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Masterplan Report – Additional Reports

Stroud Local Plan – Regulation 19 Submission | *JULY 2021*

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WISLOE

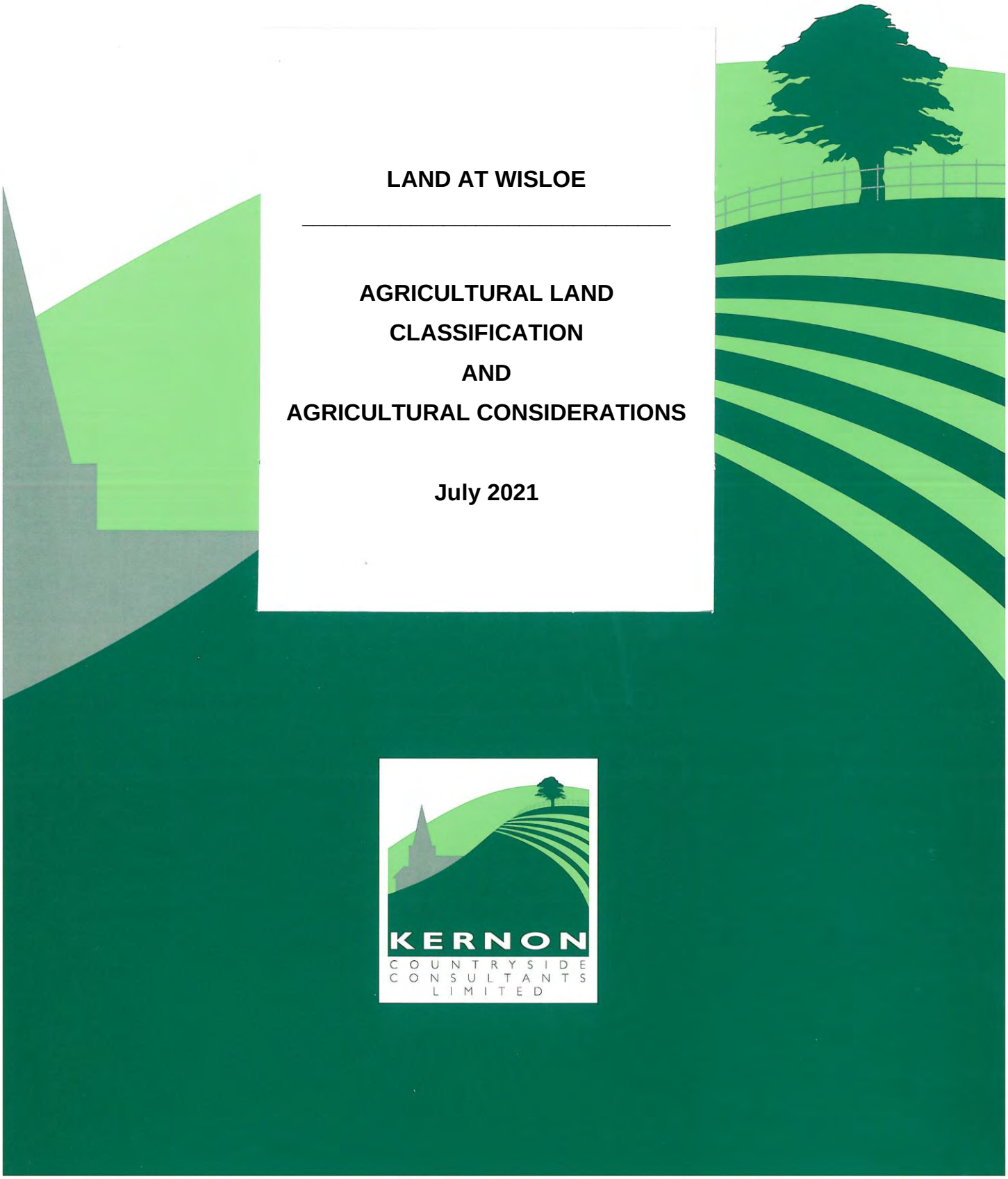
D1. Agricultural Land Classification Report

Kernon Countryside Consultants Limited

LAND AT WISLOE

AGRICULTURAL LAND CLASSIFICATION AND AGRICULTURAL CONSIDERATIONS

July 2021



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LAND AT WISLOE

AGRICULTURAL LAND CLASSIFICATION AND AGRICULTURAL CONSIDERATIONS

July 2021

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1 INTRODUCTION

1.1 This report sets out the findings of a detailed Agricultural Land Classification of approximately 77 ha at Wisloe, and sets those findings in the context of planning policy of relevance, and of land quality generally in the area.

1.2 The land surveyed is under a mixture of land uses, at present mostly agricultural and equestrian. The land is shown on the Google Earth image below, edged in red.

Insert 1: The Site

1.3 As described in this report, the detailed Agricultural Land Classification (ALC) survey has identified that the majority of the land falls into ALC Grade 2 “very good quality” agricultural land.

1.4 As also described in this report, much of the area is of similar quality.

1.5 This report:

(i) describes planning policy of relevance in section 2;

(ii) sets out the ALC field work and analysis, and the findings, in section 3;

(iii) and assesses the implications in policy terms in section 4.

1.6 [redacted]

2 PLANNING POLICY OF RELEVANCE

National Planning Policy

2.1 The National Planning Policy Framework (NPPF) was most recently revised in February 2019, and accordingly forms the starting point.

2.2 Paragraph 170 notes that planning policies and decisions should contribute to and enhance the natural and local environment by, inter alia, recognising "**the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land**".

2.3 The best and most versatile (BMV) agricultural land is defined in Annex 2 of the NPPF as that in grades 1, 2 and 3a of the Agricultural Land Classification.

2.4 Paragraph 171 deals with plan making. It requires plans to, inter alia, allocate land with the least environmental or amenity value, where consistent with other policies in the Framework. Footnote 53 of the NPPF identifies that "**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**".

2.5 There is no definition of what constitutes "significant" development. However the "Guide to assessing development proposals on agricultural land" (Natural England, January 2018) advises local planning authorities to "**take account of smaller losses (under 20 hectares) if they're significant when making your decision**", suggesting that 20 ha is a suitable threshold for defining "significant" in many cases.

Local Plan Policy

2.6 There is no policy that specifically addresses the use of agricultural land for non-agricultural development within the current Local Plan (2015).

3 AGRICULTURAL LAND QUALITY

The ALC System

3.1 The Agricultural Land Classification (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 of the ALC is described as being of excellent quality and Grade 5, at the other end of the scale, is described as being of very poor quality. The current guidelines and criteria for ALC were published by the Ministry of Agriculture, Fisheries and Food (MAFF) in 1988 ('Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land'[1]).

3.2 The ALC system and methodology is described in Natural England's Technical Information Note 049 (second edition), reproduced in **Appendix KCC1**.

3.3 TIN 049 explains that current estimates are that Grades 1 and 2 together form about 21% of all farmland in England, and subgrade 3a also covers about 21%, such that 42% of farmland is of BMV quality.

3.4 TIN 049 also explains that to determine the land quality of any particular site it is necessary to carry out a field survey.

ALC Survey Results

3.5 The site was surveyed in April and June 2021. To accord with the MAFF ALC Guidelines, we aimed for a regular 100 metre survey pattern. In this case some points were moved slightly to avoid hedges or other fixed features. A gas pipeline runs under the site and we left a wide tranch of land unsurveyed to avoid the pipe. The location of auger points is shown on **Plan KCC3027/01**. As set out in the schedules in **Appendix KCC2**, no records were taken at those points within the pipeline exclusion zone.

3.6 The survey identified that there are no gradient, micro-relief or flooding limitations to land quality. The majority of the site is covered by a very slightly stony, calcareous medium-clay-loam or heavy-clay-loam soil over a heavy-clay or clay subsoil. These soils are limited by both soil wetness and soil droughtiness to Grade 2.

[1] Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October, 1988. The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

3.7 Some parts of the site are limited to Subgrade 3a where soils are heavier, and two fairly small areas fall into Subgrade 3b due to wetness limitations.

3.8 The survey found that the majority of the site comprises of land that falls into MAFF ALC Grade 2 “very good” quality. There is an area of Subgrade 3a “good quality” in part of the site, and the northern part and very southern tip of the site fall into ALC Subgrade 3b “moderate quality”.

3.9 The distribution of ALC grades is shown on **Plan KCC3027/02**. The proportion of land within each grade is shown below.

Table 1: Proportion of ALC Grades Across the Site

Grade	**Description**	**Area (ha)**	**Area (%)**
2	Very good	59.9	77.9
3a	Good	5.3	6.9
3b	Moderate	3.9	5.1
N/A	Non-agricultural	1.5	2.0
U/S	Unsurveyed	6.3	8.1
Total		**76.9**	**100**

4 ASSESSMENT

4.1 Planning policy in the NPPF sets out that development management decisions should recognise the economic and other benefits of the best and most versatile agricultural land.

4.2 In the context of plan making the NPPF sets out that land should be allocated with the least environmental value. The footnote to paragraph 171advises that, where significant development of agricultural land is demonstrated to be necessary, poorer quality land should be used in preference.

4.3 Whether or not development is necessary is beyond the scope of this report. This assessment assumes that there is a need for the development.

4.4 This assessment also refers only to agricultural land quality, which is only one consideration in the planning balance. The NPPF requires that the Framework should be read as a whole (paragraph 3) and this report provides information to aid the balancing exercising of decision taking. It does not seek to reach conclusions on the merits of development of any particular site.

4.5 In this analysis I consider:

- land quality in the area generally and whether poorer quality land is available;
- whether, in plan making terms, this is significant development;
- what the economic benefits are in broad terms;
- what other land, and of what quality, is available;
- and the weight to be given to the loss of agricultural land in this context.

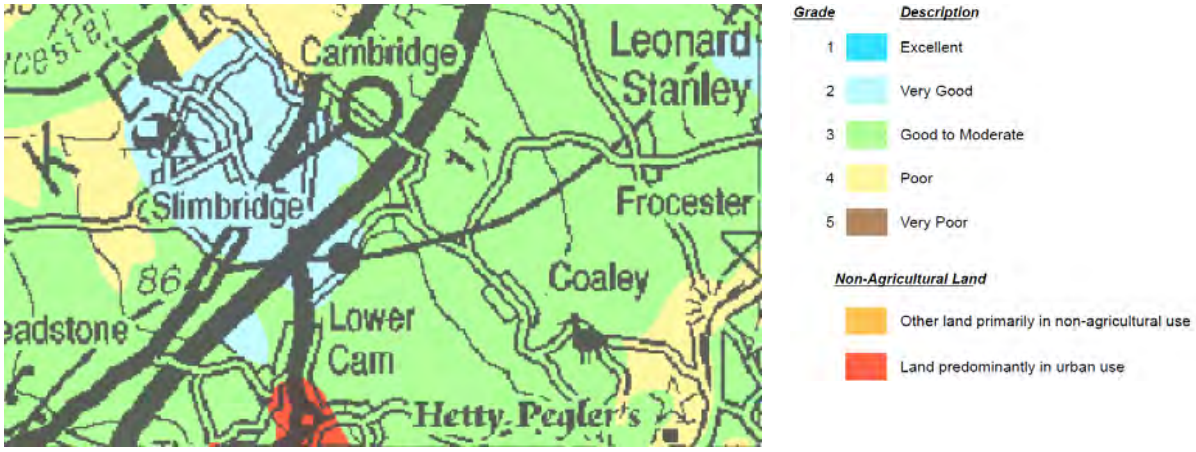
Land Quality in the Local Context

4.6 Any assessment of the significance of losing agricultural land needs to be made in context. Across England an estimated 42% of all farmland is within Grades 1, 2 and 3a (see TIN049, **Appendix KCC1).** Accordingly BMV agricultural land is not a rare resource.

4.7 Statistically about 40% of Grade 3 land falls within Subgrade 3a. However, in parts of the country the proportion is expected to be much higher.

4.8 The old “provisional” ALC maps are of limited use, as explained in TIN 049. They show the site to comprise of Grade 2 surrounded by undifferentiated Grade 3, as shown below.

Insert 2: Provisional ALC Map Extract

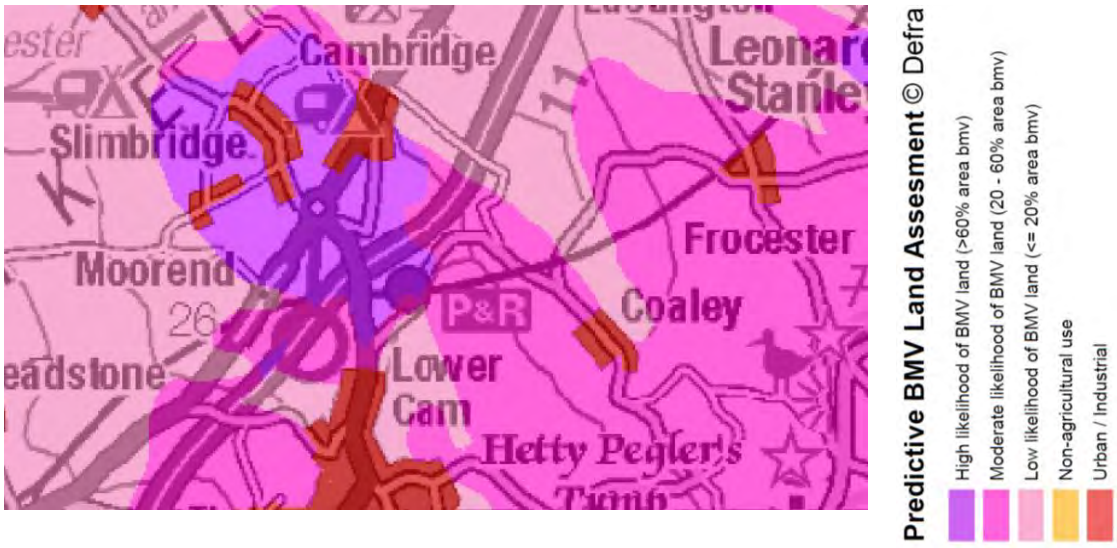


4.9 In 2017 Natural England published maps that predict the proportion of land that will be of best and most versatile quality. They have divided the country into three categories:

- low, where less than 20% of land is expected to be of BMV quality;
- medium, where 20-60% of the area is expected to be BMV;
- and high, where more than 60% of land is predicted to be of BMV quality.

4.10 An extract from the predictive BMV map is reproduced below. This shows that the site area is predicted to fall into the "**high likelihood of BMV (>60% area bmv)**" category.

Insert 3: Extract from Predictive BMV Map



4.11 As set out in TIN049 (**Appendix KCC1**) the provisional maps are not sufficiently reliable for site specific use. It is stated that "**these maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance**". For plan making and planning decisions it is necessary to obtain survey data. TIN049 notes that "**planning authorities should ensure that sufficient detailed site specific ALC survey data is available to inform decision making**".

4.12 Where survey data has been carried out by Defra (or its predecessors or agencies) it is available on www.magic.gov.uk. There is no survey data for this site, but a large area of land to the south east around Cam has been surveyed. It was found to comprise a mixture of mostly Grade 2, Subgrades 3a and 3b and Grade 4, as set out in **Appendix KCC3**.

4.13 As noted earlier, a detailed ALC has been carried out for this site. The detailed ALC survey shows the site to comprise a mix of Grades 2, 3a and 3b, although mostly the site is Grade 2.

Whether This is "Significant Development"

4.14 In the context of plan making, paragraph 171 of the NPPF advises that plans should allocate land with the least environmental or amenity value, consistent with other policies in the Framework. The footnote (53) advises that "**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**". Local Plan policy 21 takes a similar approach.

4.15 Paragraphs 170 and 171 of the NPPF consider whether poorer quality land is available, with the trigger for assessment being that the proposal involves "**significant development of agricultural land**". What is "**significant development**" is not defined in the NPPF. One threshold for determination of what is significant is the threshold for consultation with Natural England, which is set at the loss of 20 ha or more of BMV land (see TIN049 in **Appendix KCC1**). This has been the threshold for consultation with MAFF since 1987.

4.16 Accordingly this is significant development of agricultural land in policy terms.

Economic Implications

4.17 The NPPF requires recognition of the economic and other benefits of BMV land. There is no published research to assess the economic benefits of BMV land relative to non-BMV land (eg increased crop yield, for example). Accordingly any estimates can only be done in broad and somewhat crude terms.

4.18 Taking published budget books and using the crude measure (for winter wheat and a grazing livestock use) of the difference between average and high performance, the differences are shown below. The figures are taken from the Farm Management Pocketbook (2020).

Table 2: Assessment of Economics of Farmed Land

Item	Winter Wheat		Single – Suckle autumn calving suckler cows	
	Average	High	Average	High
Yield	8.7t/ha	10.0t/ha	1.65t/ha	2.0t/ha
Gross Margin / £/ha	£815	£1010	£217	£430
Fixed costs [1] £/ha	£715	£715	£645[2]	£645
Profit (loss) /ha before labour	£100	£295	(£428)	(215)
Unpaid labour £/ha	£220	£220	£390	£390
Profit (loss) after unpaid labour	(£120)	£75	(£818)	(£605)
Uplift £/ha	--	£195	-	£213

[1]Mainly cereals, under 200 ha, excluding unpaid labour

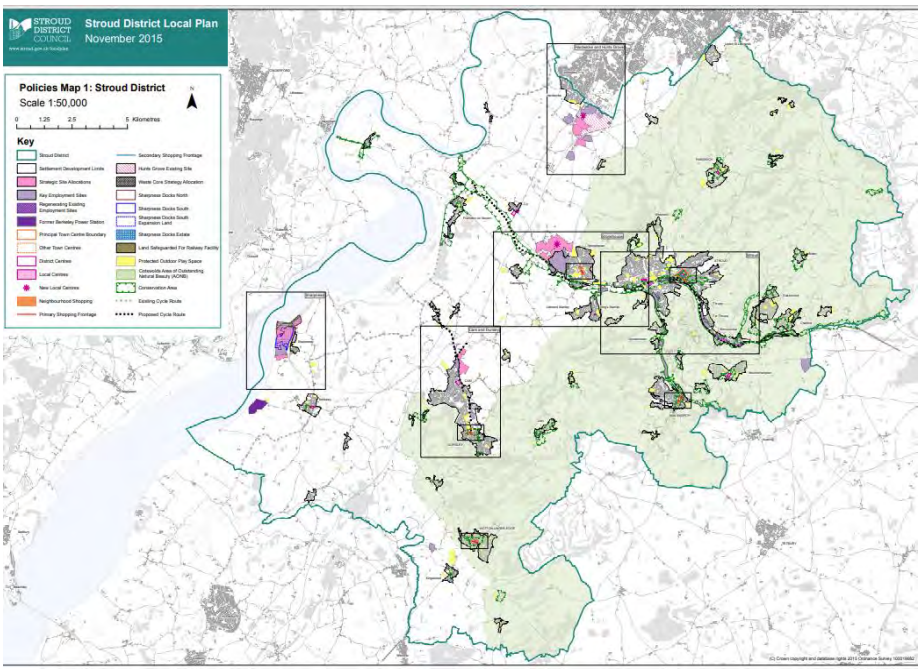
[2] Mainly sheep / cattle (lowland) farms 90-125 ha, including unpaid labour

4.19 A significant part of the site is used for grazing horses, where there is unlikely to be any economic benefit gained from the BMV/non-BMV differentiation, although grass sward damage from hooves may be less. However, for the purposes of determining an order-of-magnitude economic analysis, the economic benefit of 65.2 ha of agricultural land would be £12,700 to £13,900. This is a modest sum, therefore.

Whether Poorer Quality Land is Available

4.20 As a District, Stroud encompasses generally level or gently undulating land beside the Severn and more sloping land (much of which falls within the Cotswold Hills AONB) in the east, as shown below on an extract from the Local Plan Policies Map.

Insert 4: Local Plan (2015) Policies Map 1



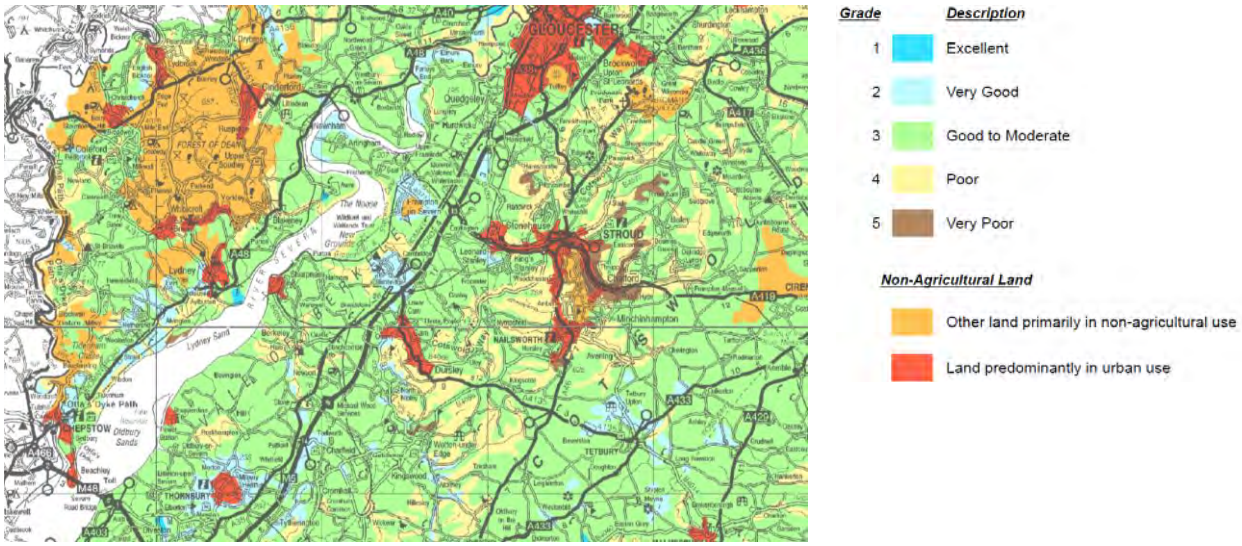
4.21 Statistics from the "provisional" MAFF ALC maps from the 1970s record that, based on the provisional maps, most of the district is undifferentiated Grade 3. The proportion of agricultural land is as follows. These maps were produced before Grade 3 was subdivided, and under a system of ALC which has since been revised.

Table 3: Proportion of ALC Grades Across the District

Grade	Proportion (%)
1	0
2	5.9
3	69.0
4	23.0
5	2.1

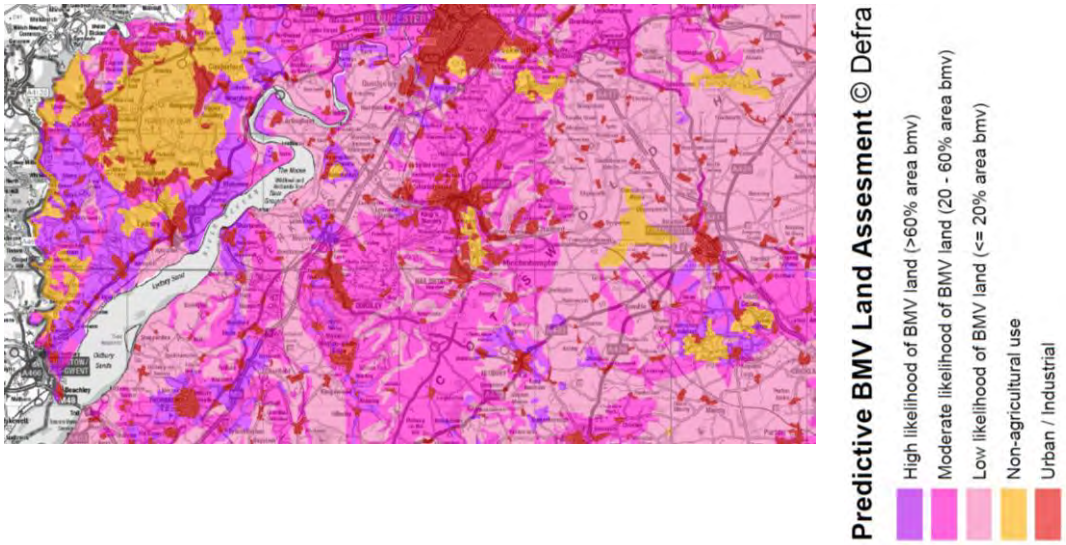
4.22 Taking a District-wide view, the Provisional map is shown below.

Insert 5: Provisional ALC Map Extract



4.23 In 2017 Natural England produced maps which show the likelihood of BMV in different areas, as shown for the site earlier. Across the District the majority of land falls into the "low (<20% area bmv)" or "moderate (20 – 60% area bmv)" categories.

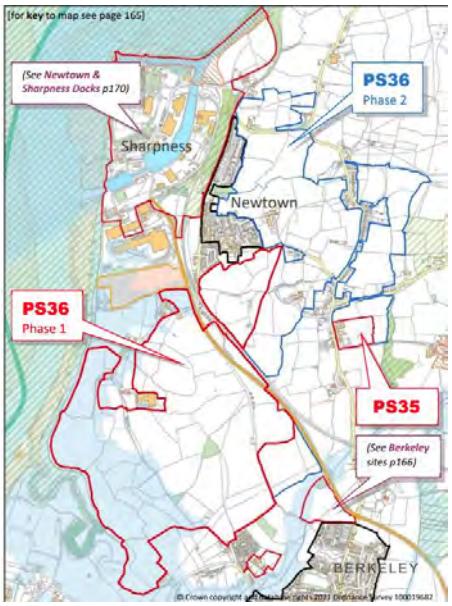
Insert 6: Predictive ALC Map Extract

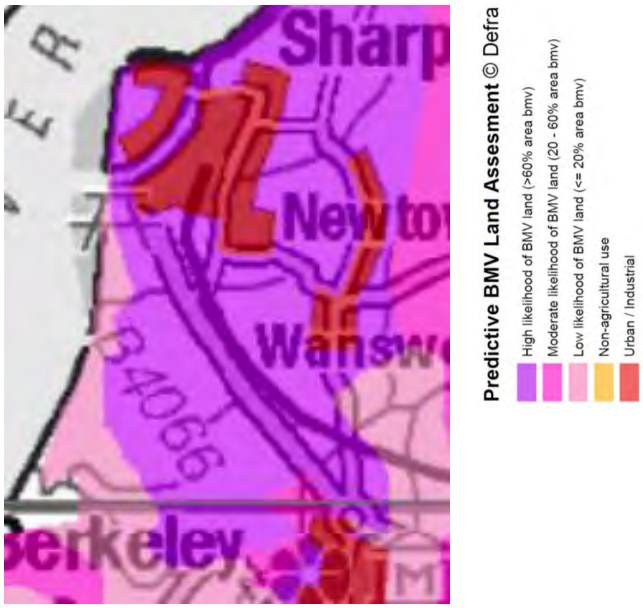


4.24 In respect of the Stroud District Local Plan Review (Presubmission Draft Plan 2021) we have considered the availability of detailed ALC information for PS36 Sharpness and land at Cam (PS24).

