

# High Speed Rail (Crewe – Manchester) Environmental Statement

## Volume 5: Appendix AG-001-0MA04

### **Agriculture, forestry and soils**

MA04: Broomedge to Glazebrook

Agriculture, forestry and soils assessment

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## Department for Transport

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# 1 Introduction

- 1.1.1 This report is an appendix to the agriculture, forestry and soils assessment. It presents the following for the Broomedge to Glazebrook community area (MA04):
- agriculture and soils baseline data for agricultural land, including open spaces and natural soils within urban areas; and
  - a summary of the farm holding impact assessment.
- 1.1.2 Additional data used for the agriculture, forestry and soils assessment are set out in Background Information and Data (BID) report Agriculture, forestry and soils baseline data (BID AG-002-0MA04)<sup>1</sup>.

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<sup>1</sup> High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background and Information Data, Agriculture, forestry and soils baseline data*, BID AG-002-0MA04. Available online at: <https://www.gov.uk/government/collections/hs2-phase-2b-crewe-manchester-environmental-statement>.

## 2 Soils and agricultural land classification

### 2.1 Background

- 2.1.1 An element of the assessment of the effects of the route of the Proposed Scheme upon agriculture is concerned with the consideration of the quantity and quality of the agricultural land affected. The determination of the quality of agricultural land is undertaken by the application of a secondary evaluation of the interaction of soil and other physical parameters in accordance with a prescribed methodology. That methodology is set out in guidelines<sup>2</sup> prepared by the Ministry of Agriculture, Fisheries and Food (MAFF) in 1988 which enables the classification of land by qualitative grade in accordance with the Agricultural Land Classification (ALC) system. This establishes the inherent productive capability of agricultural land which can be considered on a consistent basis throughout England and Wales.
- 2.1.2 The approach taken to the collection and collation of baseline data on soil types present, and the other physical characteristics of topography, climate and drainage in the Broomedge to Glazebrook area is described. The baseline data are described and how the MAFF evaluation methodology has been applied to provide the definitive classification of the quality of agricultural land affected by the route of the Proposed Scheme. This provides the baseline for the assessment of the effects of the project on agricultural land and soils which is detailed in Volume 2, Community Area report: Broomedge to Glazebrook (MA04), Section 4 Agriculture, forestry and soils.
- 2.1.3 This document should be read with reference to the Agriculture, forestry and soils baseline data contained in the Background Information and Data (BID AG-002-0MA04)<sup>1</sup> and Volume 5, Agriculture, forestry and soils Map Book (AG-01-312b to AG-01-314a).

### 2.2 Soils and agricultural land classification surveys - methodology

- 2.2.1 During the EIA process, soil and ALC information has been considered on two levels. The soils and agricultural land quality baseline conditions reported have been established from initial desktop studies and then with regard to subsequent site-specific surveys, where necessary and possible. The data are presented in this context with that derived from the material and interpretation of publicly available sources addressed first, followed by that derived from site specific surveys whereby the initial desk-based work has been extended and/or validated.

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<sup>2</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1988), *Agricultural Land Classification of England and Wales - Revised guidelines and criteria for grading the quality of agricultural land.*

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- 2.2.2 At both levels the data have been evaluated in accordance with the MAFF methodology for assessing the quality of agricultural land. The review of available existing ALC information has concentrated on the extent of detailed post-1988 survey information. There were substantive changes to the ALC system in 1988 which rendered previously available information less useful.
- 2.2.3 The ALC system is concerned with the classification of agricultural land according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The main limiting factors are climate, the physical character of a site, and soil. These factors and their interactions enable land to be attributed to one of five qualitative grades, with Grade 1 being the highest quality and Grade 5 the lowest. Grade 3 land which is the most extensive grade is divided into two subgrades; 3a and 3b.
- 2.2.4 Of relevance to the assessment of the environmental effects of the route of the Proposed Scheme is that land falling within Grades 1 and 2 and Subgrade 3a of the ALC is determined by planning policy to comprise the best and most versatile (BMV) agricultural land.
- 2.2.5 The physical factors influencing the agricultural capability of land are considered within the ALC assessment methodology as follows. The main climatic factors are temperature and rainfall. Site factors are gradient, microrelief and flood risk. Relevant soil characteristics are texture, structure, depth and stoniness. These factors can act either separately or in combination influence agricultural capability. The most important interactive limitations are soil wetness and droughtiness.
- 2.2.6 Soil wetness expresses the extent to which excess water imposes restrictions on crop growth and cultivations. The ALC methodology provides an approach which combines an assignment of soil to one of six categories of wetness class (WC) (I-VI with I being the most freely draining), the texture of the topsoil (sandy textures being freely draining and clays generally poorly draining), and the climatic regime expressed in terms of the number of days when the soil cannot absorb additional water (Field Capacity Days, FCD).
- 2.2.7 A similar approach is adopted towards the consideration of soil droughtiness. This seeks to determine the extent to which a combination of climate, soil and crop requirements provide adequate reserves of soil moisture during the growing season. The magnitude and duration of any shortfall represents a potential limitation of the land to maintain particular crops.
- 2.2.8 Soil droughtiness is determined in the ALC methodology with reference to an indicative drought risk based on two crops, winter wheat and maincrop potatoes. The average soils moisture balance for these crops is calculated on the basis of two parameters. Firstly, the measure of the quantity of water held in the soil profile which can be taken up by the specified crop, and secondly the moisture deficit which is the balance between rainfall and potential evaporation calculated over a critical part of a growing season. Land quality is derived from the moisture balance, this being the difference between the two parameters, with a negative difference relating to increasingly poorer quality in the ALC system.

