NOTTINGHAMSHIRE MINERALS LOCAL PLAN CALL FOR SITES

SITE NAME: **BOTANY BAY**

LOCATION: **LAND TO THE SOUTH OF THE A638 NEAR BARNBY MOOR AND BOTANY BAY**

	Plan Reference/Evidence	Additional Information
Proposed boundary of the site	Red Line shown on Plan 2619-5-2-3-DR0001	The site is located to the south of the A638 (Great North Road), southeast of the village of Barnby Moor and currently comprises a series of fields predominantly in arable use. Overall site area of 100 Ha.
The extent of excavations	Orange dashed line shown on Plan 2619-5-2-3-DR0001	Five main phases of working proposed with an excavation area of approximately 83 ha. Sand and gravel resource estimate of 2.438 million tonnes.
Proposed access to the site	Orange line shown on Plan 2619-5-2-3-DR0002	Proposed access off the A638 (Great North Road). Indicative details shown on Plan 2619-5-2-3-DR0002.
Potential location of processing plant	Plan 2619-5-2-3-DR0002 - Indicative Plant Site Layout.	Indicative location for processing plant, mineral haul routes, access road and ancillary/administrative facilities (i.e. wheelwash, weighbridge, car park, offices and welfare facilities) shown on Plan 2619-5-2-3-DR0002.
Phasing	Plan 2619-5-2-3-DR0001 - Outline Working Plan.	Five main working phases proposed, including the proposed plant site which will be the first phase of working.
An OS Map of the site	OS detail included on all plans.	/
Estimated number of HGV Movements per day/month/year	/	Mineral - circa 60 loads per day. Infill - circa 30 loads per day. Commencing circa 2 years after mineral extraction.

Reserve Data

	Plan Reference/Evidence	Additional Information
Quality and quantity of recoverable reserves	/	Estimated workable reserves of 2.438 mt of concreting sand and gravel.
Estimated output per annum	/	Approximately 200,000 tonnes per annum.
Estimated lifespan of the mineral working (years)	/	Approximately 12 years (2021 - 2033).
When will the site be ready to be worked?	/	Circa 2020 / 2021.

Role of Sites/Market

	Plan Reference/Evidence	Additional Information
Is the site a new Greenfield site or an extension?	/	Greenfield site.
If a Greenfield site, is it replacing an existing mineral working within or outside the county	/	The site is being promoted as a replacement for the recent production lost in the Idle Valley through the closure of Lound Quarry /Bellmoor Quarry and the closure of long term production at Finningley Quarry, which is expected to permanently close in 2019/2020.
What is your planned market	/	North Nottinghamshire , Doncaster and South Yorkshire , predominantly for use

area?		in ready mixed concrete and concrete products.
Is the location of the site optimum in terms of serving the market?	/	Yes, the site is located adjacent to the strategic road network in the form of the A638 along the northern site boundary, which links in with the A634 and ultimately the A1 approximately 2.5 km to the west.

Availability of Mineral

	Plan Reference/Evidence	**Additional Information**
Do you have the legal rights to work all of the mineral including access to a public highway or any other transport route?	/	Tarmac have a formal option agreement to take a full lease of the surface and minerals over the whole site on the grant of planning permission.

Landowner Consent

	Plan Reference/Evidence	**Additional Information**
Who is the legal owner of the site?	/	Tarmac have an option agreement from the owner of the site and the owner has fully consented for the site to be promoted.
Is the legal owner of the site also a minerals operator?	/	No
Has the legal owner made a formal agreement with any	/	Yes. Option agreement granted to Tarmac.

mineral operator for minerals exploration and/or minerals extraction?		

Agricultural Land Classification

	Plan Reference/Evidence	**Additional Information**
Agricultural land classifications found within the site	Refer to the attached assessment of Soil Resources and Agricultural Use and Quality.	In summary the majority (approximately 64%) of the land is assessed as being agricultural Subgrade 3b, with smaller areas at Subgrade 3a (approximately 29%) and Grade 2 (approximately 7%). Non-agricultural land (ie woodland and hedgerows at the northern end of the site) equates to approximately 6.4 ha.

Sensitive Receptors

	Plan Reference/Evidence	**Additional Information**
Is the site located within 250m of any sensitive receptors? (schools, residential dwellings, workplaces, healthcare facilities)	/	There are a number of residential premises within 100m of the site, which have been taken into account in the site design (i.e. through the inclusion of 100 m standoffs between the proposed extraction areas and those properties closest to the site and locating the processing plant centrally within the site in an area of low sensitivity). The properties within close proximity of the site are summarised as follows: ● Properties on the eastern edge of Barnby Moor (off the A638 and Station

		Road); ● Properties dispersed along the eastern edge of the site (off Sutton Lane); and Forest Farm situated on the southern edge of the site.

Reclamation

	Plan Reference/Evidence	Additional Information	
Proposed reclamation schemes – what opportunities for environmental benefits do you see arising from the scheme?	2619-5-2-3-DR0003 - Outline Restoration Proposals.	It is envisaged that the proposed extraction area will be restored to a combination of water-based nature conservation and agricultural land use to complement existing land uses and landscape character within the vicinity (including the presence of the Chesterfield Canal and Nature Reserves within the local area).	
Does the reclamation of the site depend on importing fill? If so, please indicate type of waste, main sources and timescales		Infill required?	Yes . Imported material to supplement use of on site overburden to infill areas to be restored to agriculture. Restoration scheme is based on importation of circa 588,000m3 of imported inert fill, expected to imported at circa 120,000 tonnes per annum.
		Type of waste	Imported inert construction and demolition material.
		Main source of waste	Excavation arisings from construction projects.
		Timescales	Progressive restoration over the course of operations (12 years proposed for life of operations). Imported infill expected to take circa 8 years during working and restoration programme.