4.25 There is limited ALC information available for the Sharpness area. On the provisional maps the PS36 allocation is shown as undifferentiated Grade 3. On the predictive BMV maps the site is shown as of a "**high likelihood of BMV land (>60% area bmv)**". Available survey data identifies that a small part of the site, the only area for which available data exists, falls into ALC Grade 2, see **Appendix KCC4**. An extract from the Presubmission Local Plan is shown below, alongside an extract from the predictive BMV map.

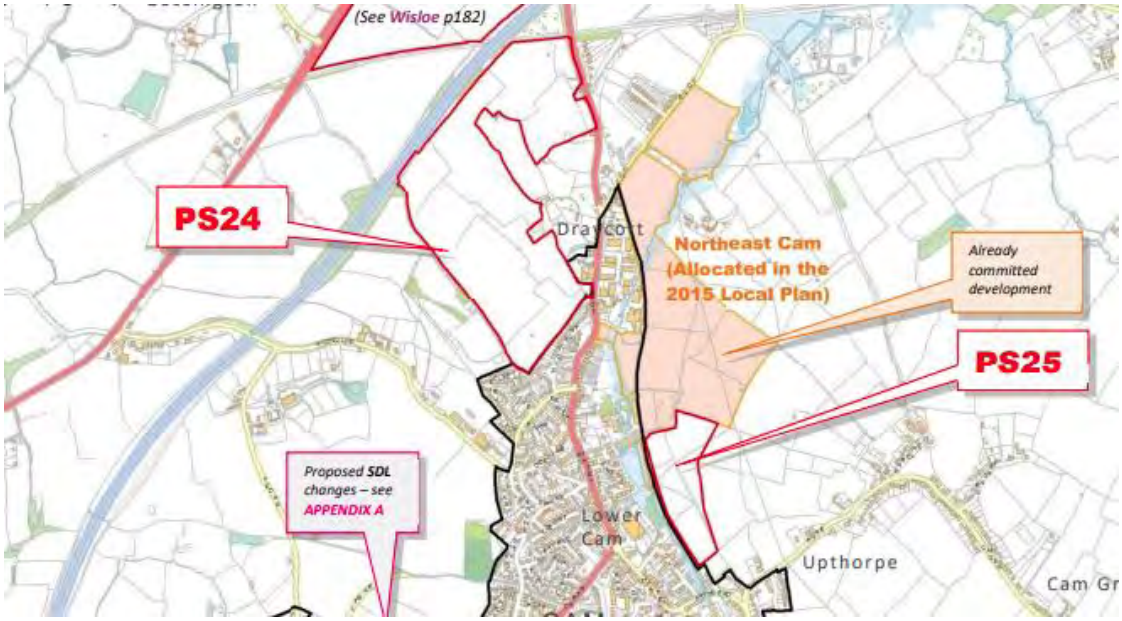
Insert 7: Predicted ALC for Sharpness Area





4.26 The committed development at northeast Cam, see below, has been permitted on a mixture of Grades 2, 3a and 3b land, as shown in **Appendix KCC3** (compared to the extract below). The Cam presubmission PS24 and PS25 sites (see below) are proposed mostly on Subgrade 3a land, see **Appendix KCC3**.

Insert 8: Extract Showing Cam Sites (extract from Presubmission Local Plan)



4.27 This analysis indicates that despite the apparent availability of land of generally lower quality district-wide, when it comes to identifying sites that meet other development management considerations (eg transport connectivity and sustainability, flooding, landscape, need etc) other sites appear similarly to involve, or be likely to involve, land of BMV quality.

4.28 The NPPF paragraph 170 makes reference to protecting soils. Where BMV land does need to be developed, detailed design consideration should be given to retaining or reusing the soil resource, especially the topsoil, within the site if possible. Guidance from Defra's "Construction Code of Practice for the Sustainable Use of Soils on Construction Sites" (2009) should be followed where possible.

5 SUMMARY AND CONCLUSIONS

5.1 The site extends to 77 ha of agricultural and equestrian grazing land.

5.2 On the provisional MAFF ALC maps the site is shown as Grade 2. On the predictive best and most versatile maps the site is shown as falling into the “high likelihood of BMV land (>60% area bmv)”.

5.3 Detailed ALC survey identifies this to be the case, with the majority of the site comprising land of Grade 2, with small areas of Subgrades 3a and 3b.

5.4 Therefore development of this area involves significant development of BMV agricultural land.

5.5 In a plan making context the policy in the NPPF (paragraph 171 footnote 53) is, where there is a choice between sites, to use land of poorer quality in preference.

5.6 This is not a bar to development of agricultural land, but the existence of significant areas of BMV must be taken into account, and there is preference towards using areas of poorer quality.

5.7 Presubmission allocation proposals at Sharpness involve land shown (similarly to Wisloe) as falling into the “high likelihood of BMV (>60% area bmv)”. Only a small area of survey data is available, but that identified Grade 2. Therefore this would use significant areas of BMV land, it is predicted.

5.8 Existing and proposed allocations on the edge of Cam utilise land of Grades 2, 3a and 3b, and accordingly significant areas of BMV land. The emerging proposed allocations are mostly of subgrade 3a.

5.9 This report therefore sets out the land quality of the site, identities the order of magnitude of the economic benefits involved, and reviews the apparent lack of availability of land of poorer quality that could be used in preference.

APPENDIX KCC1

Natural England Technical Information Note TIN049

Natural England Technical Information Note TIN049

Agricultural Land Classification: protecting the best and most versatile agricultural land

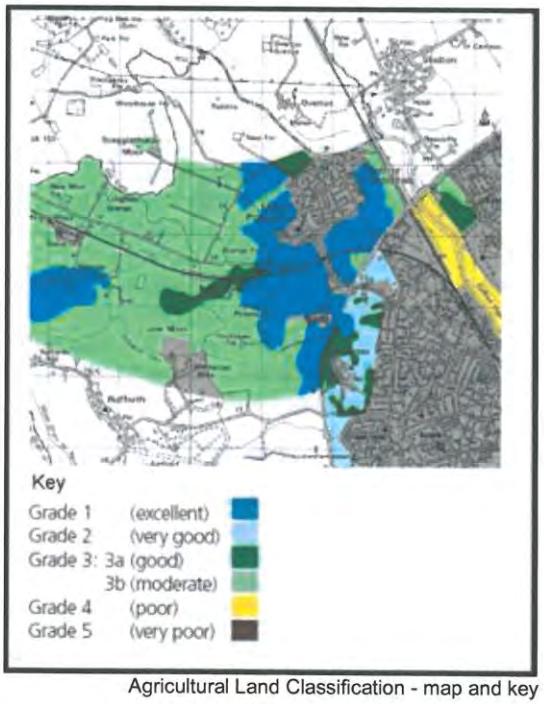
Most of our land area is in agricultural use. How this important natural resource is used is vital to sustainable development. This includes taking the right decisions about protecting it from inappropriate development.

Policy to protect agricultural land

Government policy for England is set out in the National Planning Policy Framework (NPPF) published in March 2012 (paragraph 112). Decisions rest with the relevant planning authorities who should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality. The Government has also re-affirmed the importance of protecting our soils and the services they provide in the Natural Environment White Paper The Natural Choice:securing the value of nature (June 2011), including the protection of best and most versatile agricultural land (paragraph 2.35).

The ALC system: purpose & uses

Land quality varies from place to place. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system. It helps underpin the principles of sustainable development.



Agricultural Land Classification - map and key

Second edition 19 December 2012
www.naturalengland.org.uk

NATURAL ENGLAND

Agricultural Land Classification: protecting the best and most versatile agricultural land

The ALC system classifies land into five grades, with Grade 3 subdivided into Subgrades 3a and 3b. The best and most versatile land is defined as Grades 1, 2 and 3a by policy guidance (see Annex 2 of NPPF). This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non food uses such as biomass, fibres and pharmaceuticals. Current estimates are that Grades 1 and 2 together form about 21% of all farmland in England; Subgrade 3a also covers about 21%.

The ALC system is used by Natural England and others to give advice to planning authorities, developers and the public if development is proposed on agricultural land or other greenfield sites that could potentially grow crops. The Town and Country Planning (Development Management Procedure) (England) Order 2010 (as amended) refers to the best and most versatile land policy in requiring statutory consultations with Natural England. Natural England is also responsible for Minerals and Waste Consultations where reclamation to agriculture is proposed under Schedule 5 of the Town and Country Planning Act 1990 (as amended). The ALC grading system is also used by commercial consultants to advise clients on land uses and planning issues.

Criteria and guidelines

The Classification is based on the long term physical limitations of land for agricultural use. Factors affecting the grade are climate, site and soil characteristics, and the important interactions between them. Detailed guidance for classifying land can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988):

- **Climate:** temperature and rainfall, aspect, exposure and frost risk.
- **Site:** gradient, micro-relief and flood risk.
- **Soil:** texture, structure, depth and stoniness, chemical properties which cannot be corrected.

The combination of climate and soil factors determines soil wetness and droughtiness. Wetness and droughtiness influence the choice of crops grown and the level and consistency of yields, as well as use of land for grazing livestock. The Classification is concerned with the inherent potential of land under a range of farming systems. The current agricultural use, or intensity of use, does not affect the ALC grade.

Versatility and yield

The physical limitations of land have four main effects on the way land is farmed. These are:

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

The ALC gives a high grading to land which allows more flexibility in the range of crops that can be grown (its 'versatility') and which requires lower inputs, but also takes into account ability to produce consistently high yields of a narrower range of crops.

Availability of ALC information

After the introduction of the ALC system in 1966 the whole of England and Wales was mapped from reconnaissance field surveys, to provide general strategic guidance on land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile in the period 1967 to 1974. These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended and can be downloaded from the Natural England **website**. This data is also available on 'Magic', an interactive, geographical information website **http://magic.defra.gov.uk/**.

Since 1976, selected areas have been re-surveyed in greater detail and to revised

guidelines and criteria. Information based on detailed ALC field surveys in accordance with current guidelines (MAFF, 1988) is the most definitive source. Data from the former Ministry of Agriculture, Fisheries and Food (MAFF) archive of more detailed ALC survey information (from 1988) is also available on **http://magic.defra.gov.uk/**. Revisions to the ALC guidelines and criteria have been limited and kept to the original principles, but some assessments made prior to the most recent revision in 1988 need to be checked against current criteria. More recently, strategic scale maps showing the likely occurrence of best and most versatile land have been prepared. Mapped information of all types is available from Natural England (see *Further information* below).

New field survey

Digital mapping and geographical information systems have been introduced to facilitate the provision of up-to-date information. ALC surveys are undertaken, according to the published Guidelines, by field surveyors using handheld augers to examine soils to a depth of 1.2 metres, at a frequency of one boring per hectare for a detailed assessment. This is usually supplemented by digging occasional small pits (usually by hand) to inspect the soil profile. Information obtained by these methods is combined with climatic and other data to produce an ALC map and report. ALC maps are normally produced on an Ordnance Survey base at varying scales from 1:10,000 for detailed work to 1:50 000 for reconnaissance survey

There is no comprehensive programme to survey all areas in detail. Private consultants may survey land where it is under consideration for development, especially around the edge of towns, to allow comparisons between areas and to inform environmental assessments. ALC field surveys are usually time consuming and should be initiated well in advance of planning decisions. Planning authorities should ensure that sufficient detailed site specific ALC survey data is available to inform decision making.

Consultations

Natural England is consulted by planning authorities on the preparation of all development plans as part of its remit for the natural environment. For planning applications, specific consultations with Natural England are required under the Development Management Procedure Order in relation to best and most versatile agricultural land. These are for non agricultural development proposals that are not consistent with an adopted local plan and involve the loss of twenty hectares or more of the best and most versatile land. The land protection policy is relevant to all planning applications, including those on smaller areas, but it is for the planning authority to decide how significant the agricultural land issues are, and the need for field information. The planning authority may contact Natural England if it needs technical information or advice.

Consultations with Natural England are required on all applications for mineral working or waste disposal if the proposed afteruse is for agriculture or where the loss of best and most versatile agricultural land agricultural land will be 20 ha or more. Non-agricultural afteruse, for example for nature conservation or amenity, can be acceptable even on better quality land if soil resources are conserved and the long term potential of best and most versatile land is safeguarded by careful land restoration and aftercare.

Other factors

The ALC is a basis for assessing how development proposals affect agricultural land within the planning system, but it is not the sole consideration. Planning authorities are guided by the National Planning Policy Framework to protect and enhance soils more widely. This could include, for example, conserving soil resources during mineral working or construction, not granting permission for peat extraction from new or extended mineral sites, or preventing soil from being adversely affected by pollution. For information on the application of ALC in Wales, please see below.

Further information

Details of the system of grading can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

Please note that planning authorities should send all planning related consultations and enquiries to Natural England by e-mail to **consultations@naturalengland.org.uk**. If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Natural England
Consultation Service
Hornbeam House
Electra Way
Crewe Business Park
CREWE
Cheshire
CW1 6GJ

ALC information for Wales is held by Welsh Government. Detailed information and advice is available on request from Ian Rugg (**ian.rugg@wales.gsi.gov.uk**) or David Martyn (**david.martyn@wales.gsi.gov.uk**). If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Welsh Government
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth
Ceredigion
SY23 3UR

Natural England publications are available to download from the Natural England website: **www.naturalengland.org.uk**.

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail **enquiries@naturalengland.org.uk**.

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APPENDIX KCC2

Agricultural Land Classification

AGRICULTURAL LAND CLASSIFICATION

Purpose

1 This appendix 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.

Methodology

2 The work has been carried out by an experienced ALC surveyor who is a Chartered Environmentalist (CEnv) and a Member of the Institute of Agricultural Engineers. The ALC surveyor was formerly a Lead Adviser for Natural England and Senior Adviser in the Department for Environment Food and Rural Affairs (Defra) Rural Development Service, and the former of Ministry of Agriculture, Fisheries and Food (MAFF) Farming and Rural Conservation Agency (FRCA). The ALC surveyor meets the requirements of the British Society of Soil Science (BSSS) Professional Competency Standard (PCS) scheme for ALC (see BSSS PCS Document 2 '*Agricultural Land Classification of England and Wales*'). The BSSS PCS scheme is endorsed, amongst others, Defra, Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).

3 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').

4 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 112 and Annex 2 of the National Planning Policy Framework (NPPF) of March 2012. Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049.

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

5 An ALC survey was completed on 15th April, 19th and 26th June 2021. The ALC survey involved examination of the soil's physical properties at seventy-two locations located on an approximate 100m by 100m grid; this equates to a density of one auger boring per ha. The auger locations of the detailed soil survey are shown on **Plan KCC3027/01**.

6 It should be noted that no auger bores were excavated at locations 42, 48, 49, 58, 61, 63 and 71, as this was determined to be a Utilities and Services Exclusion Zone for health and safety purposes.

7 A sample of topsoil was collected at auger locations 7, 36 and 54 as shown on Plan **KCC3027/01**. All three samples were sent to an accredited laboratory for particle size analysis, i.e. the proportions of sand, silt and clay. This is to determine the definitive texture class of the topsoil, especially with regard to distinguishing between medium clay loams (i.e., <27% clay) and heavy clay loams (27% to 35% clay).

8 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.

9 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.

10 The soil profile at each sample location was described using the '*Soil Survey Field Handbook: Describing and Sampling Soil Profiles*' (Ed. J.M. Hodgson, Cranfield University, 1997). Each soil profile was ascribed a grade following the ALC Guidelines.

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

- climate;
- site;
- soil; and
- interactive limitations.

12 These factors are considered in turn below.

Climate

13 Interpolated climate data relevant to the determination of the ALC grade of land at the Site is given in Table 1 below.

Table 1: ALC Climate Data for National Grid Reference SO747028

Climate Parameter	Data
Average Altitude (m)	19
Average Annual Rainfall (mm)	786
Accumulated Temperature above 0˚C (January – June)	1511
Moisture Deficit (mm) Wheat	101
Moisture Deficit (mm) Potatoes	94
Field Capacity Days (FCD)	175
Grade according to climate	1

14 With reference to Figure 1 '*Grade according to climate*' on page 6 of the ALC Guidelines, the quality of agricultural land at the Site is not limited by climate. As a result, agricultural land at the Site can be graded as high as Grade 1 in the absence of any other limiting factor (i.e. site and/or soil).

15 Due to the average annual rainfall, agricultural land at the Site is predicted to be at field capacity (i.e. near saturation point) for 175 days per year, mainly over the late autumn, winter and early spring. This will, in combination with topsoil texture, cause an 'interactive limitation' to agricultural land quality at the Site - namely soil wetness (see below).

Site

16 The Site is comprises approximately 72 hectares of agricultural land approximately 1km to the south-east of Slimbridge, Gloucestershire. The Site is located to the south-east of the A38, and is bordered by the River Cam along the northern boundary and by the M5 to the south. The Site is bisected by the A4135.

17 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.

18 **Gradient and Micro-Relief**. The Site is located on a north-east facing slope at an altitude of approximately 27 metres (m) above ordnance datum (AOD) in the south-west and approximately 17mAOD near the River Cam in the northeast. Gradient is not

considered to be a limiting factor to agricultural land quality at this Site as the gradient does not exceed 7° as per Table 1 in the ALC guidelines.

19 Likewise, micro-relief, i.e. complex changes in slope angle and direction over short distances, does not affect the quality of the agricultural land at the Site.

20 **Risk of Flooding**. From a Government Flood Map for Planning[3], most of the Site falls in Flood Zone 1 with a low risk of flooding. Some land flanking the River Cam along the northern boundary falls in Flood Zones 2 and 3. However, there is no evidence (data) available to determine whether or not the frequency and duration of flooding in the north of the Site limits the quality of agricultural land in ALC terms, i.e. Table 2 '*Grade according to flood risk in summer*' and Table 3 '*Grade according to flood risk in winter*' of the ALC Guidelines.

Soil

21 **Geology/Soil Parent Material**. British Geological Survey (BGS) information available online has been utilised to identify the Bedrock underlying the Site and the presence of any Superficial (Drift) Deposits[4]. This provides information on soil forming materials at the Site. The geological information shows the Site is underlain by mudstone in the Blue Lias Formation and Charmouth Mudstone Formation (undifferentiated).

22 Most of the bedrock at the Site is covered superficial deposits of Cheltenham Sand and Gravel. The is a narrow band of Alluvium on land along the River Cam in the north of the Site. The far south-western part of the Site is not covered by superficial deposits, and here the soil is developed directly from the mudstone bedrock.

23 **Published Information on Soil**. Provisional information for soils at the Site was gathered from the Soil Survey of England and Wales (SSEW) soil map of South West England (Sheet 5) at a scale of 1:250,000 and accompanying Bulletin No. 12 '*Soils and their Use in South West England*' (D.C. Findlay *et al,* Harpenden, 1984). The provisional SSEW soils information indicates that most of the agricultural land at the Site is covered by well drained, calcareous and non-calcareous fine loamy soils over limestone gravel in the Badsey 1 Association. The land in the far south-west developed on mudstone has fine loamy over clayey and clayey soils which are slowly permeable and seasonally waterlogged in the Oxpasture Association.

[3] Government Flood Risk for Planning 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

24 The SSEW describe how the Badsey 1 Association occurs on level or gently sloping river terraces along the Thames and its tributaries above Oxford, along the Severn and Avon in Worcestershire, Warwickshire and Gloucestershire and along the Yeo, Brue and Avon in Somerset, Avon and Wiltshire. The dominant Badsey soils are brown calcareous earths, mainly well drained and fine loamy with limestone river terrace gravel at shallow depth. Gravel is at shallow depth in Badsey soils, and Sacrewell series occurs where it is even shallower. Most of the river terrace gravels overlie clay at depth. Astrop soils are developed in Head on inter-terrace slope and Oxpasture and Holdenby soils are where the Head is thin over clay. Badsey, Sutton and Sacrewell soils are all well drained (Wetness Class I). Oxpasture and Holdenby soils are occasionally or seasonally waterlogged (Wetness Class II or III).

25 The SSEW describes how the Oxpasture Association occurs where thin fine textured drift covers slowly permeable Jurassic clays, silts and mudstones. The fine loamy over clayey Oxpasture series, stagnogleyic argillic brown earths, predominates and the similar but wetter Wickham series, typical stagnogley soils, is locally extensive. Where the drift is clayey Holdenby soils, typical argillic pelosols, are important. Occasionally the thin drift is absent giving wet stoneless Denchworth series, pelo-stagnogley soils. Oxpasture and Holdenby soils have slowly permeable subsoils and even after appropriate drainage are seasonally waterlogged (Wetness Class III). Wickham and Denchworth soils also have slowly permeable subsoils and are waterlogged for long periods in winter (Wetness Class IV). After suitable drainage treatment the regime is improved (Wetness Class III) in drier districts. Because of the moderate permeability of the topsoils and the slowly permeable subsoils, disposal of excess rain is mainly by lateral flow at shallow depth.

26 **Soil Survey**. From the detailed soil survey carried out on 15th April and 19th and 26th June 2021 it was determined that the majority of the Site is covered by a very slightly stony, calcareous, dark yellowish brown (e.g.10YR3/4) or brown (10YR4/3) medium clay loam or heavy clay loam topsoil, overlying a well drained slightly to moderately stony, calcareous, yellowish brown (e.g. 10YR5/4) heavy clay loam or clay subsoil. In this climate area (175 FCD), the soil profiles, which are not gleyed within 70cm below ground level, and where the top of a slowly permeable layer (SPL) occurs below 80cm below ground level, are placed in Wetness Class I (re Appendix 3 of the ALC Guidelines, October 1988).

27 A log of all the soil profiles recorded on Site is given in **Attachment A**. Three soil pits were excavated near auger-bore locations 1, 35 and 54, respectively, and are described in **Attachment B**.

28 In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, three samples of topsoil were collected over the Site (i.e., Auger Locations 7, 36 and 54). The topsoil samples were sent to an accredited laboratory for analysis of particle size distribution (PSD), based on the British Standard Institution particle size grades. The certificate of analysis is provided as **Attachment C**. The findings of the PSD analysis are shown in Table 2 below.

Table 2: Topsoil Texture (re Table 10, ALC Guidelines)

Topsoil Sample Location (See Plan KCC3027/01)	**% sand 0.063-2.0 mm**	**% silt 0.002-0.063 mm**	**% clay <0.002 mm**	**ALC Soil Texture Class**
7	21	53	26	Medium Clay Loam
36	32	42	26	Medium Clay Loam
54	32	46	22	Medium Clay Loam

Interactive Limitations

29 From the information above, together with the findings of the detailed soil survey (see Soil Profile Log given as **Attachment A**), it has been determined that the main limiting factor to the quality of agricultural land the Site is soil droughtiness, and occasionally soil wetness in parts of the Site.

30 **Soil Droughtiness**. As shown in the soil profile logs given as **Attachment A**, moisture balance (MB) calculations for the ALC reference crops (winter wheat and maincrop potatoes) have determined that the soil profiles mainly have MB values of between +30mm and +5mm for wheat, and between +10mm and -10mm for potatoes. These profiles are limited by soil droughtiness to Grade 2 (re Table 8 'Grade according to droughtiness' of the ALC Guidelines).

31 **Soil Wetness**. 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 is limited by soil wetness as per Table 3 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines).

Table 3: Predicted ALC Grade According to Soil Wetness

Wetness Class	**Texture of the Top 25 cm**	**151-175 Field Capacity Days**
I	Sandy Loam, Sandy Silt Loam Medium Clay Loam*, Medium Silty Clay Loam* Heavy Silty Clay Loam**, Heavy Clay Loam** Clay, Silty Clay	1 1 2 3a
II	Sandy Loam, Sandy Silt Loam Medium Clay Loam*, Medium Silty Clay Loam* Heavy Silty Clay Loam**, Heavy Clay Loam** Clay, Silty Clay	1 2 3a 3b
III	Sandy Loam, Sandy Silt Loam Medium Clay Loam*, Medium Silty Clay Loam* Heavy Silty Clay Loam**, Heavy Clay Loam** Clay, Silty Clay	2 3a 3a 3b
IV	Sandy Loam, Sandy Silt Loam Medium Clay Loam*, Medium Silty Clay Loam* Heavy Silty Clay Loam**, Heavy Clay Loam** Clay, Silty Clay	3a 3b 3b 3b
Key * <27% clay; and ** >27% clay		

32 In climate area with between 151-175 Field Capacity Days (FCD), well-drained soil profiles in Wetness Class I which have heavy clay loam topsoil are slightly limited by soil wetness to Grade 2. Soil profiles at the Site which are waterlogged for long periods in the winter (Wetness Class IV), and which have clay topsoil, are limited by soil wetness to Subgrade 3b in this climate area (i.e., 151-175 FCD).

33 In the far south-west (i.e., auger bore 72), the soil developed in mudstone has clay topsoil over slowly permeable clay subsoil which is seasonally waterlogged for long periods during the winter. This type of soil is limited by soil wetness to Subgrade 3b. Likewise, soil profiles developed in Alluvium adjacent to the River Cam in the north of the Site are limited by soil wetness to Subgrade 3b, where the topsoil is heavy clay loam and there is a slowly permeable subsoil is placed in Wetness Class III.

