AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

DERBYSHIRE MINERALS PLAN - EGGINTON (Sites A and B)

1.0 BACKGROUND

1.1 The survey area comprises two sites A and B which form part of the Derbyshire Minerals Plan and together extend to 37.2 hectares in size.

1.2 ADAS Statutory Resource Planning Team undertook a detailed Agricultural Land Classification (ALC) and soil physical characteristics survey of the sites during June 1995. Information was collected from auger borings, spaced at 100 m intervals, to a depth of 120 cm. Subsoil conditions were assessed from two inspection pits, with riddling used to assess profile stone contents.

1.3 On the published provisional 1:63 360 scale map, sheet 120 (MAFF, 1972) the majority of the site is mapped as grade 4 with some land to the north of Hilton Brook mapped as grade 5. Nearby field work in 1982 identified land of grades 3b and 3c (subgrade 3c equates to grade 3b in MAFF1988 Revised ALC system) within the floodplain areas of the River Dove.

1.4 At the time of the survey site A was under permanent pasture and site B was under potatoes.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climate data for the survey area was extrapolated from data published in the Agricultural Climatic Dataset (Meteorological Office, 1989). This indicates that

for an average site altitude of 45 m AOD the average annual rainfall is 670 mm (26.4"), while the accumulated temperature (ATO) is 1412 days °C. The field capacity days are 153 and moisture deficits for wheat and potatoes are 103 mm and 93 mm respectively. These characteristics do not impose any climatic limitation on the ALC grading of the area.

Altitude and Relief

2.2 Site A comprises level land at an altitude of approximately 45 m AOD and occupies part of the floodplain of the River Dove. The north eastern part of the site is separated by the Hilton Brook. Site B comprises level land at an approximate altitude of 47 m AOD to the east of site A. Neither gradient nor altitude impose a limitation to the agricultural potential of the land.

Geology and Soils

2.3 The published 1:50 000 scale solid and drift edition geology maps, sheet 140, (Geol. Survey, 1982) and sheet 141 (Geol. Survey, 1976) show the area to comprise alluvium.

2.4 No detailed soil map exists for the area but the reconnaissance 1:250 000 scale map (Sheet 3, Soil Survey of England and Wales 1983) shows the majority of the area to comprise the Fladbury 2 Association (*1) with the south western part mapped as Wharfe Association (*2).

(*1) Fladbury 2 Association - Stoneless clayey soils variably affected by groundwater, some with sandy subsoils. Some similar fine loamy soils. Flat land. Risk of flooding.

(*2) Wharfe Association - Deep stoneless permeable fine loamy soils. Some similar soils variably affected by groundwater. Flat land. Risk of flooding.

The current detailed survey identified two main soil types

Soil Type 1 (refer to Soil Types Map and Appendix 1)

2.5 The whole of site A lies close to the River Dove and consists of soils which have been derived from alluvial deposits. The profiles typically comprise non calcareous heavy clay loam topsoils over non calcareous clay subsoils which may occasionally merge into gravel deposits below 110 cms depth.

Soil Type 2 (refer to Soil Types Map and Appendix 1)

2.6 Site B lies slightly further from the river and comprises soils of moderate depth over the gravel deposits. Profiles generally consist of slightly stony medium sandy loams (or occasionally sandy clay loams) over similar upper subsoils. At depth 60/70 cms+ the upper subsoils tend to merge into gravel which comprises 40-50% flints in a matrix of medium sand. Rooting is evident throughout the profiles despite the high stone contents at depth.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The definitions of the Agricultural Land Classification (ALC) grades are included in Appendix 2.

3.2 Site A comprises grade 3b land, with Site B comprising 3a land. The table overleaf shows the breakdown of ALC grade for the survey area in hectares and % terms.

TABLE 1 AGRICULTURAL LAND CLASSIFICATION

	GRADE	ha	%
Site A	3b	31.9	86
	Non agricultural	1.3	14
	TOTAL	33.2	100
Site B	3a	4.0	100
	TOTAL	4.0	100

Flooding

3.3 Personal communication with the NRA (Fradley) indicates that the land within sites A and B is prone to flooding due to its proximity to the River Dove. This information has been interpreted in ALC terms and has been used to assess the flood risk of the sites. Site A tends to be subject to occasional medium term winter floods while Site B appears to suffer from rare or very rare medium term summer floods. This in turn precludes both of the sites from a land grade higher than 3a.

