



# Geoenvironmental Appraisal

## Land at Field Lane, Thorpe Willoughby For JSR Farms Limited

Report no: 2123/1

Date: May 2015



## SUMMARY OF GEOENVIRONMENTAL ISSUES

|                |                               |                          |            |
|----------------|-------------------------------|--------------------------|------------|
| <b>Job No.</b> | 2123                          | <b>Site area/ha</b>      | 4.7        |
| <b>Client:</b> | JSR Farms Ltd                 | <b>NGR:</b>              | SE 571 305 |
| <b>Site:</b>   | Field Lane, Thorpe Willoughby | <b>Nearest postcode:</b> | YO8 9NL    |

The site is located off Field Lane, approximately 4km west of Selby town centre, and currently comprises a pig breeding centre in the east (Area A, 2.6 ha), and an open field to the west (Area B, 2.1 ha).

Lithos were commissioned by JSR Farms (via Procters Property Consultants) to provide a geoenvironmental appraisal of the site. It is understood that the site is to be redeveloped with about 50 traditional 2 storey domestic dwellings, with associated gardens, POS and adoptable roads and sewers, together with a play area and nature trail. Lithos' investigation included a review of, the site's history and environmental setting, and a ground investigation comprising 24 trial pits, with soakaways in 10 pits, and 5 cable percussive boreholes.

A summary of salient geoenvironmental issues is provided in the Table below.

| Issue                     | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Made ground               | Made ground topsoil was encountered in 5 trial pits, with an average thickness of 300mm, and comprising slightly silty sand, with fragments of brick, concrete, scrap metal and wood.<br>A 900mm thick layer of concrete and brick rubble was noted in the northern corner of TP10.<br>A 300mm thick concrete slab was encountered in the eastern end of TP12 at 0.4m depth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Natural ground            | Topsoil (typically 300mm in thickness), over loose becoming medium dense wind-blown sand deposits (Vale of York Drift); average thickness of 3m across the site.<br>Weathered Sherwood Sandstone bedrock was encountered in 7 of the 24 pits from depths between 1.5m and 3.0m.<br>Sherwood Sandstone bedrock was encountered at relatively shallow depths in the far east and far west of the site (c. 2.5m), but deeper towards central areas (c. 5m).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Contamination             | No visual or olfactory evidence of hydrocarbon contamination was encountered during this investigation.<br>Following liaison with AHVLA, the developer will need to consider excavation and disposal of pig carcasses believed to be present in at least two (relatively limited) areas of the site.<br>A diesel AST situated within the main pig breeding facility buildings also has the potential to give rise to a degree of hydrocarbon contamination. However, this area was inaccessible to investigation.<br>A veneer of made ground is anticipated beneath buildings and areas of hardstand in Area A, and a simple post-demolition trial pit investigation will be required before definitive recommendations are provided. However, at this stage it is considered unlikely that anything more than placement of a 600mm soil cover in garden areas, and perhaps removal of a relatively small volume of fuel contaminated soils will be required. |
| Mining & quarrying        | With respect to coal mining, the site is located within a Low Risk Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Preparatory works         | Demolition of existing pig breeding facility buildings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Foundations               | Strip footings might be possible, but at this stage it is considered prudent to assume that vibro stone columns will provide the most suitable foundation solution for all new dwellings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Groundwater & excavations | Excavation stability across the site was generally poor, with spalling and/or collapse noted in all trial pits<br>Running sands were noted in TPs 18 to 21, at depths of between 0.7m and 1.9m (shallowest in the north-east). Water inflow was also noted in TP22 at 1.0m, with slight water seepage noted in the base of TP17 at 2.9m.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Flooding & drainage       | It is considered that soakaways might provide a suitable means of surface water disposal at the site, subject to the results of groundwater monitoring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Highways                  | Granular drift deposits at the site are likely to yield CBR results of around 5%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

Significant developer abnormalities relating to geoenvironmental issues at the site are:

