

**M42 Junction 6 Improvement
Scheme Number TR010027
Volume 6**

**6.3 Environmental Statement
Appendix 10.2 Agricultural Land
Classification and Impact Assessment**

Regulation 5(2)(a)

Planning Act 2008

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

January 2019

Infrastructure Planning

Planning Act 2008

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

M42 Junction 6 Improvement Development Consent Order 202[]

6.3 Environmental Statement

Appendix 10.2 Agricultural Land Classification and Impact Assessment

| | |
|---|--|
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| Planning Inspectorate Scheme Reference | TR010027 |
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***AGRICULTURAL LAND CLASSIFICATION AND IMPACT
ASSESSMENT***

AECOM

**M42
Junction 6**



Our Ref: SES/A/M42J6/#1

Date: 26th October 2018

Client:

AECOM
2 City Walk
Leeds
LS11 9AR

***AGRICULTURAL LAND CLASSIFICATION AND IMPACT
ASSESSMENT***

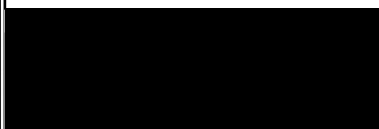
**M42
Junction 6**

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1. INTRODUCTION

An Agricultural Land Classification Study (ALC)^{1,2} has been carried out on a maximum general area of 125.1 ha of land adjacent to the M42 which is proposed to be developed as part of the Junction 6 project (Drawing ALC/1). The area surveyed is positioned around the existing M42 and is centred on OS Grid Ref. 419454, 281640.

Agricultural land is classified into the following grades according to the 1988 guidelines¹ and the 1996 draft guidelines²:

| Grade | Description |
|-------|---|
| 1 | Excellent quality agricultural land with no or very minor limitations to agricultural use. |
| 2 | Very good quality agricultural land with minor limitations which affect crop yield, cultivation or harvesting. |
| 3a | Good quality agricultural land capable of producing moderate to high yields of a narrow range of arable crops or moderate yields of a wider range of crops. |
| 3b | Moderate quality agricultural land capable of producing moderate yields of a narrow range of crops or lower yields of a wider range of crops. |
| 4 | Poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. |
| 5 | Very poor quality agricultural land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops. |

The survey was conducted on the 9th and 10th October 2018 and classifies the land into one or more of the above grades.

On the survey date the majority of the fields were in rough pasture. Fields on the south of the site were in an arable crop.

2. METHODOLOGY

The classification includes an initial desktop investigation to examine previously mapped soil types and to note the drift and solid geology. This included consultation from:

Soil Survey of England and Wales 1:250 000
British Geological Survey 1:50 000 solid and drift map.

The field survey consisted of a number of hand auger borings to a depth of 1.2 m (where possible) to examine soil profiles, using standard soil survey methods³. Pit excavations were conducted to determine sub soil structure where necessary. This data was used to map the principal soil types for determining the ALC. The soil removed during augering and pit excavations was examined in accordance with:

Soil Survey Field Handbook
Describing and Sampling Soil Profiles
Soil Survey of England and Wales, Technical Monograph No. 5, 1976

Soil Classification for Soil Survey
Monographs on Soil Survey
Butler, B E (1980) Clarendon Press, Oxford

Climatological data⁴ was used to determine the overriding site limitation and for interaction with soil parameters (Appendix A). The above information was cross referenced with geological surveys⁸, previous soil surveys and the national 1:250 000 series ALC survey⁷ relevant for this site to substantiate the findings. The ALC grade was then determined for this site and for the current survey and is detailed on Drawing ALC/2.

Other factors used for ALC grading, but which give no limitation at this site, are not discussed.

3. BASELINE CONDITIONS

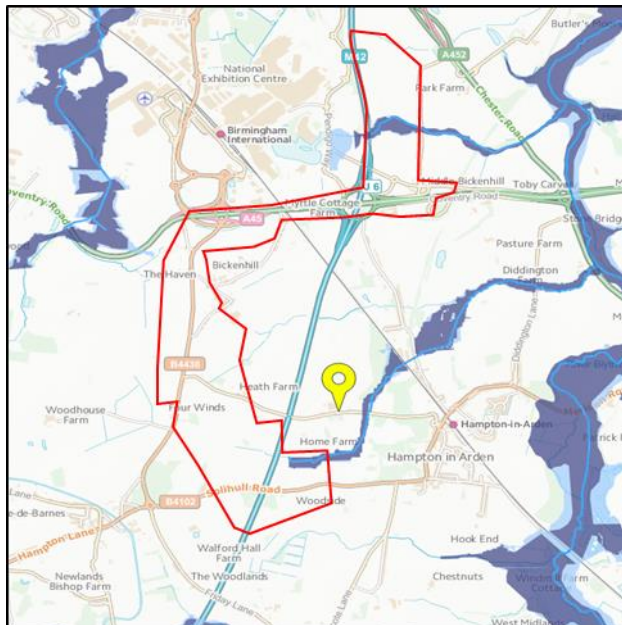
3.1. Climate and flooding

The climatological data (Table 1a) indicates average temperature, average rainfall and an average number of field capacity days for the region.

| Table 1a Climatological information⁴ | | |
|--|------------------|--------------|
| Factor | Units | Value |
| Altitude AOD | m | 102 |
| Accumulated temperature | day°C (Jan-June) | 1371.6 |
| Average Annual Rainfall | mm | 703.8 |
| Field Capacity Days | days | 165.0 |
| Moisture Deficit Wheat | mm | 96.2 |
| Moisture Deficit Potatoes | mm | 84.5 |

Two areas of the site are within a Flood Zone 3 area⁷.