Subgrade 3a

3.4 Site B wholly comprises land graded 3a. The land is associated with the lighter textured soils over gravel which are described in paragraph 2.6. The presence of light textures, profile stone and a moderate depth to gravel horizons combine to impose a moderate limitation on the available water for crop growth. Consequently this limitation along with the flood risk described in paragraph 3.3 precludes the land from a higher grade. Occasionally topsoil stone may be an equally limiting factor.

Subgrade 3b

3.5 The majority of the survey area has been graded 3b and corresponds with the alluvial soils on Site A. The land is clayey and the soils have been described in full in paragraph 2.5. Profile pit examinations indicate that this land comprises a slowly permeable layer directly below the topsoil (i.e. wetness class IV or occasionally III). The relatively heavy textures, their non calcareous nature and the presence of a slowly permeable layer at shallow depths significantly limits the flexibility of the land for agricultural production. Consequently the land is limited to 3b (moderate quality agricultural land).

Non Agricultural

3.6 Woodland, scrub and water areas have been mapped as Non Agricultural.

June 1995

Resource Planning Team
ADAS Cambridge

REFERENCES

GEOLOGICAL SURVEY OF GREAT BRITAIN (England and Wales) 1976. Solid and Drift Edition, Sheet 141. Scale 1:50 000.

GEOLOGICAL SURVEY OF GREAT BRITAIN (England and Wales) 1976. Solid and Drift Edition, Sheet 140. Scale 1:50 000.

MAFF, 1972. Agricultural Land Classification map Sheet 120. Provisional Scale 1:63 360.

MAFF, 1983. Agricultural Land Classification of England and Wales. Revised Guidelines and Criteria for Grading the Quality of Agricultural Land. MAFF, London.

METEOROLOGICAL OFFICE, 1989. Climatological data for Agricultural Land Classification. Met. Office, Bracknell.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Sheet 3, Midland and Western England. Scale 1:250 000.

Appendix 1

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE 1

Topsoil	Texture	:	heavy clay loam
	Calcareous	:	non
	Depth	:	25 cm
Upper Subsoil	Texture	:	clay
	Calcareous	:	non
	Structure	:	moderately developed coarse and very coarse angular blocky
	Gleying	:	yes
	Consistence	:	firm
	Depth	:	120 cm

SOIL TYPE 2

Topsoil	Texture	:	medium sandy loam
	Stone	:	10% total flints
	Depth	:	35 cm
Upper Subsoil	Texture	:	medium sandy loam
	Stone	:	15% flints, with 7% 40 cm+
	Structure	:	moderately developed coarse and very coarse subangular blocky becoming weakly developed 55 cm+.
	Consistence	:	friable
	Rooting	:	few fine
	Depth	:	60/70 cm
Lower Subsoil	Gravel horizon	:	40-50% stones in a medium sand matrix

Appendix 2

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly include top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 - very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

50/95

AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

DERBYSHIRE MINERALS PLAN
LAND AT SHARDLOW PIT

1.0 BACKGROUND

1.1 A detailed survey was carried out over 28.4 ha of land at Weston Grange, Shardlow, Derbyshire. This land forms part of a larger site which in total extends to 88 ha and is included with the Derbyshire Minerals Plan. Detailed survey has been restricted to this smaller area on the north western side of the site to determine whether any best and most versatile land exists within this area. Previous survey information and information from the National Rivers Authority indicates that the remainder of the site is subject to periodic flooding and as such cannot be graded higher than subgrade 3b. This report therefore only covers the area of the site on which detailed soil information has been collected.

1.2 The site is located 1 km to the south of the village of Aston-on-Trent and lies on the eastern side of the Trent and Mersey Canal, between the canal and the River Trent.

1.3 A total of 28 borings were made using a dutch auger, to a depth of 1.2 m unless stopped by impenetrable stony layers. In addition 3 soil pits were dug to assess subsoil conditions in more detail. The fieldwork was carried out on 19/20 June 1995.

1.4 At the time of the survey all the agricultural land within the survey area was in winter wheat. A small track crosses the survey area from Western Grange to the railway line, towards the western end of the site. A drainage ditch runs eastwards from the track to a pylon before turning southeast to the railway line.

This ditch then forms the eastern boundary of the survey area.

1.5 On the published 1:63 360 scale Agricultural Land Classification (ALC) map (MAFF, 1971) the whole area is mapped as grade 4. This map however is of a reconnaissance nature and the current survey was undertaken to provide more detail for the site.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climatic criteria are considered when classifying land as these may have an overriding limitation in terms of the agricultural use of the land. The main parameters used in the assessment of the overall climatic limitation are average annual rainfall, as a measure of overall wetness, and accumulated temperature (day °C Jan-June), as a measure of the relative warmth of an area.