Agricultural Land Classification Grading

Previous ALC

34 The provisional ALC map of the South Western Region (MAFF 1977), at a scale of 1:250,000, indicates that agricultural land developed on Cheltenham Sand And Gravel at the Site is in Grade 2.

35 There is no detailed (post 1988) ALC data available for the Site[5], but MAFF has determined agricultural land of Grade 2 quality on similar land to the southwest of Slimbridge (Reference ALCB08998).

ALC Grading at the Site

36 **Grade 2**. Most of the profiles over the Site with medium clay loam topsoil over slightly to moderately gravelly, medium clay loam, to heavy clay loam and clay subsoil are limited by a slight soil droughtiness limitation to Grade 2.

37 In addition, soil profiles with heavy clay loam topsoil in Wetness Class I are limited by a slight wetness (workability) limitation to Grade 2.

38 **Subgrade 3a**. An area in the northern part of the Site is limited to Subgrade 3a by soil wetness, where the soil profile, with a medium silty clay loam topsoil over a slowly permeable subsoil, is placed in Wetness Class III in a climate area with 175 FCD. There is an isolated occurrence of a soil profile with a clay topsoil overlying a well drained subsoil, which is placed in Wetness Class I and is limited by a workability limitation to Subgrade 3a.

39 **Subgrade 3b**. Agricultural land in the far northern and southern parts of the Site are limited by soil wetness to Subgrade 3b, i.e. where soil profiles with heavy clay loam overlying a slowly permeable layer are placed Wetness Class III in a climate area with 175 FCD.

40 The area and proportion of agricultural land in each ALC grade has been measured from an ALC map given as **Plan KCC3027/02**. The findings are reported in Table 4 below.

[5] MAGIC.gov.uk. Last viewed July 2021

Table 4: Agricultural Land Classification – Wisloe, Gloucestershire

ALC Grade	**Area (Ha)**	**Area (% of Total Site)**
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	59.9	77.9
Subgrade 3a (Good)	5.3	6.9
Subgrade 3b (Moderate)	3.9	5.1
Grade 4 (Poor)	0	0
Grade 5 (Very Poor)	0	0
Non-agricultural / Other land	1.5	2.0
Unsurveyed	6.3	8.1
Total	**76.9**	**100**

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ATTACHMENT A

Soil Profile Logs

Point	G+A1:D213ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
1	SO 75000 03200	375000	203200	17	≤7			0	39	39	10YR4/3					No	HCL - Cla	4	4	2	HR - All hard	
								39	42	3	10YR4/3					No	HCL - Clay loam (heavy)					
								42	50	8							HCL - Clay loam (heavy)					
								50	120	70							C - Clay	50			GH - Gravel v	
2	SO 75100 03200	375100	203200	17	≤7			0	38	38	10YR4/3					No	MCL - Cla	2	2		HR - All hard	
								38	45	7	10YR4/4					No	C - Clay					
								45	120	75							C - Clay		50		GH - Gravel v	
3	SO 75300 03100	375300	203100	16	≤7			0	38	38	10YR4/3					No	MCL - Clay loam (medium)					
								38	52	14	10YR5/4					No	MCL - Cla	50			GH - Gravel v	
								52	120	68							MCL - Cla	50			GH - Gravel v	
4	SO 75400 03100	375400	203100	16	≤7			0	35	35	10YR4/3					No	MZCL - Si	3	3		HR - All hard	
								35	45	10	10YR4/4					No	MZCL - Silty clay loam (medium)					
								45	50	5	10YR5/4					No	MZCL - Silty clay loam (medium)					
								50	120	70							MZCL - Si	50			HR - All hard	
5	SO 75500 03100	375500	203100	15	≤7			0	35	35	10YR4/3					No	MZCL - Si	2	2		HR - All hard	
								35	45	10	10YR5/3	FF - Fe	10YR5/6			Yes	HZCL - Silty clay loam (heavy)					
								45	58	13	10YR5/3	MD - f	10YR5/6			Yes	C - Clay	20			GH - Gravel v	
								58	60	2	10YR4/2					Yes	C - Clay	50			GH - Gravel v	
								60	120	60							C - Clay					
6	SO 75200 03000	375200	203000	17	≤7			0	30	30	10YR4/2					Yes	HCL - Cla	2	2		HR - All hard	
								30	40	10	10YR4/2	FF - Fe	10YR5/6			Yes	HCL - Clay loam (heavy)					
								40	65	25	10YR5/4	CF - Ca	10YR5/6			No	C - Clay	20			GH - Gravel v	
								65	120	55							C - Clay					
7	SO 75300 03000	375300	203000	16	≤7			0	38	38	10YR4/3					No	MCL - Clay loam (medium)					
								38	58	20	10YR5/4					No	C - Clay					
								58	65	7	10YR5/4	CF - Ca	7.5YR5/6			No	MCL - Cla	50			HR - All hard	
								65	120	55							MCL - Cla	50			HR - All hard	
8	SO 75400 03000	375400	203000	16	≤7			0	36	36	10YR4/3					No	MZCL - Silty clay loam (medium)					
								36	40	4	10YR5/6					No	C - Clay					
								40	58	18	10YR4/4	CF - Ca	7.5YR5/6			No	C - Clay	10			GH - Gravel v	
								58	68	10	10YR5/4					No	MCL - Cla	10			GS - Gravel w	
								68	120	52							MCL - Cla	50			GH - Gravel v	
9	SO 75500 03000	375500	203000	15	≤7			0	38	38	10YR4/3					No	MZCL - Silty clay loam (medium)					
								38	43	5	10YR4/4					No	MZCL - Silty clay loam (medium)					
								43	75	32	10YR5/4	CD - C	10YR5/6			No	C - Clay					
								75	120	45							C - Clay	50			GH - Gravel v	
10	SO 75600 03000	375600	203000	15	≤7			0	38	38	10YR4/3					No	MCL - Cla	2	2		HR - All hard	
								38	45	7	10YR4/4					No	HCL - Clay loam (heavy)					
								45	55	10	10YR5/4	CD - C	7.5YR5/6			No	C - Clay					
								55	70	15	10YR5/4	CD - C	7.5YR5/6			No	MCL - Cla	10			HR - All hard	
								70	120	50							MCL - Cla	50			HR - All hard	
11	SO 75700 03000	375700	203000	16	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	40	2	10YR4/4					No	HZCL - Silty clay loam (heavy)					
								40	45	5	10YR5/3					Yes	HCL - Clay loam (heavy)					
								45	100	55	10YR5/3	MD - f	10YR5/6			Yes	C - Clay					
								100	120	20							C - Clay					
12	SO 75100 02900	375100	202900	18	≤7			0	30	30	10YR4/3					No	HCL - Clay loam (heavy)					
								30	45	15	10YR4/4					No	HCL - Clay loam (heavy)					
								45	120	75							HCL - Cla	30			GH - Gravel v	

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
rocks or stones (i.e. those which cannot be scratched wit						Not Applic	VC - Ver	No	No	11	6	2	WC III	3b	Wetness			3b	augered to 42cm; calc fragments; exploratory pit near gleyed 50cm+	N/A
						Moderate	VC - Ver	Yes	No											
						Moderate			No											
vith non-porous (hard) stones						Poor			Yes											
rocks or stones (i.e. those which cannot be scratched wit						Not Applic	SC - Slig	No	No	32	17	1	WC III	3a	Wetness			3a		N/A
						Moderate	MC - M	Yes	No											
vith non-porous (hard) stones						Poor			Yes											
						Not Applic	NON - N	No	No	16	3	2	WC I	1	Droughtiness			2	difficult to auger 52cm gravel	N/A
vith non-porous (hard) stones						Moderate	VC - Ver	No	No											
vith non-porous (hard) stones						Moderate			No											
rocks or stones (i.e. those which cannot be scratched wit						Not Applic	NON - N	No	No	25	14	2	WC I	1	Droughtiness			2		N/A
						Moderate	NON - N	No	No											
						Moderate	VC - Ver	No	No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate			No											
rocks or stones (i.e. those which cannot be scratched wit						Not Applicable		No	No	35	20	1	WC III	3b	Wetness			3b		N/A
						Moderate		No	No											
vith non-porous (hard) stones						Moderate		Yes	Yes											
vith non-porous (hard) stones						Poor			Yes											
						Poor			Yes											
rocks or stones (i.e. those which cannot be scratched wit						Not Applicable		No	No	25	8	2	WC I	2	Wetness			3a	difficult to auger 65cm stone ; assume similar subsoil to 120cm not gleyed	N/A
						Moderate		No	No											
vith non-porous (hard) stones						Poor		Yes	No											
						Poor			No											
						Not Applicable		No	No	25	17	2	WC I	1	Droughtiness			2	NRM sample C** calc fragments 65cm	N/A
						Moderate		Yes	No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate			No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate			No											
						Not Applicable		No	No	31	24	1	WC I	1	N/A			1		N/A
						Moderate		Yes	No											
vith non-porous (hard) stones						Moderate			No											
vith porous stones (mainly soft stone types listed above)						Moderate			No											
vith non-porous (hard) stones						Moderate			No											
						Not Applicable		No	No	23	22	2	WC I	1	Droughtiness			2	augered to 75cm stone stopped auger.	N/A
						Moderate		No	No											
						Poor		Yes	No											
vith non-porous (hard) stones						Poor			No											
rocks or stones (i.e. those which cannot be scratched wit						Not Applic	NON - N	No	No	28	22	2	WC I	1	Droughtiness			2	augered to 70cm; friable at this depth and calc fragments	N/A
						Moderate	NON - N	No	No											
						Moderate	MC - M	No	No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate	VC - Ver	No	No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate			No											
						Not Applicable		No	No	31	16	1	WC III	3b	Wetness			3b		N/A
						Moderate		No	No											
						Poor		Yes	Yes											
						Poor		Yes	Yes											
						Poor			Yes											
						Not Applic	MC - M	No	No	33	14	1	WC I	2	Wetness			2	difficult to auger 45cm stone/gravel. Grass for haylage	N/A
						Moderate	VC - Ver	No	No											
vith non-porous (hard) stones						Moderate			No											

Point	G+A1:D213ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
13	SO 75200 02900	375200	202900	18	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	50	12	10YR5/4	CF - C	7.5YR5/6			No	C - Clay					
								50	52	2	10YR4/3					No	C - Clay					
								52	120	68							C - Clay	50			GH - Gravel	
14	SO 75300 02900	375300	202900	18	≤7			0	38	38	10YR4/3					No	MZCL - Silty clay loam (medium)					
								38	40	2	10YR4/4					No	HZCL - Silty clay loam (heavy)					
								40	45	5	10YR5/3	CD - C	10YR5/6			Yes	C - Clay					
								45	85	40	10YR5/3	MP - M	10YR5/6			Yes	C - Clay					
								85	120	35							C - Clay					
15	SO 75400 02900	375400	202900	18	≤7			0	38	38	10YR4/3					No	MZCL - Silty clay loam (medium)					
								38	43	5	10YR4/4					No	C - Clay					
								43	55	12	10YR5/3	MD - M	10YR5/6			Yes	C - Clay					
								55	70	15	10YR5/3	CD - C	10YR5/6			Yes	C - Clay					
								70	120	50							C - Clay					
16	SO 75500 02900	375500	202900	17	≤7			0	38	38	10YR4/3					No	HZCL - Sil	2	2		HR - All hard	
								38	65	27	10YR4/3					No	HZCL - Silty clay loam (heavy)					
								65	75	10	10YR4/4					No	HZCL - Sil	20			GH - Gravel	
								75	120	45							HZCL - Silty clay loam (heavy)					
17	SO 75600 02900	375600	202900	17	≤7			0	33	33	10YR4/3					No	MZCL - Si	3	3		HR - All hard	
								33	39	6	10YR4/4					No	MZCL - Silty clay loam (medium)					
								39	55	16	10YR5/4					No	MCL - Cla	10			GH - Gravel	
								55	120	65							MCL - Cla	50			GH - Gravel	
18	SO 75000 02800	375000	202800	19	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	42	4	10YR4/4					No	C - Clay					
								42	120	78							C - Clay	50			GH - Gravel	
19	SO 75100 02800	375100	202800	18	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	50	12	10YR4/4					No	C - Clay					
								50	120	70							C - Clay	50			GH - Gravel	
20	SO 75200 02800	375200	202800	18	≤7			0	35	35	10YR4/3					No	HCL - Cla	1	1		HR - All hard	
								35	55	20	10YR5/4					No	C - Clay					
								55	80	25	10YR5/6					No	MCL - Cla	30			GH - Gravel	
								80	120	40							MCL - Cla	50			GH - Gravel	
21	SO 75300 02800	375300	202800	18	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	40	2	10YR4/4					No	C - Clay					
								40	80	40	10YR5/4	CF - C	7.5YR5/6			No	C - Clay					
								80	120	40							C - Clay	50			GH - Gravel	
22	SO 75400 02800	375400	202800	18	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	60	22	10YR4/2	CD - C	10YR5/6			Yes	C - Clay					
								60	80	20	10YR5/3	MD - M	10YR5/6			Yes	C - Clay					
								80	120	40							C - Clay	20			GH - Gravel	
23	SO 75500 02800	375500	202800	17	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	40	2	10YR5/4					No	C - Clay					
								40	55	15	10YR5/4	CD - C	10YR5/6			No	C - Clay					
								55	85	30	10YR5/4	MF - M	10YR5/6				MCL - Cla	20			GH - Gravel	
								85	120	35							MCL - Cla	50			GH - Gravel	
24	SO 74950 02700	374950	202700	21	≤7			0	38	38	10YR4/3						HCL - Clay loam (heavy)					
								38	40	2	10YR5/4						C - Clay	50			GH - Gravel	
								40	120	80							C - Clay	50			GH - Gravel	

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
						Not Applic	NON - N	No	No	18	13	2	WC I	2	Droughtiness	Wetness		2	difficult to augr 52cm stone/gravel ; assume similar texture 52cm+ with gravel	N/A
						Moderate	NON - N	No	No											
						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applicable		No	No	36	21	1	WC III	3a	Wetness			3a	augered to 85cm	N/A
						Moderate		No	No											
			Firm			Poor		Yes	Yes											
			Very firm			Poor		Yes	Yes											
						Poor														
						Not Applic	NON - N	No	No	41	21	1	WC III	3a	Wetness			3a	difficult to auger 70cm calc frags Soil colour at 55cm+ 5/3 to 5/4	N/A
						Moderate	NON - N	No	No											
						Poor	NON - N	No	Yes											
						Poor	VC - Ver	No	Yes											
						Moderate			Yes											
l rocks or stones (i.e. those which cannot be scratched wit						Not Applic	NON - N	No	No	57	30	1	WC I	2	Wetness			2	NRM sample C (3a) sexond sample sent SPT difficult to auger 75 cm stone	N/A
						Moderate	NON - N	No	No											
with non-porous (hard) stones						Moderate	VC - Ver	No	No											
						Moderate			No											
l rocks or stones (i.e. those which cannot be scratched wit						Not Applic	MC - M	No	No	25	14	2	WC I	1	Droughtiness			2	augered to 55cm gravel	N/A
						Moderate	MC - M	No	No											
with non-porous (hard) stones						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	MC - M	No	No	12	6	2	WC I	2	Droughtiness	Wetness		2	difficult to auger 42cm gravel :	N/A
						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	MC - M	No	No	17	12	2	WC I	2	Droughtiness	Wetness		2		N/A
						Moderate	MC - M	No	No											
with non-porous (hard) stones						Moderate			No											
l rocks or stones (i.e. those which cannot be scratched wit						Not Applic	NON - N	No	No	29	18	2	WC I	2	Droughtiness	Wetness		2	augered to 80cm then much gravel	N/A
						Moderate	NON - N	Yes	No											
with non-porous (hard) stones						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	20	17	2	WC I	2	Droughtiness	Wetness		2		N/A
						Moderate	NON - N	Yes	No											
						Poor	VSC - Ve	No	No											
with non-porous (hard) stones						Poor			No											
						Not Applicable		No	No	26	16	2	WC IV	3b	Wetness			3b	patchy crop	N/A
						Poor		Yes	Yes											
						Poor		No	Yes											
with non-porous (hard) stones						Poor			Yes											
						Not Applic	NON - N	No	No	33	21	1	WC I	2	Wetness			2		N/A
						Moderate	NON - N	No	No											
						Moderate	NON - N	Yes	No											
with non-porous (hard) stones						Moderate	MC - M	No	No											
with non-porous (hard) stones						Moderate														
						Moderate	VC - Very calca		No	9	3	2	WC I	2	Droughtiness	Wetness		2	difficutl to auger 40cm stone and lmst fragments	N/A
with non-porous (hard) stones						Moderate	VC - Very calca		No											
with non-porous (hard) stones						Moderate			No											

Point	G+A1:D213ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
25	SO 75000 02700	375000	202700	21	≤7			0	30	30	10YR4/3					No	HCL - Clay loam (heavy)					
								30	40	10							HCL - Cla	15			GH - Gravel v	
								40	120	80							C - Clay	50			GH - Gravel v	
26	SO 75100 02700	375100	202700	19	≤7			0	30	30	10YR3/3						HCL - Clay loam (heavy)					
								30	40	10	10YR3/3						HCL - Cla	10			GH - Gravel v	
								40	45	5	10YR3/3						HCL - Cla	20			GH - Gravel v	
								45	120	75							HCL - Cla	50			GH - Gravel v	
27	SO 75200 02700	375200	202700	19	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	40	2	10YR4/4					No	C - Clay					
								40	120	80							C - Clay	30			GH - Gravel v	
28	SO 75300 02700	375300	202700	20	≤7			0	30	30	10YR4/3					No	HCL - Cla	1	1		HR - All hard	
								30	45	15	10YR4/4					No	HCL - Clay loam (heavy)					
								45	80	35	10YR4/4	MD - f	10YR5/6			No	C - Clay					
								80	120	40							C - Clay	30			GH - Gravel v	
29	SO 75400 02700	375400	202700	20	≤7			0	38	38	10YR4/3					No	C - Clay					
								38	60	22	10YR4/4					No	C - Clay					
								60	70	10	10YR5/4					No	C - Clay					
								70	120	50							C - Clay	30			GH - Gravel v	
30	SO 74900 02600	374900	202600	22	≤7			0	30	30	10YR4/2					Yes	HCL - Clay loam (heavy)					
								30	42	12	10YR4/3					No	C - Clay	10			GH - Gravel v	
								42	120	78							C - Clay	20			GH - Gravel v	
31	SO 75000 02600	375000	202600	21	≤7			0	30	30	10YR4/3					No	HCL - Clay loam (heavy)					
								30	40	10	10YR4/4					No	HCL - Clay loam (heavy)					
								40	50	10	10YR4/4					No	C - Clay	10			GH - Gravel v	
								50	120	70							C - Clay	20			GH - Gravel v	
32	SO 75100 02600	375100	202600	19	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	40	2	10YR4/4					No	C - Clay					
								40	120	80							C - Clay	50			GH - Gravel v	
33	SO 75200 02600	375200	202600	19	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	42	4	10YR4/4					No	C - Clay	5			HR - All hard	
								42	120	78							C - Clay	30			HR - All hard	
34	SO 75050 02500	375050	202500	24	≤7			0	30	30	10YR4/3					No	C - Clay					
								30	70	40							C - Clay	20			GH - Gravel v	
								70	120	50							C - Clay	50			GH - Gravel v	
	END																					

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
						Not Applic	MC - M	No	No	6	1	2	WC I	2	Droughtiness	Wetness		2		N/A
with non-porous (hard) stones						Moderate			No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	MC - M	No	No	16	4	2	WC I	2	Droughtiness	Wetness		2	very dry podery soil	N/A
with non-porous (hard) stones						Moderate	MC - M	No	No											
with non-porous (hard) stones						Moderate	VC - Very calca		No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	23	13	2	WC I	2	Droughtiness	Wetness		2	V Dry powder. Subsoil AB28 Clay to 80cm	N/A
						Moderate	SC - Slig	No	No											
with non-porous (hard) stones						Moderate			No											
rocks or stones (i.e. those which cannot be scratched wit						Not Applicable		No	No	31	23	1	WC I	2	Droughtiness	Wetness		2	augered to 80cm	N/A
						Moderate		No	No											
						Moderate		No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	27	22	2	WC I	3a	Wetness			3a	stones present at 70cm ; topsoil C/HCL	N/A
						Moderate	NON - N	No	No											
						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Very calca		No	26	14	2	WC I	2	Droughtiness	Wetness		2	Dry augered to 42cm	N/A
with non-porous (hard) stones						Moderate	VC - Very calca		No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	29	17	2	WC I	2	Droughtiness	Wetness		2		N/A
						Moderate	VC - Ver	No	Yes											
with non-porous (hard) stones						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	10	5	2	WC I	2	Droughtiness	Wetness		2	Difficult to auger 40cm stone	N/A
						Moderate	VC - Ver	No	No											
with non-porous (hard) stones						Moderate			No											
						Not Applic	SC - Slig	No	No	22	13	2	WC I	2	Droughtiness	Wetness		2	V Dry difficult to auger 42cm	N/A
rocks or stones (i.e. those which cannot be scratched wit						Moderate	VC - Ver	No	No											
rocks or stones (i.e. those which cannot be scratched wit						Moderate			No											
						Not Applic	VC - Very calca		No	11	10	2	WC I	3a	Wetness			3a	Soil very dry fell out of auger.	N/A
with non-porous (hard) stones						Moderate			No											
with non-porous (hard) stones						Moderate			No											

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
35	SO 74600 03000	374600	203000	18	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	45	15	10YR4/4					No	MCL - Cla	15			GH - Gravel w	
								45	80	35	10RY5/4					No	HCL - Cla	20			GH - Gravel w	
								80	100	20	10YR5/4	FF - Fe	10YR5/6			No	HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay	30			GH - Gravel w	
36	SO 74700 03000	374700	203000	17	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	60	30	10YR4/3					No	HCL - Cla	20			GH - Gravel w	
								60	100	40							HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay	30			GH - Gravel w	
37	SO 74800 03000	374800	203000	17	≤7			0	30	30	10YR3/4					No	MCL - Clay loam (medium)					
								30	45	15	10YR4/3					No	MCL - Cla	5			GH - Gravel w	
								45	100	55							HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay	30			GH - Gravel w	
38	SO 74700 02900	374700	202900	19	≤7			0	30	30	10YR3/4					No	MCL - Clay loam (medium)					
								30	45	15	10YR4/4					No	MCL - Clay loam (medium)					
								45	50	5	10YR4/4					No	HCL - Cla	20			GH - Gravel w	
								50	100	50							HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay					
39	SO 74800 02900	374800	202900	18	≤7			0	38	38	10YR4/3					No	MCL - Clay loam (medium)					
								38	40	2	10YR4/4					No	HCL - Cla	20			GH - Gravel w	
								40	100	60							HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay	35			GH - Gravel w	
40	SO 74700 02800	374700	202800	19	≤7			0	38	38	10YR4/3					No	MCL - Clay loam (medium)					
								38	40	2	10YR4/4					No	HCL - Cla	5			GH - Gravel w	
								40	100	60							HCL - Cla	30			GH - Gravel w	
								100	120	20							C - Clay	30			GH - Gravel w	
41	SO 74800 02800	374800	202800	18	≤7			0	30	30	10YR5/4					No	HCL - Clay loam (heavy)					
								30	40	10	10YR4/4					No	HCL - Clay loam (heavy)					
								40	70	30	10RY4/4					No	HCL - Cla	10			GH - Gravel w	
								70	80	10	2.5Y5/4					No	C - Clay	15			GH - Gravel w	
								80	100	20	2.5Y5/3	MD - f	10YR5/6			Yes	C - Clay	20			GH - Gravel w	
								100	120	20							C - Clay	30			GH - Gravel w	
42	SO 74800 02700	374800	202700	22	≤7																	
43	SO 74400 02600	374400	202600	20	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	40	10	10YR4/4					No	HCL - Clay loam (heavy)					
								40	70	30							C - Clay	20			GH - Gravel w	
								70	120	50							C - Clay	20			GH - Gravel w	
44	SO 74500 02600	374500	202600	22	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	50	20	10YR4/3					No	HCL - Clay loam (heavy)					
								50	70	20						No	C - Clay					
								70	120	50	10YR5/4						C - Clay	30			GH - Gravel w	
45	SO 74600 02600	374600	202600	22	≤7			0	35	35	10YR4/3					No	MCL - Clay loam (medium)					
								35	50	15	10YR4/4					No	HCL - Clay loam (heavy)					
								50	70	20	10RY5/4					No	C - Clay	10			GH - Gravel w	
								70	120	50							C - Clay	30			GH - Gravel w	
46	SO 74400 02500	374400	202500	22	≤7			0	30	30	10YR4/3					No	HCL - Clay loam (heavy)					
								30	35	5	7.5YR4/3					No	HCL - Clay loam (heavy)					
								35	50	15							HCL - Cla	20			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
						Not Applic	MC - M	No	No	30	14	1	WC I	1	N/A			1	GRASS/HORSES IN BLOCK D, E ,F ,G ; EXPLORATORY PIT	N/A
ith non-porous (hard) stones						Moderate	MC - M	No	No											
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	SC - Slig	No	No	28	11	2	WC I	1	Droughtiness			2	augered to 60cm ; dry, stone	N/A
ith non-porous (hard) stones						Moderate	MC - M	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			Yes											
						Not Applic	MC - M	No	No	29	12	2	WC I	1	Droughtiness			2	augered to 45cm closely grazed grass by horses.	N/A
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	35	14	1	WC I	1	N/A			1	augered to 50cm very dry	N/A
						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate		No	No											
ith non-porous (hard) stones						Moderate			No											
						Moderate			Yes											
						Not Applic	VC - Ver	No	No	28	12	2	WC I	1	Droughtiness			2	dry difficult to auger 40cm stoney at 40cm?	N/A
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	30	13	2	WC I	1	Droughtiness			2	dry difficult to auger to depth	N/A
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	30	20	2	WC I	1	N/A			1		N/A
						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate	VC - Ver	No	Yes											
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Poor	VC - Ver	No	Yes											
ith non-porous (hard) stones						Poor														
																				N/A
						Not Applic	VC - Ver	No	No	27	16	2	WC I	1	Droughtiness			2	augered to 40cm dry at 30cm: assume clay to 120cm; moved away from wood area (no spl)	N/A
						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	MC - M	No	No	30	24	2	WC I	1	Droughtiness			2	EXPLORATORY PIT	N/A
						Moderate	MC - M	No	No											
						Moderate		No	Yes											
ith non-porous (hard) stones						Moderate		No	No											
						Not Applic	MC - M	No	No	29	22	2	WC I	1	Droughtiness			2	augered to 70cm stone	N/A
						Moderate	MC - M	No	No											
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	NON - F	No	No	26	14	2	WC I	2	Droughtiness Wetness			2	grass/haylage;augered to 35 cm very dry	N/A
						Moderate	MC - M	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
47	SO 74500 02500	374500	202500	22	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	40	10	10YR4/4					No	HCL - Clay loam (heavy)					
								40	55	15	10YR5/4					No	C - Clay	10			GH - Gravel w	
								55	120	65							C - Clay	30			GH - Gravel w	
48	SO 74600 02500	374600	202500	22	≤7																	
49	SO 74700 02600	374700	202600	22	≤7																	
50	SO 74800 02600	374800	202600	22	≤7			0	35	35	10YR4/3					No	MCL - Clay loam (medium)					
								35	45	10	10YR5/4					No	HCL - Clay loam (heavy)					
								45	50	5	10RY5/4					No	C - Clay					
								50	120	70							C - Clay	30			GH - Gravel w	
51	SO 74750 02500	374750	202500	25	≤7			0	30	30	10YR4/3					No	MCL - Clay loam (medium)					
								30	40	10	10YR5/4					No	HCL - Clay loam (heavy)					
								40	55	15	10YR5/4	FF - Fe	10YR5/6			No	HCL - Cla	15			GH - Gravel w	
								55	70	15	10YR5/6					No	SCL - San	20			GH - Gravel w	
								70	120	50							SCL - San	20			GH - Gravel w	
52	SO 74250 02500	374250	202500	21	≤7			0	30	30	10YR3/2					No	HCL - Clay loam (heavy)					
								30	40	10	10YR3/2					No	HCL - Clay loam (heavy)					
								40	50	10							HCL - Cla	10			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
53	SO 74200 02400	374200	202400	21	≤7			0	30	30	10YR3/3					No	HCL - Clay loam (heavy)					
								30	48	18	10YR3/3					No	HCL - Clay loam (heavy)					
								48	60	12	10YR4/3						C - Clay	10			GH - Gravel w	
								60	120	60							C - Clay	20			GH - Gravel w	
54	SO 74300 02400	374300	202400	21	≤7			0	38	38	10YR3/2					No	MCL - Clay loam (medium)					
								38	50	12							C - Clay	10			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
55	SO 74400 02400	374400	202400	22	≤7			0	30	30	10YR3/3					No	HCL - Clay loam (heavy)					
								30	40	10	10YR3/3					No	HCL - Clay loam (heavy)					
								40	50	10	2.5Y4/3					No	C - Clay	10			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
56	SO 74200 02300	374200	202300	21	≤7			0	38	38	10YR3/4					No	HCL - Clay loam (heavy)					
								38	60	22	10YR4/3					No	C - Clay	10			GH - Gravel w	
								60	120	60							C - Clay	20			GH - Gravel w	
57	SO 74300 02300	374300	202300	21	≤7			0	38	38	10YR3/4					No	C - Clay					
								38	40	2	2.5Y4/3					No	C - Clay	10			GH - Gravel w	
								40	120	80							C - Clay	20			GH - Gravel w	
58	SO 74400 02300	374400	202300	22	≤7																	