3m high topsoil screen bund to A638

Phase 5

Phase 1

Phase 2

Phase 3

Phase 4

Silt Lagoon

Silt Lagoon

Clean Water Lagoon

Soil Storage Area

3m high topsoil screen bund to canal

3m high topsoil screen bund to canal

5m High subsoil Screen Bund to A638

5m High subsoil screen bund to isolated residential properties

3m high subsoil screen bund to Sutton Lane

A638

Sutton Lane

Botany Moor Bridge

Bridge Lodge

Nairn Lodge

Sutton Cross Roads

Botany Bay Crossing

Merrydene

Botany Bay Farm

Lady Bridge Cottages

Lady Bridge

Bramhope Canal

Legend

- Boundary: Site
- Boundary: Proposed Extraction Area
- Phase 1 — Proposed Phasing
- 15 — Existing Ground Surface Contour at 1m interval
- Inferred Route of Pipeline
- Temporary Topsoil Store (maximum 3m High)
- Temporary Subsoil Store (maximum 5m High)

DAVID JARVIS ASSOCIATES

TARMAC
A CRH COMPANY

Site Name: Botany Bay

Drawing Name: Outline Working Plan

Drawn By:	Scale @ A1:
DJA	1:4,000
Date:	**Drawing Number:**
28/11/2017	2619-5-2-3-DR0001

N

Legend

Boundary: Site

Boundary: Proposed Extraction Area

Existing Vegetation

DAVID JARVIS ASSOCIATES

TARMAC
A CRH COMPANY

Site Name:
Botany Bay

Drawing Name:
Indicative Plant Site Layout

Drawn By:	**Scale @ A1:**
DJA	1:1250
Date:	**Drawing Number:**
28/11/2017	2619-5-2-3-DR0002

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Site access road retained for farm management

A638

Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Drain

Drain

Sutton Lane

Barnby Moor Bridge

Botany Bay Crossing

Botany Bay Farm

Merrydene

Bridge Lodge

Nairn Lodge

Sutton Cross Roads

Lady Bridge Cottages

Lady Bridge

Churchfield Lane

Legend

- Boundary: Site
- Boundary: Proposed Extraction Area
- 15 — Existing Ground Surface Contour at 1m interval
- 12 — Proposed Restoration Ground Surface Contour at 1m interval
- Existing Vegetation (to be retained)
- Proposed Hedgerow with Standard Trees
- Land restored to Wet Woodland Scrub
- Land restored to Farmland
- Land restored Grass Pasture
- Open Water
- Land Restored to Reedbed/ Wetland Margins
- Inferred Route of Pipeline

DAVID JARVIS ASSOCIATES

TARMAC
A CRH COMPANY

Site Name: Botany Bay

Drawing Name: Outline Restoration Proposals

Drawn By:	Scale @ A1:
DJA	1:4,000
Date:	**Drawing Number:**
08/12/2017	2619-5-2-4-DR0003

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SOIL RESOURCES AND AGRICULTURAL USE & QUALITY OF LAND AT BOTANY BAY, RETFORD

Report 1318/1

7th July, 2017

Land Research ASSOCIATES
www.lra.co.uk

SOIL RESOURCES AND AGRICULTURAL USE & QUALITY OF LAND AT BOTANY BAY, RETFORD

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Report 1318/1

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Lockington Hall,
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7th July, 2017

SUMMARY

A soil resources and agricultural land quality survey has been undertaken of 108.6 ha of land at Botany Bay, Retford, Nottinghamshire.

The survey has shown three main soil types at the site: sandy loam soils; loamy sands over gravel and loamy over clayey soils. These soil types cause droughtiness limitations to land quality. The land is of mainly subgrade 3b agricultural quality with smaller areas of subgrade 3a and grade 2.

Two soil resources have been identified: a medium sandy loam / loamy sand topsoil and a predominantly medium sandy loam subsoil. These resources are high quality and easily handled unless in very wet conditions (i.e. during or just after heavy rainfall). Adherence to soil stripping and restoration recommendations would enable land to be returned to its current agricultural quality.

1.0 Introduction

1.1 This report provides information on the soil resources and agricultural quality and use of 108.6 ha of land at Botany Bay, Retford, which has been proposed for a sand and gravel quarry. The report is based on a survey of the land in June 2017.

SITE ENVIRONMENT

1.2 The site comprises seven fields in arable cropping and a woodland area in the north. It is bordered to the north by the Great North Road (A638), to the east by Sutton Lane, to the south by Chesterfield Canal and woodland and by adjoining agricultural land in the west.

1.3 The land is mainly level at an average elevation of approximately 15 m AOD, rising to 30 m AOD in the west.

AGRICULTURAL USE

1.4 All of the land is registered to an Entry Level plus Higher Level Stewardship (HLS) scheme as part of a wider 927 ha holding.

1.5 Four of the fields were in maize, two fields were in sugar beet, and one field was split between fodder beet and grassland (for HLS) at the time of survey.

PUBLISHED INFORMATION

1.6 1:50,000 BGS geological information shows the basal geology as Nottingham Castle Sandstone. River terrace sand and gravel deposits overlie the majority of the site with an area of glaciofluvial sand and gravel deposits in the north-west.

1.7 The National Soil Map[1] (1:250,000 scale) shows the land as within the Cuckney 1 Association. These soils are sandy and well draining with pebbly upper horizons passing to soft sandstone between 80 and 120 cm depth.

1.8 Provisional Agricultural Land Classification of the site shows the land as predominantly grade 2 with some grade 3 in the north-west. No more detailed survey of the site has been published.

[1] Ragg, J.M., *et al.,* (1984). *Soils and their Use in Midland and Western England,* Soil Survey of England and Wales Bulletin No. 12, Harpenden.

2.0 Soils

2.1 A detailed soil resource and agricultural quality survey was carried out in June 2017. It was based on observations at intersects of a 100 m grid, giving a sampling density of one observation per hectare. During the survey soils were examined by a combination of pits and augerings to a maximum depth of 1.2 m. A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

SOILS

2.2 Three soil types, varying principally in texture, were identified. They are mapped in Map 2 (see appendix) and are described below.