2.2 A detailed assessment of the prevailing climate for the site has been made by interpolation from the 5 km grid dataset produced by the Meteorological Office (Met Office, 1989). The details are given in the table overleaf and these show that there is no overall climatic limitation affecting the site.

2.3 Climatic factors however do interact with soil properties to influence soil wetness and droughtiness. The climate in this area is relatively dry and warm and consequently the likelihood of a droughtiness limitation may be enhanced depending on soil conditions.

Table 1: Climatic Interpolation

Grid Reference	SK422 284
Altitude (m)	30
Accumulated Temperature (Day °C, Jan-June)	1427
Average Annual Rainfall (mm)	620
Moisture Deficit, Wheat (mm)	110
Moisture Deficit, Potatoes (mm)	103
Field Capacity (Days)	138
Overall Climatic Grade	1

Altitude and Relief

2.4 The site is located in the floodplain of the River Trent and encompasses the alluvial deposits and part of the associated lower terrace. Consequently the site is relatively flat, rising very gently onto the terrace. The altitude of the site is approximately 30 m AOD. Altitude and relief therefore do not impose any limitation on the agricultural quality of the site.

Geology and Soils

2.5 The published 1:50 000 geological map (Geol. Surv. 1976) shows the entire site to be underlain by alluvium.

2.6 The reconnaissance soil survey map for the area (Soil Surv. 1983) shows the site to comprise soils from the Wharfe (*1), Fladbury 2 (*2) and Wick 1 (*3) associations. The more detailed 1:25 000 soil map for the area (Soil Surv. 1975) shows the presence of Wick, Fladbury, Wharfe and Trent series.

(*1) Wharfe Association: Deep stoneless permeable fine loamy soils in river alluvium.

(*2) Fladbury 2 Association: Stoneless clayey soils developed in river alluvium, variably affected by groundwater.

(*3) Wick 1 Association: Deep well drained coarse loamy and sandy soils locally over gravel.

2.7 The detailed survey carried out on the site shows the presence of four distinct soil types over the site and these are described briefly in the following paragraphs.

Soil Type 1 (Refer to Soil Types Map and Appendix 1)

2.8 Soil Type 1 comprises the poorly drained clayey soils which are mapped on the slightly lower lying land on the site. These soils have a grey brown heavy clay loam or clay topsoil overlying a strongly mottled grey clay subsoil with manganiferrous concretions. The soils are stoneless throughout and have slowly permeable subsoil horizons. These soils are assessed as wetness class IV.

Soil Type 2 (Refer to Soil Types Map and Appendix 1)

2.9 The better drained, fine loamy alluvial soils on the site have been included within Soil Type 2. These soils typically have a brown heavy clay loam topsoil over a brown or greyish brown upper subsoil with faint or distinct ochreous mottles and common manganiferrous concretions. Below approximately 60 cm depth the soil is typically a grey brown clay with many distinct ochreous mottles and manganiferrous concretions. The presence of the manganiferrous concretions indicates a fluctuating water table. These soils are stoneless throughout and have been assessed as wetness class II or III.

Soil Type 3 (Refer to Soil Types Map and Appendix 1)

2.10 The shallow, coarse loamy soils found on the slightly higher land adjacent to the canal are associated with the river terrace deposits. These soils have a dark brown, slightly stony topsoil over a brown, slightly or moderately stony, loamy medium sand subsoil. The underlying sand and gravel is generally encountered within 45 cm depth.

Soil Type 4 (Refer to Soil Types Map and Appendix 1)

2.11 Soil Type 4 has been mapped on the very slightly higher land on the southern part of the survey area adjacent to the railway line. These soils have a dark brown sandy clay loam or medium clay loam topsoil over a similar textured, brown subsoil both of which are very slightly stony. The soils typically become coarser textured and more stony with depth the underlying gravels being encountered with 50-90 cm depth. The soils are generally well drained and are assessed as wetness class I or very occasionally wetness class II.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The land has been classified using the guidelines contained in the Agricultural Land Classification of England and Wales (MAFF, 1988). A breakdown of the individual grades found on the site is given in the table below.