Environment Agency Risk of Flooding from Rivers and Sea Map (1:10,000 scale, 2018)



For the purpose of this report, the terms used by the Environment Agency to categorise flood risk have been changed to match terms used by MAFF. This is to allow an agricultural classification grade to be determined for the site based on flood risk. The classifications have been found to correspond as follows:

- Environment Agency Zone 3a High Probability – MAFF Frequent
- Environment Agency Zone 3b Functional Floodplain – MAFF Frequent
- Environment Agency Zone 2 Medium Probability – MAFF Occasional
- Environment Agency Zone 1 Low Probability – MAFF Rare to Very Rare

The total site area affected by the Zone 3 High Probability flooding is approximately 4.2 ha (Table 1b).

Table 1b. ALC Grade according to flood risk

WINTER Mid November to mid March

| ALC Grade | Frequency | Duration | Approx. Area affected (m ²) |
|-----------|------------|----------|---|
| 1 | rare | short | |
| 2 | rare | medium | |
| 2 | occasional | short | |
| 3a | rare | long | |
| 3a | occasional | medium | |
| 3a | frequent | short | |
| 3b | occasional | long | |
| 3b | frequent | medium | 42,000.00 |
| 4 | frequent | long | |

SUMMER Mid March to mid November

| ALC Grade | Frequency | Duration | Approx. Area affected (m ²) |
|-----------|------------|-----------------|---|
| 1 | very rare | short | NA |
| 2 | rare | short | NA |
| 3a | very rare | medium or long | NA |
| 3a | rare | medium | NA |
| 3a | occasional | short | NA |
| 3b | rare | long | NA |
| 3b | occasional | medium | NA |
| 4 | occasional | long | NA |
| 4 | frequent | short or medium | NA |
| 5 | frequent | long | NA |

MAFF Frequency definitions

| | |
|------------|------------------|
| very rare | < 1 in 15 year |
| rare | 1 in 10 -14 year |
| occasional | 1 in 3 - 9 year |
| frequent | > 1 in 3 year |

Duration definitions

| | |
|--------|-------------|
| short | <48 hrs |
| medium | 2 to 4 days |
| long | > 4 days |

3.2. Soils, geology and topography

3.2.1. Soils

The site has previously been mapped as having soils of the *Rockhurst 1 association*^{4, 5}.

Two general soil types were noted for the purposes of ALC grading.

This study has identified the soils to be:

1. Disturbed medium clay loams over mudstone at an average depth of 60 cm bgl.
2. Clay loam over clay to depth.

3.2.2. Geology⁸

Superficial Geology

Majority of site

None recorded.

Band to the south and north

1:50 000 scale superficial deposits description: *Alluvium - Clay, Silt, Sand And Gravel. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U).*

Pockets across the site

1:50 000 scale superficial deposits description: *Glaciofluvial Deposits, Mid Pleistocene - Sand And Gravel. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions (UGF).*

Bedrock Geology

South and centre

1:50 000 scale bedrock geology description: *Sidmouth Mudstone Formation - Mudstone. Sedimentary Bedrock formed approximately 228 to 250 million years ago in the Triassic Period. Local environment previously dominated by hot deserts.*

North

1:50 000 scale bedrock geology description: Branscombe Mudstone Formation - Mudstone. Sedimentary Bedrock formed approximately 201 to 228 million years ago in the Triassic Period. Local environment previously dominated by hot deserts.

Band towards north

1:50 000 scale bedrock geology description: Arden Sandstone Formation - Sandstone, Siltstone And Mudstone. Sedimentary Bedrock formed approximately 228 to 237 million years ago in the Triassic Period. Local environment previously dominated by rivers.

3.2.3. Topography

The site has little to no slope and hence gradient will not limit the ALC Grade across the site.

4. FIELDWORK RESULTS

4.1. Descriptions of soil types

The soils across the site were disturbed medium clay loams over mudstone at an average depth of 60 cm bgl or clay loam over clay to depth. (Table 2). Full profile data is listed in Appendix B.