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
						Not Applic	NON - N	No	No	25	16	2	WC I	1	Droughtiness			2	dry augered to 55cm S&G? topsoil m/hcl : assumed clay to depth	N/A
		ith non-porous (hard) stones				Moderate	NON - N	No	No											
		ith non-porous (hard) stones				Moderate	MC - M	No	No											
						Moderate			No											
																			moved gas pipeline;augered to 90cm	N/A
																				N/A
						Not Applic	VC - Ver	No	No	26	17	2	WC I	1	Droughtiness			2	augered to 50cm; dry, stony, gravel	N/A
						Moderate	VC - Ver	No	No											
						Moderate	VC - Ver	No	No											
		ith non-porous (hard) stones				Moderate			No											
						Not Applic	MC - Moderat		No	40	15	1	WC I	1	N/A			1	augered to 58cm then s+g /scl matrix to 70cm	N/A
		ith non-porous (hard) stones				Moderate	MC - Moderat		No											
		ith non-porous (hard) stones				Moderate	VC - Ver	Yes	No											
		ith non-porous (hard) stones				Moderate	VC - Very calc		No											
						Moderate			No											
						Not Applic	VC - Ver	No	No	29	17	2	WC I	2	Droughtiness Wetness			2	tramlines followed;augered to 40cm	N/A
		ith non-porous (hard) stones				Moderate	VC - Ver	No	No											
		ith non-porous (hard) stones				Moderate			No											
						Moderate			No											
						Not Applic	VC - Ver	No	No	31	20	1	WC I	2	Wetness			2		N/A
		ith non-porous (hard) stones				Moderate	VC - Ver	No	No											
		ith non-porous (hard) stones				Moderate	VC - Ver	Yes	No											
						Moderate			No											
						Not Applic	VC - Ver	No	No	30	18	1	WC I	2	Wetness			2	soil very dry- fell out of auger; topsoil hcl/c	N/A
		ith non-porous (hard) stones				Moderate			No											
		ith non-porous (hard) stones				Moderate			No											
						Not Applic	VC - Ver	No	No	29	17	2	WC I	2	Droughtiness Wetness			2	augered to 50cm dry	N/A
		ith non-porous (hard) stones				Moderate	MC - M	No	No											
		ith non-porous (hard) stones				Moderate	VC - Ver	No	No											
						Moderate			No											
						Not Applic	VC - Ver	No	No	31	20	1	WC I	2	Wetness			2		N/A
		ith non-porous (hard) stones				Moderate	VC - Ver	No	No											
		ith non-porous (hard) stones				Moderate			No											
						Not Applic	MC - M	No	No	25	13	2	WC I	3a	Wetness			3a		N/A
		ith non-porous (hard) stones				Moderate	VC - Ver	No	No											
		ith non-porous (hard) stones				Moderate			No											
																				N/A

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
59	SO 74200 02200	374200	202200	23	≤7			0	40	40	10YR3/3					No	HCL - Cla	5			GH - Gravel w	
								40	50	10							HCL - Cla	10			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
60	SO 74300 02200	374300	202200	23	≤7			0	38	38	10YR3/3					No	HCL - Clay loam (heavy)					
								38	70	32	10YR4/3	CF - Cr	10YR5/6			No	C - Clay	10			GH - Gravel w	
								70	120	50						No	C - Clay	20			GH - Gravel w	
61	SO 74500 02400	374500	202400	22	≤7																	
62	SO 74600 02400	374600	202400	22	≤7			0	35	35	10YR4/3					No	HCL - Clay loam (heavy)					
								35	65	30	10YR4/4					No	HCL - Clay loam (heavy)					
								65	120	55							C - Clay	20			GH - Gravel w	
63	SO 74500 02300	374500	202300	22	≤7																	
64	SO 74600 02300	374600	202300	22	≤7			0	30	30	10YR3/4					No	MCL - Cla	5			GH - Gravel w	
								30	40	10	10YR4/4					No	MCL - Cla	5			GH - Gravel w	
								40	65	25							HCL - Cla	10			GH - Gravel w	
								65	120	55							C - Clay	20			GH - Gravel w	
65	SO 74420 02200	374420	202200	24	≤7																	
66	SO 74500 02200	374500	202200	26	≤7			0	38	38	10YR4/3					No	HCL - Cla	3			GH - Gravel w	
								38	50	12							HCL - Cla	10			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
67	SO 74100 02200	374100	202200	23	≤7			0	38	38	10YR4/3					No	HCL - Clay loam (heavy)					
								38	60	22	10YR4/4					No	C - Clay					
								60	120	60							C - Clay	30			GH - Gravel w	
68	SO 74000 02100	374000	202100	22	≤7			0	35	35	10YR3/3					No	HCL - Clay loam (heavy)					
								35	40	5	7.5YR4/3					No	HCL - Clay loam (heavy)					
								40	45	5	10YR5/4						C - Clay					
								45	120	75							C - Clay	30			GH - Gravel w	
69	SO 74100 02100	374100	202100	23	≤7			0	35	35	10YR3/3					No	HCL - Clay loam (heavy)					
								35	45	10	10YR3/3					No	HCL - Clay loam (heavy)					
								45	50	5							HCL - Cla	20			GH - Gravel w	
								50	120	70							C - Clay	20			GH - Gravel w	
70	SO 74200 02100	374200	202100	23	≤7			0	39	39	10YR4/3					No	HCL - Clay loam (heavy)					

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
ith non-porous (hard) stones						Not Applic	VC - Ver	No	No	28	16	2	WC I	2	Droughtiness	Wetness		2	DRY +STONE DIFFICULT TO AUGER 40CM+	N/A
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	32	21	1	WC I	2	Wetness			2	AUGERED TO 70CM ; Assume WCI	N/A
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate		No	No											
																				N/A
						Not Applicable		No	No	36	24	1	WC I	2	Wetness			2	re-located clear of gas pipeline /exclusion zone ; cereal (wheat) ; augered to 65cm dry from 60cm	N/A
ith non-porous (hard) stones						Moderate		No	No											
						Moderate			No											
																				N/A
ith non-porous (hard) stones						Not Applic	VC - Ver	No	No	29	16	2	WC I	1	Droughtiness			2	AUHERED TO 40CM DRY LMST FRAGMENTS ON SURFACE DRY SOIL	N/A
ith non-porous (hard) stones						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
																				N/A
ith non-porous (hard) stones						Not Applic	VC - Ver	No	No	28	16	2	WC I	2	Droughtiness	Wetness		2	DIFFICULT TO AUGER 38CM DRY LMST FRAGMENTS	N/A
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	VC - Ver	No	No	29	21	2	WC I	2	Droughtiness	Wetness		2	AUGERED TO 60CM VERY DRY	N/A
						Moderate	VC - Ver	No	No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	24	14	2	WC I	2	Droughtiness	Wetness		2	VERY DRY SOIL	N/A
						Moderate	NON - N	No	No											
						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	30	18	2	WC I	2	Droughtiness	Wetness		2		N/A
						Moderate	SC - Slig	No	No											
ith non-porous (hard) stones						Moderate			No											
ith non-porous (hard) stones						Moderate			No											
						Not Applic	NON - N	No	No	31	20	1	WC I	2	Wetness			2	topsoil hcl/c; dificult to auger 60cm	N/A

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%
								39	60	21	10YR4/4					No	C - Clay	10			GH - Gravel w	
								60	120	60							C - Clay	20			GH - Gravel w	
71	SO 74280	02100	374280	202100	23	≤7																
72	SO 73920	02020	373920	202020	28	≤7		0	30	30	2.5Y4/2					Yes	C - Clay					
								30	80	50	2.5Y6/2	MD - f	10YR5/6			Yes	C - Clay					
								80	120	40							C - Clay					
	END																					

Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC				Profile notes	Client Ref.
> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade		
ith non-porous (hard) stones						Moderate	MC - M	Yes	No										stone	
ith non-porous (hard) stones						Moderate			No											
																				N/A
						Not Applic	NON - M	No	No	24	9	2	WC IV	3b	Wetness			3b	BGS viewer Blue Lias Clay and Charmouth Mudstone formation- slight rise to knoll- clay surface hexagonal cracking	N/A
						Poor	NON - M	Yes	Yes											
						Poor			Yes											

ATTACHMENT B

Soil Pit Descriptions

SOIL PIT DESCRIPTIONS

Wisloe

Pit 1

Grid Reference SO 74985 03204 19th April 2021

Cereal crop

Depth to slowly permeable layer 50cm

Wetness Class III

ALC grade 3b

Depth	Description
0-25cm	Heavy clay loam; brown (10YR4/3);weakly developed fine subangular blocky; friable; calcareous; very slightly stony(>2cm 3% and >6cm 2%)
25-40cm	Heavy clay loam; brown (10YR4/3);weakly developed fine subangular blocky; friable; calcareous; very slightly stony(>2cm 3% and >6cm 2%); > than 0.5% biopores greater than 0.5mm diameter
40-50cm	Medium clay loam; dark yellowish brown (10YR4/4); moderately developed medium subangular blocky; friable;> than 0.5% biopores greater than 0.5mm diameter;calcareous
50-55cm	Clay;grey (10YR6/1) weakly developed coarse angular blocky; many distinct ochreous mottles;very firm; ;< than 0.5% biopores greater than 0.5mm diameter;calcareous; very stony; difficult to dig below 55cm

Pit 2

Grid Reference SO74528 03000 26th June 2021

Grass (horse grazing)

Wetness Class I

ALC grade 1

Depth	Description
0-30 cm	Medium clay loam; brown (10YR4/3); calcareous; very slightly stony 3% >2cm
30-50 cm	Medium clay loam; dark yellowish brown (10YR4/4)weakly developed fine subangular blocky; friable; calcareous; very slightly stony(>2cm 3% and >6cm 2%); > than 0.5% biopores greater than 0.5mm diameter;many roots at 50cm
40-50cm	Medium clay loam; dark yellowish brown (10YR4/4); moderately developed medium subangular blocky; friable;> than 0.5% biopores greater than 0.5mm diameter;calcareous
	Soil very dry; augered to 100cm heavy clay loam yellowish brown (10YR5/4) no signs of gleying

Pit 2
Subsoil Structure
26th June 2021

Pit 3

Grid Reference SO754515 02658 26th June 2021

Grass (for haylage)

Wetness Class I

ALC grade 1

Depth	Description
0-30 cm	Medium clay loam; brown (10YR4/3); calcareous;
30-50 cm	Heavy clay loam; brown (10YR4/43weakly developed fine angular blocky; firm; calcareous; very slightly stony(>2cm 3% and >6cm 2%); > than 0.5% biopores greater than 0.5mm diameter;many roots at 50cm
50cm+	Dry soil; augered to 70cm yellowish brown (10YR5/4) no signs of gleying above 70cm calcareous

ATTACHMENT C

Laboratory Analysis

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 16/07/2021

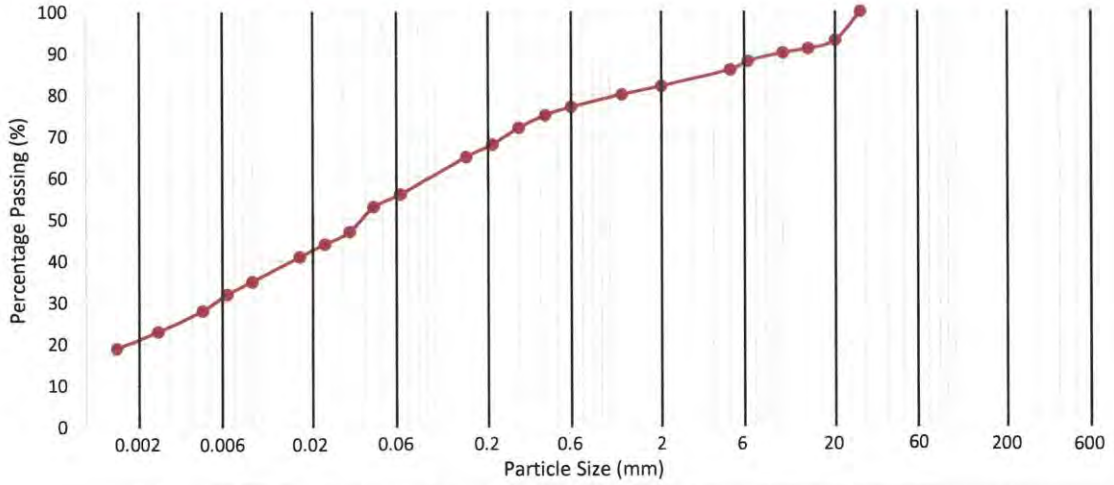
UKAS TESTING 0998

Contract	Wisloe
Serial No.	39026_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
-	0.00 - 0.25	J	54	Dark brown slightly gravelly slightly sandy silty CLAY. Gravel is white angular and subangular chalk and rare yellowish brown and brown limestone and sandstone	

Method of Test:	Wet Sieve + Hydrometer	Method of Pretreatment:	Not required



Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0444	53	35
	0.0324	47	
	0.0234	44	
	0.0168	41	Clay by Dry Mass (%)
	0.0089	35	
	0.0064	32	
	0.0046	28	21
	0.0026	23	
	0.0015	19	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	82	26
1.18	80	
0.600	77	
0.425	75	
0.300	72	
0.212	68	
0.150	65	
0.063	56	

Fines By Dry Mass (%)	
<0.063mm	56

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		18
125		
90		
63		
50		
37.5		
28	100	
20	93	
14	91	
10	90	
6.3	88	
5	86	

Method of Preparation:	BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test:	BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 16/07/2021

UKAS TESTING

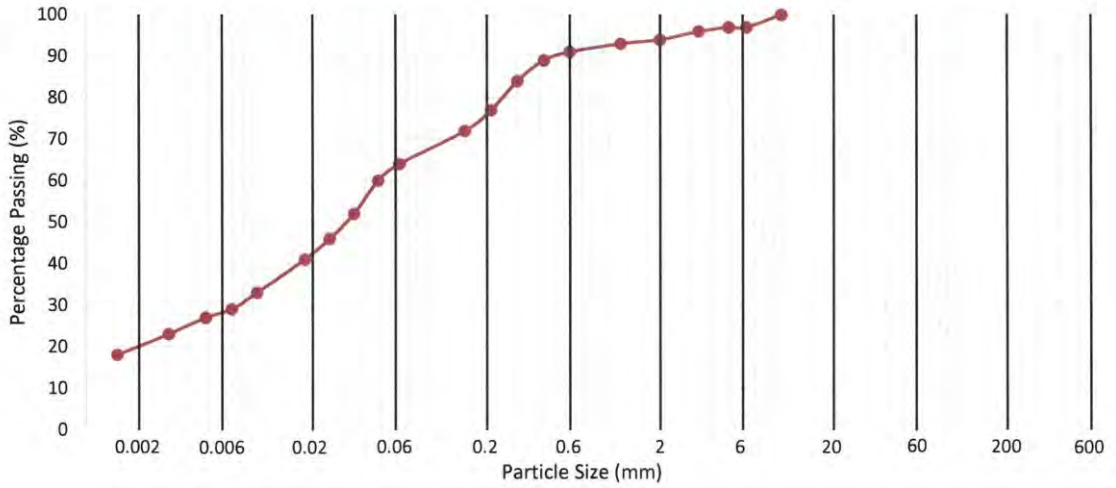
0998

Contract	Wisloe
Serial No.	39026_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
-	0.00 - 0.25	D	36	Yellowish brown slightly gravelly slightly sandy silty CLAY with frequent recently active roots. Gravel is white subangular and subrounded chalk	

Method of Test:	Hydrometer + Pre-sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer

Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Clay by Dry Mass (%)
0.0476	60	44	
0.0346	52		
0.0250	46		
0.0180	41		
0.0095	33		
0.0068	29		
0.0048	27		20
0.0030	23		
0.0015	18		

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	94	30
1.18	93	
0.600	91	
0.425	89	
0.300	84	
0.212	77	
0.150	72	
0.063	64	

Fines By Dry Mass (%)	
<0.063mm	64

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		6
125		
90		
63		
50		
37.5		
28		
20		
14		
10	100	
6.3	97	
5	97	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5

Method of test: BS1377: Part 2: 1990: 9.2,9.5

Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter

Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 16/07/2021

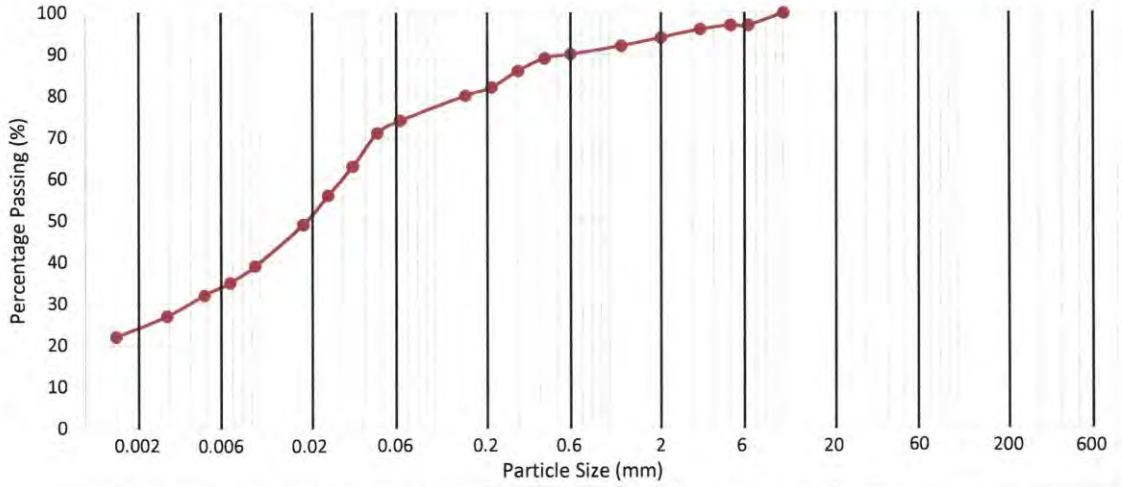
UKAS TESTING 0998

Contract	Wisloe
Serial No.	39026_1

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
-	0.00 - 0.25	B	7	Yellowish brown slightly gravelly slightly sandy silty CLAY with frequent recently active roots. Gravel is white subangular and subrounded chalk	

Method of Test:	Hydrometer + Pre-sieve	Method of Pretreatment:	Not required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

Hydrometer

Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
0.0467	71	50
0.0339	63	
0.0246	56	
0.0177	49	Clay by Dry Mass (%)
0.0094	39	
0.0068	35	
0.0048	32	24
0.0029	27	
0.0015	22	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	94	20
1.18	92	
0.600	90	
0.425	89	
0.300	86	
0.212	82	
0.150	80	
0.063	74	

Fines By Dry Mass (%)	
<0.063mm	74

Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
300		6
125		
90		
63		
50		
37.5		
28		
20		
14		
10	100	
6.3	97	
5	97	

Method of Preparation:	BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test:	BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

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Particle size class estimator

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Enter soil sample proportions:

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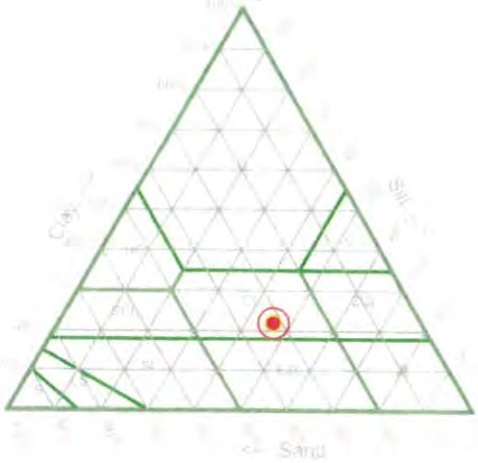

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J54 **Soil sample is a Clay Loam** (Medium)

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Enter soil sample proportions:

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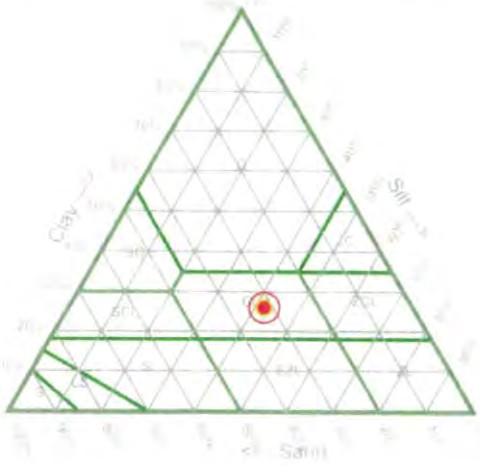

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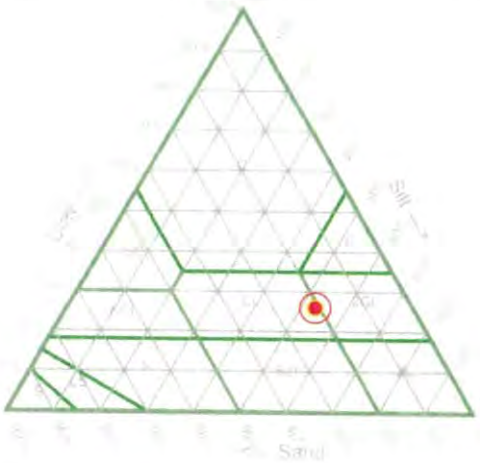
Enter soil sample proportions:

Clay (%):	X 26	Sand (%):	X 21	Silt (%):	X 53	•Calculate	Calculate	•F



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B7 Soil sample is a Clay Loam