Sandy loam soils

2.3 These soils predominate at the site. They broadly comprise sandy loam topsoils over sandy loam or loamy sand subsoils that are gleyed in places (evidence of historic waterlogging).

2.4 An example of a gleyed sandy profile from a pit at observation 10 (Map 1) is described below:

0-32 cm	Brown (7.5YR 4/2) medium sandy loam; slightly stony with 10% small and medium rounded and subrounded hard stones; moderately developed fine subangular blocky structure; friable; smooth clear boundary to:
32-120 cm+	Very pale brown (10YR 7/4) loamy medium sand with many fine and medium distinct reddish yellow (5YR 7/8), white (7.5YR 8/1) and light grey (7.5YR 7/1) mottles; slightly stony with 10% small and medium rounded and subrounded hard stones; weakly developed fine angular structure; very friable.

2.5 An example of an ungleyed sandy profile from a pit at observation 13 (Map 1) is described below:

0-36 cm	Brown (7.5YR 4/2) medium sandy loam slightly stony with 10% small and medium rounded and subrounded hard stones; moderately developed fine subangular blocky structure; very friable; smooth clear boundary to:
36-79 cm	Reddish yellow (7.5YR 6/8) medium sandy loam with few pale diffuse reddish yellow (5YR 8/8) mottles; slightly stony with 10% small and medium rounded and subrounded hard stones; moderately developed fine angular blocky structure; very friable; diffuse smooth boundary to:
79-120 cm+	Very pale brown (10YR 7/4) medium sand with common medium distinct reddish yellow (5YR 8/8) mottles; slightly stony with 10% small rounded and subrounded hard stones; single grain; loose.

2.6 These soils are freely-draining (Soil Wetness Class I) and have a high capacity to absorb excess winter rainfall.

Loamy soils over slowly permeable subsoils

2.7 These soils are mainly located in the west, with a small patch in the east of the site. They comprise mainly sandy clay loam topsoils with bands of slowly permeable gleyed clay or sandy clay loam subsoils at varying depths.

2.8 An example profile from a nearby pit at observation 71 (see Map 1) is described below:

0-31 cm	Dark greyish brown (10YR 4/2) sandy clay loam; slightly stony with 15% small and medium hard rounded stones; moderately developed medium subangular blocky structure; friable; smooth clear boundary to:
31-69 cm	Reddish yellow (5YR 7/8) sandy clay with large distinct grey (Gley 1 6/1) mottles; slightly stony with 5-10% small hard rounded stones; weakly developed coarse prismatic blocky structure; smooth clear boundary to:
69-120 cm+	Grey (Gley 1 6/1) medium sandy loam with medium distinct reddish yellow (5YR 7/8) mottles; moderately stony with 25% small and medium hard rounded stones; weakly developed medium angular blocky structure; friable.

2.9 These soils are imperfectly-draining (Soil Wetness Class III) and have a moderate capacity to absorb excess winter rainfall.

Loamy soils over gravel

2.10 These soils are recorded in bands across the site. They broadly comprise medium sandy loam topsoils over sandy loam or loamy sand subsoils. The subsoils become gravelly below approximately 50 cm depth.

2.11 An example profile from a pit at observation 98 (Map 1) is described below:

0-35 cm	Brown (7.5YR 4/2) medium sandy loam; moderately stony with 15-20% small and medium rounded hard stones; moderately developed fine subangular blocky structure; friable; smooth clear boundary to:
35-120 cm+	Reddish yellow (7.5YR 6/8) medium sand with few fine pale reddish yellow (5YR 7/6) mottles; very stony with 40% small and medium rounded and subrounded hard stones; loose single grain structure.

2.12 These soils are freely-draining (Soil Wetness Class I) and have a high capacity to absorb excess winter rainfall.

3.0 Agricultural Quality

3.1 To assist in assessing land quality, the former Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF Agricultural Land Classification (ALC) system classifies land into five grades numbered 1 to 5, with grade 3 divided into two sub-grades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.

3.2 The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification.[2] The relevant site data for an average elevation of 15 m is given below.

• Average annual rainfall:	578 mm
• January-June accumulated temperature >0°C	1415 day°
• Field capacity period (when the soils are fully replete with water)	113 days early Dec – early Apr
• Summer moisture deficits for:	wheat: 112 mm potatoes: 106 mm

3.3 The survey described in the previous section was used in conjunction with the agroclimatic data above to classify the site using the revised guidelines for Agricultural Land Classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food.[3] There are no climatic limitations in this area of Notitnghamshire.

SURVEY RESULTS

3.4 Land of grade 2 and 3 exists on the site. Land quality is mainly determined by droughtiness with some wetness limitations in areas of the site.

[2] *Climatological Data for Agricultural Land Classification*. Meteorological Office, 1989
[3] *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*. MAFF, 1988.

Grade 2

3.5 This grade accounts for 7.2 ha of the land and comprises permeable loamy soils that are limited by slight droughtiness. This is due to the slightly sub-optimal soil moisture reserve under the dry local climate.

Subgrade 3a

3.6 This grade accounts for 29.3 ha of the land, comprising mainly sandy loams over loamy sands and sandy loams over gravel. The subsoil has a restricted moisture storage capacity which is likely to reduce average yields of arable crops.

3.7 A smaller area of land comprises sandy clay loams over clayey subsoils that are slowly permeable and limited by wetness. The dense subsoils impede drainage and this combined with the moderately high topsoil clay content result in restricted land access in winter and early spring.

Subgrade 3b

3.8 This subgrade accounts for 65.7 ha of the site, made up of land limited by droughtiness. Soils in this land grade are sandy or gravelly and will not hold enough moisture to support optimum crop growth in summer months and result in low average yields of arable (and horticultural) crops.

Non agricultural

3.9 This land comprises hedgerows and an area of woodland in the north.

Grade areas

3.10 The boundaries between the different grades of land are shown on Map 3 and the areas occupied by each are shown below.