A summary of the features of the soil type/s are listed in Table 2.

| Table 2. Soil Type descriptions | | | |
|--|---|--|--------|
| Profile Description | Soil types | | |
| | Type 1 (Disturbed) | Type 2 | Type 3 |
| Horizon 1 (topsoil) | 0-35 cm Dark brown (10YR 3/3) slightly stony medium clay loam, few fine ochreous mottles; weak medium subangular blocky structure. Some brick, coal, tile and stone pieces were encountered. | 0-50 cm Dark brown (10YR 3/3) slightly stony clay loam, no mottles; weak medium subangular blocky structure. | |
| Horizon 2 (subsoil 1) | 35-55 cm Brown (7.5YR 4/4) moderately stony clay loam, few medium ochreous and greyish mottles; weak coarse angular blocky structure. | 50-120 cm Dark yellowish brown (10YR 4/4) slightly stony clay, few fine ochreous mottles; weak medium angular blocky structure. | |
| Horizon 3 (subsoil 2) | 55 cm Strong brown (7.5YR 5/6) bedded mudstone, fine angular blocky rock structure. | | |
| <p>Survey points (Drawing ALC/1) and soil types: BHs/ TPs</p> <p>Type 1 soil = 4, 5, 8, 10, 11, 14, 18, 19, 20, 21, 23, 25, 29, 31, 35, 36, 37, 38, 39, 40, 41, 42, 43 Type 2 soil = 1, 2, 3, 6, 7, 9, 12, 13, 15, 16</p> <p>Not surveyed – 17, 22, 24, 26, 27, 28, 30, 32, 33, 34</p> <p>Notes:</p> | | | |

4.2. Field study photographs

Photo 1. Borehole location 10 – Profile of Soil Type 1



Photo 2. Borehole location 13 – Profile of Soil Type 2



NB Borehole photographs are included for an illustration of horizons, to verify profile depth and provide an indication of colour but are not intended to verify any structure.

Photo 3. Pit 1 location 25

Profile of Soil Type 1



Photo 4. Pit 1 location 25

Subsoil 1 Structure



4.3. In-field wetness class assessment

An in-field wetness assessment was conducted for the soil type (Table 3).

| Table 3. In-field Wetness Assessment | | | | | | |
|---|---|------------------------|---|----|-------------|-----|
| Soil Type | Feature Assessment | Parameters | Findings | WC | | |
| 1 | Site conditions | Undisturbed/ disturbed | Disturbed | IV | | |
| | | FCD | 165.0 | | | |
| | Potential Slowly Permeable Layer (SPL) | Horizon depth (cm) | 35-55 | | | |
| | | Texture | CL | | | |
| | | Structure | WCAB | | | |
| | | Biopores > 0.5 mm (%) | >0.5 | | | |
| | | Evidence of wetness | Mottles | | | |
| | Potential Gleyed Horizon | Matrix colour | Pale - 7.5YR 4/4 | | | |
| | | Ped faces colour | Pale - 7.5YR 4/4 | | | |
| | | Mottles | Ochreous – 10YR 5/6 Greyish – 10YR 5/1 | | | |
| | | Depth to gleying (cm) | 35 | | | |
| | Figure reference in ALC guidelines – 7a | | | | | |
| | 2 | Site conditions | Undisturbed/ disturbed | | Undisturbed | III |
| | | | FCD | | 165.0 | |
| Potential Slowly Permeable Layer (SPL) | | Horizon depth (cm) | 50-120 | | | |
| | | Texture | C | | | |
| | | Structure | WMAB | | | |
| | | Biopores > 0.5 mm (%) | >0.5 | | | |
| | | Evidence of wetness | Mottles | | | |
| Potential Gleyed Horizon | | Matrix colour | Pale – 10YR 4/4 | | | |
| | | Ped faces colour | Pale – 10YR 4/4 | | | |
| | | Mottles | Greyish – 10YR 4/6 | | | |
| | | Depth to gleying (cm) | 50 | | | |
| Figure reference in ALC guidelines – 8 | | | | | | |
| Key C –Clay WCAB – Weak Coarse Angular Blocky CL – Clay Loam WMAB – Weak Medium Angular Blocky | | | | | | |
| Notes: | | | | | | |

5. AGRICULTURAL LAND CLASSIFICATION

5.1. National 1:250 000 map grading

Grading on the MAFF (1983) 1: 250 000 map⁶ indicated **ALC Grade 2** across the site, with areas of **Grade 3** mapped to the south.

5.2. Current grading

This survey has resulted in an Agricultural Land Classification of the following grades (Drawing ALC/1):

| Table 4. ALC gradings and limitations | | |
|--|-------------------|---------------------------------------|
| Grade | Area (ha)* | Limitation |
| 1 | | |
| 2 | | |
| 3a | 21.4 | Type 2 soils – Wetness |
| 3b | 77.8 | Type 1 soils – Wetness |
| | 4.2 | Site – Flood Risk |
| 4 | | |
| 5 | | |
| Unsurveyed land | 21.7 | No access was available on site dates |

*Area is maximum general area calculated from the boreholes undertaken on site (Drawings ALC/1 and ALC/2)

Type 1 soils –Wetness limitation

The combination of the topsoil texture (disturbed medium clay loam), Wetness Class (IV) and the number of Field Capacity Days (165.0) results in ALC Grade 3b for Type 1 soils.

Type 2 soils –Wetness limitation

The combination of the topsoil texture (medium clay loam), Wetness Class (IV) and the number of Field Capacity Days (165.0) results in ALC Grade 3b for Type 2 soils.

