravel Deposit, consisting of mainly well drained calcareous fine loamy soils. Soils on the Alluvium of the River Chelt are mapped as stoneless, clayey soils (in places calcareous and variably affected by groundwater) of the Fladbury 1 association. The soils of the Charmouth Mudstone Formation are mapped as the Evesham 2 association of slowly permeable calcareous clayey soils, with some slowly permeable seasonally waterlogged non-calcareous clayey and fine loamy or fine silty over clayey soils. In the vicinity of the Cheltenham Sand and Gravel Deposit, the topsoil is lighter, improving the structure and drainage.

2.4. Climatological data for ALC

2.4.1. The local climatic parameters relevant to ALC have been taken from the Met. Office Climatological Data for ALC[10] and are provided in Table 2-1 for a location close to the M5 at Ordnance Survey national grid reference SO 900 250. The chosen location is considered representative for the extent of the Scheme and study area. These values are utilised in Section 6 of this report to assign wetness classes to the profiles and are used in calculating the droughtiness of the profile.

[7] MET (1989). Climatological dataset for ALC. Accessed on 8th June 2021 from http://publications.naturalengland.org.uk/publication/6493605842649088
[8] BGS (2021). Onshore Geoindex. Accessed on 8th June 2021 from https://mapapps2.bgs.ac.uk/geoindex/home.html
[9] Soil Survey of England and Wales (1983). Soils of England and Wales, Sheet 5 South West England, Rothamsted Experimental Station, Harpenden
[10] MET (1989). Climatological dataset for ALC. Accessed on 8th June 2021 from http://publications.naturalengland.org.uk/publication/6493605842649088

Table 2-1 - Climatological data

Parameter	Unit	Measure
Average annual rainfall (AAR)	mm	624
Field Capacity Days (FCD)	Days	138
Accumulated temperature (AT0)	Day °C	1491
Moisture deficit wheat (MDW)	mm	114
Moisture deficit potatoes (MDP)	mm	108
Height above mean sea level (ALT)	m	25

2.5. Weather conditions

2.5.1. The Met Office climatological records were reviewed to summarise the weather conditions in the week preceding the survey work (10th and 11th December 2020) for Cheltenham.

2.5.2. There was an average temperature of 2.6°C and a total of 7mm rainfall recorded during the week preceding the survey[11]. Standing water was present on fields within the survey area on either side of the A4019.

[11] World Weather Online (2021). Accessed on 8th June 2021 from https://www.worldweatheronline.com/cheltenham-weather-history/gloucestershire/gb.aspx

3. Survey methodology

3.1.1. The survey was carried out by a Soil Surveyor with more than 15 years' experience of soil/ALC surveys and meeting the British Society of Soil Science (BSSS) ALC competency standards. The Soil Surveyor was accompanied by a field assistant who is a full member of the BSSS and is working towards the BSSS ALC competency standards.

3.1.2. The survey area comprised the proposed Link Road, between the A4019 in the north and the B4634 in the south, and associated attenuation basins. Soils were examined at a total of 14 survey points at approximately 100 m intervals where access was available. Non-agricultural land (such as woodland, embankments and shrubland) was not included in the survey.

3.1.3. Information at each survey point was recorded in accordance the Ministry of Agriculture, Fisheries and Food (MAFF) ALC of England and Wales Revised guidelines and criteria for grading the quality of agricultural land[12] (see Section 0).

3.1.4. Augering was completed to 120 cm depth (where possible) using a 4cm diameter Dutch auger. Soil properties including texture, structure (where suitable), colour and mottling (using a Munsell colour chart[13]), stone content and rooting depth were recorded at each location using the methods in the Soil Survey Field Handbook[14]. Site conditions such as gradient (using a Suunto Clinometer), exposure, microrelief and aspect were noted for each survey point. Weak hydrochloric acid (10%) was used to confirm the presence and indicative amount of calcium carbonate in each horizon.

3.1.5. The texture of the soil was determined by hand texturing, which requires rubbing a moist sample of soil between the thumb and fingers to detect proportions of sand, silt and clay. Clay content as a percentage was also estimated when heavy soils were encountered (clay content greater than 27% as this is relevant to assigning ALC).