- Excavation and disposal of pig carcasses believed to be present in at least two (relatively limited) areas of the site
- Demolition of existing buildings/foundations and grubbing up of hardstand
- Shoring of any excavations greater than about 1m deep
- Vibro stone columns

*This brief summary should not be assumed to represent a complete account of all the potential geo-environmental issues that may exist at the site. As such it is strongly recommended that the report be read in its entirety.*

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| 04 | Contamination laboratory analysis & interpretation |
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### Appendix B - Drawings

| Drawing No. | Revision | Title                             |
|-------------|----------|-----------------------------------|
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| 2123/2      | -        | Proposed site layout              |
| 2123/3      | -        | Site features                     |
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| 2123/5      | -        | Preliminary conceptual site model |
| 2123/6      | -        | Exploratory hole locations        |
| 2123/7      | -        | Revised conceptual site model     |

### Appendix C - Commission

### Appendix D - Historical OS plans

### Appendix E - Search responses#

| From     | Date     | Content                             |
|----------|----------|-------------------------------------|
| Landmark | 10/03/15 | Environmental search data           |
| Landmark | 10/03/15 | Coal Authority Mining report        |
| AHVLA    | 11/03/15 | Advice regarding animal burial pits |

### Appendix F - Exploratory records

### Appendix G - Chemical test results

### Appendix H - Geotechnical test results

### Appendix I – Soakaway test results

# Some of this data is not included within the paper or PDF copies of this report; it is all included on the CD.

## FOREWORD (geoenvironmental appraisal report)

This report has been prepared for the sole internal use and reliance of the Client named on page 1. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Lithos Consulting Limited (Lithos); such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

The report presents observations and factual data obtained during our site investigation, and provides an assessment of geoenvironmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from Lithos prior to significant revision of the development proposals.

The report should be read in its entirety, including all associated drawings and appendices. Lithos cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context. However, it should be noted that in order to keep the number of sheets of paper in the hard copy to a minimum, some information (e.g. full copy of the Landmark/Groundsure Report) is only included on the accompanying CD.

The findings and opinions conveyed in this report (including review of any third party reports) are based on information obtained from a variety of sources as detailed within this report, and which Lithos believes are reliable. All reasonable care and skill has been applied in examining the information obtained. Nevertheless, Lithos cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The report represents the findings and opinions of experienced geoenvironmental consultants. Lithos does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by Lithos, whilst fully appropriate, may not have encountered all significant subsurface conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy.

It should be borne in mind that the timescale over which the investigation was undertaken may not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present and that houses will be of two storey construction. If this is not to be the case, then some modification to this report may be required.

Lithos cannot be responsible for the consequences of changing practices, revisions to waste management legislation etc that may affect the viability of proposed remediation options.

Lithos reserve the right to amend their conclusions and recommendations in the light of further information that may become available.

**GEOENVIRONMENTAL APPRAISAL**  
**of land at**  
**FIELD LANE, THORPE WILLOUGHBY**

## **1 INTRODUCTION**

### **1.1 The commission and brief**

- 1.1.1 Lithos Consulting Limited were commissioned by JSR Farms Limited (via Procters Property Consultants) to carry out a geoenvironmental appraisal of land off Field Lane, Thorpe Willoughby.
- 1.1.2 Correspondence regarding Lithos' appointment, including the brief for this investigation, is included in Appendix C. The agreed scope of works included:
- A site walkover and inspection
  - An assessment of the land use history
  - Determination of the site's environmental setting
  - An intrusive ground investigation comprising 24 trial pits, with 10 soakaway tests and 5 cable percussive boreholes
  - Assessment of the geotechnical properties of the near surface deposits to enable provision of foundation and highway recommendations
  - A qualitative assessment of contamination risks
  - Recommendations for the necessary site preparatory and remediation works
- 1.1.3 Primary aims of this exploratory phase of investigation within Area A (pig breeding facility) were to identify salient geoenvironmental issues affecting to support and meet the conditions of existing planning consent. With respect to Area B (open field), these were to support the submission of a planning application, and enable the developer to obtain budget costs for foundations and site preparatory and remediation works.