## 2.3 Soils and agricultural land classification surveys - publicly available information

- 2.3.1 Initially, the assessment of the impacts on soils and agricultural land quality was based on publicly available data gathered by desk based studies. This related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:
- National Soil Map<sup>3</sup>;
  - Soils and Their Use in Midland and Western England; regional reconnaissance mapping showing soil associations (groupings of spatially related soil types)<sup>4</sup>;
  - solid and superficial deposits from the Geology of Britain viewer<sup>5</sup>;
  - grid point meteorological data for ALC of England and Wales<sup>6</sup>;
  - Provisional ALC of England and Wales (1:250,000)<sup>7</sup>;
  - Defra Likelihood of Best and Most Versatile Agricultural Land mapping (1:250,000)<sup>8</sup>;
  - agri-environment schemes<sup>9</sup>; and
  - aerial photography.
- 2.3.2 Publicly available existing detailed ALC information is generally at a mapped scale of 1:10,000 based on field surveys of soils and agricultural land quality carried out by MAFF and the Soil Survey of England and Wales (SSEW). A desk based assessment of soils and agricultural land quality was based on this publicly available data.
- 2.3.3 Existing detailed ALC survey data covering agricultural land within the study area is available for one site near Glazebrook, i.e. Warrington Local Plan – Glazebrook Site 13<sup>10</sup>. Within 2km

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<sup>3</sup> Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*, Cranfield University: National Soil Resources Institute.

<sup>4</sup> Soil Survey of England and Wales (1984), *Soils and Their Use in Midland and Western England*, Harpenden.

<sup>5</sup> British Geological Survey, *Geology of Britain Viewer*. Available online at: [www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html](http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html).

<sup>6</sup> Meteorological Office (1989), *Grid point Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

<sup>7</sup> Ministry of Agriculture, Fisheries and Food (1983), *Agricultural Land Classification of England and Wales (1:250,000)*.

<sup>8</sup> Department for Environment, Food and Rural Affairs (2005), *Likelihood of Best and Most Versatile Agricultural Land (1:250,000)*.

<sup>9</sup> Multi-Agency Geographical Information for the Countryside (MAGIC). Available online at: [www.magic.gov.uk](http://www.magic.gov.uk).

<sup>10</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1993), *Agricultural Land Classification, Warrington Local Plan – Glazebrook Site 13*, MAFF Ref ALCW06393.



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of the study area, use has been made of MAFF detailed ALC at Chat Moss<sup>11</sup>, Rixton New Hall<sup>12</sup>, High Legh Park Golf Course<sup>13</sup> and Oughtrington<sup>14</sup>. This assessment has also made use of MAFF detailed ALC surveys within 5km of the study area for agricultural land to the east of the M6<sup>15</sup> and off Birch Road, Carrington<sup>16</sup>.

- 2.3.4 Findings of the desk based studies based on publicly available information are described in the following section. The location and extent of different soil types and ALC grades/subgrades are influenced by topography and drainage, by geology and soil parent materials, and by climate which are now described in turn.

## 2.4 Soil parent materials

- 2.4.1 This section only considers geology as a soil parent material<sup>17</sup>. The soil association developed in each parent material is identified below. The soil associations are described under 'Description and distribution of soil types'.
- 2.4.2 Glaciofluvial deposits comprising sand and gravel are present intermittently within the study area around Heatley and Hollins Green. Where this parent material is seasonally waterlogged by a fluctuating ground-water table, it produces soils in the Blackwood association. Where this parent material comprises glaciofluvial sands and gravels which form gently undulating or hummocky ground, shallow, well-drained, and acidic soils in the Crannymoor association are found.
- 2.4.3 Alluvial deposits comprising variable proportions of clay, sand and gravel underlie the parts of the study area within the vicinity of streams and rivers. Alluvium is present in the area associated with the River Bollin and the former alignment of the River Mersey, which has been canalised as the Manchester Ship Canal, around Heatley and Hollins Green

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<sup>11</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1988), *Agricultural Land Classification, Chat Moss*, MAFF Ref ALCW05988.

<sup>12</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1996), *Agricultural Land Classification, Warrington*, MAFF Ref ALCW08096.

<sup>13</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1993), *Agricultural Land Classification, High Legh Park Golf Course*, MAFF Ref ALCW08993.

<sup>14</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1993), *Agricultural Land Classification, Warrington Local Plan*, MAFF Ref ALCW06493.

<sup>15</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1995), *Agricultural Land Classification, Motorway Service Area*, MAFF Ref ALCW07795.

<sup>16</sup> Ministry of Agriculture, Fisheries and Food (MAFF) (1996), *Agricultural Land Classification, Greater Manchester*, MAFF Ref ALCW10696.

<sup>17</sup> British Geological Survey. 'A parent material is a soil-science name for a weathered rock or deposit from and within which a soil has formed. In the UK, parent materials provide the basic foundations and building blocks of the soil, influencing their texture, structure, drainage and chemistry.' Available online at: [Soil Parent Material Model - British Geological Survey \(bgs.ac.uk\)](https://www.bgs.ac.uk/parent-material-model/).

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respectively. This parent material gives rise to deep, stoneless silty clay and clay soils in the Conway association.

- 2.4.4 There is reddish glacial till in the southern section of the study area to the south of the A56 Higher Lane and around the Helmsdale Brook, and to the north of the study area around the Glaze Brook and south-west of Glazebrook Moss. This parent material gives rise to clay loam over clay soils in the Salop association.
- 2.4.5 An area of peat forms Glazebrook Moss at the northern end of the study area. This parent material gives rise to deep, peat soil in the Turbary Moor association.