Table 2: Distribution of grades and subgrades

AGRICULTURAL LAND CLASSIFICATION

Grade	ha	%
3a	10.3	36
3b	17.8	63
Non Agricultural	0.3	1
TOTAL	28.4	100

Flooding

3.2 Information on flooding over the whole site has been sought from the National Rivers Authority. The southern and eastern parts of the site which have not been surveyed are subject to periodic flooding and the NRA state that "the land adjacent to the River Trent may be subject to flooding during minor events in the region of 1 and 2 year return periods and flood water would be expected to remain on site from approximately 4 to 8 days" (pers com). This land therefore

cannot be graded higher than subgrade 3b. The NRA however, consider that the land on the western side of the site "would be rarely inundated".

Subgrade 3a

3.3 The well drained fine loamy soils overlying gravel, Soil Type 4, described in detail in paragraph 2.11, together with the moderately well drained soils contained within Soil Type 2 (see paragraph 2.9), are included within this subgrade. The former are restricted to this subgrade due to a moderate droughtiness limitation. The depth to the underlying sand and gravel is variable throughout this soil type, restricting the soil available water capacity. Moisture balance calculations indicate that in this relatively dry area, the majority of the area will be subgrade 3a, although some grade 2 profiles will occur locally, depending on the rooting depth. However, due to the scale of mapping it is not possible to delineate these areas separately.

3.4 The moderately well drained soils included with Soil Type 2 are included within this subgrade due to a wetness limitation. These soils which are assessed as wetness class II have heavy clay loam topsoils, which during the wetter periods of the year will have workability restrictions, limiting the land to subgrade 3a.

Subgrade 3b

3.5 The majority of the survey area has been restricted to this subgrade and correlates with the soils of Soil Types 1 and 3 and the less well drained variants of Soil Type 2. Wetness is the main limitation associated with Soil Types 1 and 2. These units represent the clayey and fine loamy alluvial soils described in paragraphs 2.8 and 2.9 above, which have been assessed as wetness class III or IV. These soils will have moderately severe workability limitations during the wetter periods of the year due to the presence of heavy clay loam or clay

topsoil horizons, which will impose a significant limitation on the agricultural potential of the site restricting the land to subgrade 3b.

4.5 On the slightly higher land adjacent to the canal associated with the shallow coarse loamy soils of Soil Type 3 (see paragraph 2.10), droughtiness is the major limitation. These soils have a moderately low available water capacity, which combined with the moderately high soil moisture deficits that are prevalent in this area will result in a significant droughtiness limitation. Moisture balance calculations indicate that this limitation will restrict the land quality to subgrade 3b.

June 1995

Resource Planning Team
ADAS Cambridge

REFERENCES

BRITISH GEOLOGICAL SURVEY, 1976. Sheet 141, Loughborough, 1:50,000 scale.

MAFF, 1971. Agricultural Land Classification Map. Provisional. Scale 1:63 360 Sheet 121.

MAFF, 1988. Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for grading the quality of agricultural land). Alnwick.

METEOROLOGICAL OFFICE, 1989. Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND WALES, 1975. Soil Survey Map Sheet SK 32/42, Melbourne, 1:25 000 scale.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Sheet 3, "Soils of Midland and Western England". 1:250 000 scale.

Appendix 1

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE 1

Topsoil	Texture	:	heavy clay loam and clay
	Colour	:	dark greyish brown 10YR4/3
	Stones	:	stoneless
	Depth	:	30 cm
	Boundary	:	clear smooth
Subsoil	Texture	:	clay
	Colour	:	greyish brown or brown 10YR5/2 and 7.5YR5/2.
	Mottles	:	many distinct ochreous
	Manganese	:	few concretions
	Stones	:	stoneless
	Structure	:	coarse prismatic
	Depth	:	120+ cm

Wetness Class IV

SOIL TYPE 2

Topsoil	Texture	:	heavy clay loam
	Colour	:	dark brown 7.5YR4/3
	Stones	:	stoneless
	Depth	:	30 cm
	Boundary	:	abrupt smooth
Upper subsoil	Texture	:	heavy clay loam
	Colour	:	brown 10YR5/3 and 7.5YR5/3
	Mottles	:	common faint or distinct ochreous
	Manganese	:	common concretions
	Stones	:	stoneless
	Structure	:	very coarse subangular blocky or coarse prismatic.
	Depth	:	60 cm
Lower subsoil	Texture	:	clay
	Colour	:	brown 10YR5/3 and 7.5YR5/3
	Mottles	:	common/many distinct ochreous
	Manganese	:	common concretions
	Stones	:	stoneless
	Structure	:	very coarse prismatic
	Depth	:	120+ cm