3.1.6. Any additional information, such as the depth to the water table where it was encountered, was also noted.

3.1.7. The coordinates (eastings and northings) and elevation at each survey point were measured using a Garmin GPS 12.

3.1.8. Results of the survey at each investigation point are provided in Appendix B. Particle Size Analysis of three soil samples sent to a laboratory are provided in Appendix C.

[12] MAFF (1988). Revised guidelines and criteria for grading the quality of agricultural land. Accessed on 8th June 2021 from http://publications.naturalengland.org.uk/publication/6257050620264448
[13] Baltimore. (1975). Munsell Soil Color Charts, Maryland 21218, USA.
[14] Hodgson, J.M. (1997). Soil Survey Field Handbook.

4. Soil series

4.1.1. The profiles encountered in the December 2020 ALC survey reflect the published soil and geology maps. The Badsey series, slightly calcareous sandy clay loams with little gleying encountered above 40cm, was present in the northern extent of the survey area (the Link Road).

4.1.2. Progressing south, from the Cheltenham Sand and Gravel Deposit and onto the River Chelt Alluvium, the profiles were stoneless, non-calcareous, gleyed clay soils of the Fladbury series. Due to limited land access, the extent of the Fladbury series could not be confirmed but it is anticipated to be present to the edge of the mapped Alluvium[8].

4.1.3. On the southern extent of the survey study area, the Evesham series of stoneless, slightly calcareous, gleyed clay soils was encountered.

5. ALC interpretation

5.1. Agricultural Land Classification

5.1.1. The MAFF guidance provides a framework for classifying land according to the extent to which its characteristics impose long-term limitations on agricultural use. ALC Grades are split into Grade 1, Grade 2, Subgrade 3a, Subgrade 3b, Grade 4 and Grade 5. Grade 1 land is of excellent quality and Grade 5 land is of very poor quality. Grades 1 and 2 and Subgrade 3a are of BMV land[12].

5.1.2. An overall ALC Grade has been ascribed to each survey location completed based on the most limiting factor identified. Limitations do not have an accumulative effect on Grade. The overall Grade at each survey point is provided in Appendix B and shown collectively on Figure 10-3 in Appendix 10.8 (Geology and Soils Chapter Figures, application document TR010063 - APP 6.15). Table 5-1 provides an estimate of the likely extent of BMV in the survey area.

5.1.3. Subgrade 3a BMV land is present on the northern extent of the Link Road, limited by droughtiness. Subgrade 3b non-BMV land is present across the Alluvium and mudstone to the southern extent of the Link Road which is limited by wetness.

Table 5-1 - Areas assigned to each ALC Grade within the Link Road and attenuation basins survey area

ALC Grade	Area (ha)	Percentage of survey study area (%)
Subgrade 3a (BMV)	2.8	40
Subgrade 3b (non-BMV)	4.2	60

5.1.4. Considering the required Link Road intersects the BMV land (which is effectively dictated by the perpendicular river alignment/alluvial deposits), there is not considered to be an alternative route which would require less BMV land take.

5.1.5. The following sections provide a summary of the main features considered in assigning the overall ALC Grade.

5.2. Climate

5.2.1. Climatic conditions at the site do not limit the Grade of the land. With reference to Figure 1 of the ALC guidance[12], AAR of 624 and AT0 of 1491 equates to Grade 1. FCD are relatively low and therefore not a significantly limiting factor when determining wetness Grades.

5.3. Site

5.3.1. Site conditions such as gradient, exposure and microrelief are not considered to be limiting factors in the survey area.

5.3.2. Although the size, structure and location of farms, the standard of fixed equipment and the accessibility of land may influence land use decisions, they do not affect grading. Therefore, they are not considered in this report.

5.3.3. As described in Section 2.2, some of the area is prone to flooding. Where these events occur, they are considered an overriding limitation to the land quality. The duration and frequency of flooding would suggest that the corridor either side of the River Chert would be Subgrade 3b on flood events, whilst the remainder of the study area is Subgrade 3a on flood events.