## 2.5 Topography and drainage

- 2.5.1 In the south of the study area, the land dips over a gentle slope (approximately two degrees) from the Bridgwater Canal, at an elevation of 28m above Ordnance Datum (AOD), to the River Bollin at 16m AOD. To the north of the River Bollin, there is a gentle incline (approximately two degrees) to higher ground at Warburton Lane at 21m AOD. From Warburton Lane, the land along the route of the Proposed Scheme is broadly level at 20m AOD until Warburton Park, where the land dips gently (approximately two degrees) to the Manchester Ship Canal at 16m AOD. To the north of the Manchester Ship Canal, the land rises up a gentle slope (approximately two degrees) to higher ground at the A57 Manchester Road at 21m AOD. The land over the remainder of the study area gently rises and falls between elevations of 21m and 23m AOD.
- 2.5.2 Drainage of the land in the southern and central part of the area is predominantly via the River Bollin, which enters to area in the east near Dunham Woodhouses and crosses the study area near Heatley, before linking with the Manchester Ship Canal to the north of Lymm and to the west of Warburton. The Manchester Canal crosses the study area near Hollins Green.
- 2.5.3 Drainage of the land in the northern part of the area is via the Red Brook located to the south of Partington, and Glaze Brook near Glazebrook.
- 2.5.4 Flood risk is potentially limiting to agricultural land quality within the study area in the floodplain of the River Bollin, Red Brook and Glaze Brook. The land in these floodplains is classed as predominantly flood zone 3, in which there is a 1 in 100 or greater annual probability of flooding.

## 2.6 Agro-climate

- 2.6.1 The local agro-climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at three representative points within the study area shown in Table 1. There is some variation across the study area.

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- 2.6.2 Average annual rainfall is between 833mm to 863mm, generally increasing further north. FCDs range from 196 days to 204 days. Moisture deficits are between 88mm to 90mm for wheat and 75mm to 78mm for potatoes, with the lower values occurring on the higher ground.
- 2.6.3 Accumulated temperature is the excess of daily air temperatures above a selected threshold temperature (0°C), summed over a specified period (January to June which is the critical growth period for most crops). The accumulated temperature within the study area is between 1,423 and 1,430 day °C.

**Table 1: Interpolated agro-climatic data**

Agro-climatic parameter	SJ714869 Lymm	SJ699910 Hollinfare	SJ689923 Glazebrook
Altitude (mAOD)	26	22	18
Average annual rainfall (mm)	833	857	863
Accumulated temperature >0°C (day°)	1,423	1,426	1,430
Field capacity days (days)	196	201	204
Average moisture deficit, wheat (mm)	90	88	88
Average moisture deficit, potatoes (mm)	78	76	75

## 2.7 Description and distribution of soil types

- 2.7.1 The characteristics of the soils are described in the SSEW regional bulletin covering the study area and their distribution is illustrated on the National Soil Map<sup>3</sup>. The soils are grouped into soil associations of a range of soil types that are spatially related and are summarised in Table 2. Their distribution is shown on map AG-02-304 (Volume 5, Agriculture, forestry and soils Map Book).

**Table 2: Soil associations**

Soil association: code shown on map AG-02-304	Soil association: name	Description	Wetness class
821b	Blackwood	Deep permeable sandy and coarse loamy soils, affected by fluctuating groundwater.	III-IV
631f	Crannymoor	Very acidic and well drained sandy soils.	I
711m	Salop	Slowly permeable and seasonally waterlogged clay loams over clay soils in reddish drift.	III-IV

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Soil association: code shown on map AG-02-304	Soil association: name	Description	Wetness class
1021	Turbary Moor	Peat soils on lowland raised bog peats. WC will vary depending on the level of the water-table and duration of waterlogging during the winter months.	I
811b	Conway	Greyish brown or grey, deep stoneless fine silty soils on the floodplains of rivers and streams affected by high groundwater.	IV

2.7.2 The National Soil Map shows the general distribution of the following five soil associations in the study area:

- the most prevalent soils are grouped in the Blackwood association. They occur in the south, centre and north of the study area. This group comprises deep, permeable sandy and sandy loam soils. They are developed in glacial river deposits which are variable in stone content and frequently overlie clay deposited in glacial lakes, or glacial till, at depth. Where undrained, the Blackwood soils are waterlogged for long periods during the winter (WC III and WC IV). These soils experience fluctuating levels of groundwater, but where the water-table has been lowered, the soils are well drained (WC I) or only slightly seasonally waterlogged (WC II);
- to the south of the Manchester Ship Canal, soils grouped in the Crannymoor association are developed in glaciofluvial sands and gravels. This group consists mainly of very acidic and well drained (WC I) sandy soils. These soils are slightly to moderately droughty for most arable crops and very droughty for grass;
- soils grouped in the Salop association occur in the north of the study area near Glazebrook. This association comprises slowly permeable and seasonally waterlogged clay loams over clay soils (WC III to IV). They are developed in reddish glacial deposits, i.e. till and glaciofluvial sand and gravel deposits. These soils, which are seasonally waterlogged in the winter and slightly droughty for most crops (moderately droughty for grass) in the summer, are traditionally used for grass production and for the basis of the dairy industry in Cheshire;
- between Glazebrook and the far northern end of the area, near Glazebrook Moss and the M62 motorway, there is an area of peat in which deep, earthy peat soils of the Turbary Moor association are formed. WC will vary depending on the level of the water-table and duration of waterlogging during the winter months. These peat soils hold large amounts of water available for crops; and
- there are some deep, stoneless, fine silty soils in the Conway association developed in alluvium in the floodplains of the River Bollin and the River Mersey/Manchester Ship Canal. These soils are usually greyish brown or grey and are affected by high groundwater. They are waterlogged for long periods during the winter (WC IV).

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2.7.3 Soils of the Blackwood and Salop associations are described further in the Soils Guide<sup>18</sup> which is available at Cranfield University's Landis website.

2.7.4 Detailed descriptions for the dominant soil series in the Blackmoor, Crannymoor, Salop, Turbary Moor and Conway associations, and are given in Table 3.