Wetness Class IV

SOIL TYPE 3

Topsoil	Texture	:	medium sandy loam
	Colour	:	dark brown 7.5YR3/3
	Stones	:	slightly stony 5-10% small and medium rounded quartzite pebbles.
	Depth	:	30 cm
	Boundary	:	abrupt smooth
Upper subsoil	Texture	:	loamy medium sand
	Colour	:	dark brown 7.5YR4/4
	Stones	:	slightly/moderate stony 10-15% small and medium rounded quartzite pebbles.
	Structure	:	coarse subangular blocky
	Roots	:	many fine and very fine
	Depth	:	45 cm
Lower subsoil	Texture	:	medium sand
	Colour	:	reddish brown 5YR4/3
	Stones	:	very stony 50% quartzite gravel
	Roots	:	many to 60 cm, few to 75 cm none below 75 cm.
	Depth	:	75+ cm

Wetness Class I

SOIL TYPE 4

Topsoil	Texture	:	sandy clay loam or medium clay loam
	Colour	:	dark brown 7.5YR4/3
	Stones	:	slightly stony 3-5% small and medium rounded quartzite pebbles.
	Depth	:	30 cm
	Boundary	:	clear smooth
Upper subsoil	Texture	:	sandy clay loam or medium clay loam
	Colour	:	brown or reddish brown 7.5YR4/4 or 5YR4/4.
	Stones	:	slightly stony 5-15% small and medium rounded quartzite pebbles.
	Structure	:	strong coarse and very coarse subangular blocky.
	Roots	:	common fine and very fine
	Depth	:	45/80 cm

Lower subsoil	Texture	:	medium sandy loam
	Colour	:	strong brown 7.5YR4/6
	Stones	:	slightly stony 5-15%
	Structure	:	weak coarse subangular blocky
	Depth	:	50/90 cm

Wetness Class I

Appendix 2

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly include top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 - very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

AGRICULTURAL LAND CLASSIFICATION
DERBYSHIRE MINERALS PLAN - ATTENBOROUGH SITE A & B

1.0 BACKGROUND

1.1 The sites, together approximately 48 ha, form part of the Derbyshire Minerals Plan.

1.2 On the published provisional 1:63 360 scale map, sheet 121 (MAFF, 1971) the sites are mapped as grade 3.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climate data for the sites was extrapolated from data published in the Agricultural Climatic Dataset (Meteorological Office, 1989). This indicates that for an average site altitude of 25 m AOD the average annual rainfall is 593 mm (23.3"), while the accumulated temperature (ATO) is 1430 days °C. The field capacity days are 126 and moisture deficits for wheat and potatoes are 113 mm and 107 mm respectively. These characteristics do not impose any climatic limitation on the ALC grading of the sites.

Altitude and Relief

2.2 Site A and B comprise level land at an altitude of approximately 27 m AOD being part of the floodplain of the River Trent.

Geology and Soils

2.3 The published 1:50 000 scale solid and drift edition geology map, sheet 141 (Geol. Survey, 1976) show both sites to comprise Alluvium.

2.4 No detailed soil map exists for the area but the reconnaissance 1:250 000 scale map (sheet 3, Soil Survey of England and Wales 1983) shows both sites to comprise Wharfe Association (*1).

Flood Risk

2.5 Both sites lie within the floodplain of the River Trent. The National Rivers Authority have confirmed that these sites are prone to flooding. Site A is likely to suffer some inundation of flood water during a 1 in 5 year return period event. Depending upon the magnitude of the flood event, flood water would be expected to remain on the site from approximately 4 to 8 days.

2.6 Site B is slightly higher and as a result the flood risk is marginally less.

2.7 Using MAFF's guidelines for the grading of agricultural land (1988) the grade according to flood risk is not better than subgrade 3b (occasional and long for winter flooding, see Appendix 2 for definitions).

2.8 As flood risk is a major limitation no fieldwork has been undertaken on this site to date.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The definition of the Agricultural Land Classification (ALC) grades are included in Appendix 1.

(*1) Wharfe Association - Deep stoneless permeable fine loamy soils. Some similar soils variably affected by groundwater. Flat land. Risk of flooding.

3.2 Both sites have been graded 3b and the table below shows the size and grade of the site.

Table 1: AGRICULTURAL LAND CLASSIFICATION

Grade	ha	%
Not better than		
Subgrade 3b	48.2	100

Subgrade 3b

3.3 All and land has been graded at best 3b due to flood risk (see paragraphs 2.5-2.8). Other limitations may be equally present but no fieldwork has been undertaken to date.