5.4. Soil

5.4.1. The texture and structure of soil both have major influences on wetness and droughtiness of the profile[12]. The features effect the ability of the soil as a growing medium and can affect its workability. Calcareous soils tend to be of better quality as they enhance drainage capability and soil structure.

5.4.2. In the northern extent of the survey area, textures comprised a sandy clay loam over sandy clay. Profiles of the Fladbury and the Evesham in the centre and south of the study area respectively, were heavy clays.

5.4.3. Soil depth was not a limitation, as soil thickness was to at least 60 cm in each profile.

5.5. Interactive limitations

5.5.1. Wetness class (WC) defines the duration and depth of waterlogging. The soils in the study area vary from WC I (rarely wet), WC II (slight seasonal waterlogging), WC III (seasonal waterlogging) to WC IV (frequent waterlogging)[12]. WC I soils tend to be present in the north, on the better drained sand and gravels. WC was the most limiting factor to ALC Grade for the Fladbury and Evesham profiles.

5.5.2. An adequate supply of water throughout the growing season is required to achieve a full crop yield. Crops on land where rainfall is low and the quantity of soil moisture available in the growing season is constrained by texture, stoniness, soil structure, are likely to experience drought. The ALC guidance provides two calculations for droughtiness to assign a Grade to this potential limitation. One is for wheat (assuming a full crop rooting depth to 120cm) and the other is for potatoes (assuming a full crop rooting depth to 70cm). The values presented in Table 2-1 were used to calculate droughtiness for each horizon in the 14 profiles (factoring in texture, stone and soil structure information) using crop-adjusted available water capacity and moisture deficit. The potential for irrigation of droughty land is not taken into account when assigning an ALC Grade.

5.5.3. Results of the droughtiness calculations are provided with the profile descriptions in Appendix B. The majority of profiles above the floodplain are in sand and gravel deposits. The sandiest soils at the north of the proposed Link Road area are Subgrade 3b because of drought. Drought is not a limitation to the alluvial soils or mudstone soils.

5.5.4. There was little evidence of erosion occurring along the study area. The majority of fields were covered with grass and were mostly flat with little risk of rapid runoff into drainage ditches. Rills were not noted on any of the fields.

5.5.5. Crops on sandy textured soils, which lose heat rapidly at night, are prone to frost damage where cold air flows to low ground. There were no fields surveyed with a sandy topsoil and a gradient >2° and so frost risk was not considered to be a limiting factor.

6. Unsurveyable land

6.1.1. There were two relatively small land parcels where access was not granted. These coincide with the transition between the Fladbury and Evesham. Due to the predictability of the clay parent material and minor variations in landform, the ALC Grades, where the proposed route passes through these holdings, have been predicted with high confidence, using available information and professional judgement.

7. Soil handling

7.1.1. Before construction commences, a document should be prepared which describes the methods to be implemented for soil handling during the construction of the Scheme. This should include methods for stripping, stockpiling, reinstatement, restoration targets (where the land is returning to agricultural use after temporary works) and opportunities for sustainable soil reuse where soils will be permanently displaced by the Scheme.

7.1.2. In general terms, all alluvial and heavy clay soils which require storage should be limited to stockpile heights up to 3m. All other soils, with sandy clay loam textures, are of higher resilience to handling and stockpile heights up to 4m are likely to be suitable. However, the soil survey data provided in Appendix B of this document (or the other ALC surveys information) should be reviewed in detail when finalising localised handling requirements across the Scheme.

7.1.3. Soil handling should be carried out in suitable weather conditions and soils remaining in situ should be protected from construction works. Further details on these and other soil handling practices which should be implemented on site are described in the Department for Environment, Food and Rural Affairs (DEFRA) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[15]. The archived MAFF good practice guide for handling soils also provides guidance on soil handling[16].

7.1.4. Opportunities to maximise the sustainable reuse of surplus soils should first consider the condition of the soil in order to ensure their suitability for the desired end use. Proposed uses of surplus soils based on published soil data and the findings of the ALC survey are described in Section 8.