**Table 3: Dominant soil series**

Soil series	
<b>Blackwood series</b>	
0 – 20cm	Very dark greyish brown (10YR3/2), loose slightly stony or stoneless loamy sand; mainly small and medium sub-rounded quartzite pebbles; weak fine and medium granular; abundant fine pores; common fine fibrous roots; clear abrupt boundary.
20 – 35cm	Pale brown (10YR6/3), slightly stony loamy sand; mainly medium and large sub-rounded quartzite pebbles; common very pale brown (10YR7/3), light grey (10YR 7/2) and light yellowish brown (10YR 6/4) prominent mottles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
35 – 90cm	Light brownish grey (10YR6/2), slightly stony loamy sand to sand; mainly medium and large sub-rounded quartzite pebbles; common brown (10YR5/3), pale brown (10YR6/3) and very pale brown (10YR7/3) mottles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
90 – 100cm	Greyish brown (10YR5/2) loamy sand to sand, stoneless; common brown (10YR5/3), pale brown (10YR6/3) and very pale brown (10YR7/3) mottles; single grain structure.
<b>Crannymoor series</b>	
0 – 25cm	Dark brown (10YR3/3), stoneless friable loamy sand; moderately weak medium and coarse subangular blocky and medium granular; abundant large pores; moderate organic matter; earthworms common; sharp irregular boundary.
25 – 40cm	Pale brown (10YR 6/3), stoneless friable loamy sand; moderately weak fine subangular blocky and very fine granular; abundant large pores; moderate organic matter; earthworms common; sharp irregular boundary.
40 – 50cm	Dark reddish brown (5YR3/3), stoneless sand; single grain; few faint mottles (5YR5/8); gradual wavy boundary.
50 – 80cm	Strong brown (7.5YR5/6) stoneless sand; single grain; gradual wavy boundary.
80 – 100cm	Yellowish brown (10YR5/4) stoneless sand; single grain.
<b>Salop series</b>	
0 – 25cm	Very dark greyish brown (10YR3/3) slightly stony clay loam; moist; moderately developed medium angular blocky; low packing density; moderately weak soil strength; few very fine fibrous roots; non-calcareous; sharp smooth boundary.
25 – 45cm	Brownish grey (2.5Y5/2) slightly stony clay loam very many fine strong brown (7.5YR5/8) mottles; moist; moderate medium subangular blocky or prismatic structure; medium packing density; moderately firm ped strength; few very fine fibrous roots; non-calcareous; few irregular soft ferri-manganiferous concentrations; abrupt smooth boundary.
45 – 100cm	Yellowish red (10YR4/1) slightly stony clay with many medium yellowish brown (10YR5/6) mottles; very moist; moderate coarse prismatic structure, moderately developed coarse prismatic with dark greyish brown (10YR4/2) faces; medium packing density; moderately firm

<sup>18</sup> Cranfield University (2017), *The Soils Guide*. Available online at: [www.landis.org.uk](http://www.landis.org.uk).

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Soil series	
	soil strength; few very fine fibrous roots; non-calcareous; few rounded ferri-manganiferous nodules; clear smooth boundary.
100 – 120cm	Reddish brown (10YR4/2) slightly stony clay with many medium reddish brown (5YR4/4) mottles; massive or coarse prismatic structure; sometimes with calcium carbonate concentrations; very moist; moderately developed medium prismatic with dark grey (10YR4/1) faces; medium packing density; moderately weak soil strength; common very fine fibrous roots; non-calcareous; common rounded soft ferruginous concentrations; abrupt wavy boundary.
Turbary Moor series	
0 – 20cm	Black (7.5YR2.5/1) humified peat.
20 – 40cm	Dark reddish brown (5R2.5/2) fibrous or semi-fibrous peat with moss and heather remains.
40 – 120cm	Dark brown (7.5YR3/2) fibrous or semi-fibrous peat with cotton grass, some moss and heath remain.
Conway series	
0 – 17cm	Dark greyish brown to greyish brown (10YR4.5/2) silty clay with common rusty root traces and few faint fine greyish brown (2.5Y5/2) mottles; stoneless; weak medium prismatic breaking to moderate medium and fine subangular blocky; F2, K3, P1, C2; moist; extremely abundant fine fibrous roots; sharp boundary.
17 – 30cm	Light brownish grey (2.5Y6/2) and greyish brown (2.5Y5/2) silty clay loam with common faint fine yellowish brown (10YR5/8) mottles; few very fine concretions; stoneless; weak coarse prismatic breaking to moderate coarse and medium subangular blocky; F2, K3, P1, C2; moist; few roots; narrow boundary.
30 – 45cm	Light brownish grey (2.5Y6/2) silty clay loam with many distinct fine strong brown (7.5YR5/6) and dark brown to brown (7.5YR4/4) mottles; few fine manganiferous concretions; stoneless; weak coarse prismatic breaking to moderate coarse and medium subangular blocky; F2, K2, P1, C2; moist; few roots within fissures; merging boundary.
45 – 67cm	Light brownish grey to light grey (2.5Y6.5/2) silty clay loam with few distinct fine yellowish brown (10YR5/8) mottles; stoneless; weak coarse prismatic breaking to moderate coarse and medium subangular blocky; F2, K1, P1, C4; few roots within fissures; moist; narrow boundary.
67 – 75cm	Light grey (5Y7/2) silty clay loam with few diffuse fine yellowish brown (10YR5/8) mottles; many prominent few manganiferous concretions; stoneless; structureless, massive; F2, K1, P1, C5; rare roots; moist; sharp boundary.
75 – 90cm+	Light brownish grey (2.5Y6/2) and light olive-grey (5Y6/2) silty clay loam with many distinct fine yellowish brown (10YR5/8), strong brown (7.5YR5/8) and dark brown to brown (7.5YR4/4) mottles; stoneless; structureless; massive F2, K1, P1, C5; very few old root channels; moist.

## 2.8 Soil and land use interactions

- 2.8.1 As described earlier, the assessment of the quality of agricultural land is derived from the consideration of the extent to which long-term limitations are placed on agricultural productive capability by the key physical factors, either individually or interactively. The publicly available information and general familiarisation with the study area established the following limitations and interactions.

## Agricultural land quality

- 2.8.2 The principal physical factors influencing agricultural production and land quality in this study area are climate, site and soil and the interactions between them. Soil wetness and workability and gradient of slope are particularly relevant limitations in this area.