June 1995

Resource Planning Team
ADAS Cambridge

Appendix 1

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly include top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 - very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Appendix 2

Flooding

The incidence of flooding is strongly influenced by topography but the extent, duration, frequency and timing can be difficult to establish precisely, The risk of flooding may be significant in affecting the choice of crops to be grown, because at certain times of the year it can have a detrimental effect on yield, and may give rise to soil management problems. The overall effect of flooding depends on a range of circumstances. The after-effects of inundation depend in part on soil type and will generally be more serious on impermeable soils, which remain saturated for longer periods than permeable soils. Floodplain morphology influences water velocities and therefore affects the amount of soil erosion, siltation and physical damage to crops. The time of year at which flooding occurs is particularly significant. Floods which occur in summer are generally more damaging than winter floods because the crop root systems are active and more likely to be affected by waterlogging. Crops vary in their tolerance to flooding and this is reflected in the stricter limits on high quality land where flexibility of cropping is required.

The guidelines in Tables 2 and 3 take account of frequency, duration and timing of flooding and apply to soils of good or moderate permeability. Further downgrading may be justified where flooding affects soils of low permeability. The year is divided into two parts, with a long 'summer' period which includes the spring sowing and late autumn harvesting seasons. When grading land, the flood limitation is assessed separately for the summer and winter seasons and, applying the 'most limiting factor' principle, either assessment can determine the grade. Information on flooding at a local scale is often fragmentary and the assessment may have to be based on local knowledge, together with any information or advice which can be obtained from Water Authorities. Most weight should be given to the predicted long-term risk, or the return periods used in the design of flood protection schemes, rather than to the average incidence of flooding in recent years, which may have been influenced by atypical climatic conditions.

Table 1: Grade according to flood risk in summer

Grade/Subgrade		Flood limits	
		frequency	*duration*
1		very rare	short
2		rare	short
3a		very rare	medium or long
	or	rare	medium
	or	occasional	short
3b		rare	long
	or	occasional	medium
4		occasional	long
	or	frequent	short or medium
5		frequent	long

Table 1: Grade according to flood risk in winter

Grade/Subgrade		Flood limits	
		frequency	*duration*
1		rare	short
2		rare	medium
	or	occasional	short
3a		rare	long
	or	occasional	medium
	or	frequent	short
3b		occasional	long
	or	frequent	medium
4		frequent	medium

The terms used in Tables 1 and 2 are defined as follows:

Season — summer - mid March to mid November

winter - mid November to mid March

Duration — short - not more than 2 days (48 hours)

medium - more than 2 but not more than 4 days

long - more than 4 days

Frequency	very rare - not more than once in 15 years
	rare - once in 10 to once in 14 years
	occasional - once in 3 to once in 9 years
	frequent - more than once in 3 years

No ALC or pdf map.

AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

DERBYSHIRE MINERAL PLAN - ELVASTON QUARRY

1.0 BACKGROUND

1.1 ADAS Statutory Resource Planning Team undertook a detailed Agricultural Land Classification (ALC) and soil physical characteristics survey of 61.6 ha of land near to the village of Elvaston in Derbyshire. This land forms part of a larger site which in total extends to 180 ha and is to be included in the Derbyshire Minerals Plan. The detailed survey was restricted to the smaller area on the western side of the site as previous survey information and information from the National Rivers Authority indicates that the remainder of the site is subject to periodic flooding. This flooding risk restricts such areas of the site to a grade no higher than subgrade 3b. This report therefore only covers the area of the site on which detailed soil information has been collected.

1.2 The site is located to the south of the River Derwent between the villages of Elvaston and Ambaston in Derbyshire.

1.3 Information was collected from auger borings, spaced at 100 m intervals, to a depth of 120 cm wherever possible. In addition four soil pits were dug to assess subsoil conditions in more detail. Fieldwork was carried out in June 1995. At the time of the survey the agricultural land within the survey area was under wheat, barley or grass.

1.4 On the published provisional 1:63 360 scale map, sheet 121 (MAFF, 1971) the majority of the site is mapped as grade 3 with grade 4 mapped in the extreme north of the site. An earlier reconnaissance survey (1984) identified land

grades of 3a, 3b, 3c and 4 (subgrade 3c equates to subgrade 3b in the MAFF 1988 Revised ALC system) within the site.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climate data for the survey area was interpolated from data published in the Agricultural Climatic Dataset (Meteorological Office, 1989). This indicates that for an average site altitude of 35 m AOD the average annual rainfall is 625 mm (24.6"), while the accumulated temperature (ATO) is 1420 °C. The field capacity days are 138, and moisture deficits for wheat and potatoes are 109 mm and 102 mm respectively. These characteristics do not impose any climatic limitation on the ALC grading of the area.