### **1.2 The proposed development**

- 1.2.1 It is understood that consideration is being given to redevelopment of the site with about 51 two storey domestic dwellings with associated gardens, POS, adoptable roads and sewers, together with a play area and nature trail. A site layout has been provided (Drawing ref: R33189 SK25/06/13-2) and has been reproduced as drawing no. 2123/2 in Appendix B.
- 1.2.2 At this stage planning consent is restricted to the pig breeding centre; the eastern half of a wider site, referred to as Area A in this Report.
- 1.2.3 Following initial refusal and a successful appeal, the proposed redevelopment has outline planning permission for residential development, following the demolition of the existing buildings within the site in accordance with the terms of Application Ref: 2013/1041/OUT dated 11<sup>th</sup> October 2013.
- 1.2.4 With respect to ground, the planning consent includes a number of Conditions; most notably:
- Condition **9**. Requires a Construction Environmental Management Plan and implementation of mitigation measures to protect groundwater.
  - Condition **10**. Requires a scheme for the provision of surface water drainage works, including assessment of the suitability of soakaways as a means of surface water disposal.

- Condition **13**. This states: *'No development shall take place until a remediation strategy that includes the following components to deal with the risks associated with contamination of the site has been submitted to and approved in writing by the Local Planning Authority:*
  - A site investigation scheme, based on a desk top study to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off-site.
  - The results of the site investigation and the detailed risk assessment and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures require and how they are to be undertaken.
  - A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.
- Condition **14**. Requires a verification report to demonstrate completion of works set out in the approved remediation strategy.
- Condition **15**. Deals with unexpected contamination encountered during development of the site.
- Condition **16**. This states: *'Piling or any other foundation designs using penetrative methods shall not be undertaken without the express written consent of the Local Planning Authority. The development shall be carried out in accordance with the approved details.'*

1.2.5 This Report will assist with the discharge of Conditions 10, 13 and 16; although a separate Remediation Strategy & Verification Plan Report will ultimately be required. Conditions 14 & 15 cannot be discharged prior to completion of the necessary site preparatory and remediation works.

1.2.6 Lithos could prepare a Construction Environmental Management Strategy (CEMS) to identify and assess risks associated with the construction phase, and make recommendations on the measures required to mitigate them, in order to minimise the environmental impact of the works. The subsequent Construction Environmental Management Plan (CEMP) will need to accord with, and address all matters contained within the approved CEMS.

1.2.7 The CEMP is typically prepared by the Developer or their Principal Contractor, and must take account of the CEMS. The CEMP must then be communicated to site operatives, site management staff and delivery drivers.

### 1.3 Report format and limitations

1.3.1 All standard definitions, procedures and guidance are contained within Appendix A, which includes background, generic information on:

- Assessment of the site's environmental setting
- Ground investigation fieldwork
- Geotechnical testing
- Contamination testing
- Soakaways

1.3.2 General notes and limitations relevant to all Lithos geoenvironmental investigations are described in the Foreword and should be read in conjunction with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

## 2 SITE DESCRIPTION

### 2.1 General

- 2.1.1 The site's location is shown on Drawing No. 2123/1 presented in Appendix B to this report. Site details are summarised in the Table below.

| Detail           | Remarks                                                                                                                                          |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Location         | 4 km west of Selby town centre                                                                                                                   |
| NGR              | SE 571 305                                                                                                                                       |
| Approximate area | 4.7 ha (12 acres)                                                                                                                                |
| Known services   | Underground electric<br>Underground BT<br>Underground water<br>Overhead BT<br>Various private underground water/sewerage utilities (Area A only) |

### 2.2 Site features

- 2.2.1 Lithos completed a walkover survey of the site on 12<sup>th</sup> March 2015. The site currently comprises a pig breeding centre in the east (Area A, 2.6 ha), and an open field in the west (Area B, 2.1 ha). The site lies immediately north of the A63 Selby by-pass, but is accessed via Field Lane.
- 2.2.2 Area A is currently an operational pig breeding centre, established around the 1940s. It comprises pig sheds, a laboratory, garages, open farm space and storage barns interspersed with concrete hardstand, roadways, grass and shrubbery. This area is surrounded by hedgerows and mature trees on all sides.
- 2.2.3 Area B comprises an open green field surrounded by hedgerows, mature trees and low chain-link fencing.
- 2.2.4 Existing salient features, at the time of the walkover are presented on Drawing No. 2123/3 in Appendix B to this report, and summarised in the Table below.