## Agro-climatic limitations

- 2.8.3 The local agro-climatic factors have been interpolated from the Meteorological Office's standard 5km grid point dataset at three points within the study area, as set out in Table 1. Average annual rainfall is from 833mm to 863mm, increasing with altitude. FCDs range from 196 days to 204 days. Moisture deficits are 88mm to 90mm for wheat and 75mm to 78mm for potatoes, with the lower values occurring on the higher ground.
- 2.8.4 Average annual rainfall and accumulated temperature do not place any limitation upon the land in this study area, but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the soil.

## Site limitations

- 2.8.5 The assessment of site limitations is primarily concerned with the way in which topography influences the use of agricultural machinery and hence the cropping potential of land. In addition, gradient influences the risk of soil erosion on cultivated land, particularly where the soil is weakly structured. Gradient and microrelief are not limiting to agricultural land quality across the study area.
- 2.8.6 Flood risk is potentially limiting to agricultural land quality in the floodplain of the River Bollin, the Red Brook, and Graze Brook, although site-specific data on duration and frequency of flooding in terms of Table 2 'Grade according to flood risk in summer' and Table 3 'Grade according to flood risk in winter' in the MAFF ALC Guidelines (1988) is not available. The land in these floodplains is classed as predominantly flood zone 3, in which there is a 1 in 100 or greater annual probability of flooding. Further details are provided in Volume 2, Community Area report: Broomedge to Glazebrook (MA04), Section 15, Water resources and flood risk.

## Soil limitations

- 2.8.7 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, drainage, workability and trafficability. The main soil characteristics within the study area are:
- deep permeable sandy and coarse loamy soils in glaciofluvial drift, affected by fluctuating groundwater;



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- slowly permeable and seasonally waterlogged clay loams over clay soils in reddish drift;
- peat soils on lowland raised bog peats affected by fluctuating groundwater; and
- deep stoneless fine silty soils on the floodplains of rivers and streams affected by high groundwater.

2.8.8 Soil depth and chemical limitations are not encountered in this study area.

## Interactive limitations

- 2.8.9 The physical limitations which result from interactions between climate, the site and soil are soil wetness, droughtiness and erosion. Each soil can be allocated a WC based on soil structure, evidence of waterlogging and the number of FCDs; the topsoil texture then determines its ALC Grade in accordance with the MAFF ALC guidelines. The conclusions reached on the quality of agricultural land in the study area from the initial desk-based consideration are as follows.
- 2.8.10 The quality of agricultural land with soils in the Blackwood series is limited by soil wetness to Subgrade 3a where the subsoil is seasonally waterlogged (WC III) or Subgrade 3b where the subsoil is waterlogged for long periods over the winter (WC IV). Where the agricultural land is drained (WC I and WC II), soil in the Blackwood series are more likely to be limited by soil droughtiness to Grade 2 or Subgrade 3a.
- 2.8.11 Agricultural land with well drained (WC I) sandy soils in the Crannymoor association is mainly limited in quality by soil droughtiness during the summer to mainly Grade 2 or Subgrade 3a, with some Subgrade 3b where factors such as stone content make droughtiness more pronounced.
- 2.8.12 Where soils in the Salop association are slowly permeable and seasonally waterlogged (WC III to IV) clay loams over clay soils in reddish drift, agricultural land quality is limited mainly by soil wetness to mainly Subgrade 3a or Subgrade 3b. Where the WC is IV and the topsoil is heavy clay loam over clay subsoil, the land is in Grade 4.
- 2.8.13 Agricultural land with deep, earthy peat soils in the Turbary Moor association holds large amounts of water available for crops. Wetness class varies depending on the level of the water-table and duration of waterlogging during the winter months. MAFF detailed ALC at Chat Moss<sup>12</sup>, located approximately 1km to the north-east of the study area, has determined that agricultural land with peaty Turbary Moor soils is Grade 1 (see Section 2.3).
- 2.8.14 Greyish brown or grey, deep stoneless fine silty soils in the Conway association occur on the floodplains of rivers and streams affected by high groundwater (WC IV). The quality of agricultural land is limited by soil wetness, and possibly by the risk of flooding, to mainly Subgrade 3b.



## 2.9 Soils and agricultural land classification surveys - detailed soil/ALC field surveys

- 2.9.1 The collection of site-specific information on soil resources and physical conditions has enabled a refinement and extension of published information on agricultural land quality. The analysis of the additional baseline information (topography and soils) identifies individual soil types and definitive agricultural land quality in accordance with the methodology prescribed by MAFF.
- 2.9.2 Site specific soils data have been collected through the observation of individual soil profiles at density of one observation per hectare across the study area; this being the degree of detail required for a definitive agricultural land classification. The characteristics of soil profiles were recorded to a maximum depth of 120cm where possible, or to any impenetrable layer, in relation to the following attributes:
- soil texture;
  - significant stoniness;
  - colour (including local gley and mottle colours);
  - consistency;
  - structural condition;
  - free carbonate; and
  - depth.
- 2.9.3 Soil WC was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick. Soil available water capacity, relevant to the assessment of drought risk, was estimated from texture, structure, organic matter content, stone content and profile depth.
- 2.9.4 Soil data associated with post-1988 detailed ALC surveys are available from Natural England. A full archive of the soil data collected from field surveys undertaken on behalf of HS2 Ltd is presented as a series of soil survey proformas in a separate Background information document (BID AG-002-0MA04)<sup>1</sup>.
- 2.9.5 The detailed soil data confirm the presence in the study area of the soil series relating to the soil associations shown on the National Soil Map. Representative soil profiles from the Blackwood, Salop, Crannymoor, Turbary Moor and Conway are described in Table 4.

**Table 4: Dominant soil series within study area taken from site survey data**

Soil series	
<b>Blackwood series (371300, 387300)</b>	
0-30cm	Dark greyish brown (10YR4/2), medium clay loam; mainly small and medium sub-rounded quartzite pebbles; weak fine and medium granular; abundant fine pores; common fine fibrous roots; clear abrupt boundary.