Altitude and Relief

2.2 The site comprises level land at an altitude of approximately 35 m AOD.

Geology & Soils

2.3 The published 1:50 000 scale solid and drift edition geology map, sheet 141, (Geol. Survey 1976) shows the site to comprise alluvium.

2.4 No detailed soil map exists for the area but the reconnaissance 1:250 000 scale map (Sheet 3, Soil Survey of England and Wales, 1983) shows the area to comprise the Wharfe Association (*1). The current detailed survey identified three main soil types.

(*1) Wharfe Association - Deep stoneless permeable fine loamy soils. Some similar soils variably affected by ground water. Flat Land. Risk of flooding.

Soil Type 1 (refer to Soil Types Map and Appendix 1)

2.5 The majority of the site typically comprises non calcareous medium or heavy clay loam overlying a similar upper subsoil. A non calcareous heavy clay loam or clay textured lower subsoil occasionally merged into gravel deposits below approximately 80 cm. The upper soil profile is generally stoneless or only very slightly stony. Subsoils are strongly mottled with common ferri-manganiferous concretions. Wetness class is generally assessed as II or III depending on the depth to the slowly permeable lower subsoil.

Soil Type 2 (refer to Soil Types Map and Appendix 1)

2.6 Soil type 2 comprises generally poorly drained soils comprising of non calcareous medium or heavy clay loam topsoil overlying clay textured subsoils. The profile is generally stoneless or only very slightly stony. Subsoils are strongly mottled with common ferri-manganiferous concretions. The clay textured upper subsoil generally constitutes a slowly permeable layer and hence wetness class is generally assessed as IV or occasionally wetness class III.

Soil Type 3 (refer to Soil Types Map and Appendix 1)

2.7 This soil type is restricted to the north east of the survey area and consists of well drained profiles assessed as wetness class I or II. These soils typically consist of a medium sandy clay loam topsoil overlying a medium sandy clay loam or medium sandy loam upper subsoil which are very slightly or slightly stony. A very stony lower subsoil of medium sandy loam texture is found at approximately 60 cm.

3.0 *AGRICULTURAL LAND CLASSIFICATION*

3.1 The definitions of the Agricultural Land Classification (ALC) grades are included in Appendix 2.

3.2 The land has been classified using the guidelines contained in the Agricultural Land Classification of England and Wales (MAFF, 1988). A breakdown of the extent of individual grades found on the site is given in the table below.

Table 1. AGRICULTURAL LAND CLASSIFICATION

Grade	Area (ha)	% of survey area
3a	38.2	62.0
3b	22.9	37.2
Urban	0.3	0.5
Non-agricultural	0.2	0.3
TOTAL	61.6	100.0

Flooding

3.3 Information on flooding over the whole site has been sought from the National Rivers Authority (NRA) and only those areas surveyed were excluded from the floodplain of the River Derwent. Hence the majority of the whole site would be subject to flooding with a likely return period of 1 in 5 years with flood water expected to remain on site for approximately 4 to 8 days. However, areas adjacent to the River Derwent would be expected to be inundated during more minor flood events. The area of the floodplain cannot therefore be graded higher than subgrade 3b.

Subgrade 3a

3.4 Land of this grade is principally associated with soil types 1 and 3 described in paragraph 2.5 and 2.7. For soil type 1 (paragraph 2.5) land of subgrade 3a is restricted to those areas assessed as wetness class II or III together with a topsoil of heavy clay loam or medium clay loam texture respectively. Hence these areas will have wetness and workability restrictions limiting the land to subgrade 3a.

3.5 Land within the area of soil type 3 (paragraph 2.7) has a moderate limitation on the available water for crop growth particularly for deeper rooting crops such as wheat. Hence droughtiness limits the land to subgrade 3a.

3.6 A small area of soil type 2 (paragraph 2.6) in the south east of the survey area was found to have wetness and workability limitations which limited the area to subgrade 3a.

Subgrade 3b

3.7 The land assessed as subgrade 3b correlates closely to those areas mapped as soil type 2 (paragraph 2.6), with occasional profiles of land mapped as soil type 1 (paragraph 2.5) also assessed as subgrade 3b. For soil type 2 (paragraph 2.6) the soil profiles were assessed predominantly as wetness class IV or occasionally wetness class III. Profiles of wetness class IV and either medium or heavy clay loam topsoil or profiles of wetness class III and heavy clay loam topsoils have moderately severe wetness and workability limitations which will impose restrictions on the agricultural potential of the land. Such areas of land are therefore restricted to subgrade 3b.