Site – Flood Risk

A Zone 3 High Probability of flooding is mapped on 4.2 ha of land resulting in ALC Grade 3b within the Flood Risk area.

6. IMPACT ASSESSMENT

6.1. Agricultural Land Significance Criteria

There is no nationally agreed methodology for determining the effects of a development on the loss of agricultural land or soils. The approach outlined below has therefore been developed through the preparation of other *Environmental Statements*, having regard to guidance available^{9, 10}.

The magnitude of the loss of agricultural land from the national resource is described as either 'high', 'medium', 'low' or 'negligible' as defined in Table 5 below.

Table 5 Definition of significance of loss of agricultural land.

| Significance | Definition |
|--|---|
| High | 20 ha or more of best most versatile land (i.e. agricultural land classified as Grades 1, 2 or 3a under ALC system) will be lost as a result of the proposed development. |
| Medium | 4 – 19.9 ha or more of best most versatile land will be lost as a result of the proposed development. |
| Low | Between 1 and 3.9 ha of best most versatile land will be lost as a result of the proposed development. |
| Negligible | The proposed development does not include 1 ha or more of contiguous best most versatile land. |
| <p>Guidance set out in the NPPF¹⁵ (July 2018) regarding the loss of best and most versatile land identifies <i>'planning policies and decisions should contribute to and enhance the natural and local environment by recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.'</i> In addition, the guidance also states, <i>'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.'</i></p> <p>Natural England has however inherited the statutory right to be consulted where the threshold of 20ha or more of best and most versatile land is exceeded. The 20 ha threshold represents a measure of significance for the loss of such land which has been tried and tested in land use planning, and public inquiries over the last two decades or more.</p> <p>A threshold of 10 acres (or approximately 4 ha) or more follows the approach of paragraph 6 of Department of the Environment Circular 71/71 (Welsh Office Circular 152/71) 'Development of Agricultural Land'.</p> | |

The sensitivity of the receptor is described as either ‘high’, ‘medium’, ‘low’ or ‘negligible’ as defined in Table 6 below.

Table 6 Definition of sensitivity of receptors.

| Sensitivity of Receptor | Definition |
|-------------------------|---|
| High | Irreversible loss of Grade 1 or 2 Agricultural Land |
| Medium | Irreversible loss of Grade 3a Agricultural Land |
| Low | Irreversible loss of Grade 3b Agricultural Land |
| Negligible | Irreversible loss of Grade 4 or 5 Agricultural Land |

The overall significance criteria of the loss of agricultural land is found through combining the significance of loss (Table 5) and the sensitivity of the receptor (the land being lost; Table 6), as identified in Table 7. Please note that it is assumed for the purpose of this chapter that Substantial, Moderate and Minor effects are Adverse and that significant adverse effects are those of Moderate and Substantial significance.

It should be noted that where the matrix in Table 7 identifies a potential range of effects, there is a requirement for professional judgement in determining the overall significance of the loss of agricultural land. This professional judgement takes into account the loss of the agricultural land in the context of best and most versatile land in the surrounding region. It is considered that in areas where best and most versatile land is not uncommon and there is a comparatively high proportion of Grade 1 and 2 land, the loss of grade 3a land is not considered to be as significant.

Table 7 Overall Significance Criteria

| Overall Significance Criteria | | | | |
|-------------------------------|-------------------------|----------------------|------------|------------|
| Significance of Loss | Sensitivity of receptor | | | |
| | High | Medium | Low | Negligible |
| High | Substantial | Moderate-Substantial | Moderate | Negligible |
| Medium | Moderate-Substantial | Moderate | Minor | Negligible |
| Low | Moderate | Minor | Minor | Negligible |
| Negligible | Negligible | Negligible | Negligible | Negligible |

6.2. Soil Resources Significance Criteria

The significance criteria for loss of or damage to the soil resources on the site is described within Table 8 below.

Table 8 Definition of the magnitude of effect on soil resources

| Sensitivity of Receptor | Definition |
|-------------------------|---|
| Substantial Adverse | Soil is lost through burial or removal and waste disposal. |
| Moderate Adverse | Soil is retained but is of limited function due to permanent degradation. |
| Minor Adverse | Soil is retained but with degradation which is difficult to redress |
| Negligible | Soil function is fully retained or minor degradation which is easily redressed. |

6.3. Assessment of Effects

6.3.1. Construction

Agricultural Land

It has been determined that a general maximum area of 21.4 ha of Grade 3a agricultural land would be lost as a result of the proposed development. It is predicted that topsoil and subsoil would be affected (e.g. excavated, driven over or used for storing materials) during the construction phase of the proposed development.

Although approximately 21.4 ha of Best and Most Versatile¹¹ (BMV) land would be lost due to the development of the site, the surrounding area has a high proportion of good quality (Grade 3) agricultural land. In accordance with the criteria defined in Table 7, the magnitude of effect would be ***moderate-substantial adverse*** with regards to the loss of BMV agricultural land due to the proposed development.