| Feature               | Remarks                                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current Access        | Off Field Lane                                                                                                                                       |
| Topography            | Relatively flat                                                                                                                                      |
| Approximate areas     | 3,800 m <sup>2</sup> buildings<br>6,500 m <sup>2</sup> concrete hardstand<br>36,700 m <sup>2</sup> grass                                             |
| Nature of boundaries  | Area A – Mature trees on all sides, with intermittent chain-link fencing.<br>Area B – Mature trees and intermittent chain-link fencing on all sides. |
| Surrounding land uses | North & east – sports fields<br>South and West – A63, with arable farmland beyond.                                                                   |

- 2.2.5 A selection of site photographs is included on Drawing 2123/4.

## 2.3 Site operations

### Area A

- 2.3.1 The breeding centre currently has about 150 pigs. It is understood that the pigs are kept indoors at all times, although this has not always been the case.
- 2.3.2 The two main buildings are single storey 'shed' type structures in the centre of site, which are of brick and concrete construction, with corrugated asbestos-cement roofs. The southern-most shed comprises a laboratory used for the preparation and testing of boar semen, whilst the northern-most shed houses pigs.
- 2.3.3 A third main 'shed' housing pigs exists in the south-east of the area. Air-coolers associated with temperature control inside the buildings are visible outside the main two 'sheds', and comprise large extractor fans and pipes.
- 2.3.4 There is a two storey 'office' type building exists adjoining the two main pig sheds and laboratory. This is largely disused and is in a state of disrepair, and comprises a toilet and seminar room. An above-ground storage tank (AST) of about 20,000 litres capacity exists within this building. The refill point for this tank comprises a small pipe with an associated tap, which protrudes out of the building. No evidence of spillage or leakage was visible at the time of the site walkover.
- 2.3.5 A set of 4 garages, predominantly of wood and brick, are positioned in the centre north-west of Area A, and have mains electricity within.
- 2.3.6 Two metal feeding silos, containing pig feed in the form of pellets are present immediately outside the southern wall of the southern-most main 'shed'. A further feeding silo exists immediately to the eastern wall of the third pig 'shed' in the south-west of Area A.
- 2.3.7 To the north of the main sheds, there is a storage area comprising two main barns predominantly containing straw, constructed from breeze blocks, corrugated metal and with asbestos-cement sheet roofs. The area surrounding these barns has intermittent areas of hardstand and grass. It is understood that the areas of hardstand were associated with former pig pens. Various stockpiles of straw and pig manure were present in this area. Other materials stored in this area include wooden pallets, chopped wood and small items of farm machinery. It is believed that the pig manure is stockpiled and subsequently taken away from the site in lorries.
- 2.3.8 It is thought that a relict drainage system, associated with the disposal of slurry, is present beneath this area, but is now redundant. It is understood that the slurry once drained into a slurry pit in the adjacent field to the north of the site.
- 2.3.9 A large telephone mast and associated sub-station is present in the north-west corner of Area A.
- 2.3.10 From discussion with the breeding centre manager, it is understood that there are buried pig carcasses in the north-west corner of Area A, mainly behind the larger of the two barns, adjacent to the telephone mast. Small depressions in the ground in this location also potentially indicate the presence of a burial site. It is understood that no more than around 10 carcasses would have been buried in this location, at relatively shallow depths.
- 2.3.11 Further anecdotal evidence indicated the presence of possible buried asbestos-cement roofing also in the north-west corner of Area A, at an undisclosed depth. It is thought that no more than 2 or 3 sheets were buried in this location.