Table 1. Areas within the survey area occupied by the different land grades

Grade/sub-grade	*Area (ha)*	*% of agricultural land*
Grade 2	7.2	7
Subgrade 3a	29.3	29
Subgrade 3b	65.7	64
Non agricultural	6.4	-
Total	108.6	100

4.0 Soil resources and their use

4.1 Government policy as outlined in the Defra Soil Strategy for England and Department of Communities and Local Government's National Planning Policy Framework (paragraphs 109 and 143) is to protect valuable soil resources from loss or damage during land disturbance and ensure that stripped soils are used to either for land reinstatement after quarrying or other beneficial use off-site.

4.2 There are two soil resource units identified for use in land restoration: one topsoil and one subsoil, which are described below and shown on Map 2.

Topsoil - TS1

4.3 The topsoil across the whole of the site is a high quality resource comprising mainly sandy loams with some sandy clay loams and loamy sands (**TS1**). This resource should be stripped as a single resource to a thickness of **300 mm**. The soil is well structured and easy to handle although handling with machinery should be avoided during or after heavy rainfall.

4.4 ***Estimated potential yield TS1:*** 306,600 m^3

Subsoil - SS1

4.5 The upper subsoil of the loamy over gravel soils and the total subsoil of the rest of the site are high quality resources to be used in restoration. This resource (**SS1**) should be stripped to a thickness of **200 mm** in areas recorded as loamy over gravel soils (see Map 2). Stripping over the rest of the site should be carried out to a thickness of **900 mm**. **SS1** should be stripped and stockpiled as a single resource.

4.6 ***Estimated potential yield SS1:*** 604,300 m^3

5.0 Soil Handling and Restoration

5.1 Soil resources can be damaged by being stripped or moved when wet. Consequently, stripping should only take place in the driest parts of the year and avoided during or just after heavy rainfall. Soils should be stripped using the excavator and dumper method as described by Sheet 1 in the MAFF Good Practice Guide for Handling Soils[4].

5.2 The resources should be stripped and stored separately in low bunds (no more than 3 m high for topsoil). Topsoil should be stripped from areas designated for storing subsoil. The bunds should be constructed either by excavator or bulldozer (Sheets 2 and 14 in the MAFF Good Practice Guide) avoiding over-compaction. They should be sown with grass to help maintain biological activity and prevent water erosion.

5.3 The soils should be removed from storage (Sheet 3 in the MAFF Good Practice Guide) and replaced by excavator during the summer using the loose tipping technique (Sheet 4 in MAFF Good Practice Guide), which avoids traffic on the restored surfaces.

Base layer

5.4 Permeable overburden should firstly be placed to a thickness of **300 mm**. In order to maintain good drainage on the site, this material should be non-compacted and have low clay content. Examples of suitable material include permeable fines from sand and gravel washing, loamy subsoil or gravel / aggregate. A combination of these materials would also be acceptable as a base layer in order to reach required volumes.

Subsoil

5.5 Subsoil resource **SS1** should be laid to a thickness of **600 mm**, the combination of the higher clay content sandy clay loam soils with the sandier soils should improve the soil's moisture storing capacity whilst maintaining its permeability.

[4] MAFF Good Practice Guide for Handling Soils, (www.defra.gov.uk/farm/environment/land-use/soilguid/)

Topsoil

5.6 The topsoil (**TS1**) should be laid at a thickness of **300 mm** bringing the profile to a total depth of 1.2 m, see figure 1. The land should then be run through with long tines to merge the topsoil / subsoil boundary following the topsoil emplacement.

TS1 **300 mm thickness** (medium sandy loam)	Run through with tines after emplacement
SS1 **600-900 mm thickness** (loamy sand/sandy loam soils)	Thickness dependent on amount of agricultural restoration / surplus SS1 resource
Permeable overburden **0-300 mm thickness** Amount required: 307,200 m^3	Thickness dependent on amount of SS1 available, suitable materials for permeable overburden include: washing fines; gravel / aggregate; permeable loamy subsoil

Figure 1. Restored soil profile to 1.2 m depth

5.7 If the management guidance is followed and the land is restored to agricultural use, the land quality of the site following restoration will be predominantly subgrade 3a. The mainly medium sandy loam topsoil and upper subsoil across the majority of the site will retain moisture so that droughtiness restrictions only slightly impede crop yield in dry summers.