Urban

3.8 A track consisting of concrete and hardcore has been mapped as urban.

Non-agricultural

3.9 A small area of land towards the north of the survey area consisting of demolished buildings and scrub has been mapped as non-agricultural.

July 1995

Resource Planning Team
ADAS Cambridge

REFERENCES

GEOLOGICAL SURVEY OF GREAT BRITAIN (England and Wales) 1976. Solid and Drift Edition. Sheet 141. Scale 1:50 000.

MAFF, 1971. Agricultural Land Classification map Sheet 141. Provisional. Scale 1:63 360.

MAFF, 1988. Agricultural Land Classification of England and Wales. Revised Guidelines and Criteria for Grading the Quality of Agricultural Land. MAFF, London.

METEOROLOGICAL OFFICE, 1989. Climatological data for Agricultural Land Classification. Met. Office, Bracknell.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Sheet 3, Midland and Western England. Scale 1:250 000.

Appendix 1

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS
SOIL TYPE 1

Topsoil	Texture	:	medium/heavy clay loam
	Colour	:	brown 10YR4/3
	Stone	:	stoneless - very slightly stony
	Boundary	:	smooth, abrupt
	Roots	:	many, fine and very fine
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium/heavy clay loam
	Matrix colour	:	greyish brown 10YR5/2, brown 10YR5/3
	Stone	:	stoneless - very slightly stony
	Structure	:	strongly developed coarse and very coarse subangular blocky.
	Consistence	:	firm
	Porosity	:	<0.5% biopores
	Boundary	:	smooth, abrupt
	Roots	:	many, fine and very fine
	Depth	:	55 cm
Lower Subsoil	Texture	:	heavy clay loam/clay
	Matrix colour	:	greyish brown 10YR5/2, 2.5Y5/2
	Stone	:	moderately - very stony
	Structure	:	weakly developed medium subangular blocky.
	Consistence	:	firm
	Porosity	:	<0.5% biopores
	Roots	:	many fine
	Depth	:	120 cm

Comments : common ferri-manganiferrous concretions in subsoil horizons.

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS
SOIL TYPE 2

Topsoil	Texture	:	*medium/heavy clay loam*
	Colour	:	brown 10YR4/3
	Stone	:	stoneless - very slightly stony
	Boundary	:	smooth, abrupt
	Roots	:	many, fine and very fine
	Depth	:	30 cm
Upper Subsoil	Texture	:	clay
	Matrix colour	:	greyish brown 10YR5/2
	Stone	:	stoneless - very slightly stony
	Structure	:	moderately developed coarse prismatic breaking to medium and coarse angular blocky.
	Consistence	:	firm
	Porosity	:	<0.5% biopores
	Boundary	:	smooth, abrupt
	Roots	:	many, fine and very fine
	Depth	:	80 cm
Lower Subsoil	Texture	:	clay/clay + sand
	Matrix colour	:	greyish brown 2.5Y5/2, occasionally light olive brown 2.5Y5/3.
	Stone	:	stoneless - very slightly stony
	Structure	:	weakly developed coarse and very coarse prismatic.
	Consistence	:	firm
	Porosity	:	<0.5% biopores
	Depth	:	120 cm

Comments : common ferri-manganiferrous concretions in subsoil horizons.

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS
SOIL TYPE 3

Topsoil	Texture	:	medium sandy clay loam/medium clay loam
	Colour	:	brown 10YR4/3
	Stone	:	very slightly stony
	Boundary	:	smooth, abrupt
	Roots	:	many, fine and very fine
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium sandy clay loam/sandy loam
	Matrix colour	:	brown 10YR5/3
	Stone	:	slightly stony
	Structure	:	weakly developed coarse subangular blocky
	Consistence	:	firm
	Porosity	:	1% biopores
	Boundary	:	smooth, abrupt
	Roots	:	common fine and very fine
	Depth	:	57 cm
Lower Subsoil	Texture	:	medium sandy loam
	Matrix colour	:	yellowish brown 10YR5/4, 10YR5/6
	Stone	:	very stony
	Structure	:	too stony to estimate
	Roots	:	common fine and very fine
	Depth	:	120 cm

Appendix 2

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly include top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 - very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.