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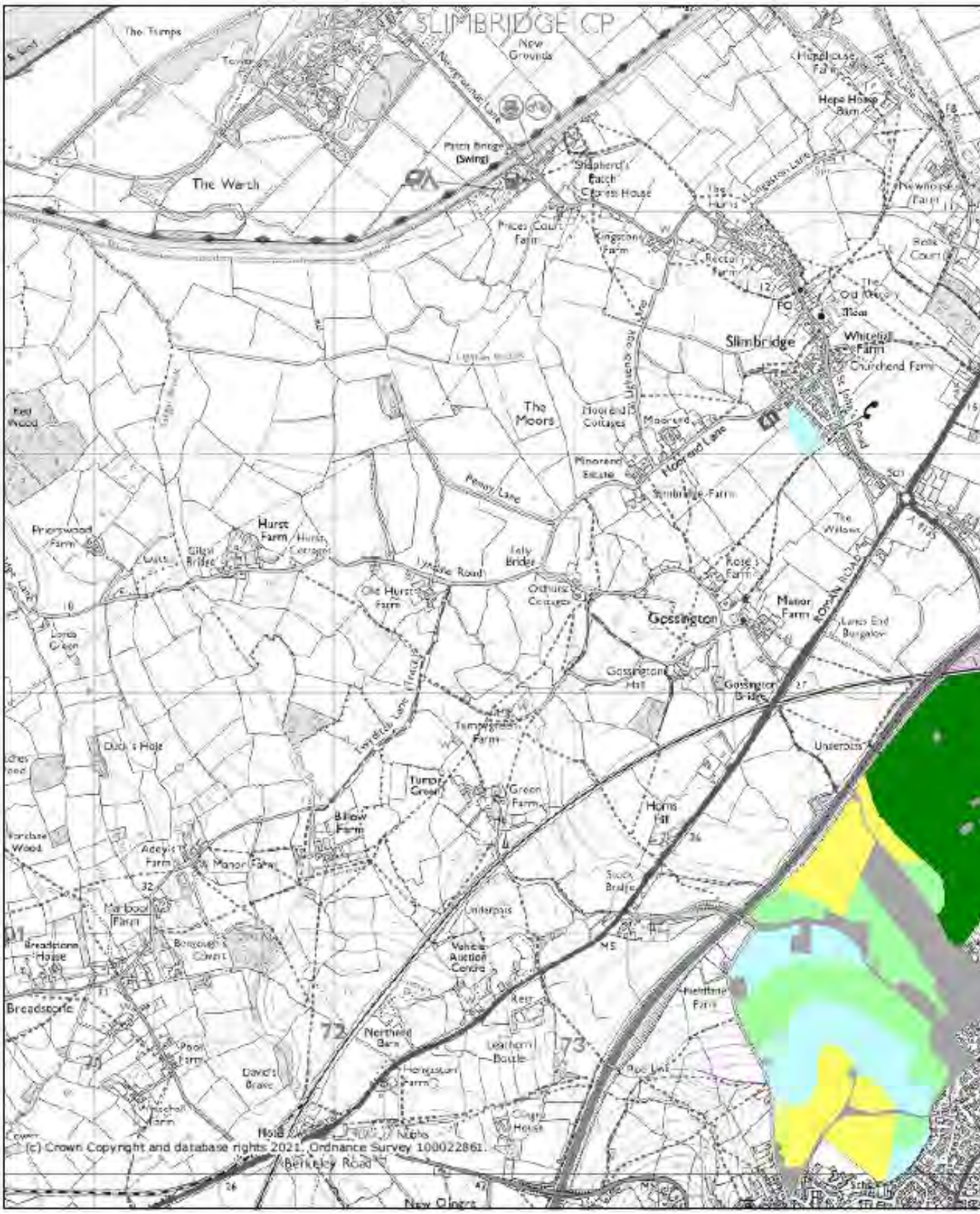
APPENDIX KCC3

ALC Around Cam and Wisloe


SLIMBRIDGE CP
The Tramps
New Grounds
Patch Bridge (Swing)
The Warth
Shepherd's Patch
Prices Court Farm
Rectory Farm
Slimbridge
Whitehall Farm
Churchend Farm
The Moors
Moorend Cottages
Moorend Estate
Moorend Lane
Penny Lane
Hurst Farm
Priorswood Farm
Old Hurst Farm
Orchurst Cottages
Gossington
Manor Farm
Gossington Hill
Gossington Bridge
Tumpstream Farm
Turner Green
Green Farm
Blow Farm
Horns Hill
Adeyes Farm
Manor Farm
Marlwood Farm
Breadstone House
Breadstone
Vehicle Auction Centre
Northend Barn
Leathorn Bottle
Hogsdown Farm
Poor Farm
David's Brake
Berkeley Road
New Grange
Duck's Hole
Lords Green
Kite's Farm
The Willows
Lanes End Bungalow
Fieldtone Farm
Pool Leaze
Stock Bridge
Underpass
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Legend

Post 1988 Agricultural Land Classification (England)

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Not Surveyed
- Other

Projection = OSGB36
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ymin = 200600
xmax = 377400
ymax = 204100

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km

Map produced by MAGIC on 29 March, 2021.

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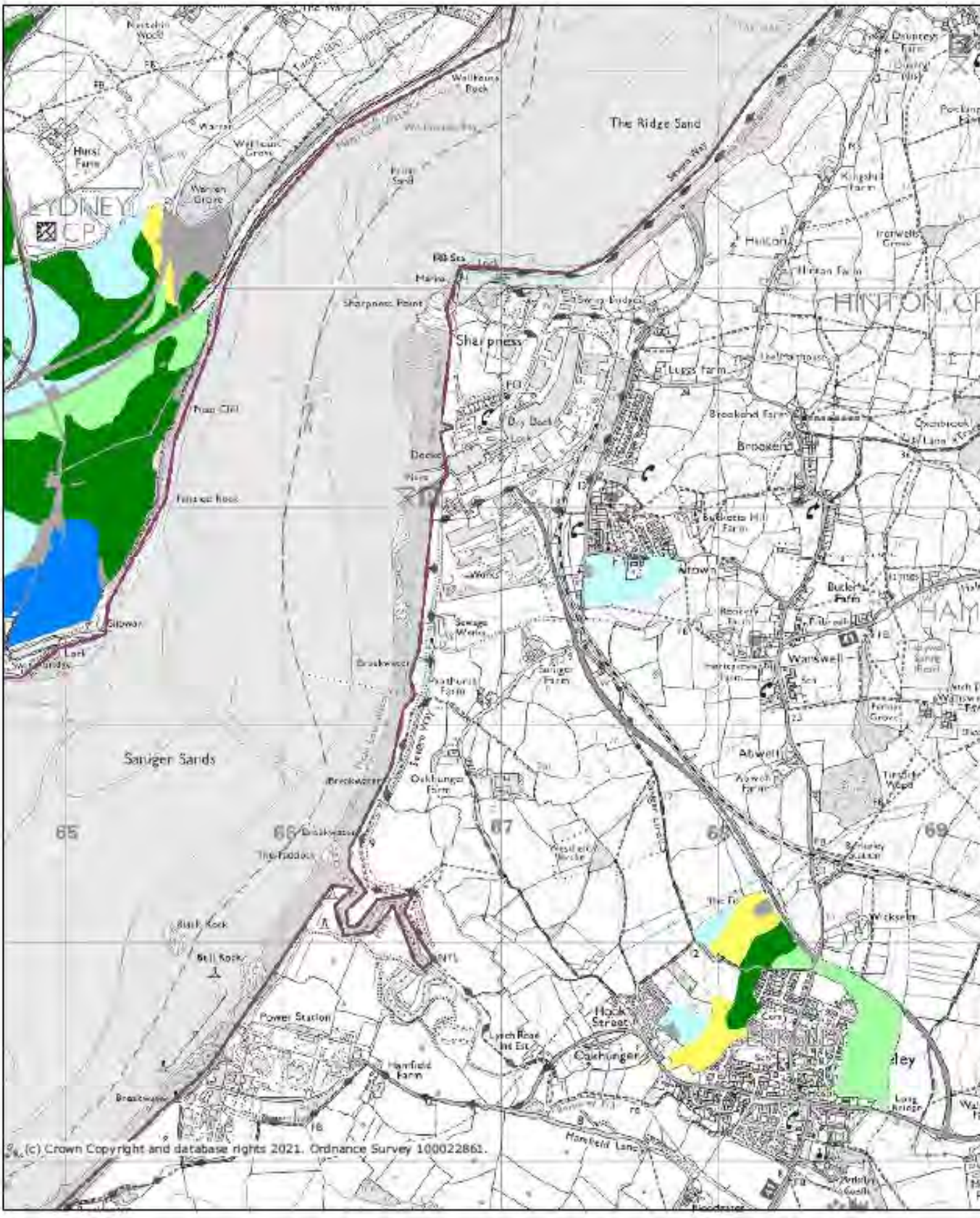
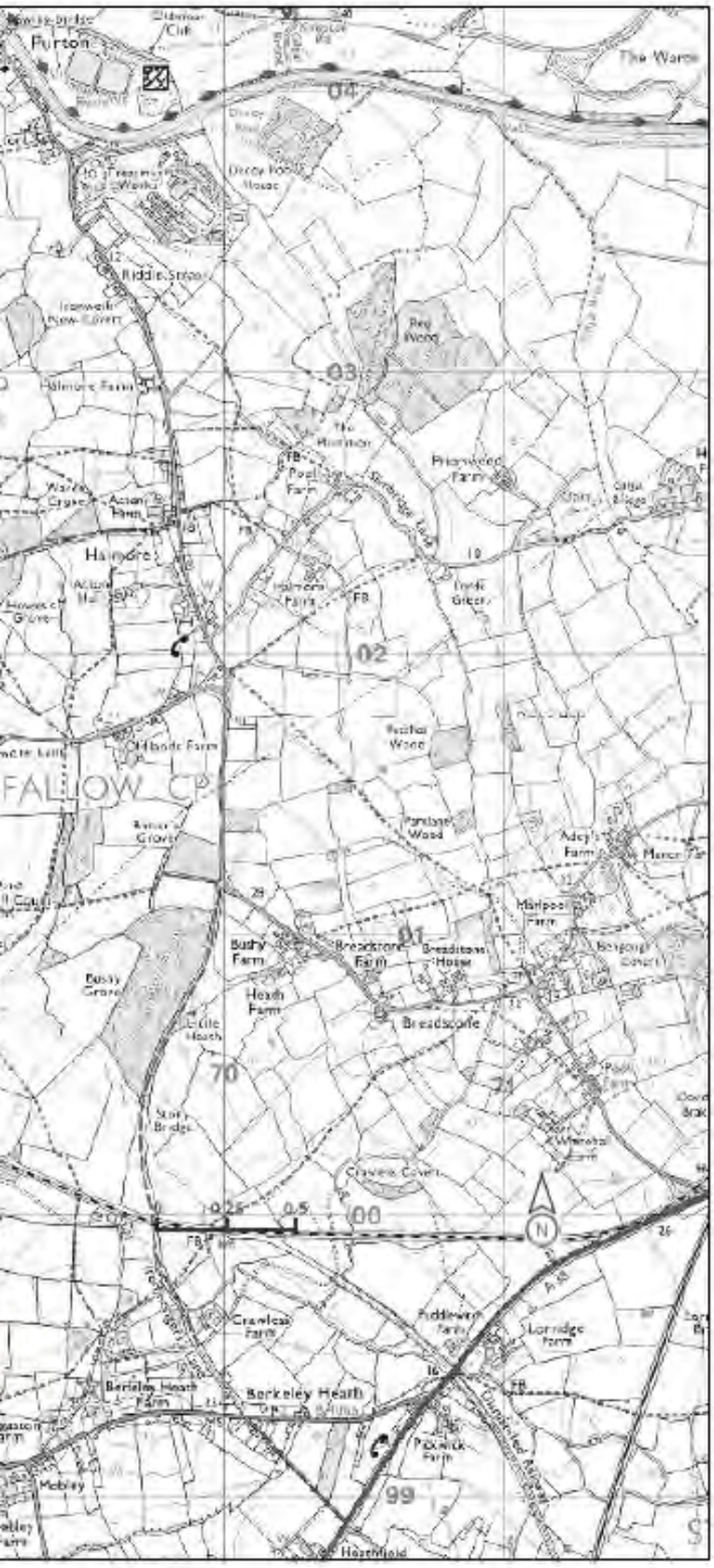
APPENDIX KCC4

ALC Around Sharpness

MAGIC

Magic Map





Legend

Post 1988 Agricultural Land Classification (England)

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- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Not Surveyed
- Other

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ymax = 204300

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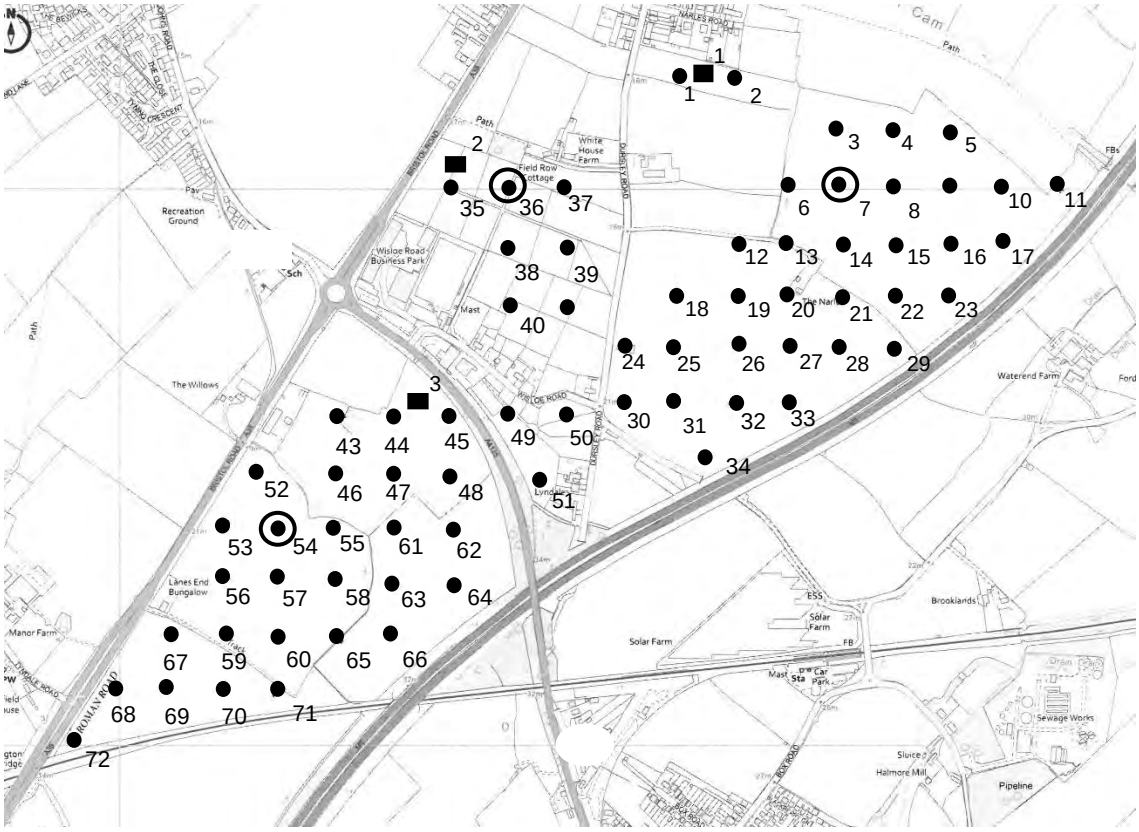
km

Map produced by MAGIC on 20 July, 2021.
 Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

PLAN KCC3027/01

Auger Points Plan



KEY				
●	Auger sample location	**PLAN**	**KCC3027/01**	
○	Topsoil texture sample	**TITLE**	**Auger Points Plan**	
■	Soil Pit	**SITE**	Wisloe, Nr Stroud	
		CLIENT	Stantec	
		NUMBER	**KCC3027/01 07/21tk**	
		DATE	July 2021	**SCALE** NTS

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WILTSHIRE SN5 4LL
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PLAN KCC3027/02

Agricultural Land Classification

KEY		Ha	%	PLAN	KCC3027/02		
	Grade 1			TITLE	Agricultural Land Classification Plan		
	Grade 2	59.9	77.9	SITE	Wisloe, Nr Stroud		
	Grade 3a	5.3	6.9	CLIENT	Stantec		
	Grade 3b	3.9	5.1	NUMBER	KCC3027/02 07/21tk		
	Grade 4			DATE	July 2021	SCALE	NTS
	Grade 5			**KERNON COUNTRYSIDE CONSULTANTS LTD** **GREENACRES BARN, PURTON STOKE, SWINDON,** **WILTSHIRE, SN5 4LL** Tel 01793 771 333 Email: info@kernon.co.uk 		
	Non-agricultural	1.5	2.0				
	Urban						
	Not surveyed	6.3	8.1				

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WISLOE

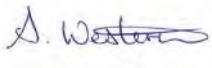
D2. Gas Main Feasibility Study

Fingleton White and Wales & West Utilities

DOCUMENT FACEPLATE

CLIENT:	Wales & West Utilities
PROJECT:	Wisloe Green Feasibility Study
CLIENT PROJECT NO.:	N/A
TITLE:	Feasibility Study
DOCUMENT NO.:	0961-23-RG-1001

APPROVALS FOR THIS ISSUE

REVISION NO.: 0	**PURPOSE: For Issue**		
Name	**Position**	**Signature**	**Date**
Rosa Andrea Mangue **Author**	**Design Engineer**		***16/04/2021***
Scott Western **Approver**	**Project Manager**		***16/04/2021***

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HISTORY OF ISSUES / APPROVALS

REV	DATE	DESCRIPTION OF CHANGES	FILE NUMBER
0	16/04/2021	Issued for Comment	0961-23-RG-1001-R0

EXECUTIVE SUMMARY

This report is a feasibility study investigating the possible route options associated with the diversion of the existing HP gas main at Wisloe Green, Gloucester.

The existing WWU operated 350 NB HP steel gas main crosses the proposed development area from south-west to north-east. The presence of this pipeline in its unmodified state would restrict the development proposal. Therefore, a diversion or relaying of the existing Gloucester to Wickwar gas main is required.

During consultation between FW and the developer on the 1st March 2021, connection point locations for the installation of the new steel pipeline were discussed. Whilst connection point options outside of the developer site boundary were considered, these would introduce third party agreements and further engineering constraints i.e., crossing of railway line, and as such the developer had no objection to locating connection points within the developer site boundary.

Two connection points were considered as tie-in points for the diversion routes as part of this feasibility study. Connection Points A is proposed to be located approximately 10m north of the railway line, within the development site. Connection Point B is proposed to be located within the development site, approximately 160m south-west of Narles Road. These connection points will allow for sufficient space for bypass installation while allowing for the development to be constructed as planned.

In addition to relaying new pipeline with a heavier walled pipe, another key risk mitigation measure is to re-route pipeline within green open space within the proposed development site in order to accommodate the pipeline easement and avoid impact on the safe operation of the pipeline. It was confirmed during consultation with Stantec that green areas running along the eastern boundary of the proposed development will be dedicated as noise buffers.

The assessment of the pipeline diversion routes is detailed in section 5.0 of this study and proposed routes are shown in Figure 7. Route Option 1 was proposed in sympathy with the developers' concept 2 route option, which stays largely within the noise buffer area and land owned by the developer. Route Options 2 & 3 also allow for the development to be built as planned, however these routes would be partially routed within third party land and would require several road crossings. In addition, Route option 2 would cross the existing HP gas main at one location, adding to complexity and safety risks during construction.

Overall, Fingleton White recommends Route Option 1 as the preferred diversion route for the following reasons:

- In accordance with HSE general guidance on risk mitigation measures i.e. designing the network of green open space within proposed development to accommodate the pipeline easement and avoid impact on the safe operation of the pipeline
- Route in sympathy with developers' concept 2 route option
- Route is within designated corridor
- No constraints in terms of existing utilities

In conclusion, the proposed diversion route (Route Option 1) is the most acceptable solution in terms of meeting the requirements of WWU, the developer and IGEM/TD/1 Edition 5.

		Diversion Pipe Length		Ground Category	
Option	Rank	Public Land	Private Land	Public Land	Private Land
1	1st	30	2370 m	Tarmac	Grass
2	3rd	60	1940 m	Tarmac	Grass
3	2nd	60	2440 m	Tarmac	Grass

Table 1 – Diversion Routes Overview

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1.0 INTRODUCTION

Wales & West Utilities (WWU) have appointed Fingleton White (FW) to carry out a feasibility study investigating the possible route options associated with the diversion of an existing High Pressure (HP) gas mains at Wisloe Green, Gloucester.

The purpose of this feasibility study is to review the route option proposed by LHC Design and propose alternative routes, if needed, in order to identify a preferred pipeline diversion option.

1.1 Background

An area at Wisloe Green is being developed for residential use by Stantec. An existing WWU operated 350 NB HP steel gas main crosses the proposed development area from south-west to north-east. The existence of this pipelines belonging to Wales and West Utilities in its unmodified state restricts the development proposal.

For major accident hazard pipelines, the HSE sets a consultation distance (CD) based on available scientific knowledge using hazard /risk assessment models.

The HSE Planning Advice Web App is the name given to the software used to provide HSE's Land Usage Planning (LUP) advice to Planning Authorities on proposed developments near major hazard sites and major accident hazard pipelines. It replaced PADHI+ ((Planning Advice for Developments near Hazardous Installations) in 2015.

For major accident hazard pipelines, HSE Pipelines Inspectors determine if the potential consequences of the pipelines being approved are acceptable. HSE then determine the sizes of the 3 consultation zones to be used for LUP purposes basing their assessment on the pipeline details notified to HSE by the pipeline operator.

The consultation zones are normally determined by a detailed assessment of the risks and/or hazards of the installation or pipeline which takes into account several factors. The risks and hazards from the major hazard are greatest in the Inner Zone and hence the restrictions on development are strictest within that zone. Consultation Zones consist of an Inner Zone, Middle Zone and Outer Zone.

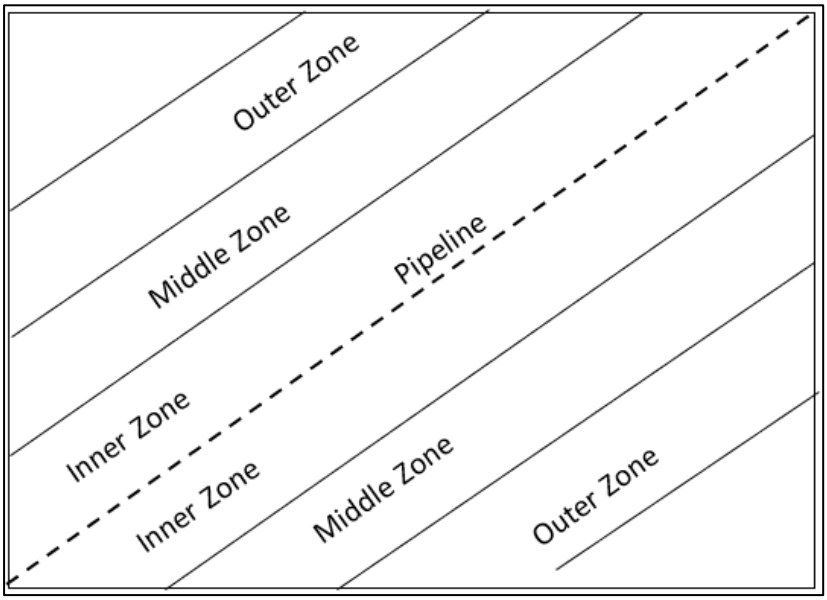


Figure 1 - Pipeline Consultation Zone

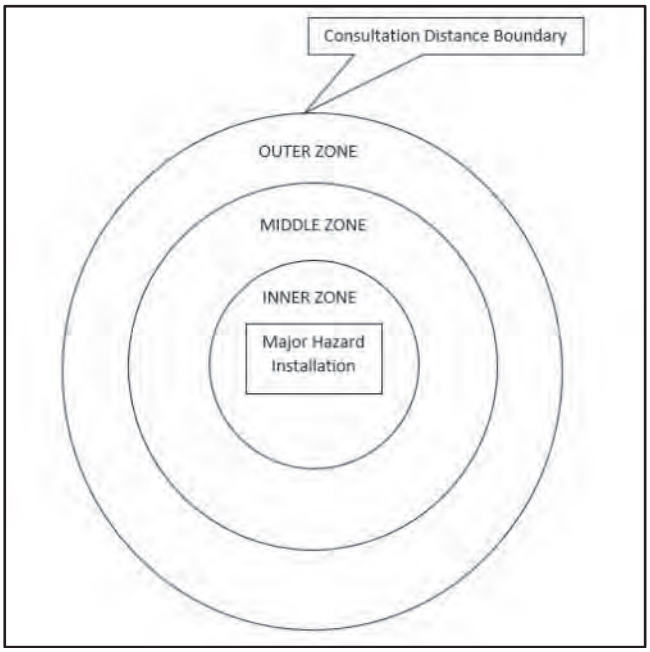


Figure 2 - Installation Consultation Zone

The recommendations of the HSE and in particular the exclusion zones outlined within Planning Advice for Developments near Hazardous Installations (PADHI) methodology require a diversion of the pipeline where it passes through the proposed development area.

The pipeline enters the development area from a location north of an existing railway line, and approximately 160m west of the M5 motorway. The pipeline is routed north-east through fields for about 2.5 km, crossing the A4135 road, Wisloe Road, and Dursley Road. The pipeline exits the development site at a location south-east of Narles Road.

The Gloucester to Wickwar pipeline was constructed prior to 1972, from API Grade X46 steel pipe. Therefore, this pipeline is classified as a P18 pipeline and may require further specialist investigation in accordance with T/SP/P/18 due to the potential of defective girth welds. This installation is not subject to a “lift and shift” agreement.

Given the strategic nature of this pipeline, it cannot be taken out of service and any modification will need to maintain gas supply. WWU records indicate that the pipeline is buried at a nominal depth of cover of 900 mm, but this may vary at crossings.

Figure 3 below shows the proposed development site and the existing HP gas main route overlayed on to google earth.