[15] Defra (2008). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Accessed on 10th June 2021 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf

[16] MAFF (2000). Good practice guide for handling soils. Accessed on 10th June 2021 from https://webarchive.nationalarchives.gov.uk/20090317221756/http://www.defra.gov.uk/farm/environment/land-use/soilguid/index.htm

8. Soil reuse opportunities

8.1.1. Other than soils displaced by the new road layout and flood compensation area, surplus topsoil may be generated where low maintenance grassed roadside verges / embankments are proposed, as seeding directly into the subsoil proves effective in creating this landscape, and is a key initiative identified by Highways England in creating biodiversity[17].

8.1.2. Beneficial reuse of soil should be prioritised over general fill or removal as waste, as this is the most sustainable approach and results in financial benefits. Examples of sustainable reuse include using surplus soil to improve land returning to agriculture, creating new habitats of increased biodiversity, selling to nearby companies or donating to interested organisations.

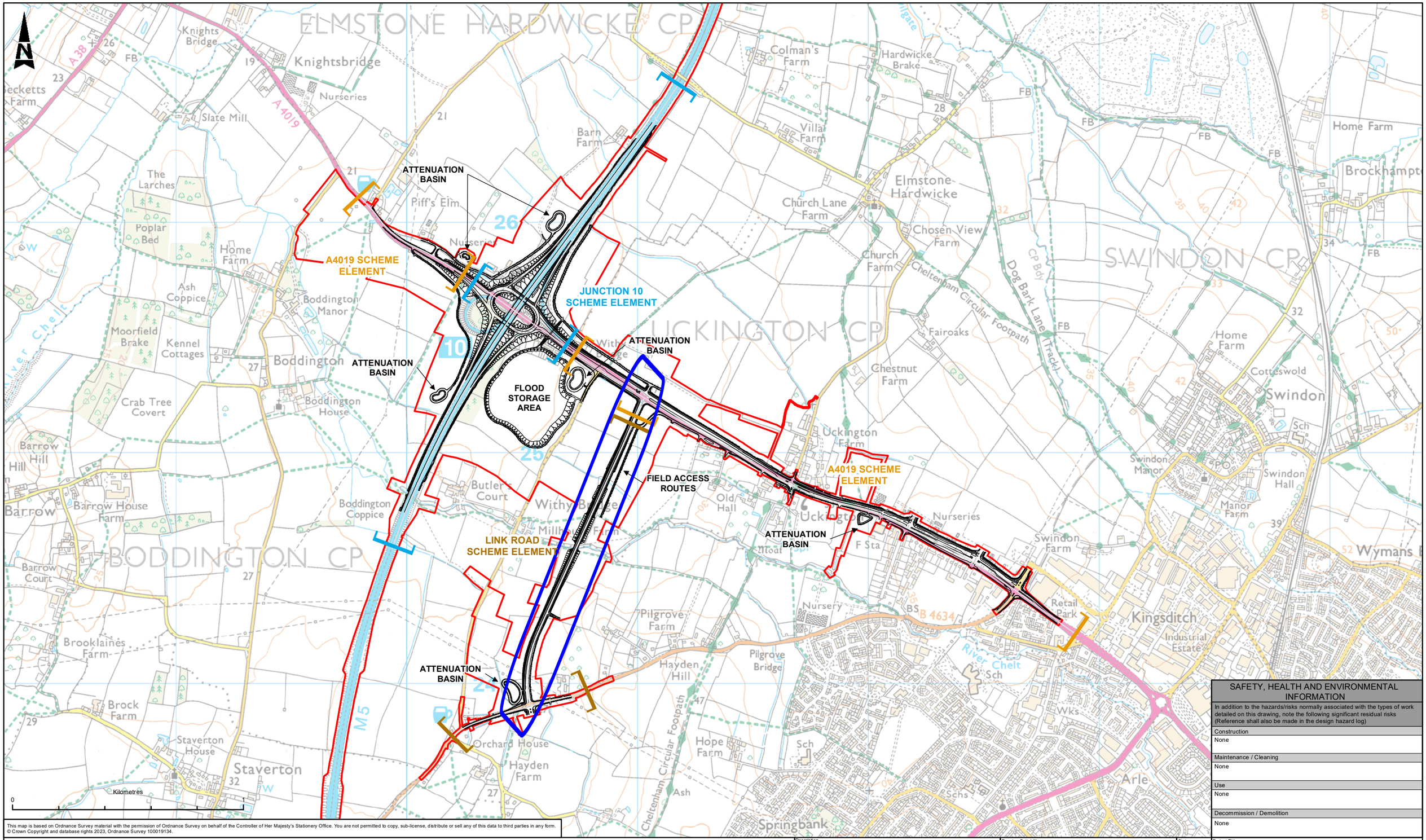
8.1.3. If design requires, calcareous grassland could be created using surplus subsoil generated in the south of the Link Road survey area but further investigation would be required in the calcium content as the field test utilised in the ALC survey is indicative only. Neutral grassland could be created from surplus soils elsewhere on the Scheme.