Soil Resources

The proposed development has the potential to result in natural soil being retained but is of limited function due to permanent degradation. In accordance with the criteria defined in Table 8, the magnitude of impact of the proposed development is assessed as ***moderate adverse*** regarding the magnitude of impact on soil resources.

In conclusion, the impact of the proposed development prior to the implementation of mitigation measures will be ***moderate*** to ***moderate-substantial adverse***.

6.3.2. Operational Phase

Agricultural Land

Some agricultural land would be lost during the construction phase of the proposed development. As such there will be no further effects on the agricultural land during the operation of the development.

Soil Resources

The effect on soil resources will be ***moderate adverse*** during the operational period, as although soil is retained on the site it is of limited function due to permanent degradation caused by the soil movement operations (heavy machinery causing compaction and removal of soil structure).

6.3.3 Mitigation

Agricultural Land

The development will result in the permanent loss of some agricultural land and therefore no further mitigation is possible.

Soil Resources

The potential damage to soil resources during excavation requires that appropriate soil handling strategies are employed as mitigation^{12, 13}.

The soil over the site is likely to be of ‘multi-purpose’ grade in terms of BS3882¹⁰ (subject to appropriate laboratory certification). In such cases, it could be suitable for re-use on other projects and for a landscaping scheme, for example, provided it is handled appropriately.

The quality and quantity of soil within the site should be maintained by implementing appropriate techniques for stripping, storing and re-use^{12, 13, 14}. This approach should be adopted in a Soil Management Strategy (SMS) to be prepared as part of the proposed development. This is consistent with the findings and recommendations of recent research carried out on behalf of DEFRA¹⁴, including the development of a code of practice.

6.3.4. Residual Effects

Agricultural Land

The development will result in the permanent loss of some agricultural land and therefore no further mitigation is possible.

Soil Resource

The Soil Management Strategy will ensure that any areas of soil remaining on the site will be adequately managed. The residual effect on soil resource during the operation phase is therefore ***negligible***.

6.4. Conclusion

The loss of a general maximum area of 21.4 ha of BMV agricultural land as part of this proposed development is identified as a ***moderate-substantial adverse*** effect. However, the site is positioned within an area abundant with BMV land, therefore the effect of the loss of this area of Grade 3a land, will be of a lesser effect in comparison to other areas not surrounded by BMV land.

The magnitude of effect on soil resources has been identified as ***moderate adverse***, however with the implementation of a suitable SMS the residual effects of the proposed development on soil resources are of ***negligible*** significance.