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Soil series	
30-50cm	Very dark grey (10YR3/1), peaty loam; mainly medium and large sub-rounded quartzite pebbles; common very pale brown (10YR7/3); single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
50-120cm	Greyish brown (2.5Y5/2), medium sand; mainly medium and large sub-rounded quartzite pebbles; single grain to weak medium coarse subangular blocky structure; gradual wavy boundary.
<b>Salop series (369100, 392200)</b>	
0 -30cm	Very dark greyish brown (10YR4/2) medium sandy silt loam; moist; moderately developed medium angular blocky; low packing density; moderately weak soil strength; few very fine fibrous roots; non-calcareous; sharp smooth boundary.
30-40cm	Brown (10YR4/3) medium sandy silt loam; moist; moderate medium subangular blocky or prismatic structure; medium packing density; moderately firm ped strength; few very fine fibrous roots; non-calcareous; few irregular soft ferri-manganiferous concentrations; abrupt smooth boundary.
40-120cm	Yellowish brown (10YR5/6) medium sandy silt loam; moderate coarse prismatic structure, moderately developed coarse prismatic with dark greyish brown (10YR4/2) faces; medium packing density; moderately firm soil strength; few very fine fibrous roots; non-calcareous; few rounded ferri-manganiferous nodules; clear smooth boundary.
<b>Crannymoor series (370800, 389300)</b>	
0-30cm	Very dark grey (10YR3/1), medium sandy loam; moderately weak medium and coarse subangular blocky and medium granular; abundant large pores; moderate organic matter; earthworms common; sharp irregular boundary.
30-40cm	Very dark grey (10YR3/1), medium sandy loam; moderately weak fine subangular blocky and very fine granular; abundant large pores; moderate organic matter; earthworms common; sharp irregular boundary.
40-78cm	Very dark grey (10YR3/1), loamy medium sand; single grain; few faint mottles (5YR5/8); gradual wavy boundary.
78-90cm	Very dark greyish brown (10YR3/2) loamy medium sand; single grain; gradual wavy boundary.
90-120cm	Dark greyish brown (10YR4/2) loamy medium sand; single grain.
<b>Turbary Moor series (368700, 392600)</b>	
0-20cm	Black (7.5YR2.5/1) humified peat.
20-40cm	Very dark brown (7.5YR2.5/2) fibrous or semi-fibrous peat with moss and heather remains.
40-120cm	Very dark brown (7.5YR2.5/3) fibrous or semi-fibrous peat with cotton grass, some moss and heath remains.
<b>Conway series (369900, 391100)</b>	
0-30cm	Dark brown (7.5YR3/2) coarse sandy loam; stoneless; weak medium prismatic breaking to moderate medium and fine subangular blocky; moist; extremely abundant fine fibrous roots; sharp boundary.
30-80+cm	Very dark brown (7.5YR2.5/3) loamy medium sand; few very fine concretions; stoneless; weak coarse prismatic breaking to moderate coarse and medium subangular blocky; F2, K3, P1, C2; moist; few roots; narrow boundary.

2.9.6 Where there is no available published information and it has not been possible to undertake a detailed survey of agricultural land affected by the route of the Proposed Scheme, professional judgement has been used to extrapolate from known data to provide a comprehensive ALC coverage.

2.9.7 The assessment of the quality of agricultural land in the study area based on publicly available data and additional detailed survey data have been reviewed, and the final

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conclusions on the distribution of agricultural land in the various grades of the ALC in the study area are shown in the Volume 5, Agriculture, forestry and soils Map Book (AG-04-312b to AG-04-314a).

2.9.8 The distribution of agricultural land in the different grades is shown in Table 5.

**Table 5: Distribution of grades of agricultural land in the study area**

Grade	Area (ha)	% of study area	% of Agricultural land area
1	14.8	3.8	6.5
2	144.0	36.6	62.8
3a	34.3	8.7	15.0
BMV subtotal	<b>193.1</b>	<b>49.1</b>	<b>84.3</b>
3b	31.0	7.9	13.5
4	5.0	1.3	2.2
5	0	0	0
Non agricultural	164.1	41.7	---
<b>Total area</b>	<b>393.2</b>	<b>100</b>	<b>100</b>

### 3 Assessment of effects on holdings

- 3.1.1 The effects on land holdings have been assessed according to the methodology set out in the in the Environmental Impact Assessment Scope and Methodology Report (SMR), (see Volume 5, Appendix CT-001-00001).
- 3.1.2 The land holdings assessed in this section are also presented in Volume 2, Community Area report: Broomedge to Glazebrook (MA04), Section 4 Agriculture, forestry and soils and shown on the Volume 5, Agriculture, forestry and soils Map Book (AG-01-312b to AG-01-314a).
- 3.1.3 A summary of the assessment is provided in Table 6. The nature of the impacts considered includes:
- temporary and permanent land required from the holding;
  - the temporary and permanent severance of land;
  - the permanent loss of key farm infrastructure; and
  - disruption (particularly noise and dust) on land uses and the holding's operations.
- 3.1.4 These impacts occur primarily during the construction phase of the Proposed Scheme.

**Table 6: Summary of assessment of impacts and effects on holdings**

Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
MA04/1 Agden Lane Farm* 2.4ha arable holding Low sensitivity to change	Land required: High 1.8ha; 75% of holding required for the construction of Lymm north embankment and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 1.4ha; 58% of holding required for the Lymm south embankment and landscape mitigation planting. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA04/2 Land at Rose Cottage * 1.7ha equestrian (non-commercial) holding Low sensitivity to change	Land required: High 0.6ha; 33% of holding required for the construction of the Heatley south embankment and soil stores. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Medium 0.3ha; 20% of holding required for the Heatley south embankment and landscape mitigation planting. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Minor adverse
MA04/3 Wet Gate Lane Farm Owner occupier	Land required: Medium 6.2ha; 16% of holding required for the construction of the Heatley south embankment and soil stores.	Land required: Low 3.1ha; 8% of holding required for the Heatley south embankment and landscape mitigation planting.