[17] Highways England (2020). Press release: Breaking new ground with eco drive to bring the country's verges to life. Accessed on 10th June 2021 from https://www.gov.uk/government/news/breaking-new-ground-with-eco-drive-to-bring-the-countrys-verges-to-life

Appendices

Appendix A. Schedule of figures included in this application document

Figure reference	Document title	Sheet	Document number	Revision
2-2	Scheme overview including ALC study area	1 of 1	GCCM5J10-ATK-EGN-ZZ-GS-GI-000001	0



LEGEND

- SCHEME ALIGNMENT
- ORDER LIMITS
- STUDY AREA OF THE ALC

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P03	JM	SL	CC	LJ	09/06/23

Drawing Suitability: **PUBLISHED** — Status: **A1**

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 2-2 SCHEME OVERVIEW INCLUDING ALC STUDY AREA

ATKINS
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume: GCCM5J10 - ATK - EGN
ZZ - GS - GI - 000001
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:15,000	5214106	1 of 1	P03

Appendix B. Soil Profiles

ASKEW LAND+SOIL

Project Number	Project Name	Parcel
C759	Atkins: J10 M5 Gloucestershire	

Date of Survey	Survey Type	Surveyor(s)	Company
10 & 11 Dec 2020	Detailed ALC	RWA & LG	Askew Land and Soil

Weather	Relief	Land use and vegetation
Cold, cloudy, dry	Gently undulated betwee 26m - 28m	LEY (Ley Grass)

Grid Reference	Postcode	Altitude	Area
SO908246	GL51 0SW	27	19

MAFF prov	MAFF detailed	Flooding
All Grade	No Post 1988 at site; MAFF 3a and 3b to west	Flood Zones 2 and 3

AAR	AT0	MDw	MDp	FCD	Climate grade
627	1489	113	107	139	1

Bedrock	Superficial deposits
Charmouth Mudstone Formation	Cheltenham Sand And Gravel and Alluvium in north

Soil association(s) 1:250,000	Detailed soil information
Badsey 2; Fladbury; Evesham 2	No SSEW 1:25K soil map