DRAWING ALC/1

Soil Types and Sample Locations

ALC Grade

- Soil Type 1
- Soil Type 2
- Not Surveyed
- Borehole Location
- Pit Location

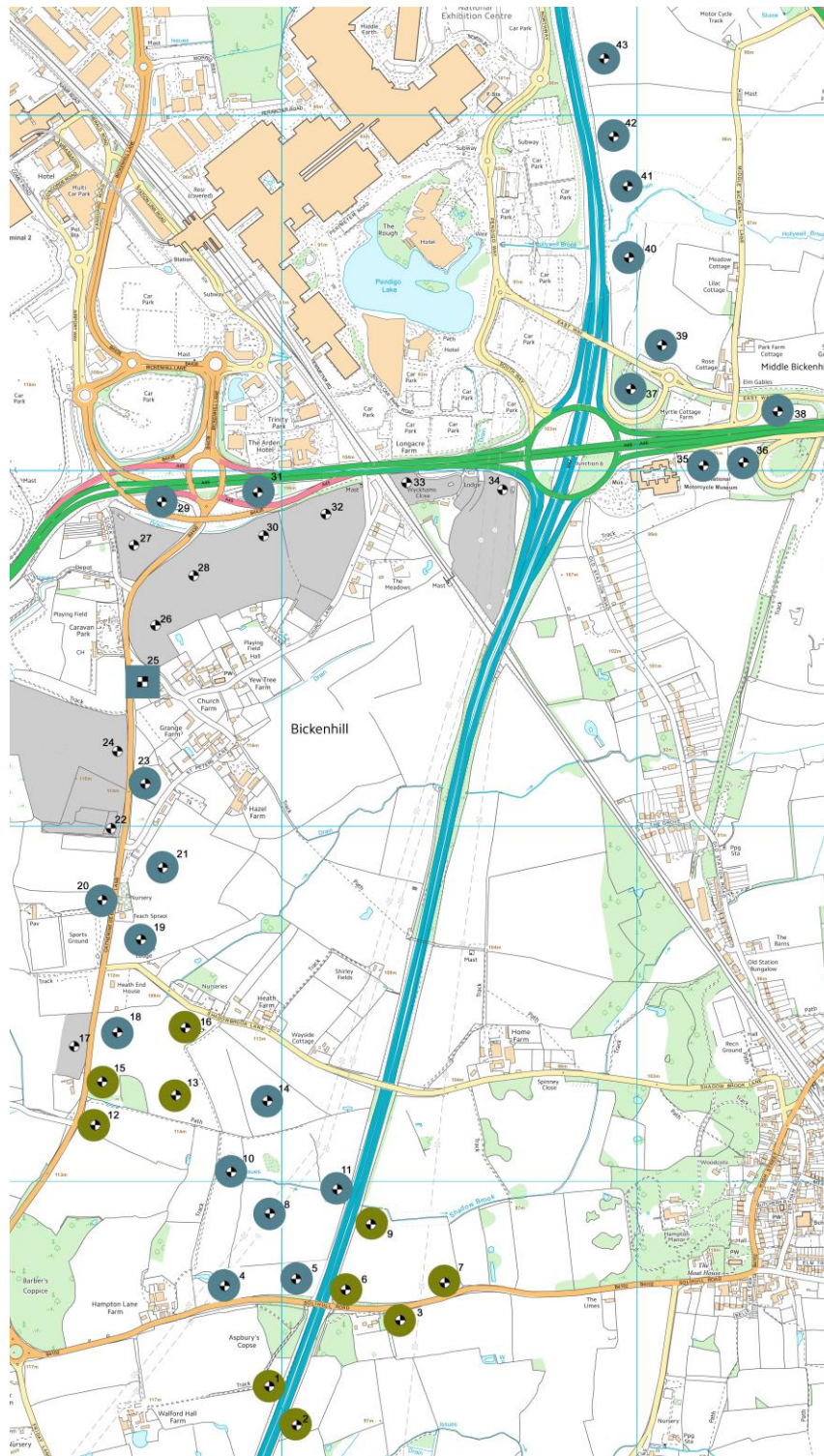
Soil Environment Services

Drawing Title: Soil Types and Sample Locations

Drawing No.: ALC/1

Scale: 1:19224

Date: 10/10/2018



DRAWING ALC/2

ALC Grade

ALC Grade

- Good quality – 3a
- Moderate quality – 3b
- Not Surveyed
- Borehole Location
- Pit Location