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
40ha arable and beef cattle holding. Also runs a livery business. Diversified activities includes caravan storage. Medium sensitivity to change	Severance: Negligible Disruption: Low Riding and exercising horses close to construction activities may need to be limited. Overall temporary assessment: Moderate adverse due to the proportion of land required	Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Minor adverse
MA04/4 Heatley Heath Farm Owner occupier 4.3ha equestrian DIY livery holding Medium sensitivity to change	Land required: High 1.7ha; 39% of holding required for the construction of the Heatley south embankment, Spring Lane underbridge, Little Heatley accommodation access diversion and soil stores. Severance: Negligible Disruption: Low Riding and exercising horses close to construction activities may need to be limited. Overall temporary assessment: Major/moderate adverse due to the proportion area of land required	Land required: High 1.6ha; 38% of holding required for the Heatley south embankment, Spring Lane underbridge and realignment, Little Heatley accommodation access and landscape mitigation planting. Severance: Negligible Infrastructure: High Demolition of residential property and stables. Overall permanent assessment: Major/moderate adverse due to the proportion of land required and property demolition
MA04/5 Wet Gate Farm Owner occupier 100ha arable and grassland holding; grass made into hay and sold; no livestock. Medium sensitivity to change	Land required: Medium 11.7ha; 12% of holding required for the construction of the Heatley south embankment, Wet Gate Lane satellite compound, Wet Gate Lane realignment, River Bollin west viaduct, soil stores and utility diversions. Severance: Medium Holding will severed during construction of the River Bollin west viaduct. Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required and severance	Land required: Low 5.2ha; >5% of holding required for the Heatley south embankment, Wet Gate Lane realignment, balancing pond, River Bollin west viaduct and landscape mitigation planting. Severance: Low Access to farmland will be possible by passing under the River Bollin west viaduct. Infrastructure: Negligible Overall permanent assessment: Minor adverse
MA04/6 Lower Carr Green Farm Owner occupier 32ha arable and beef cattle holding. The majority of the arable land is let to others. Medium sensitivity to change	Land required: High 12.1ha; 38% of holding required for the construction of the Heatley north embankment, River Bollin west viaduct, River Bollin satellite compound, soil stores and utility diversions. Severance: Negligible	Land required: High 8.1ha; 25% of holding required for the Heatley north embankment, River Bollin west viaduct, balancing pond and access, landscape and ecology mitigation planting. Severance: Negligible

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
	Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Infrastructure: Negligible Overall permanent assessment: Major/moderate adverse due to the proportion of land required
MA04/7 Moss Brow Farm Owner occupier 83ha mixed holding with potatoes and vegetables grown to service own farm shop; with free-range egg production. Diversified activities include phone mast. Medium sensitivity to change	Land required: High 28.2ha; 34% of holding required for the construction of the Heatley north embankment, Warburton cutting, Footpath Warburton 3 accommodation overbridge, soil stores and utility diversions. Severance: Low Holding severed but Footpath Warburton 3 accommodation overbridge provided. Disruption: Low Potential for dust arising from construction to affect vegetables, possible interruption to irrigation facilities. Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Medium 10.1ha; 12% of holding required for the Heatley north embankment, Warburton cutting, Footpath Warburton 3 accommodation overbridge, and landscape mitigation planting. Severance: Low Holding severed but Footpath Warburton 3 accommodation overbridge provided. Infrastructure: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA04/8 Yew Tree House Farm Holding rented from a number of different owners on various Farm Business Tenancy (FBT) agreements. 263ha arable and grassland holding; no livestock Medium sensitivity to change	Land required: Negligible 4.5ha; 2% of holding required for the construction of the Warburton Cutting, Paddock Lane transfer node, A6144 Paddock Lane realignment, A6144 Paddock Lane satellite compound, soil stores and utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Negligible	Land required: Negligible 2.5ha; <1% of holding required for the Warburton Cutting, A6144 Paddock Lane realignment and landscape mitigation planting. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/9 Land at Moss Brow Owner occupied 49ha arable and grassland holding Medium sensitivity to change	Land required: Medium 5.0ha; >10% of holding required for the construction of the Warburton Cutting, A6144 Paddock Lane realignment, soil stores and utility diversions Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Low 3.4ha; 7% of holding required for the Warburton Cutting, A6144 Paddock Lane realignment and landscape mitigation planting. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Minor adverse
MA04/10	Land required: High	Land required: Negligible

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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
Land at Warburton Lane* 0.7ha grassland holding Low sensitivity to change	0.2ha; 31% of holding required for the construction of the Warburton Embankment, Warburton Embankment satellite compound, soil stores and utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	No land permanently required. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/11 Land at Partington* 0.6ha grassland holding Low sensitivity to change	Land required: High 0.6ha; 100% of holding required for construction activities. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: High 0.6ha; 100% of holding required for woodland habitat creation. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Moderate adverse due to the proportion of land required
MA04/12 Millbank Hall Farm Owner occupier 5ha grassland holding Low sensitivity to change	Land required: Medium 0.9ha; 18% of holding required for the construction of the Manchester Ship Canal viaduct. Severance: Medium Holding will severed during construction of the Manchester Ship Canal viaduct. Disruption: Negligible Overall temporary assessment: Minor adverse	Land required: Low 0.4ha; 8% of holding required for woodland habitat creation. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/13 Mount Pleasant Farm Owner occupier 18ha arable holding, much of the land is let to others or contract farmed Medium sensitivity to change	Land required: High 11.3ha; 63% of holding required for the construction of the Manchester Ship Canal viaduct, Manchester Ship Canal viaduct north main compound and soil stores. Severance: Medium Holding will severed during construction of the Manchester Ship Canal viaduct Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible 0.5ha; 3% of holding required for landscape mitigation planting. Severance: Low Access to farmland will be possible by passing under the Manchester Ship Canal viaduct. Infrastructure: Negligible Overall permanent assessment: Minor adverse
MA04/14 Bridge Farm	Land required: Medium 14.4ha; 15% of holding required for the construction of the Manchester Ship Canal viaduct, Manchester Ship	Land required: Negligible 2.9ha; 3% of holding required for balancing pond and access, and landscape mitigation planting.