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land at Botany Bay: Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
1	0-34	MSL	5	34-100+	MSL sl st	xxx				1	I	2	D
2	0-30	MSL	5	30-53	MSL sl st	xxx	53+	Too stony		1	I	3a	D
3	0-36	MSL	5-10	36-50	SZL	o	50+	Too stony		0	I	3a	D
4	0-34	LMS	10	34-45	LMS mod st	x	45-65+	MS gravelly	o	3	I	3b	D
5	0-32	MSL	5	32-67	LMS sl st	xx	67-100+	MSL/SCL	xxx	2	I/II	3a	D
6	0-30	MSL	5-10	30-46	LMS mod st	xxx	46+	Too stony		0	I	3b	D
7	0-31	MSL	5	31-48	LMS sl st	o	48-100+	LMS/MS sl st	o	2	I	3b	D
8	0-29	LMS	<5	29-48	LMS v sl st	o	48-100+	MSr	o	2	I	3b	D
9	0-28	MSL	5	28-56	LMS mod st	xx	56+	Too stony		2	I	3b	D
10	0-32	MSL	10	32-100+	MSL	xxx				0	I	2	D
11	0-31	LMS	5	31-100+	MS v sl st	o				1	I	3b	D
12	0-29	CSL	10-15	29-55+	CSL v st	xx	55+	Too stony		2	I	3a	D
13	0-36	MSL	5-10	36-79	MSL/LMS	x	79-120+	MS	xx(x)	0	I	3a	D
14	0-31	MSL	5-10	31-55	MSL	xxx	55+	Too stony		0	I	2	D
15	0-30	MSL	5-10	30+	Too stony					0	I	3b	D
16	0-31	MSL	10	31-40	MSL	xxx	40+	Too stony		0	I	3a	D
17	0-29	LMS	10-15	29-66	MSr	o	66+	Too stony		2	I	3b	D
18	0-30	CSL	10-15	30-52	CLS gravelly	o	52+	Too stony		2	I	3b	D
19	0-28	MSL	5	28-44	MSL	o	44-100+	LMSr	o	1	I	3a	D
20	0-28	MSL	10-15	28-80+	MSr	x				0	I	3b	D
21	0-30	MSL	<5	30-100+	MSL	xxx				0	I	2	D
22	0-30	SCL/MSL	5-10	30-75	SCL sl st	xxx	75-100+	SCL	xxx	0	II	2	W/D
23	0-33	MSL	10	33-63	LMS mod st	xx	63+	Too stony		0	I	3b	D
24	0-30	MSL	5-10	30-100	LMS	xxx				0	I	3b	D
25	0-31	MSL	5-10	31-45	LMS mod st	xxx	45+	Too stony		0	I	3b	D
26	0-33	SCL	5-10	33-64	MSL	xxx	64-100+	MS	xxx	0	I	3a	D
27	0-28	MSL	5	28-45	LMS mod st	o	45-80 80-100+	MS LMSr	xx x	2	I	3b	D
28	0-25	CSL	5-10	25-48	LCS mod st	o	48-72+	CSL sl st	o	1	I	3b	D
29	0-34	MSL	5	34-66	LMS mod st	o	66+	Too stony		0	I	3b	D
30	0-32	MSL	5	32-75	MLS mod st	o	75+	Too stony		0	I	3b	D
31	0-31	SCL	<5	31-44	SCL sl st	xxx	44-74+	SCLr mod st	xxx	0	II	2	W/D
32	Disturbed – track / drain												
33	0-31	MCL/SCL	5-10	31-52	SCL	xxx	52+	Too stony		0	II	3a	D
34	0-31	MSL	5-10	31-90+	LMS mod st	xxx				0	I	3b	D
35	0-32	MSL	5-10	32-90+	LMS	xxx				0	I	3b	D
36	0-35	SCL	5-10	35-50	LMS	xxx	50+	Too stony		0	I	3b	D
37	0-34	SCL	5-10	34-61	SCL	xxx	61-90+	MSL	xxx	0	I	3a	D
38	0-32	CSL	5-10	32-63	LCSr gravelly	o	63+	Too stony		3	I	3b	D
39	0-29	MSL	5	29-90+	LMS mod st	o				1	I	3b	D
40	0-28	MSL	5	28-82	MS mod st	x	82+	Too stony		0	I	3b	D
41	0-28	MSL	<5	28-100+	LMS sl st	xxx				0	I	3b	D
42	0-30	MSL	5-10	30-50	MSLr	xxx	50+	Too stony		0	I	3a	D
43	0-30	MCL	5-10	30-70+	LMS	xxx				0	I	3a	D
44	0-30	M/HCL	5-10	30-80	HCL (topsoil?dist)	o	80-100+	SCL	xxx	0	I	2	D

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
45	0-33	MSL	5-10	33-52	LMS	xxx	52-77 77-100+	LMS MS	xxx xxx	0	I	3b	D
46	0-35	MSL	5-10	35-67	MSL	xxx	67+	Too stony		0	I	3a	D
47	0-38	MSL	5-10	38-60	MLS mod st	xxx	60+	Too stony		0	I	3b	D
48	0-32	MSL	5-10	32-60	SCL	xxx	60-80 80+	LCS Too stony	xxx	0	I	3a	D
49	0-33	MSL	<5	33-90+	MSL sl st	xxx				1	I	2	D
50	0-29	MSL	5	29-65	LMS	x	65+	Too stony		0	I	3b	D
51	0-31	MSL	5-10	31-80+	MSLr mod st	xxx				0	I	2/3a	D
52	0-33	SCL	5-10	33-70	SCL	xxx	70-100+	M/CS mod st	xxx	0	I	3a	D
53	0-34	MSL	10	34-65	MS	xxx	65-100+	MS	xxx	0	I	3b	D
54	0-31	MSL	5-10	31-80+	LMS mod st	xxx				0	I	3b	D
55	0-32	MSL	5-10	32-59	SCL	xxx	59-100+	SCL/MSL	xxx	0	I	3a	D
56	0-26	MSL ca	5-10	26-44	SCL	xxx	44-80+	LMS v st	xxx	0	I	3a	D
57	0-32	MSL ca	5-10	32-60+	SCL	xxx	60+	Too stony		0	I	3a	D
58	0-33	MSL	5-10	33-44	LMSr mod st	xx	44+	Too stony		0	I	3b	D
59	0-35	MSL	5-10	35-80+	MSr	x				0	I	3b	D
60	0-30	SCL	10-15	30-40	SCL	xxx	40+	Too stony		0	I	3a	D
61	0-32	MCL	5-10	32-50	MSL	xxx	50-100	LMS	xxx	0	I	3a	D
62	0-29	SCL	5-10	29-45	SCL	xxx	45-80+ 80+	MLS Too stony	xxx	1	I	3b	D
63	0-30	MCL ca	5-10	30-60	SCL ca	xxx	60-80+ 80+	MSL Too stony	xxx	0	I	3a	D
64	0-30	SCL ca	5-10	30-50	SCL	xxx	50+	Too stony		0	I	3a	D
65	0-34	SZL/MSL	10-15	34+	Too stony					0	I	3b	D
66	0-32	LMS	5-10	32-100	MSr mod st	xx(x)				0	I	3b	D
67	0-22	MSL	5-10	22-35	LMS	xx(x)	35-80+	MSr		0	I	3b	D
68	0-36	MSL	5-10	36-80+	LMSr	xxx				0	I	3b	D
69	0-36	MSL	5-10	36-90+	LMS	xxx				0	I	3b	D
70	0-32	MLS	5-10	32-70	LMS	xxx	70+	Too stony		0	I	3b	D
71	0-31	SCL	5-10	31-69	SCL	xxx	69-80 80-100+	CSL LCS	xxx xxx	0	III	3a	W
72	0-30	MCL ca	5-10	30-62	SCL	xxx	62-100+	MSL	xxx	0	II	3a	W/D
73	0-29	SZL/MSL	5-10	29-60+	LMS	xxx	60+	Too stony		0	I	3b	D
74	0-33	MSL	5-10	33-100	MSr	x				0	I	3b	D
75	0-36	MCL/SCL	5-10	36-90+	MSL	xxx				0	I	2	D
76	0-30	MSL	10-15	30-80+	MSL	xxx				0	I	2	D
77	0-35	MSL/SCL	10-15	35-80+	MSL mod st	xxx				0	I	2	D
78	0-29	SCL	5-10	29-90+	CSL/SCL	xxx				0	I	2	D
79	0-29	SCL	5-10	29-58	SCL	xxx	58-90+	SCL	xxx	0	II/III	3a	W
80	0-35	MSL	<5	35-64	MSL	xxx	64+	Too stony		0	I	3a	D
81	0-27	MSL	5-10	27-41	MSL	o	41-82 82-100+	MSr Soft SST	o	0	I	3b	D
82	0-30	MSL	5-10	30-60	CLS mod st	xx	60+	Too stony		0	I	3b	D
83	0-31	MSL	5-10	31-77	CLS mod st	xx	77+	Too stony/gravel		0	I	3b	D
84	0-31	MSL	5-10	31-74	CLS mod st	xx	74+	Too stony		0	I	3b	D
85	0-30	MSL	5-10	30-65	MLS sl/mod st	xxx	65+	Too stony		0	I	3b	D
86	0-60+	MSL	<5	Disturbed									