Revision Number	Date Revised
2	21/12/2020

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				Profile notes
	NGR						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	
	E	N																																					
1	SO 91050	25300	391050	225300	28	<7°	South	LEY	0	19	19	2.5Y4/4				No	SCL - Sandy	4	2	0	GH - Gravel with non-porous (hard) stones							Not Applic	SC - Slightly	No	No	-3	-11	3a	WC I	1	Droughtiness			3a	Surveyed by Lucy Gilbert on 11th December 2020
							19	32	13	2.5Y4/4	FF - Fe7.5YR4/6				No	SCL - Sandy	4			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							32	60	28	2.5Y4/2	MD - h7.5YR4/6				No	SC - Sand	4			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							60	120	60	2.5Y6/6	MD - h7.5YR4/6				No	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
2	SO 90900	25250	390900	225250	26	<7°	South	LEY	0	33	33	2.5Y4/2				No	SCL - Sandy	4	2	0	GH - Gravel with non-porous (hard) stones							Not Applic	SC - Slightly	No	No	-3	-8	3a	WC I	1	Droughtiness			3a	
							33	62	29	2.5Y5/4	FF - Fe7.5YR4/6				No	SCL - Sandy	8			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							62	120	58	2.5Y6/2	FD - Fe7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	Yes	No										
3	SO 91000	25200	391000	225200	27	<7°	South	LEY	0	34	34	2.5Y3/2				No	SCL - Sandy	6	2	0	GH - Gravel with non-porous (hard) stones							Not Applic	SC - Slightly	No	No	-6	-12	3a	WC I	1	Droughtiness			3a	
							34	58	24	2.5Y5/4	FF - Fe7.5YR4/6				No	SCL - Sandy	8			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							58	120	62	2.5Y6/2	CD - Cz7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	Yes	No										
4	SO 91100	25100	391100	225100	27	<7°	South	LEY	0	32	32	2.5Y4/3				No	SCL - Sandy	6	1	0	GH - Gravel with non-porous (hard) stones							Not Applic	SC - Slightly	No	No	-6	-12	3a	WC I	1	Droughtiness			3a	
							32	58	26	2.5Y5/4	FF - Fe7.5YR4/6				No	SCL - Sandy	8			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							58	120	62	2.5Y6/2	CD - Cz7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	Yes	No										
5	SO 90950	25100	390950	225100	27	<7°	South	LEY	0	32	32	2.5Y4/2				No	SCL - Sandy	6	2	0	GH - Gravel with non-porous (hard) stones							Not Applic	SC - Slightly	No	No	-6	-12	3a	WC I	1	Droughtiness			3a	
							32	58	26	2.5Y5/4	FF - Fe7.5YR4/6				No	SCL - Sandy	8			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							58	120	62	2.5Y6/2	CD - Cz7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	Yes	No										
6	SO 90900	25000	390900	225000	27	<7°	South	LEY	0	33	33	2.5Y3/2				No	SCL - Sandy	2	1	0	GH - Gravel with non-porous (hard) stones							Not Applic	VSC - Very	No	No	2	-3	3a	WC III	2	Droughtiness			3a	
							33	65	32	2.5Y5/4	CD - Cz7.5YR4/6				Yes	SCL - Sandy	4			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							65	120	55	2.5Y6/2	CD - Cz7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	Yes	No										
7	SO 90900	24900	390900	224900	28	<7°	South	LEY	0	25	25	2.5Y4/3				No	C - Clay	4	2	0	GH - Gravel with non-porous (hard) stones							Not Applic	VSC - Very	No	No	-1	1	3a	WC I	3a	Droughtiness Wetness			3a	
							25	70	45	2.5Y5/3	FD - Fe7.5YR4/6				Yes	C - Clay	8			GH - Gravel with non-porous (hard) stones							Moderate	SC - Slightly	No	No										
							70	120	50	2.5Y6/2	CD - Cz7.5YR4/6				Yes	SC - Sand	70			GH - Gravel with non-porous (hard) stones							Moderate	MC - Mod	Yes	No										
8	SO 90850	24800	390850	224800	27	<7°	South	LEY	0	24	24	2.5Y5/3				No	C - Clay	0										Not Applic	NON - Non	No	No	17	0	2	WC III	3b	Wetness			3b	
							24	45	21	2.5Y5/3	CD - Cz7.5YR4/6				Yes	C - Clay	0										Moderate	NON - Non	No	No										
							45	84	39	2.5Y5/6	MP - h7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	Yes	Yes										
							84	120	36	2.5Y6/2	MP - h7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	Yes	Yes										
9	SO 90850	24700	390850	224700	27	<7°	South	LEY	0	24	24	2.5Y5/3				No	C - Clay	0										Not Applic	NON - Non	No	No	11	-6	2	WC IV	3b	Wetness			3b	
							24	45	21	2.5Y5/6	MP - h7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	Yes	Yes										
							45	120	75	2.5Y6/2	MP - h7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	Yes	Yes										
10	SO 90800	24600	390800	224600	27	<7°	South	LEY	0	26	26	2.5Y4/4				No	C - Clay	0										Not Applic	NON - Non	No	No	11	-6	2	WC IV	3b	Wetness			3b	
							26	50	24	2.5Y5/3	CD - Cz7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	No	Yes										
							50	120	70	2.5Y6/2	CD - Cz7.5YR4/6				Yes	C - Clay	0										Poor	NON - Non	No	Yes										
11	SO 90800	24500	390800	224500	28	<7°	South	LEY																																No access on 10/12/2020
12	SO 90700	24500	390700	224500	27	<7°	South	LEY																																No access on 10/12/2020
13	SO 90700	24400	390700	224400	28	<7°	South	LEY																																No access on 10/12/2020