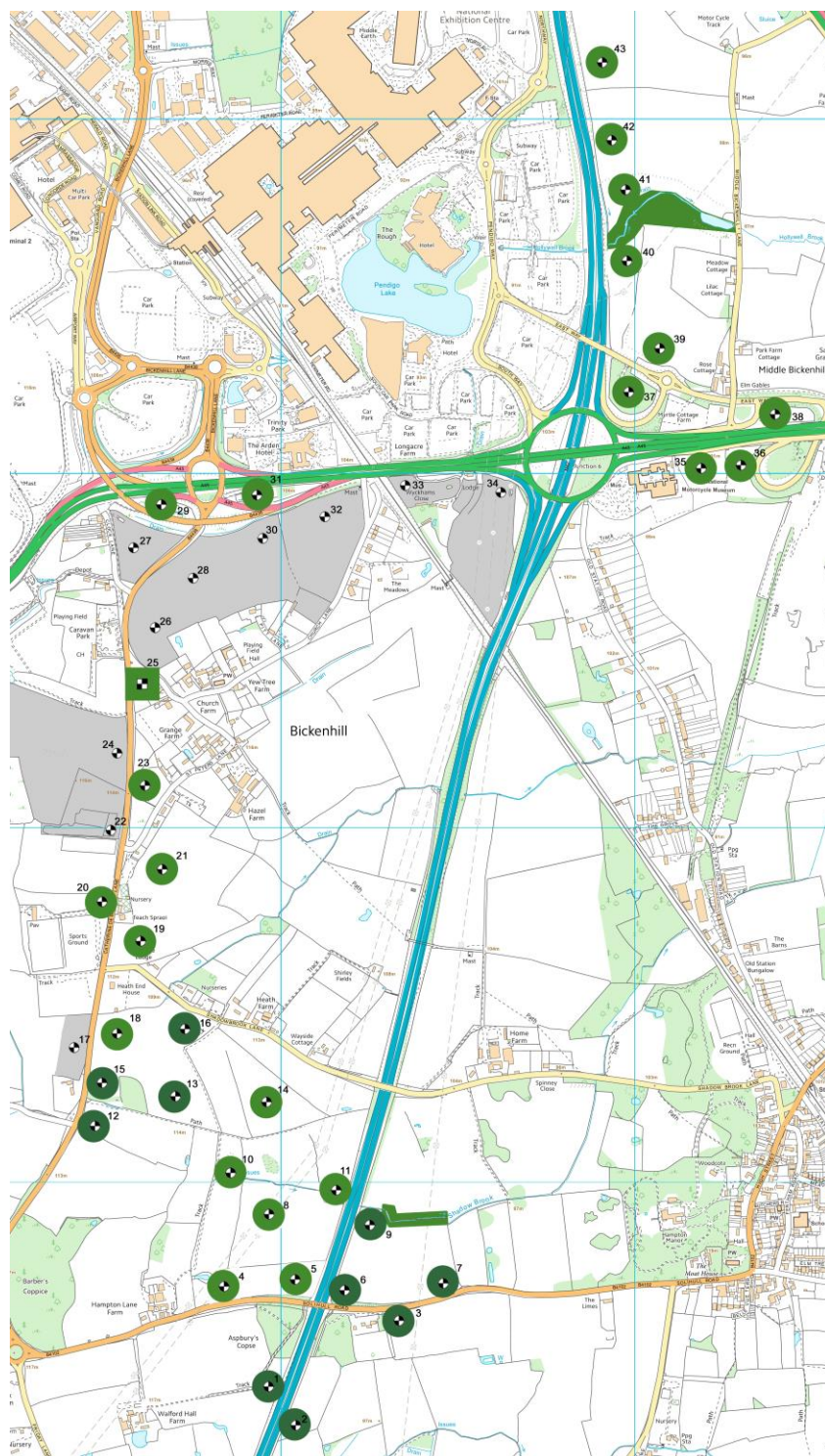
Soil Environment Services

Drawing Title: ALC Grade

Drawing No.: ALC/2

Scale: 1: 19224

Date: 10/10/2018



APPENDIX A

Climatological data for
Agricultural Land Classification

Agricultural Land Classification

- Met. Information & droughtiness

Data and adjustment calculations from: The Met. Office, *Climatological Data for Agricultural Land Classification* 1989.

Input data in box cells only, results in shaded cells.

| | | |
|-----------------|----------------|------|
| Site name | M42 Junction 6 | |
| Site altitude = | 102 | m |
| Site GR | 4194 | 2816 |

Meteorological information for surrounding national grid reference points

| | Easting | Northing | ALT | AAR | LR_AAR | ATO | MDMWHT | MDMPOT | FCD |
|----|---------|----------|-----|-----|--------|------|--------|--------|-----|
| NW | 4150 | 2850 | 95 | 701 | 1.3 | 1379 | 96 | 85 | 167 |
| NE | 4200 | 2850 | 99 | 680 | 0.7 | 1373 | 99 | 88 | 159 |
| SW | 4150 | 2800 | 130 | 724 | 1.1 | 1341 | 90 | 77 | 170 |
| SE | 4200 | 2800 | 102 | 710 | 0.6 | 1372 | 96 | 84 | 166 |

Altitude adjustment of surrounding meteorological information with respect to site.

Adjusted surrounding points

| | AAR | ATO | FCD |
|----|-------|--------|-------|
| NW | 710.1 | 1371.0 | 168.3 |
| NE | 682.1 | 1369.6 | 159.3 |
| SW | 693.2 | 1372.9 | 165.5 |
| SE | 710.0 | 1372.0 | 166.0 |

Site adjusted meteorological information

| | 1 Dsg | 2 Wg | Wp |
|-----|----------|----------|----------|
| NW | 55.60576 | 0.000323 | 0.064129 |
| NE | 34.52535 | 0.000839 | 0.166348 |
| SW | 46.8188 | 0.000456 | 0.090459 |
| SE | 17.08801 | 0.003425 | 0.679064 |
| Sum | | 0.005043 | |

| Site | AAR | ATO | FCD |
|------|-------|--------|-------|
| | 703.8 | 1371.6 | 165.0 |

ALC according to climate

Grade 1

Soil wetness class (drained)

Type 1

| |
|----|
| IV |
|----|

Type 2

| | |
|--------|---|
| Type 3 | |
|--------|---|

ALC according to wetness/climate texture

Type 1

| |
|----|
| 3b |
|----|

| | |
|--------|----|
| Type 2 | 3a |
|--------|----|

Type 3 

Soil moisture deficit of surrounding points

| | Cw | Cp | Adjusted | |
|----|--------|---------|----------|-------|
| NW | 5.0288 | 6.6024 | 95.0288 | 83.60 |
| NE | -0.455 | -0.5994 | 98.5452 | 87.40 |
| SW | -1.355 | -1.777 | 94.6448 | 83.22 |
| SE | 0.0000 | 0.0000 | 96.0000 | 84.00 |

Site results for soil moisture deficit

MDMW MDMPOT

Adjustment data for stone type and content

[illegible]

Droughtiness (moisture balance) determination for each soil type and restored profile

Moisture availability data for each texture from MAFF ALC Guidelines 1988

Moisture Balance (MB) = AP - MD for wheat and potatoes (adjusted for stones)

| | Horizon | Type 1 | | Type 2 | | Type 3 | | | |
|--|---------|---------|-------|---------|-------|---------|-------|--|--|
| | | texture | water | texture | water | texture | water | | |
| TAvt - Topsoil water available (mm) | | CL | 16.30 | CL | 16.30 | 0 | 0.00 | | |
| LTt - Topsoil thickness (cm) | | 0 | 35.00 | 0 | 30.00 | 0 | 0.00 | | |
| TAvs - Subsoil total available | 1 | CL | 14.00 | C | 14.50 | 0 | 0.00 | | |
| | 2 | MS | 8.00 | 0 | 0.00 | 0 | 0.00 | | |
| | 3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| EAvs - Subsoil (SS) easily available | 1 | CL | 8.75 | C | 7.25 | 0 | 0.00 | | |
| | 2 | MS | 5.00 | 0 | 0.00 | 0 | 0.00 | | |
| | 3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| LT50 - Thickness ss layers to 50cm | 1 | CL | 15.00 | C | 20.00 | 0 | 0.00 | | |
| | 2 | MS | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| | 3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| LT120 - Thickness ss layers 50 to 120cm | 1 | CL | 10.00 | C | 70.00 | 0 | 0.00 | | |
| | 2 | MS | 60.00 | 0 | 0.00 | 0 | 0.00 | | |
| | 3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| LT0 - Thickness ss layers to 70cm | 1 | CL | 25.00 | C | 40.00 | 0 | 0.00 | | |
| | 2 | MS | 10.00 | 0 | 0.00 | 0 | 0.00 | | |
| | 3 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | | |
| Total profile thickness for soil type cm | | 0 | 120 | | 120 | 0 | 0 | | |