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
87	0-53	MSL (dist.)	5	55-63+	LMS	o	63+	Too stony		0	I	3b0	D
88	0-27	MSL	5-10	27-62	CLS mod st	xx	62+	Too stony		0	I	3b	D
89	0-31	MSL	5-10	31-84+	MSL sl st	xxx				0	I	2	D
90	0-31	MSL	5	30-67	MS sl st	x	67+	Too stony		0	I	3b	D
91	0-29	MSL	5	29-100+	LMS sl st	xx				0	I	3b	D
92	0-28	MSL	5	28-64+	LMS mod st	xx				0	I	3b	D
93	0-30	MSL	5	30-100+	MS sl st	xx				0	I	3b	D
94	0-28	MSL	5	28-90+	CLS mod st	xxx				0	I	3b	D
95	0-31	MSL	5	31-100+	LMS sl st	xxx				0	I	3b	D
96	0-33	MSL	5	33-64	MS sl st	xxx	64+	Too stony		0	I	3b	D
97	0-30	MSL	5	30-90+	MS sl/mod st	x				0	I	3b	D
98	0-30	LMS	10	30-76	M/CS mod st	x	76+	Too stony (stopped on gravel)		0	I	3b	D
99	0-29	MSL	5-10	29-55	CS/gravel	xx	55+	Too stony		0	I	3b	D
100	0-34	MSL	5	34-90	LMS	xx	90-100+	LMSr	o	0	I	3b	D
101	0-31	MSL	5	31-70	MSLr sl st	xx	70-100+	LMSr sl st	xx	0	I	3a	D
102	0-33	MSL	5	33-100	LMS sl st	xxx				0	I	3b	D

Key to table

Mottle intensity:
- o unmottled
- x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
- xx common to many ochreous mottles and/or dull structure faces
- xxx common to many greyish or pale mottles (gleyed horizon)
- xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

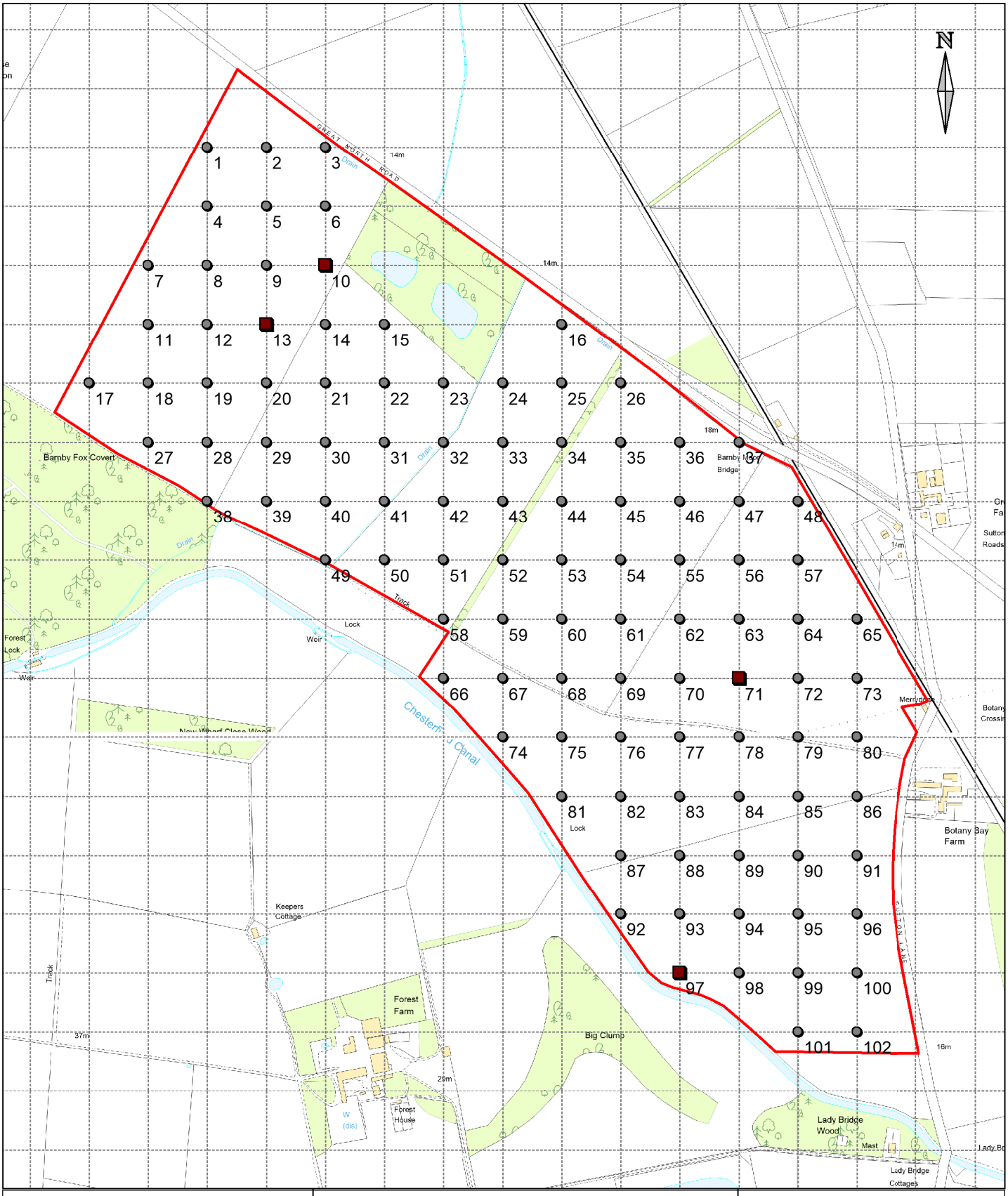
a depth underlined (e.g. <u>50</u>) indicates the top of a slowly permeable layer