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				Profile notes
	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	
14	SO 90650 24300	390650	224300	28	<7°	South	LEY																																	No access on 10/12/2020
15	SO 90600 24200	390600	224200	27	<7°	South	LEY	0	15	15	2.5Y4/3					No	C - Clay	0										Not Applic	NON - I	No	No	11	-6	2	WC IV	3b	Wetness			3b	
								15	28	13	5Y4/2			MD - h 7.5YR4/6		Yes	C - Clay	0										Moderate	SC - Sli	No	No										
								28	120	92	5Y5/3			MD - h 7.5YR4/6		Yes	C - Clay	0										Poor	MC - M	No	Yes										
16	SO 90500 24200	390500	224200	26	<7°	South	LEY	0	16	16	2.5Y4/3					No	C - Clay	0										Not Applic	VSC - V	No	No	18	1	2	WC III	3b	Wetness			3b	
								16	50	34	2.5Y5/3					Yes	C - Clay	0										Moderate	SC - Sli	No	No										
								50	120	70	5Y5/3					Yes	C - Clay	0										Poor	MC - M	Yes	Yes										
17	SO 90550 24100	390550	224100	27	<7°	South	LEY	0	15	15	2.5Y4/4					No	C - Clay	0										Not Applic	VSC - V	No	No	16	-1	2	WC III	3b	Wetness			3b	
								15	45	30	2.5Y5/3					Yes	C - Clay	0										Moderate	SC - Sli	No	No										
								45	60	15	5Y4/3					Yes	C - Clay	0										Poor	SC - Sli	Yes	Yes										
								60	120	60	5Y5/3					Yes	C - Clay	0										Poor	MC - M	Yes	Yes										
18	SO 90550 24000	390550	224000	27	<7°	South	LEY	0	18	18	2.5Y4/3					No	C - Clay	0										Not Applic	VSC - V	No	No	19	4	2	WC III	3b	Wetness			3b	
								18	45	27	2.5Y5/3					Yes	C - Clay	0										Moderate	SC - Sli	No	No										
								45	60	15	5Y4/3					Yes	C - Clay	0										Moderate	SC - Sli	No	No										
								60	120	60	5Y5/3					Yes	C - Clay	0										Poor	MC - M	Yes	Yes										
19	SO 90550 23850	390550	223850	28	<7°	South	LEY																																	No access on 10/12/2020
	END																																						

ASKEW LAND+SOIL

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% $CaCO_3$)
VSC - Very slightly calcareous (0.5 - 1% $CaCO_3$)
SC - Slightly calcareous (1 - 5% $CaCO_3$)
MC - Moderately calcareous (5 - 10% $CaCO_3$)
VC - Very calcareous (>10% $CaCO_3$)

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. Laboratory Analysis

ANALYTICAL REPORT

Report Number	**34370-20**	**N717**	**ROB ASKEW**
Date Received	**14-DEC-2020**		**RW ASKEW**
Date Reported	**21-DEC-2020**		**THE OLD STABLES**
Project	**SOIL**		**UPEXE**
Reference	**C759 J10 M5**		**EXETER**
Order Number			**DEVON EX5 5ND**

Laboratory Reference		SOIL499763	SOIL499764	SOIL499765
Sample Reference		AB5	AB10	AB18
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**
Sand 2.00-0.063mm	% w/w	57	29	24
Silt 0.063-0.002mm	% w/w	17	36	24
Clay <0.002mm	% w/w	26	35	52
Textural Class **		SCL	C/HCL	C

Notes

Analysis Notes: The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Document Control: **This test report shall not be reproduced, except in full, without the written approval of the laboratory.**

** Please see the attached document for the definition of textural classes.

Reported by: *Myles Nicholson*

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Technical Information

ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

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

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

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

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

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

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

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

For further information on all analyses and services available from NRM Laboratories contact us on:
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