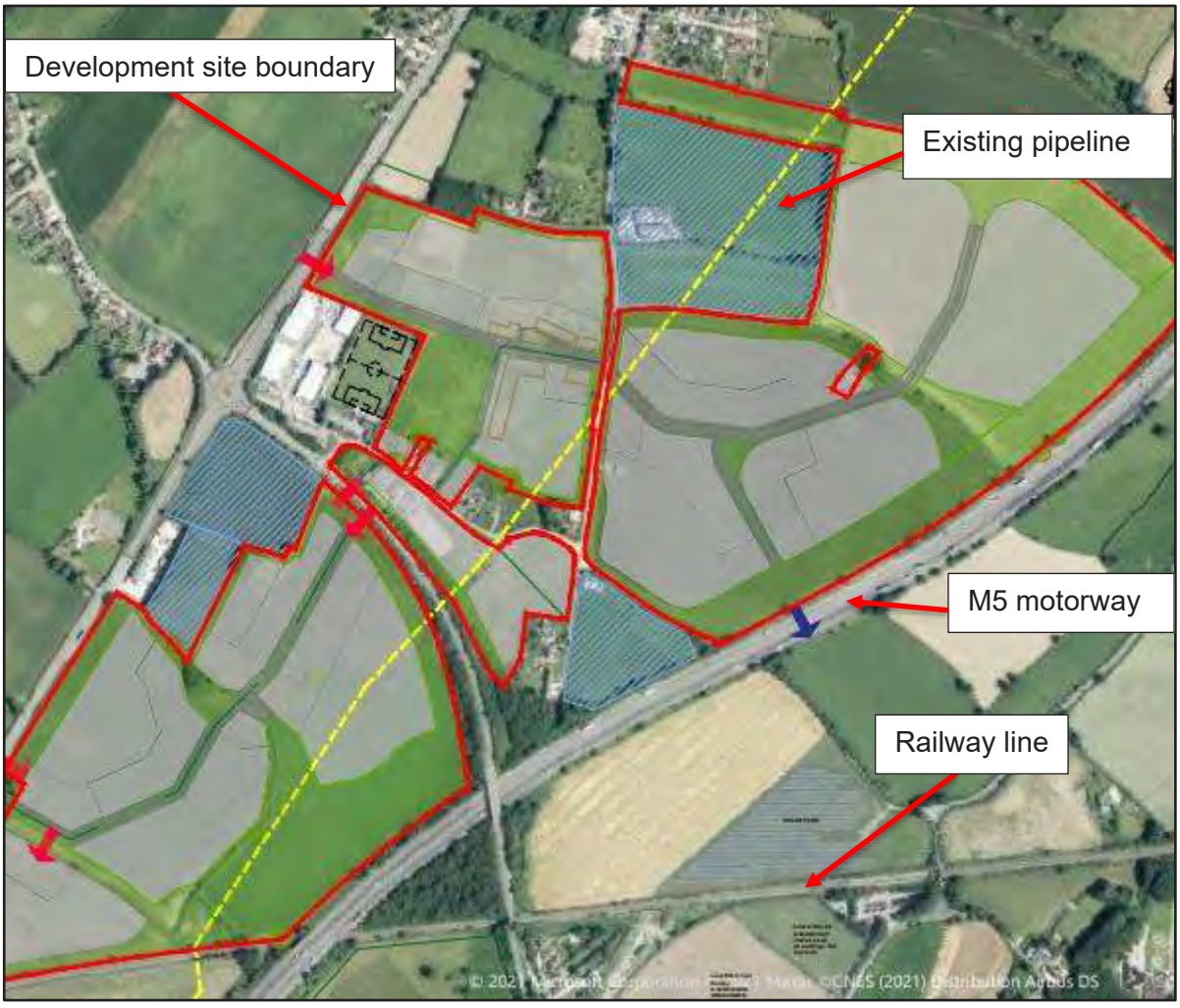


Figure 3 - Existing 350 NB Gloucester-Wickwar Pipeline Route

1.2 Scope of Study

The scope of works for this study has been identified by WWU as:

- Undertaking a site visit
- Identify, assess and review route option presented by Stantec.
- Identify, assess and review potential route options above and beyond those previously identified.
- Identify connection locations to the existing system.
- Identify health, safety and engineering difficulties,
- Identify scope for subsequent conceptual and detail design studies,
- Determine any special operational requirements,
- Review design with respect to Institution of Gas Engineers and Managers (IGEM) and WWU Standards,
- Identify long lead materials,
- Identify budget costs,
- Compilation of a design report to include high level programme, risk assessments, budget costs and option assessment for the options identified.

1.3 Abbreviations

Abbreviation	Definition
BPD	Building Proximity Distance
FW	Fingleton White
HSE	Health and Safety Executive
LUP	Land Usage Planning
MOP	Maximum Operating Pressure
PADHI	Planning Advice for Developments near Hazardous Installations
SSSI	Site of Special Scientific Interest
WWU	Wales & West Utilities

Table 2 - Abbreviations

2.0 DESIGN CRITERIA

2.1 General

This scope makes reference to recognised standards, specifications and codes of practice. Unless otherwise specified the latest editions of these documents including all addenda and revisions shall apply.

It is important to note that the documents listed are not exhaustive and other standards may apply. However, this does not relieve the commitment to carry out the work and/or compliance with the relevant standards.

In the event of a variation from a standard, specification or code of practice, a statement shall be submitted to WWU for approval identifying the area of nonconformity. The terms to be used are as follows:

- Non-compliant- Does not fully meet the requirements of the specification.
- Alternative- A proposal which does not fully comply with the specification but which an alternative solution is available while meeting operational requirements.

Any variations shall clearly state how the proposal differs from the requirements. If clarification of any requirements is required, this shall be sought as soon as possible.

2.2 Design Philosophy

The design philosophy is to provide a pipeline system “fit for purpose” without compromising safety, security, reliability and the environment.

The new pipeline, which is the subject of this report, will match or exceed the design criteria for the existing pipeline and all current design standards as appropriate.

2.3 Legislation

The existing system is designed and operated in accordance with the Pressure Systems Safety Regulations (PSSR):2000.

Additionally, the existing system design takes into account the requirements of:

- The Gas Act 1986 (amended 1995)
- The Pipelines Safety Regulations (PSR):1996
- The Construction (Design and Management) (CDM) Regulations 2015.
- Health and Safety at Work Act (HSWA):1974
- The Public Gas Transporter Pipelines Works (Environmental Impact Assessment) Regulations 1999.

The new Pipeline will be designed to the same legislation and any other legislation which is applicable to the project.

2.4 Principal Design Codes and Application

A list of relevant standards and specifications are outlined in Table 3. The pipeline diversion will be designed in accordance with IGEM/TD/1 Ed 5 and relevant Wales and West specifications.

Document No.	Document Title
IGEM/TD/1 Ed 5	Steel pipelines for high pressure gas transmission
T/SP/P/10	General pipelining designed to operate at pressures greater than 7barg
IGEM/GL/5	Managing New Works, Modifications & Repairs
2014/68/EU	Pressure Equipment Directive
GIS/DAT6:2019	Specification for standard sizes of carbon and carbon manganese steel pipe for operating pressure greater than 7 bar.
T/SP/F/4	Specification for hot tap and stopping off connections (for operating pressures 7 bar to 70 bar inclusive).
T/PM/P/18	Specification for working on pipelines containing defective girth welds of unknown quality.
T/SP/TR/18	Specification for engineering of pipelines and installations operating at [pressures] above 7 barg
T/SP/TR/21	Specification for feasibility studies of pipelines and installations operating at [pressures] above 7 barg.
T/PM/P/11	Management Procedure for Inspection, Assessment and Repair of Damaged Non-leaking Steel Pipelines Designed to Operate at Pressures Greater than 2 bar
T/PM/P/20	Management Procedure for Inspection Assessment and Repair of Damaged (Non-leaking) Steel Pipelines and Pipework up to 150mm Nominal Diameter Designed to Operate at Pressures Greater than 2 bar
T/SP/CW/6	Specification for the External Protection of Steel Line Pipe and Fittings Using Fusion Bonded Powder and Other Coating Systems
T/SP/CW/5	Specification for Field Applied External Coatings for Buried Pipelines and Systems
T/SP/P/9	Specifications for the Welding of Fittings to Pipelines Operating Under Pressure
T/SP/PT/1	Pressure Testing Pipework, Pipelines, Small Bore Pipework and Above Ground Austenitic Stainless-Steel Pipework
T/SP/B/12	Specification for Steel Bends, Tees, Reducers and End Caps for Operating Pressures Greater than 7 bar
T/SP/NDT/2	Specification for Non-Destructive Testing of Welded Joints on Construction and Fabrication Projects

Table 3 - Standards & Specifications

All relevant WWU Specifications, Standards and Codes of Practice applicable to this type of system shall apply and unless otherwise specified the latest editions of these documents including all addenda and revisions.

3.0 MECHANICAL REQUIREMENTS

The works detailed herein have been developed based on information supplied by WWU. The process conditions for the existing pipelines are summarised in Table 4 below. The existing pipelines were designed in compliance with Standards prevalent at the time of construction and considerations now thought of as a norm would not necessarily have been incorporated. Design factors, operating stresses and Building Proximity Distance (BPD) have been assessed against the latest Specifications.

3.1 Existing Pipeline Data

The existing Gloucester to Wickwar pipeline data is outlined in Table 4 below:

Gloucester to Wickwar Pipeline Operating Parameters	
Parameter	**Existing**
Maximum Operating Pressure (MOP)	32.6 barg
Nominal Diameter	350 NB
Outside Diameter	355.6 mm
Pipe Wall thickness	7.9 mm
Material Grade	X46
Pipe Type	Seam Welded (assumed)
Building Proximity Distance	15.6 m
Depth of Cover	0.9m (May very at crossings)

Table 4 - Existing Pipeline Design Parameters

3.2 Design Life

The pipeline diversion will have a design life of 40 years.

3.3 Pipeline Routing

The existing gas pipeline is located within the proposed new housing development at Wisloe Green. To facilitate the development, a diversion of the existing gas pipeline is required, whilst relaying the pipeline with an increased wall thickness and at an increased depth of cover. The pipe wall thickness is required to be ≥11.91 mm to avoid an increase in the BPD.

Properties of New Diversion Pipeline	
Parameter	**Value**
Pipeline Diameter	355.6 mm
Pipe Wall thickness	12.7mm
Material Grade	L360NE
Pipe Type	Seamless
Depth of Cover	1.2 m

Table 5 - Properties of New Diversion Pipelines

Details of pipeline tie-in points are found in section 4.0

3.4 Building Proximity Distance (BPD)

The minimum BPD is calculated in accordance with IGEM/TD/1 for new pipeline and results are presented in Table 6 below. Refer to appendices for detailed calculations.

Parameter	Value
Pipe size	355.6 mm (OD)
MOP	32.6 barg
Wall Thickness	12.7 mm
Area Type	S
Minimum BDP	3 m

Table 6 - Minimum BPD for New Diversion Pipeline

3.5 Pipeline Design Factors

Table 7 outlines the area types and corresponding design factors in accordance with IGEM/TD/1. The number of persons per hectare in the relevant area is > 2.5 (refer to appendices for detailed calculations). Therefore, type S area has been determined for pipeline design, which incorporates a design factor of 0.3.

Area Description	Area Type	Design Factor
Rural Areas with a population density not exceeding 2.5 persons per hectare	R	0.72
Areas intermediate in character between types R and T in which the population exceeds 2.5 persons per hectare and which may be extensively developed with residential properties, schools, shops etc.	S	0.3
Central areas of towns or cities, with a high population density, many multi-storey buildings, dense traffic and numerous underground services.	T	-

Table 7 - Area Design Factor

3.6 Design Wall Thickness

Design wall thickness to be determined as follows:

$$t = \frac{PD}{20fs}$$

Where:

t = minimum allowable wall thickness
P = *design pressure (bar)*
D = *outside diameter of pipe (mm)*
f = *design factor*
s = *specified minimum yield strength (N mm^{-2})*

The following are the wall thickness under-tolerances used to determine the minimum wall thickness of welded steel pipe to EN 3183.

Wall Thickness t (mm)	Tolerance	
Seamless Pipe		
t < 4	+0.6 mm	-0.5 mm
4 < t < 25	+15%	-12.5%
Welded Pipe		
t ≤10	+1.0 mm	-0.5 mm
10 < t < 20	+10%	-5%
t ≥20	+2.0 mm	- 1.0 mm

Table 8 - Tolerances on Wall Thickness (Ref: EN 3183)

Refer to appendices for detailed calculations of allowable pipe wall thicknesses.

3.7 Components & Fittings

The pipe specification, grade and wall thickness are defined in Table 4. All piping components and fittings shall be selected for the proposed design pressures and temperatures specified in the table below with a material composition compatible with the selected adjoining pipe.

Site	Component	Design Pressure (barg)	Rating	Design Temp (°C)	
				Max	Min
Gloucester to Wickwar	Fittings	32.6	CL300	+60	-20

Table 9- Components & Fittings Parameters

3.8 Pipeline Design Velocities

IGEM/TD/1 Edition 5 section 6.2 notes that as long as the gas quality is maintained at the prescribed levels, there is no need to limit the design velocity of gas in pipelines.

3.9 Pipeline Pressure Loss

The pipeline diversions will only have a marginal effect on the total length of the pipeline. Therefore, it is expected that gas pressures will not be adversely affected.

3.10 Pipeline Crossing Methods

Several road crossings were identified in this study. The A413 road, Bristol Road, St. John's Road and Dursley Road. These three roads may be classed as 'Other Traffic Route'. The requirements for crossing 'Other Traffic Routes', defined as those not designated as 'High-Density Traffic Routes' is outlined within IGEM/TD/1 Edition 5 and WWU Specification T/SP/P/10.

3.11 Existing Weld Conditions

WWU have indicated that the existing Gloucester to Wickwar pipeline was constructed prior to 1972 and constructed from API Grade X46 steel pipe. Therefore, there is the potential for defective grith welds. WWU have procedures in place for identifying and addressing such welds (WWU Specification T/SP/P/18).

The T/SP/P/18 procedure provides advice on reduction of risk of grith weld failure when working on buried pipelines and buried installation pipework.

The criteria for classifying weld defects and identifying the potential need for a repair are defined in T/SP/P/18 section 8. All girth welds requiring repair should be repaired in accordance with T/PM/P/11 or T/PM/P/20 as applicable.

Where there is potential for defective grith welds, a preliminary excavation shall be performed to identify weld locations, to establish the quality of welds and to determine their ability to withstand forces. All welds within the excavation should be inspected using NDT inspection techniques such as radiography and/or ultrasonic methods. This is in order to determine weld quality and check for defects that fall outside acceptable levels.

4.0 CONNECTIONS & TIE-INS

4.1 Connection Point Details

Two connection points were considered in this study as shown in Figure 4 below. These connection points were proposed by Stantec and are located within the development site.

Connection Point A is proposed to be located within the greenfield site north of the existing railway line. There is concrete sleeve protection installed at the location where the pipeline crosses the railway. The existence of this railway and the sleeve protection in the vicinity of the proposed location for Connection Point A should be taken into consideration during detail design.

Connection Point B is proposed to be located within a greenfield site south-east of Narles road. This connection is proposed to be located in close proximity to a water crossing.

These connection points would position the associated PADHI zones the furthest away from the proposed dwellings while allowing for sufficient space for bypass installation. Further investigation at connection point A and B would be required at detailed design stage to confirm the depth of cover. As-laids were not available during the feasibility study however a depth of cover of 0.9m has been stated by WWU for the existing HP gas main.

Figure 4 - Connection Point Details

Indicative PADHI zones of 16 m (inner), 49 m (middle) and 70 m (outer), used in this study were provided by Stantec, see Appendix 3.

4.2 Stoppling Arrangement Options

The connection points will require the Gloucester to Wickwar pipeline to be 'line-stopped' ('stoppled') to isolate the connection points and bypasses installed to maintain supply to downstream off-takes. The connection tie-in points will vary depending on factors such as space availability, condition of the existing pipeline, weld locations, etc.

To allow the pipeline to be 'stoppled' and bypassed, these connections will be required upstream of the tie-in point. An excavation in the order of 20 m in length may be expected for such a connection with further potential excavations downstream of the tie-in to allow for a secondary 'stopple' and bypass connection, see Figure 5 and Figure 6 below. Removal of trees and shrubs may be required to accommodate the connections.

A 'bifurcated stopple operation' uses the newly diverted pipeline as a temporary gas conduit while the cut-outs are being made and reduces the number of fittings and connection length as the secondary isolation position is not required. A 'five position stopple' operation entails two close stopples to isolate a section of the parent pipeline. With a bypass around the isolated section, the intermediate section of pipeline can be cut out to accommodate the end of the new diversion.

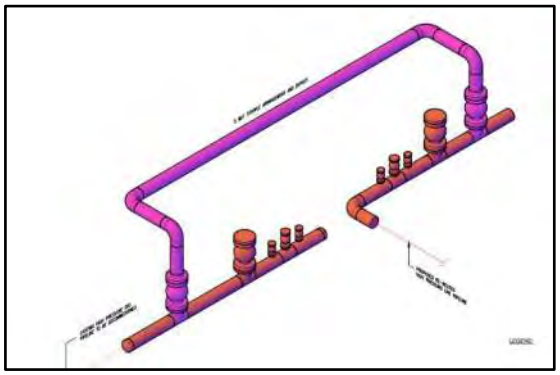


Figure 5 - Typical 'Five Position' Stopple

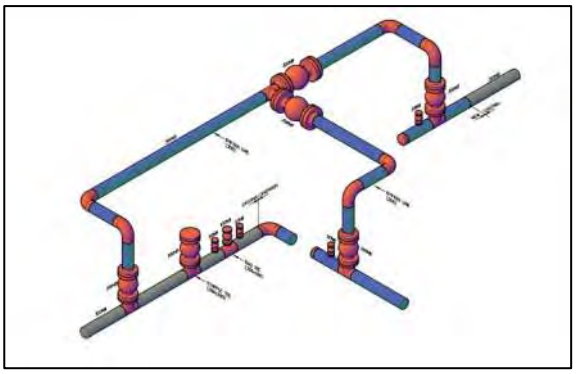


Figure 6 - Typical 'Bifurcated' Stopple

Further analysis of the connections should be done at detail design stages once the diversion route is agreed, and investigations carried out to determine weld locations and straight pipe lengths on the existing pipeline. The exact locations of the connection points should be considered at detailed design to ensure there is sufficient space to carry out the tie-ins in accordance with the governing standards.

5.0 ROUTE DETAILS

To propose a feasible diversion route, several design considerations were established. The main design considerations that influenced the diversion routes proposed are the following:

- Proposed development layout
- Location of connection points
- PADHI Zones and how they affect proposed dwellings.
- Land ownership
- Existing utilities / Constraints
- Diversion route length / shortest route

A diversion route has been proposed by Stantec, however, following a review of the proposed route by Fingleton White during this study, amendments have been applied to the suggested route to address proximity issues with the existing HP gas main during construction.

The diversion routes proposed below are a pipeline corridor, the final routes will be determined at detail design stage. The proposed routes are shown in Figure 7 below, shown along with the engineering features and hazards considered during design.

Pipeline Route Option 1 – Route proposed for diversion is proposed to be installed largely within the land owned by the developer. The route is detailed in section 5.1.

Pipeline Route Option 2 – Route proposed for diversion is proposed to be installed largely within the land owned by the developer. The route is detailed in section 5.2.

Pipeline Route Option 3 – Route proposed for diversion is proposed to be installed partially within the land owned by the developer and partially through a private field. The route is detailed in section 5.3.

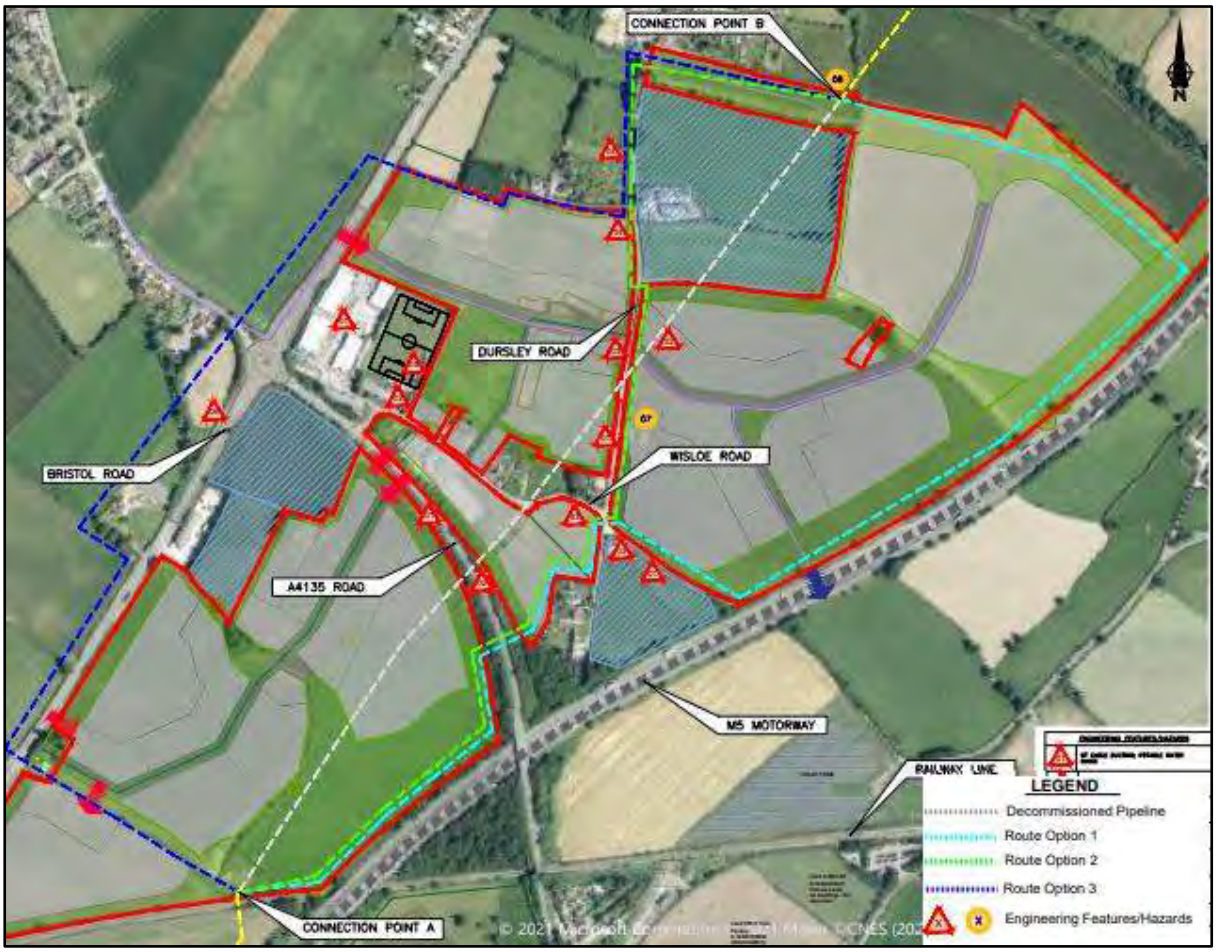


Figure 7 - Diversion Route Options

5.1 Route Option 1

Pipeline Route Option 1 connects to the existing HP gas pipeline within the development site at Connection Point A, located approximately 10m north of the railway line. From the connection point the pipeline is proposed to be routed east, running parallel to the M5 motorway for approximately 450m. It is then routed in a northerly direction, running parallel to the A4135 road for approximately 120m before crossing into the greenfield site, north of the A4135 road. The diversion route then follows a zigzag arrangement avoiding the existing houses that are located to the north-west of Dursley road. The proposed route crosses Dursley road onto the greenfield site west of the M5 and continues for approximately 200m, before turning north and continuing parallel to the M5 for approximately 700m. The proposed route then runs west of the M5 for approximately 520m and connects back into the existing pipeline at connection point B, located approximately 160m south-east of Narles Road.

It should be noted that the crossing of the A4135 road will involve removal of a substantial number of trees and vegetation on both sides of the road. An environmental survey should be conducted prior to construction to avoid works overlapping with bird nesting season and/or other environmental constraints.

This diversion route option is similar to the diversion option proposed by Stantec and has been proposed in sympathy with the development plans. It stays within the proposed noise buffer area where no plots are being planned for development and avoids any third-party land constraints. However, some utilities are routed along the location where this diversion route crosses Dursley road. These utilities include overhead electricity cables and a low-

pressure gas main. In addition, the developer may have to liaise with Highways England due to proposed works within the vicinity of the M5 motorway. This should be taken into consideration at detail design.

The length of this diversion route option is approximately 2,400m.