gr – greyish, br – brownish, r - reddish

Texture:
- C - clay
- ZC - silty clay
- SC - sandy clay
- CL - clay loam (H-heavy, M-medium)
- ZCL - silty clay loam (H-heavy, M-medium)
- SCL - sandy clay loam
- SZL - sandy silt loam (F-fine, M-medium,C-coarse)
- SL - sandy loam (F-fine, M-medium, C-coarse)
- LS - loamy sand (F-fine, M-medium, C-coarse)
- S - sand (F-fine, M-medium, C-coarse)
- P - peat (H-humified, SF-semi-fibrous, F-fibrous)
- LP - loamy peat; PL - peaty loam
- lst – Limestone, chk - Chalk

Limitations:
- W - wetness/workability
- D - droughtiness
- De - depth
- St – stoniness
- Sl – slope
- Fl - Flooding
- T – topography/microrelief

Texture suffixes & prefixes:
- ca – calcareous: x-extremely, v-very, sl-slightly
- (ca) – marginally calcareous
- st – stony, v st – very stony
- h –organic



Client: TARMAC A CRH COMPANY

Project: Land at Botany Bay, Retford

Map title: Map 1 Survey observations

KEY

- Survey observation
- Soil/land grade description pit
- Survey area

Scale: 1:9,000 at A4

Date: 07/07/2017

1318/1

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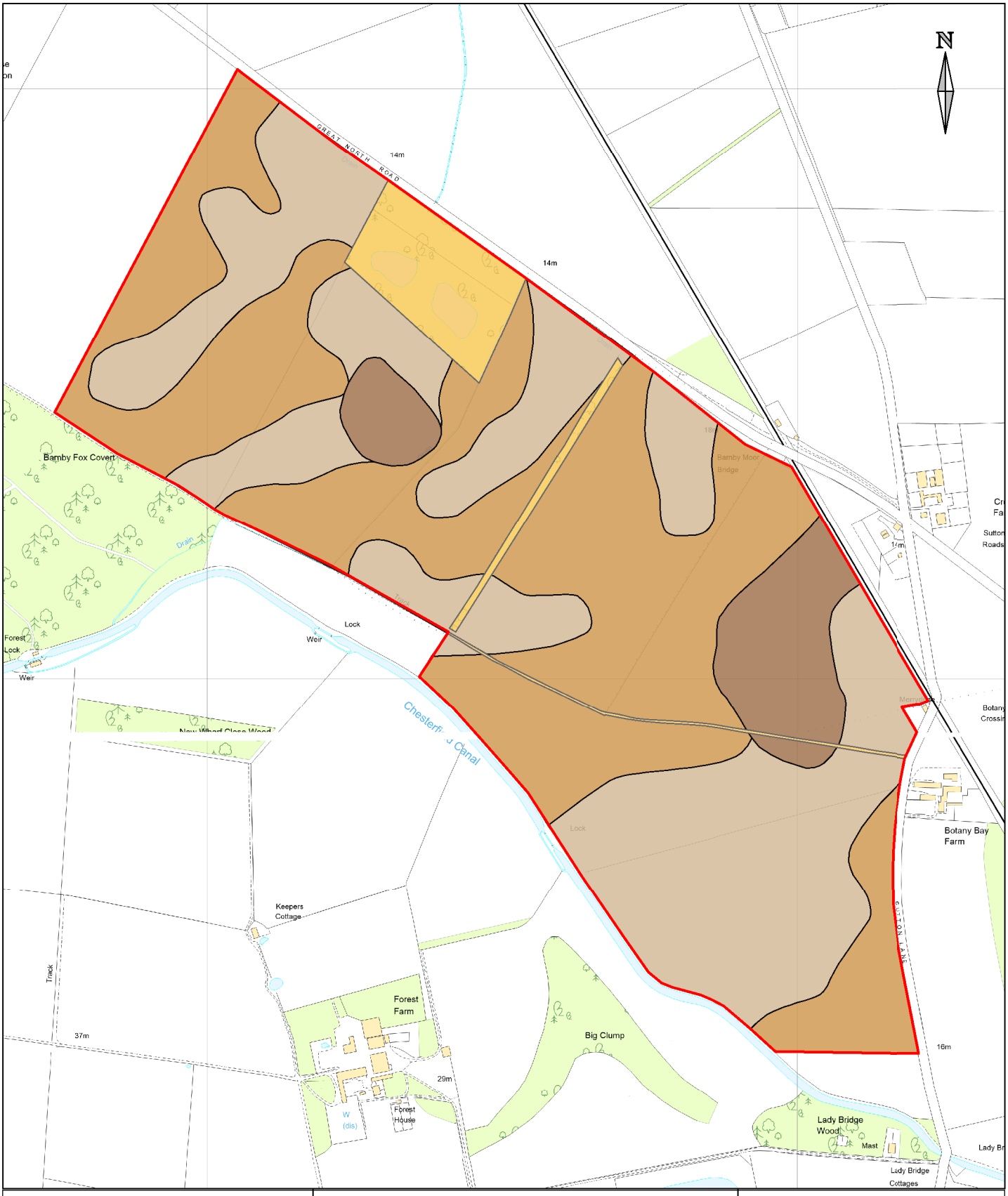