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Holding reference, name, description and sensitivity to change	Temporary impacts and effects	Permanent impacts and effects
<p>Owner occupier with some land rented on annual licence agreements            97ha arable holding with glasshouse horticultural production            Glasshouses high sensitivity to change. Arable land medium sensitivity to change</p>	<p>Canal viaduct north main compound, Glazebrook embankment south, soil stores and utility diversions.            Severance: Negligible            Disruption: Negligible            Overall temporary assessment: Moderate adverse due to the proportion of land required</p>	<p>Severance: Negligible            Infrastructure: Negligible            Overall permanent assessment: Negligible</p>
<p>MA04/15            Southwall Hall Farm            Mainly owner occupier with some land rented on FBT agreements.            546ha arable holding            Diversified activities include agricultural contracting.            Medium sensitivity to change</p>	<p>Land required: Negligible            8.3ha; 2% of holding required for the construction of the Manchester Ship Canal viaduct, the Manchester Ship Canal viaduct north main compound and soil stores.            Severance: Negligible            Disruption: Negligible            Overall temporary assessment: Negligible</p>	<p>Land required: Negligible            3.9ha; 1% of holding required for landscape mitigation planting.            Severance: Negligible            Infrastructure: Negligible            Overall permanent assessment: Negligible</p>
<p>MA04/16            Rixton New Hall Farm            Mainly tenanted farm, 8ha owned            119ha arable and beef cattle holding            Medium sensitivity to change</p>	<p>Land required: Negligible            &lt;0.1ha; &lt;1% of holding required for utility diversions.            Severance: Negligible            Disruption: Negligible            Overall temporary assessment: Negligible</p>	<p>Land required: Negligible            No land permanently required.            Severance: Negligible            Infrastructure: Negligible            Overall permanent assessment: Negligible</p>
<p>MA04/17            Brush Farm, Rixton            Owner occupier            55ha arable holding with majority of cropping managed by agricultural contractors.            Land let for local shoot.            Medium sensitivity to change</p>	<p>Land required: High            20.4ha; 37% of holding required for the construction of the Glazebrook embankment south, soil stores and utility diversions.            Severance: Negligible            Disruption: Negligible            Overall temporary assessment: Major/moderate adverse due to the proportion of land required</p>	<p>Land required: Medium            7.7ha; 14% of holding required for the Glazebrook south embankment, balancing ponds and accesses, and landscape and ecology mitigation planting.            Severance: Negligible            Infrastructure: Negligible            Overall permanent assessment: Moderate adverse due to the proportion of land required</p>
<p>MA04/18            Moss Farm, Glazebrook            Owner occupier            3ha grassland holding            Low sensitivity to change</p>	<p>Land required: High            2.7ha; 89% of holding required for the construction of the Glazebrook embankment north, Glazebrook Railway north satellite compound, stores and utility diversions.            Severance: Negligible            Disruption: Negligible</p>	<p>Land required: High            1.3ha; 43% of holding required for the Glazebrook north embankment and landscape mitigation planting.            Severance: Negligible            Infrastructure: Negligible            Overall permanent assessment: Moderate adverse due to the proportion of land required</p>



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	Overall temporary assessment: Moderate adverse due to the proportion of land required	
MA04/19 Hole Mill Farm* 62ha arable holding Medium sensitivity to change	Land required: Medium 9.4ha; 15% of holding required for utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/20 Church Farm Owner occupier 12ha grassland holding providing stables and lessons for Riding for the Disabled Association Medium sensitivity to change	Land required: High 7.3ha; 61% of holding required for the construction of the Glazebrook embankment north, soil stores and utility diversions. Severance: Negligible Disruption: Medium Riding and exercising horses close to construction activities may need to be limited especially for vulnerable riders. Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: High 3.7ha; 31% of holding required for the Glazebrook north embankment, and landscape and ecology mitigation planting. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Major/moderate adverse due to the proportion of land required
MA04/21 Land at Moss Lane* 7ha grassland holding Medium sensitivity to change	Land required: High 1.7ha; 25% of holding required for utility diversions. Severance: Negligible Disruption: Negligible Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Land required: Negligible No land permanently required. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/22 Holcroft Hall Farm 607ha arable and grassland holding, including sheep Medium sensitivity to change	Land required: Negligible 8.8ha; 1% of holding required. Severance: Negligible Disruption: Negligible Overall temporary assessment: Negligible	Land required: Negligible 0.6ha; <1% of holding required. Severance: Negligible Infrastructure: Negligible Overall permanent assessment: Negligible
MA04/23 Beechfield Farm Owner occupier 23ha arable and grassland holding. 8ha arable rented by others; 15ha providing grassland for livery clients	Land required: High 6.6ha; 29% of holding required for the construction of the Glazebrook embankment north, soil stores and utility diversions. Severance: Negligible Disruption: Negligible	Land required: Medium 2.4ha; >10% of holding required for the Glazebrook north embankment, and landscape and ecology mitigation planting. Severance: Negligible Infrastructure: Negligible

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<b>Holding reference, name, description and sensitivity to change</b>	<b>Temporary impacts and effects</b>	<b>Permanent impacts and effects</b>
Diversified activities include equestrian livery and agricultural engineering. Medium sensitivity to change	Overall temporary assessment: Major/moderate adverse due to the proportion of land required	Overall permanent assessment: Moderate adverse due to the proportion of land required

*\* It has not been possible to arrange farm impact assessment interviews with these holdings. Publicly available sources have been used to obtain the information presented.*







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