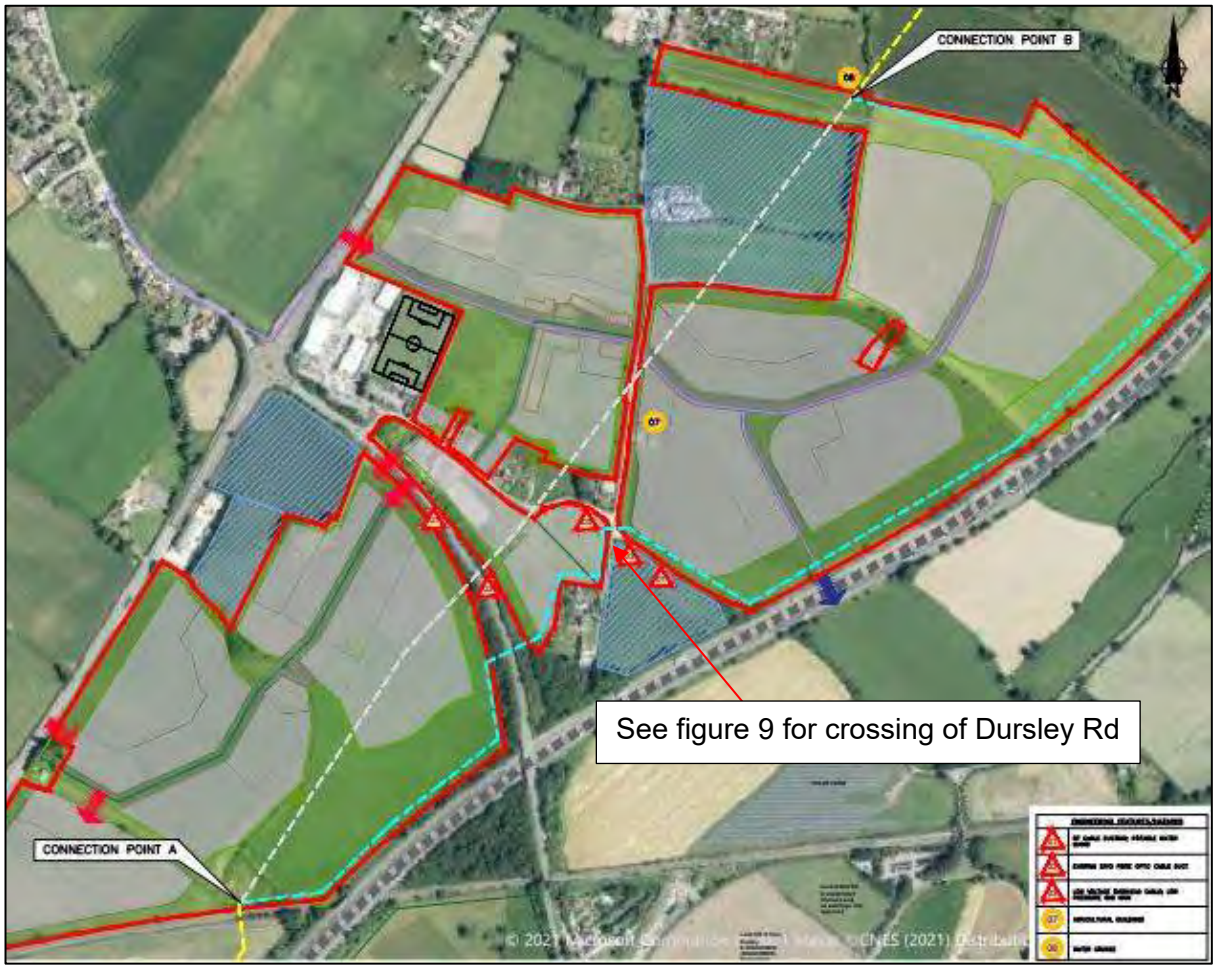


Figure 8 - Diversion Route Option 1

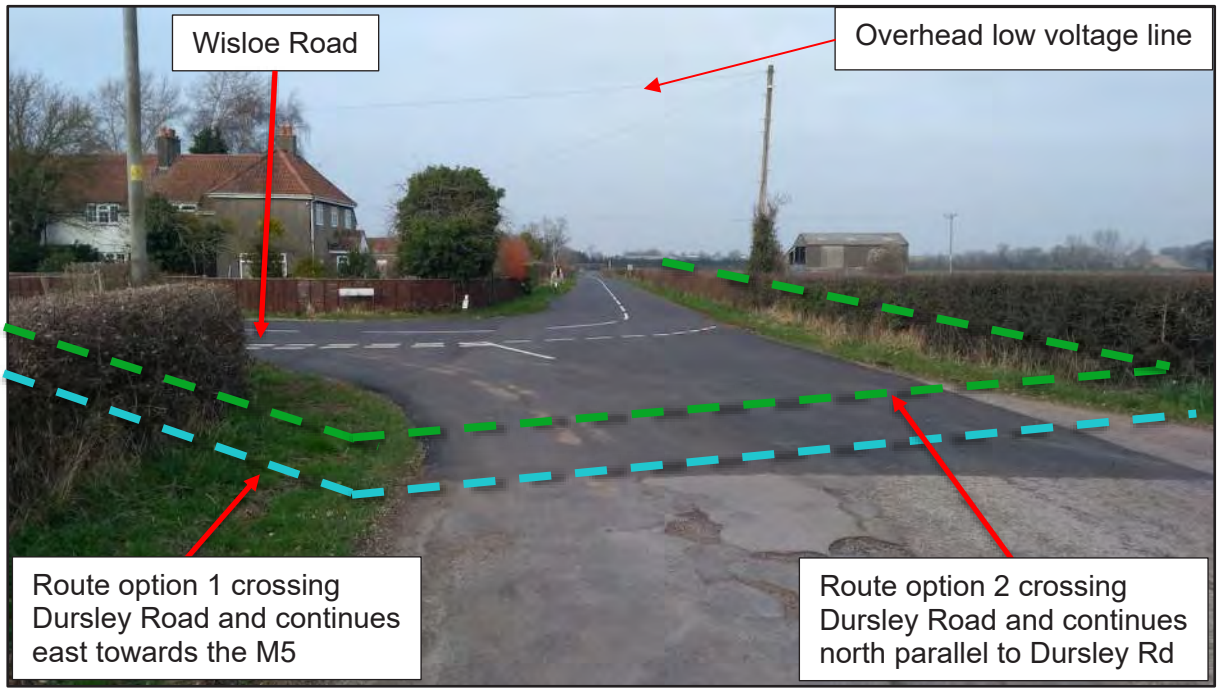


Figure 9 - Proposed Diversion Options 1 & 2 Crossing Dursley Rd.

5.2 Route Option 2

Pipeline Route Option 2 connects to the existing HP gas pipeline at Connection Point A, as per Route Option 1. From the connection point the pipeline is routed east parallel to the M5 motorway for approximately 450m. It then turns north and is routed parallel to the A4135 road for approximately 120m before crossing onto the greenfield site north of the A4135 road. The diversion route then follows a zigzag pattern avoiding the existing houses north-west of Dursley Road, similar to diversion Route Option 1. The diversion route then continues north, along the eastern verge of Dursley Road for approximately 330m before crossing Dursley Road and continuing north on the western verge of it for approximately 320m. The diversion route crosses Dursley Road again, into the greenfield site east of it and continues for approximately 270m, before connecting back into the existing pipeline at connection point B, located approximately 160m south-east of Narles Road.

It should be noted that the crossing of the A4135 road will involve removal of a substantial number of trees and vegetation on both sides of the road. An environmental survey should be conducted prior to construction to avoid works overlapping with bird nesting season and/or other environmental constraints.

This diversion route option has been proposed in sympathy with the development plans. It stays largely within the proposed noise buffer area where no plots are being planned for development. However, approximately 220m of this diversion would be routed within third party land. In addition, it crosses the existing Dursley Road at three locations and the existing 300 NB HP gas main at one location, adding to complexity during construction. Also, several utilities are routed along Dursley Road, including overhead electricity cables, underground electricity cables, potable water mains and low-pressure gas mains. This should be taken into consideration at detail design.

The length of this diversion route is approximately 2,000m.

Figure 10 - Diversion Route Option 2

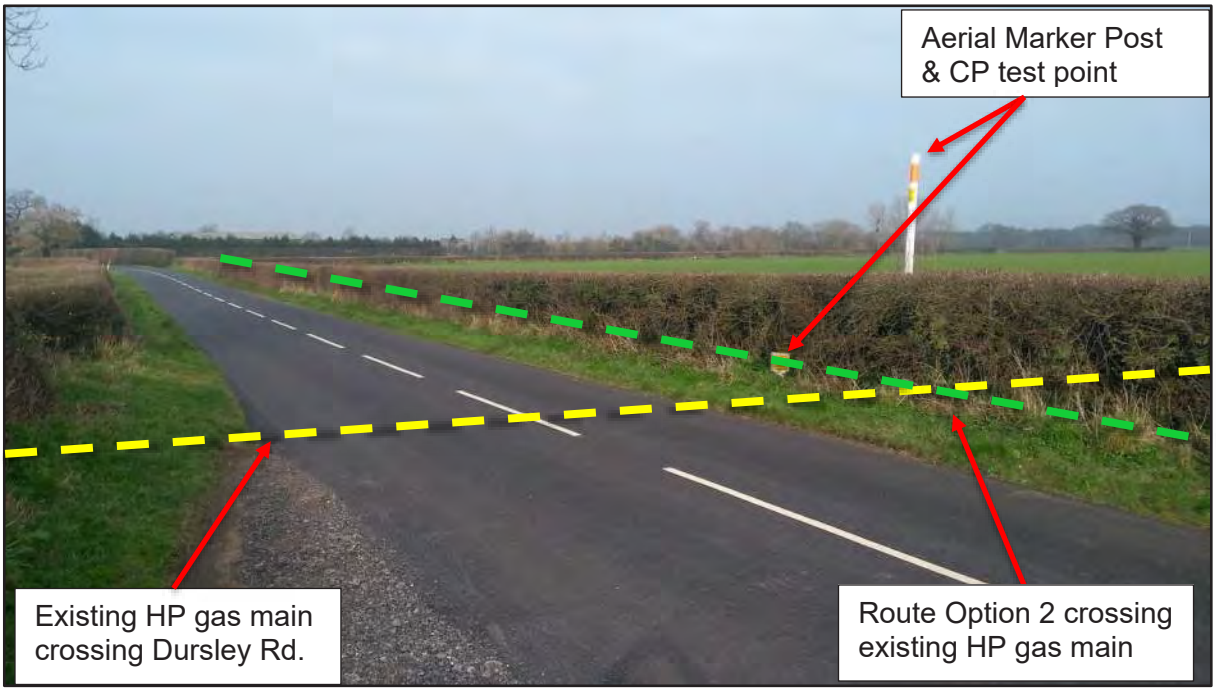


Figure 11 - Location Where Route Option 2 Crosses Existing Pipeline

5.3 Route Option 3

Pipeline Route Option 3 connects to the existing HP gas pipeline at Connection Point A, as per Route Option 1From the connection point the pipeline is routed west through the greenfield site within the development site for approximately 310m before crossing Bristol Road into the greenfield site west of it. The diversion route continues north for approximately 770m along the western verge of Bristol Road avoiding the existing houses on the west of Bristol Road. It then crosses St. John's Road and continues north along the western verge of Bristol Road for approximately 300m before crossing it and continuing onto the greenfield site east of Bristol Road for about 350m. It is then routed north, along the western verge of Dursley Road for approximately 220m before it crosses into the greenfield site located to the east and continues for approximately 270m. The diversion route connects back onto the existing pipeline at connection point B, located approximately 160m south-east of Narles Road.

This route option is partially routed outside the proposed development site and is the longest route option. Sections of the pipeline would be routed within third party land and at least four road crossings have been identified, adding to complexity during construction. In addition, several utilities are routed along Bristol Road and Dursley Road, including electricity cables, potable water mains,low pressure gas mains and overhead BT cables. This should be taken into consideration at detail design.

The length of this diversion route is approximately 2,500m.

Figure 12 - Diversion Route Option 3

Figure 13 – Location Where Route Option 3 Crosses St. John's Rd.

6.0 OPTIONS ASSESMENT

The following table summarises the advantages and disadvantages associated with the options identified for routing of diversion main between the identified start and end points.

6.1 Route Option 1

The option detailed in section 5.1 is proposed to be installed within the proposed development as the diversion connects off and back into the existing main. This option has the least number of road crossings and stays largely within a green area that at initial consultation with Stantec was confirmed to be assigned as a dedicated noise buffer area. In addition, it was the preferred route during initial consultation with Stantec as the route ensured sufficient separation to allow for flexibility when developing a detailed plot layout scheme . For these reasons Route Option 1 ranks first in the SWOT analysis.

Strengths	Weaknesses
•Pipeline fully routed along designated corridor •Shorter route compared with option 3 •Standard opencut technique •Minimal inpact on tree/hedgerows •Least number of road crossings compared with options 2 & 3 •Low house density in the viscinity of proposed route	•Crossing road embankment •Proximity risks to existing utilities, specifically electricity cables and low pressure gas main •Proximity to motorway •Multiple bends
Opportunities	**Threats**
•Trenchless technique could be used to cross wooded areas and roads	•Potential Environmental issues impacting construction programme •Proximity to existing pipeline during construction

6.2 Route Option 2

The route option detailed in section 5.2 is proposed to be largely routed within the proposed development site as the diversion connects off and back into the existing main. Route option 2 is the shortest route and allows the development to be built as proposed. However, it will require four road crossings, it crosses the existing gas main at one location and is partially routed within third party land. For these reasons Route Option 2 ranks third in the SWOT analysis.

Strengths	Weaknesses
•Standard construction techniques(i.e stable ground conditions etc.) •Pipeline largely routed along designated corridor •Shortest route - lower material/installation costs	•Safety risks to crossing of HP gas pipeline •Route through vegetation, ditches, hedgerows, etc. •Diversion works in vicinity of exsiting building •Works might lead to road closures •Proximity risks to existing utilities, specifically overhead cables and below ground gas line •Highest number of road corssings compared with options 1 & 3
Opportunities	**Threats**
•Trenchless technique could be used to cross wooded areas and roads	•Potential Environmental issues impacting construction programme •Proximity to existing pipeline during construction

6.3 Route Option 3

The option detailed in section 5.3 is proposed to be partially within the development site and partially parallel to Bristol road as the diversion connects off and back into the existing main. Route option 3 allows the development to be built as proposed. However, it is the longest route option and will require four road crossings. For these reasons Route Option 3 ranks second in the SWOT analysis.

Strengths	Weaknesses
•Standard construction techniques(i.e stable ground conditions etc.) •Minimal inpact on tree/hedgerows •No proximity issues to existing pipeline during construction	•Route through vegetation, ditches, hedgerows, etc. •Diversion works in vicinity of exsiting buildings and utilities •Longest route leading to higher material/installations costs. •Approximately four road crossings •Route within third party land
Opportunities	**Threats**
•Trenchless technique could be used to cross wooded areas and roads •Increase development area due to diversion route further away from development area	•Potential Environmental issues impacting construction programme •Third party consent

7.0 MATERIALS

7.1 General

All materials, fittings and equipment that will form a permanent or temporary part of the pipeline system will be designed to meet the defined process conditions and to withstand the environmental conditions. This will include the requirement to enable continuous service without significant corrosion, erosion or other deterioration. All materials, fittings and equipment will be in accordance with the requirements of the relevant WWU Standards, and where no WWU technical specification exists, consideration of the following should be made:

- National or International Standards
- Industry Recommendations
- Established Industry Codes (particularly IGEM codes), or
- Company Policy

Any deviation from WWU Technical Specifications should be agreed in writing prior to procurement taking place. Materials will be procured in accordance with the European Community (EC) Utilities Directive and will be supplied complete with certification and evidence of an ISO9000 quality review.

7.2 Proposed Pipe

350 NB pipe is considered to be a non-standard pipe diameter for HP gas pipelines. As such 350 NB is not listed within WWU Specification T/SP/DAT/6.

IGEM/TD/1 Edition 5 requires the suitable diversion pipe to have a minimum wall thickness of 11.91 mm and a design factor no greater than 0.3. From the list of available pipe sizes, the corresponding wall thickness immediately higher than 11.9 mm is 12.7 mm. The material parameters for the diversion are given in Table 5.

7.3 Other Materials

In addition to the pipe requirement identified above, a number of forged bends will be needed to negotiate the changes in direction and level. The quantity of bends required will need to be determined at detailed design stage. IGEM/TD/1 Edition 5 recommends the use of 3D bends to allow unrestricted pipeline pigging. Bends shall be in accordance with WWU Specification T/SP/B/12.

7.4 Connections

WWU have indicated that the Gloucester to Wickwar pipeline cannot be taken out of service and therefore WWU will have no option but undertake a live stoppling operation to divert the existing pipeline along the proposed diversion route.

This will require the use of under-pressure tees and fittings fixed to the pipeline by welding. Welded under-pressure fittings shall be in accordance with WWU Specification T/SP/F/4 and specified as ANSI Class 300 to suit the pipeline operating pressure.

Space availability and maintaining a suitable separation between any unmodified parts of the pipeline and normally occupied buildings will be a key issue during detailed design.

7.5 Material Schedule

Larger materials associated with gas pipeline construction are generally not 'off-the-shelf' items and a lead-time should be expected between placement of order and delivery to site. Lead-times at present are typically.

Item	Lead Time (Weeks)
Line pipe	40
Under-pressure fittings	24
Bends	24
Forgings	24
Valves	30

Table 10 - Typical Material Lead Time

8.0 CORROSION PROTECTION

Corrosion can be controlled by a combination of protective coatings, paints and Cathodic Protection (CP). These measures are summarised as follows and shall be in accordance with the appropriate WWU Specification:

- Internal Coatings (WWU Specification T/SP/CM/10)
- External Coatings: Pipe and major fittings shall be supplied with a supplier applied factory coating (WWU Specification T/SP/CW/6).
- Following welding and weld inspection the joints shall be coated. The coating system shall be applied in accordance with the appropriate
- Procedure (WWU Specification T/SP/CW/5).
- Cathodic Protection: The existing pipeline CP system will need to be investigated and evaluated during later stages of the design process.

Design of the cathodic protection system will be completed by specialist designers.

The likelihood is that the existing pipeline CP system will need to be monitored and tested following construction. The likelihood is that the existing system would be capable of protecting the minor additional length of steel pipe material involved. However additional CP test posts are likely to be required along the length of the diverted pipeline.

9.0 CIVIL REQUIREMENTS

9.1 General

The civil elements for the project will typically comprise the following:

- Accommodation works, including formation of temporary accesses, hard standings, etc.
- Trench excavation and support.
- Ground dewatering, trench backfill, compaction, and reinstatement.
- Temporary pipe supports as required.

It is envisaged that much of the diverted pipes will be laid using a traditional 'working spread' methodology where the 'spread' will be a defined working area fenced off from adjacent land parcels. The topsoil will be stripped to form a working area, where pipe welding, trenching, pipe lowering, etc will take place.

Trench excavation and support shall be in accordance with Construction Regulations and Codes of Practice and subject to daily and weekly inspections. These shall be recorded in the Health and Safety file register. Support of deep excavations shall be subject to design approval by a competent person on behalf of WWU.

9.2 Ground Conditions

A geotechnical ground investigation has not been undertaken as part of this study. Preliminary Information obtained through investigation in the British Geological Survey (BGS) maps indicate the overall geological composition of the proposed development land, see section 12.3.

It has been assumed that ground surveys have not been done by the developer at this stage.

The presence of aquifers, refuse tips or localised features cannot be determined at this stage. Therefore, it is recommended that developer's survey results (if available) are reviewed, and further boreholes undertaken if appropriate.

10.0 INSTALLATION AND TESTING REQUIREMENTS

10.1 General

All pressure testing in general shall be carried out in accordance with the requirements of the latest edition of IGEM/TD/1 and WWU Specification T/SP/P/10 and T/SP/PT/1.

10.2 Welding

Welded joints shall be made and inspected in accordance with WWU Specification T/SP/P/2.

Welding of the encirclement tees and associated fittings shall be carried out in accordance with T/SP/P/9.

Details of the pipe sizes, wall thickness and materials should be confirmed at the detail design stage.

All welds shall be subject to 100% non-destructive testing (NDT) in accordance with T/SP/NDT/2.

10.3 Hydrostatic Testing

A hydrostatic pressure test shall be undertaken to prove the structural integrity of the pipeline system and redistribute any construction stresses.

Prior to testing, a test drawing will be prepared by the works contractor and submitted to WWU for approval. In addition, the new section of pipeline shall be swabbed and gauged using approved pigging devices. Similarly, approved pigs shall be used for filling, dewatering and final swabbing operations.

The hydrostatic test will exclude the welds designated as “tie-ins”. However, the sections shall be pre-tested prior to the tie-in connection being made and the tie-ins shall be subject to NDT to T/SP/NDT/2 and T/SP/PT/1.

10.4 Records & Documentation

All records information, documentation, certification of materials and components and any other appropriate information that can be used as a permanent record of fitness for purpose shall be preserved by WWU.

All fittings shall have sufficient documentation to provide complete traceability. For pressure systems, which will be subject to schemes of examination, there is a requirement to retain sufficient information concerning its design, construction, examination, operation and maintenance. Records shall typically include:

- Fully detailed “as built” drawings.
- Welding and fabrication records
- Full material certification.
- Equipment data sheets.
- Selected suppliers return – e.g. purchase orders.
- Inspection reports.
- Weld acceptance certificates.
- Weld procedures
- Letters of conformity.

- Design calculations.
- Pressure test records

All fittings shall be indelibly marked with a unique identification number and be recorded in a suitable register with the supplier's order numbers to ensure complete traceability.

11.0 SAFETY ENGINEERING

11.1 General

The design and engineering activities for this project will be carried out in accordance with all current Health and Safety Legislation, in particular the Construction (Design and Management) Regulations (CDM).

As part of this study, safety issues to be considered for inclusion in the preliminary Health and Safety Plan should include:

- Works in the vicinity of the existing WWU “live” operational plant.
- Programme of works for development.
- Third party landowner consents
- Potentially defective welds
- Effect on the environment.
- Unknown ground conditions
- Design issues.
- Satisfying permissible minimum building proximity distances between the pipeline and proposed dwellings.
- Transfer of duties from the Designer to the Principal Contractor.
- Tie-in arrangements.
- Working in the vicinity of existing utilities

11.2 HAZID/HAZOP

Safety is considered in the design process. The requirement for HAZID/HAZOP/HAZCON shall be reviewed at later design stages.

12.0 ENVIRONMENTAL CONSTRAINTS

No formal environmental studies have been undertaken as part of this report. It is recommended that a full environmental impact assessment is conducted at detail design.

12.1 Designations

A search of the statutory designations around the proposed development site identified a SSSI (Site of Special Scientific Interest) Impact Risk Zone crossing various sections of the development site. The development site was also identified as being located within a Drinking Water Safe Guard Zone (Surface Water). No other issues have been identified.

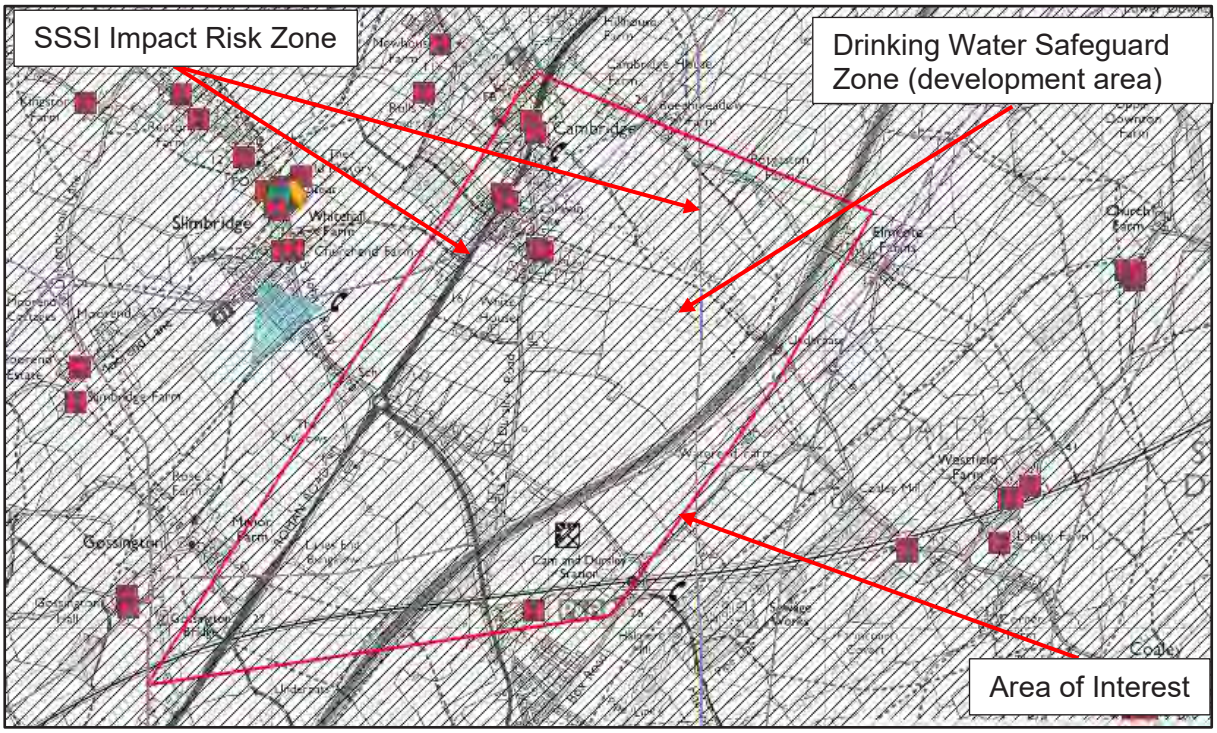


Figure 14 - Designations Mapping https://magic.defra.gov.uk/magicmap.aspx

12.2 Flood Zoning

The development area is located within a “Flood Zone 1” according to the Environmental Agency Data at a high risk. Flood Zone 1 Land having a less than 1 in 1,000 annual probability of river or sea flooding. A formal flood risk assessment should be carried out at detailed design since it may be affected in the future by sources of flooding other than rivers and the sea, for example surface water drains.

Figure 15 - Flood Zone Mapping https://flood-map-for-planning.service.gov.uk/

12.3 Geology

British Geological Survey (BGS) maps denotes the underlying bedrock of the propose development site as a mixture between mudstone, siltstone and limestone. The superficial deposits are a combination of clay, silt, sand, and gravel.

Figure 16 - Geological Data https://mapapps.bgs.ac.uk/geologyofbritain/home.html

A search of the available boreholes in the proposed development site is shown in Figure 17 below. Several 10-30m deep publicly available boreholes have been identified within the development site and along the M5 motorway. These are unlikely to affect the diversion works.