SOIL Droughtiness (moisture balance) results

Type 1

Grade

Results

AP wheat = 116.8

Moisture balance wheat = 20.6 2

AP potatoes = 106.1

Moisture balance potatoes = 21.6 1

Type 2

Results

AP wheat = 128.7

Moisture balance wheat = 32.4 1

AP potatoes = 106.9

Moisture balance potatoes = 22.4 1

Notes

| ALC Grade | Moisture Balance Limits | |
|-----------|-------------------------|----------|
| | wheat | potatoes |
| 1 | 30 | 10 |
| 2 | 5 | -10 |
| 3a | -20 | -30 |
| 3b | -50 | -55 |
| 4 | <-50 | <-55 |

APPENDIX B

Site Survey Field Notes

ALC Survey Profile Data Sheet

Site: M42, Junction 6

| BH no. | Topsoil | | | | | | Subsoil 1 | | | | | | Subsoil 2 | | | | | |
|--------|--------------------------|---------|------------------|---------------|---------|-----------|------------|---------|------------------|---------------|---------|-----------|------------|---------|------------------|---------------|---------|-----------|
| | Depth (cm) | Texture | Colour (Munsell) | Stoniness (%) | Mottles | Structure | Depth (cm) | Texture | Colour (Munsell) | Stoniness (%) | Mottles | Structure | Depth (cm) | Texture | Colour (Munsell) | Stoniness (%) | Mottles | Structure |
| 1 | 0-50 | MCL | 10YR 3/3 | 10 | No | WMSAB | 50-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 2 | 0-48 | MCL | 10YR 3/3 | 10 | No | WMSAB | 48-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 3 | 0-50 | MCL | 10YR 3/3 | 10 | No | WMSAB | 50-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 4 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 5 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 6 | 0-45 | MCL | 10YR 3/3 | 10 | No | WMSAB | 45-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 7 | 0-50 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 50-120 | C | 10YR 4/4 | 10 | MFO | WMAB | | | | | | |
| 8 | 0-40 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 40-65 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 65 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 9 | 0-35 | MCL | 10YR 3/3 | 10 | No | WMSAB | 35-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 10 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 11 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 12 | 0-30 | MCL | 10YR 3/3 | 10 | No | WMSAB | 30-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 13 | 0-50 | MCL | 10YR 3/3 | 10 | No | WMSAB | 50-120 | C | 10YR 4/4 | 5 | FFO | WMAB | | | | | | |
| 14 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMO | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 15 | 0-50 | MCL | 10YR 3/3 | 15 | No | WMSAB | 50-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 16 | 0-50 | MCL | 10YR 3/3 | 10 | No | WMSAB | 50-120 | C | 10YR 4/4 | 10 | FFO | WMAB | | | | | | |
| 17 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 18 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 19 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 20 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |

| | | | | | | | | | | | | | | | | | | |
|----|--------------------------|-----|----------|----|-----|-------|-------|-----|-----------|----|------|------|----|-----|-----------|-----|---|-----|
| 21 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 22 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 23 | 0-30 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 24 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 25 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 26 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 27 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 28 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 29 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 30 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 31 | 0-30 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 30-60 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 60 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 32 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 33 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 34 | Not Surveyed - No access | | | | | | | | | | | | | | | | | |
| 35 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 36 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-60 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 60 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 37 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMO | WMAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 38 | 0-30 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 30-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 39 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 40 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-60 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 60 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 41 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 42 | 0-35 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 35-55 | MCL | 7.5YR 4/4 | 25 | FMOG | WMAB | 55 | MST | 7.5YR 5/6 | 100 | - | FAB |
| 43 | 0-40 | MCL | 10YR 3/3 | 10 | FFO | WMSAB | 40-65 | MCL | 7.5YR 4/4 | 25 | FMOG | WCAB | 65 | MST | 7.5YR 5/6 | 100 | - | FAB |

Key:

MCL - Medium Clay Loam

C - Clay

MST - Mudstone

FFO - Few Fine Ochreous

FMO - Few Medium Ochreous

FMOG - Few Medium Ochreous and Greyish

FAB - Fine Angular Blocky Rock Structure

WMSAB - Weak Medium Subangular Blocky

WMAB - Weak Medium Angular Blocky

WCAB - Weak Coarse Angular Blocky

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