Client: TARMAC A CRH COMPANY

Project:

Land at Botany Bay, Retford

Map title:

Map 2
Soil resources

KEY

Sandy loam soils
TS1 - strip 300 mm
SS1 - strip 900 mm

Loamy over clayey soils
TS1 - strip 300 mm
SS1 - strip 900 mm

Loamy sands over gravel
TS1 - strip 300 mm
SS1 - strip 200 mm

Non agricultural

Survey area

1318/1

Scale: 1:9,000 at A4

Date: 07/07/2017

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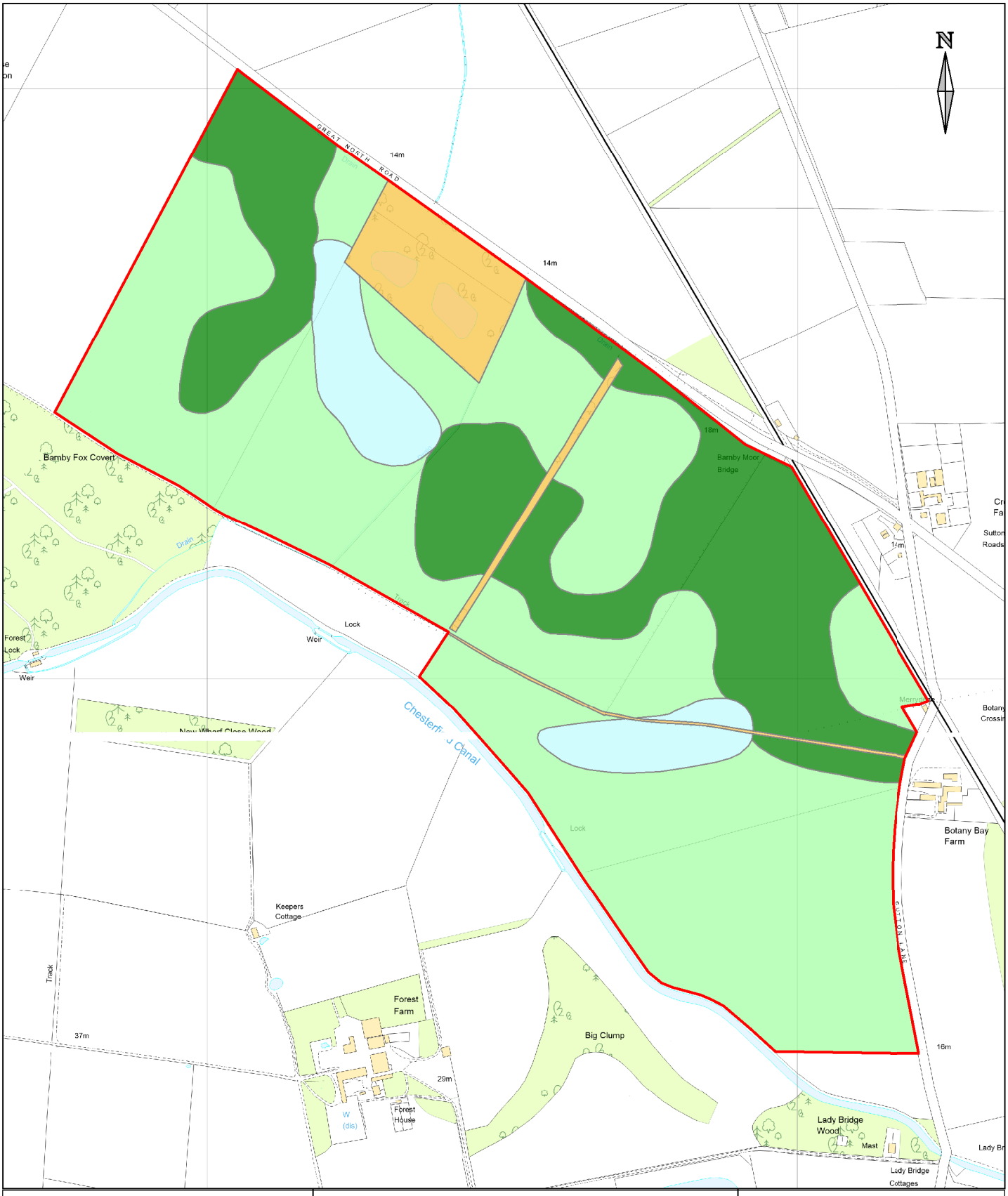

Client: TARMAC A CRH COMPANY

Project:
Land at Botany Bay, Retford

Map title:
Map 3
Agricultural land classification

KEY

- Grade 2
- Subgrade 3a
- Subgrade 3b
- Non agricultural
- Survey area

1318/1

Scale: 1:9,000 at A4

Date: 07/07/2017

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