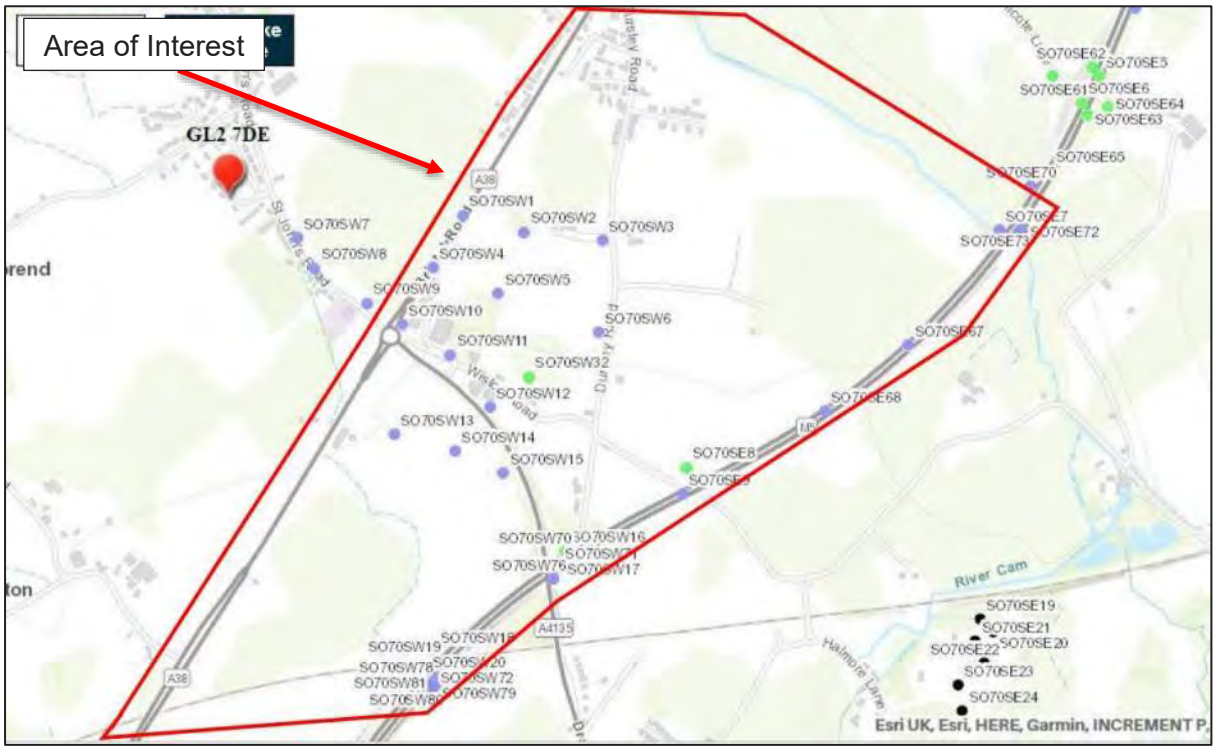


Figure 17 – Available Borehole Ground Investigation

12.4 Abandoned Mines

A search of the listed abandoned mines did not highlight any areas which present a risk to the proposed diversion route.

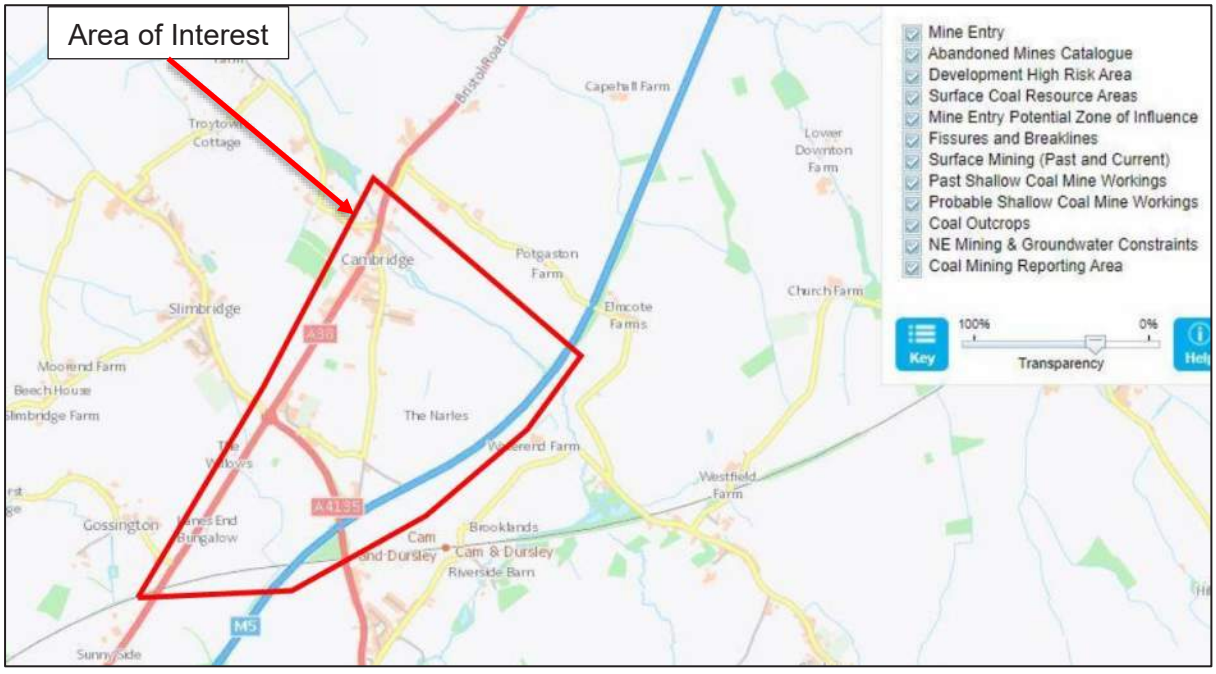


Figure 18 - Abandoned Mines https://mapapps2.bgs.ac.uk/coalauthority/home.html

12.5 Unexploded Ordnance Assessment

A preliminary assessment to determine the potential presence of Unexploded Bomb (UXB) as a result of World War II (WWII) bombings in the region was conducted for the proposed development site.

The development area is shown in the figure below to be a low risk area. Low risk is described as area having 15 bombs per 1000 acres or less. Further specialised assessment by an Unexploded Ordinance (UXO) specialist might be required at detail design.

Figure 19 - UXO Risk Assessment https://zeticauxo.com/downloads-and-resources/risk-maps/

13.0 PROJECT RISKS

The following key issues have been identified as those that potentially present a risk to the successful completion of the project. A project risk workshop should be carried out at the early design stage to further develop the project planning. Key project risks are outlined in Table 11 below:

Project Risks	Description
Long-lead materials	Durations of up to 40 weeks can be expected for some materials that will dictate the start of construction.
External services and contractor appointment	Various sub-contractor services will need to be engaged in a timely manner.
Connections	A number of connection issues have been considered. Installing the required stopples and fittings within the development site can potentially reduce costs and programme delays
Hydrostatic testing	Suitable exclusion zones should be enforced between 'persons at risk' and pipelines under hydrostatic test. Pre-testing pipe and pipe fabrications can mitigate the risk to a more acceptable level.
Venting operations	Gas plumes can present an ignition hazard and venting may be noisy and disruptive to local habited dwellings. Notifying homeowners and carriageway traffic of activities and temporary road closures can partially mitigate the hazard.
Environmental	Unforeseen issues including identification of protected species that require mitigating measures for preservation could impact on the programme.
Weld quality	The pipeline weld quality is unknown at this stage. If substandard welds are found near the proposed connection positions, then this will have a major bearing on successful completion. Shelling or repairing substandard welds could be a costly exercise
Other utilities	Preliminary information has been received from the developer to determine existing utilities in the area. More information will be required at detail design to ensure that there is no conflict between diverted pipeline and any other existing utilities.
Archaeology	Unforeseen issues including the discovery of archaeological finds that require mitigating finds could impact on the programme.
Covid-19	The Covid-19 pandemic may have an impact on the project including programme delays, material delivery etc.

Table 11 - Project Risks

14.0 PROGRAMME

The programme based upon the following assumptions:

- WWU will programme the immediate start of the detail design phase and not undertake a Conceptual Design.
- Investigations on the existing pipeline will begin immediately to establish weld locations and condition to inform the detail design team.
- Pipe is available and can be delivered within a 40-week lead time.
- Unforeseen environmental constraints (protected species windows, consents, etc) have not been factored into the programme.

Item	Description	Programme
1	Feasibility Study	8 Weeks
2	Detailed Design	15 Weeks
3	Planning (Engineering Design)	12 Weeks
4	Legislation and Planning Consents	24 Weeks
5	Procurement	40 Weeks
6	Construction and Fabrication	25 Weeks
7	Testing and Commissioning	4 Weeks
8	Decommission Existing Pipeline	6 Weeks
Total Project Programme		134 Weeks

Table 12 - Outline Programme

The procurement lead time is based on typical lead times for materials. This can be mitigated or reduced by ordering the long lead materials early in the design process

15.0 BUDGET COST ESTIMATE

The budget cost estimate presented below is a high-level cost based upon current costs for the construction of a similar diversion project. The estimate assumes that areas of land will be made available to the Contractor to form a site establishment area and pipe storage.

Item	Description	WWU Overheads	Option 1	Option 2	Option 3
1	Project Management	121%	£71,299	£71,299	£71,299
2	Detailed Design	8%	£115,175	£115,175	£115,175
3	GL5	8%	£16,454	£16,454	£16,454
4	Planning and Consents		WWU to advise	WWU to advise	WWU to advise
5	Materials Procurement	2%	£600,581	£546,285	£596,742
6	Wayleaves		WWU to advise	WWU to advise	WWU to advise
7	Construction Costs	8%	£285,883	£262,190	£285,883
8	Testing and Commissioning Costs	8%	£98,151	£98,151	£98,151
9	Diversion Construction Costs	8%	£789,768	£658,140	£822,675
10	Decommissioning and Demolition	8%	£164,535	£165,535	£164,535
	Total Estimate		**£2,141,844**	**£1,932,226**	**£2,170,912**
	Budget Price +/-40%		**£2,200,000**	**£2,000,000**	**£2,200,000**

Table 13 - Budget Estimate

16.0 ASSUMPTIONS, EXCLUSIONS & CLARIFICATIONS

The following study has been reviewed and assessed against the information provided by WWU, data freely available in the public domain and a site survey.

The existing pipeline parameters are taken as those provided in the study brief by WWU. The design pressure has been assumed to be the same as the MOP provided in the study brief. The exact pipe material parameters are not known and will need to be confirmed prior to ordering under-pressure fittings. The pipeline is considered to be a strategic supply and has been taken to be uninterruptible.

The development land is owned by The Ernest Cook Trust. However, the pipeline is not subject to a 'Lift and Shift agreement', this will have to be addressed at detail design stage.

The diversion and stopple operations will lie within the development area and are unlikely to suffer landowner objections.

Pipeline route coordinates were not provided for this study. It was therefore assumed that no trial holes have been performed to determine the exact location of the existing pipeline. Ground investigations will be required before commencement of works. Existing pipeline route is based on PDF strip maps provided by WWU.

It was confirmed by WWU that the existing pipeline is 'piggable' and the diversion pipeline should be of the same diameter. The ability to pass a Pipeline Inspection Gauge (PIG) has dictated the connection methodologies outlined in the report.

The pipelines was constructed prior to 1972 and may require further specialist investigative procedures in accordance with T/SP/P/18 due to the potential of defective girth welds.

Utility drawings provided by Stantec show several underground and overhead utilities routed at various locations around and within the development site, see Appendix 3. It is assumed in this study that no formal services search has been undertaken by the developer and no formal enquiries have been made to the owner of those services. Therefore, details of their easement and engineering requirements is not known and advice from the relevant bodies should be sought at detail design stage.

No formal environmental surveying has been undertaken as part of this study.

Indicative PADHI zones used in this study were provided by Stantec through correspondence.

17.0 CONCLUSIONS

A review of the presented and available information with regards to the diversion of the existing HP gas main from Gloucester to Wickwar has been undertaken.

It is apparent that a do-nothing approach will restrict the proposed development at Wisloe Green and will require the development plans to be rearranged in order to accommodate for the minimum BPD to nearest occupied building (subject to PADHI assessment). Therefore, a diversion of the existing pipeline is required.

The diversion routes proposed by the developer along with alternative routes were examined in this study. Route Option 1 ranked highest in the SWOT analysis and has been identified as the preferred route.

In terms of constructability of the diversion pipelines, no major obstacles or engineering difficulties were identified, and the pipeline diversions can be constructed using typical pipeline construction techniques.

A site survey and utility drawings provided by the developer identified several underground and overhead utilities routed at various locations around and within the development site. This will present some difficulty during construction since these utilities are route in close proximity to the proposed diversion route corridors.

A site survey and utility drawings provided by the developer identified several utilities routed along the house. This will present some difficulties during construction since these utilities are all in close proximity to the proposed diversion route corridor.

Information obtained through investigations in the public domain has identified an SSSI Impact Risk Zone and the surface water, no other issues were identified.

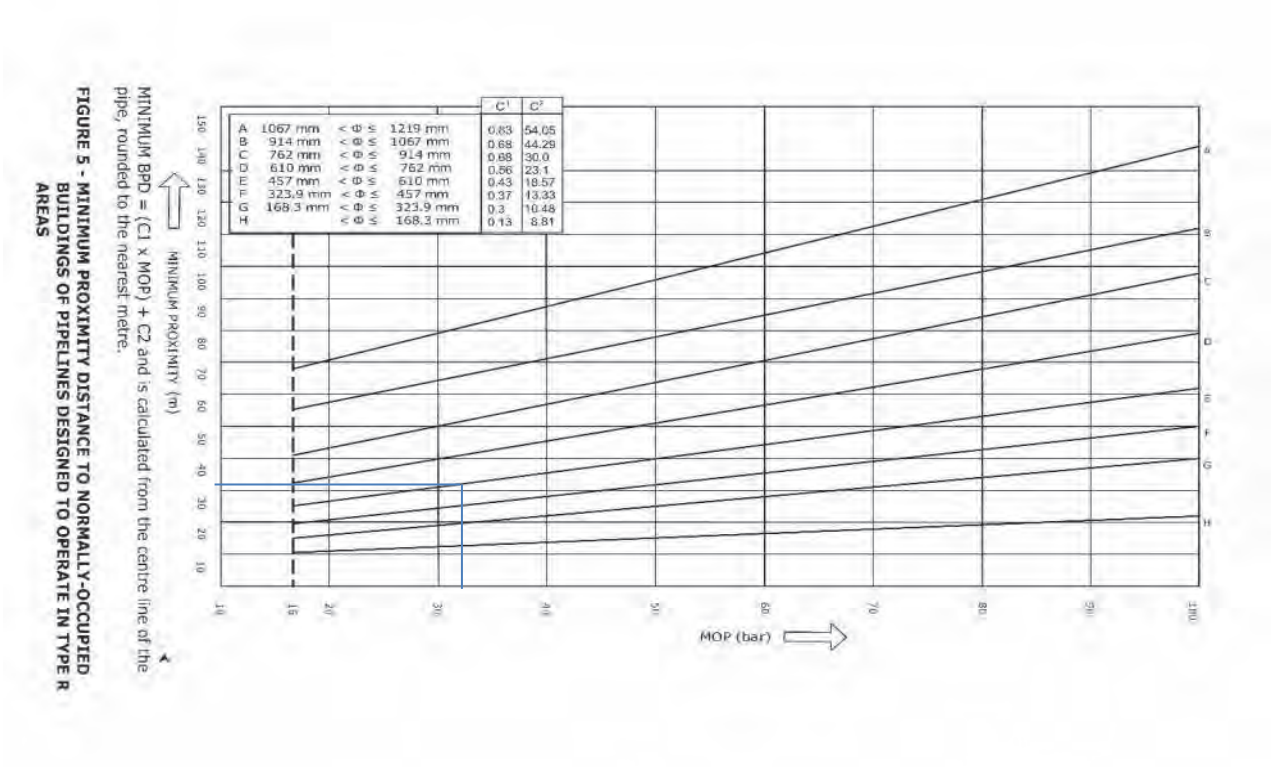
In conclusion, the diversion route proposed here Route Option 1 is considered to be the most acceptable solution in terms of meeting the requirements of WWU, the developer and IGEM/TD/1 Edition 5.

APPENDIX 1: CALCULATIONS

Calculation Index

Table Of Contents	Sheet # - # of Pages
Building Proximity Distance	4-1
Type S Area	5-1
Diversion-Existing	6-2
Diversion-New	7-2

Building Proximity Distance



Pipesize	350	mm
MOP	32.6	bar
C1	0.12	
C2	12	
Minimum BPD	16	m

ESTIMATION OF POPULATION DENSITY

6.7.2 **Estimation of population density**

6.7.2.1 The population density, expressed as the number of persons per unit area, shall be the average within a 1.6 km strip centred on the pipeline of a width 8 times the minimum BPD for a Type R area pipeline as defined in Figure 5.

Note 1: For MOP exceeding 100 bar, Figure 5 may be extended by linear extrapolation using the correlations provided to define the width of the strip used in calculating population density.

Note 2: The strip width may be defined by the distance to a risk level of 0.3 cpm on the individual risk transect.

6.7.2.2 Measurement of population density shall be based on a survey, for example by aerial photography, of normally occupied buildings and premises where people congregate for significant periods of time, for example schools, public halls, etc.

6.7.2.3 The occupancy of houses should be determined from Census statistics, although the occupancy of typical houses may be assumed to be 3 persons per dwelling.

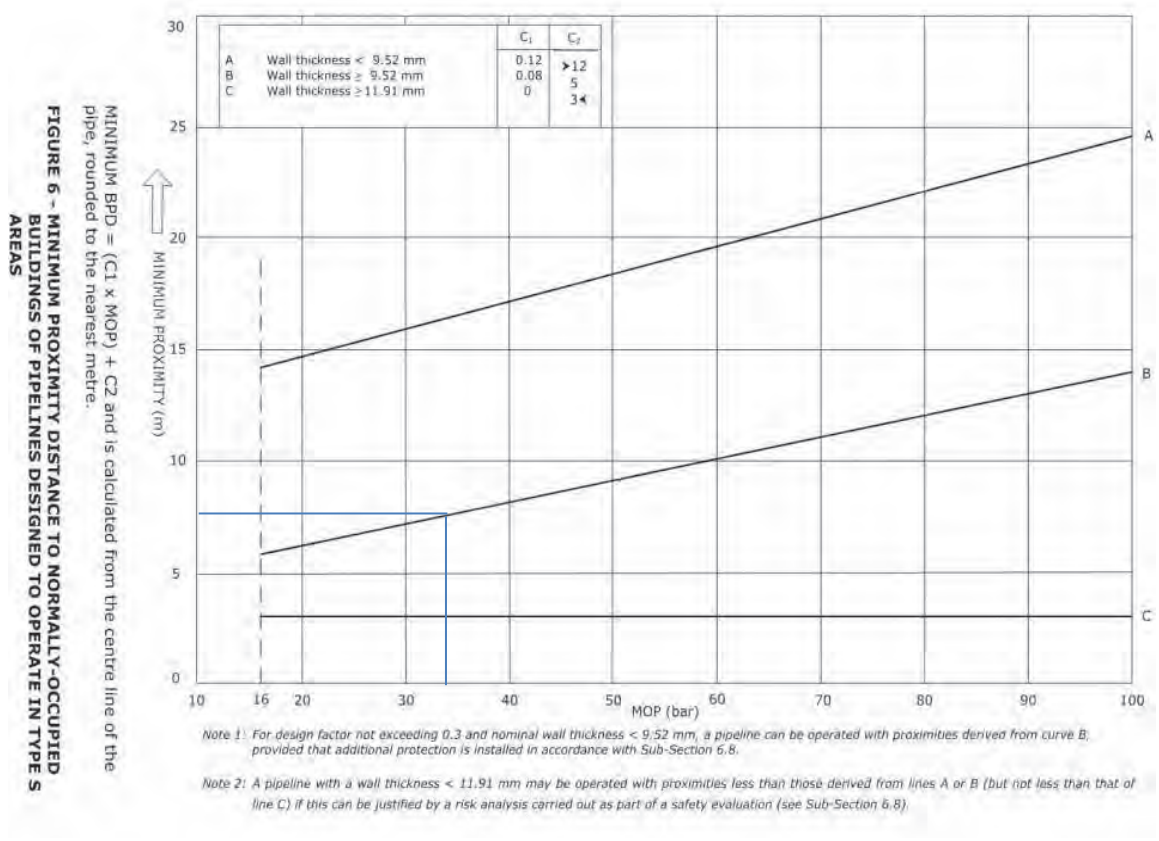
The occupancy of other buildings shall be assessed.

Width of 1.6km strip	127.3	m
No of typical houses	40	
Average no of persons	3	
No of hectares	20	ha
No of persons per hectare	5.89	

No of persons per hectare >2.5, hence Type S area determined for Pipeline and design factor of 0.3

Design Factor **0.3**

Type S Area



Pipesize	350		mm
MOP	32.6		bar
	Existing	**Proposed**	
Wall Thickness	7.9	12.5	mm
C1	0.12	0	
C2	12	3	
Minimum BPD	16	3	m

Diversion-Existing

INTRODUCTION:

Calculations below are in respect of the Gloucester to Wickwar 350NB pipeline diversion at Wisloe Green
The diversion is required to allow for a proposed development.

CALCULATION:

Existing Pipeline System:

Description	Gloucester to Wickwar		
Diameter	350	mm	
Wall thickness	7.9	mm	
Pipe Grade	X46		317 N/mm2
Max Operating Pressure (MOP)	32.6	barg	
Depth of cover	0.9	m	
Building Proximity Distance (BPD)	16	m	
Diversion Length (approximate)	2.8	km	
Area Classification	Type S		

Wall Thickness / BPD Check

Pipe Type	TBC		
Underthickness tolerance	12.50%		(Assumed)
Design Wall thickness	7.8	mm	
Actual Design Factor (f = PD/20ts)	0.25		
Minimum BPD	16	m	Based on IGEM/TD/1 Ed. 5

Reference

Under Thickness Tolerances

Wall	Tolerance
Seamless Pipe:	
$T < 4$	+0.6 mm / -0.5 mm
$4 < T < 25$	+15 % / -12.5 %
Welded Pipe:	
$T < 10$	+0.5 mm / -0.5 mm
$10 < T < 20$	10 % / -10 %
$T > 20$	+1.5 mm / - 1.5 mm

EN3183:2012

Diversion-New

INTRODUCTION:

Calculations below are in respect of the Gloucester to Wickwar 350NB pipeline diversion at Wisloe Green
The diversion is required to allow for a proposed development.

CALCULATION:
Diversion Pipeline:

Diameter	350	mm	
Wall thickness	12.5	mm	
Pipe Grade	L360	MB	360 N/mm2
Max Operating Pressure (MOP)	32.6	barg	

Wall Thickness / BPD Check

Pipe Type	Seamless	
Underthickness tolerance	12.5%	
Design Wall thickness	10.94	mm
Actual Design Factor (f = PDX/20ts)	0.14	
Minimum BPD	3	m

Reference

Under Thickness Tolerances

Wall	Tolerance
Seamless Pipe:	
$T < 4$	+0.6 mm / -0.5 mm
$4 < T < 25$	+15 % / -12.5 %
Welded Pipe:	
$T < 5$	+0.5 mm / -0.5 mm
$5 < T < 15$	+10 % / -10 %
$T > 15$	+1.5 mm / - 1.5 mm

EN 3183:2012

APPENDIX 2: PROJECT DRAWINGS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Key

- Existing Pipeline
- Site Boundary (78 ha)
- Mixed-Use: Residential Areas, Schools, Pitches and Potential for later living
- Offsite Potential Residential Areas
- GI / Noise Buffer Area (25.8 ha)
- Potential Access points
- Primary routes
- Public Transport Link
- Existing PROW
- Potential Ped/Cycle links
- National Cycle route

DRAFT

REV.	DATE	REVISION	BY	CHKD.	APPR.
0	16/04/21	FINAL ISSUE	LH	RAM	SW

Client

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Project

Wisloe Green

High Pressure Gas Main Diversion

Existing Route

Drawn	Scale	Drawing Number	Rev.
L.HUSSEY	1:2500/A1	961-23-DG-0001	0
Chkd. R.A.MANGUE	Date 16/04/21	sheet 1 of 1	
Apprd. S.WESTERN	Status ISSUED		


INNER, MIDDLE AND OUTER ZONE - 0m - 3m
(EITHER SIDE) - NSE

Key

- Existing Pipeline
- Proposed Pipeline Diversion
- Site Boundary (78 ha)
- Mixed-Use: Residential Areas, Schools, Pitches and Potential for later living
- Offsite Potential Residential Areas
- GI / Noise Buffer Area (25.8 ha)
- Potential Access points
- Primary routes
- Public Transport Link
- Existing PROW
- Potential Ped/Cycle links
- National Cycle route

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Project

Wisloe Green

High Pressure Gas Main Diversion

Existing & Proposed Route

Drawn	Scale	Drawing Number	Rev.
L.HUSSEY	1:2500/A1	961-23-DG-0002	0
Chkd. R.A.MANGUE	Date 16/04/21	sheet 1 of 1	
Apprd. S.WESTERN	Status ISSUED		


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NOTES

Key

- Existing Pipeline
- Site Boundary (78 ha)
- Mixed-Use: Residential Areas, Schools, Pitches and Potential for later living
- Offsite Potential Residential Areas
- GI / Noise Buffer Area (25.8 ha)
- Potential Access points
- Primary routes
- Public Transport Link
- Existing PROW
- Potential Ped/Cycle links
- National Cycle route
- Inner PADHI Zone (16m Buffer)
- Middle PADHI Zone (40m Buffer)
- Outer PADHI Zone (70m Buffer)

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Project

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High Pressure Gas Main Diversion

PADHI Zones

Drawn	Scale	Drawing Number	Rev.
L.HUSSEY	1:2500/A1	961-23-DG-0003	0
Chkd. R.A.MANGUE	Date 16/04/21	sheet 1 of 1	
Apprd. S.WESTERN	Status ISSUED		


CONNECTION POINT A
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LEGEND

- EXISTING GLOUCESTER TO WICKWAR HP PIPELINE
- PROPOSED DECOMMISSIONED HP PIPELINE
- 16m INNER PADHI ZONE
- 49m MIDDLE PADHI ZONE
- 70m OUTER PADHI ZONE
- SITE BOUNDARY (78 HA)
- MIXED–USE: RESIDENTIAL AREAS, SCHOOLS, PITCHES AND POTENTIAL FOR LATER LIVING
- OFFSITE POTENTIAL RESIDENTIAL AREAS
- GI/NOISE BUFFER AREA (25.8 HA)
- POTENTIAL ACCESS POINTS
- PRIMARY ROUTES
- PUBLIC TRANSPORT LINK
- EXISTING PROW
- POTENTIAL PED/CYCLE LINKS
- NATIONAL CYCLE ROUTE

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Project

Wisloe Green

High Pressure Gas Main Diversion
Connection Point PADHI Zones
Gloucester to Wickwar - Route Options 1, 2 & 3

Drawn L.HUSSEY	Scale 1:2500/A1	Drawing Number 961-23-DG-0004	Rev. 0
Chkd. R.A.MANGUE	Date 16/04/21	sheet 1 of 1	131
Apprd. S.WESTERN	Status ISSUED		