- 2.3.12 It is also understood that a further pig carcase burial pit (albeit much older, perhaps 1960-70s) is present beneath the existing hardstand to the east of the south-western barn. It is understood that these pigs were slaughtered or died as a result of an outbreak of swine dysentery. Again, it is thought that only a small number of pig carcasses (perhaps 10) were buried here.
- 2.3.13 Two houses exist within the grounds of the pig breeding centre and within the site boundary.
- 2.3.14 A large 'tank' of concrete construction, with an associated pumping station is present in the south-west corner of Area A. It is understood that both pig waste and human waste flows in underground sewers from the three pig sheds, and from the two houses within the site boundary to the south-east. Anecdotal evidence suggests that this system is in a very poor state of repair, and is now essentially defunct. It is understood that the solids are occasionally spread onto the nearby grass.
- 2.3.15 The 'liquid' which separates from the solids within this pit flows into a separate tank further to the south-west corner, after which it is pumped into a small pool within a thickly vegetated area.
- 2.3.16 An underground slurry 'pit' also exists in this area, which contains waste from the three main pig sheds.
- 2.3.17 Drainage infrastructure across the site mainly comprises soakaways.

#### Area B

- 2.3.18 Chopped wood is stored in the south of the area, with occasional stockpiles of wood chippings are dotted around the site.
- 2.3.19 Flooding is known to occur in the north-east corner of the northern field, which appeared relatively boggy at the time of the walkover.
- 2.3.20 Anecdotal evidence indicates that slurry arising from the pig breeding centre is sometimes sprayed over this field as a natural fertilizer.
- 2.3.21 There is also a large stockpile of tree debris and wood (to be burnt as a fire) in the centre west of this section.

## 2.4 AHVLA information

- 2.4.1 Lithos have contacted the Animal Health and Veterinary Laboratories Agency (AHVLA) who have advised that they have no records of any mass burial sites from the 2001 Foot & Mouth outbreak. Prior to that outbreak AHVLA do not hold any records to refer to as it was not illegal to bury animal carcasses prior to that date. There may well be remains of animals buried on this site which have died of natural causes.
- 2.4.2 AHVLA state that it is illegal to dig up any carcase or part of a carcase under the Animal Health Act 1981. If any excavation encounters any such remains work must cease immediately, and the AHVLA be contacted. An Officer from the AHVLA will then visit the site and advise on the safe disposal of the remains and issue a licence to authorise this. Advice will also be given on the cleansing and disinfection of any machinery used. No carcase should be touched by hand unless protective clothing is worn.
- 2.4.3 AHVLA also provided a copy of their Code of Practice relating to precautions to prevent the spread of animal and poultry diseases.
- 2.4.4 Correspondence received from AHVLA is included in Appendix E.

### 3 SITE HISTORY

- 3.1 Site centred extracts from Ordnance Survey (OS) plans dating back to 1850 have been examined. Some of these plans are presented in Appendix D to this report
- 3.2 The Table below provides a summary of the salient points relating to the history of the site. It is not the intention of this report to describe in detail all the changes that have occurred on or adjacent to the site. Significant former uses/operations are highlighted in bold text for ease of reference.

| Date | Site                                                                                                                                                                                                                              | Surrounding land                                                                                                                  |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1850 | Open agricultural fields.                                                                                                                                                                                                         | 'Field Lane' shown immediately to south.<br>'Gravel Pit' shown approximately 1km to south-east.                                   |
| 1894 | No significant change.                                                                                                                                                                                                            | Gravel pit no longer shown.                                                                                                       |
| 1908 |                                                                                                                                                                                                                                   | 'Sand pit' shown approximately 1km to south-south-east.                                                                           |
| 1953 | Long rectangular building shown in south-east, with associated small square outbuilding.                                                                                                                                          | 'Sand pit' has extended. Additional 'sand pit' present approximately 1km to the south.                                            |
| 1964 | <b>'Pig Progeny Testing Station'</b> now present, comprising two main elongate rectangular buildings, with associated <b>slurry tanks</b> and driveways.<br>Terraced housing appears to straddle the south-eastern site boundary. | Drains shown immediately north-west of site, and along northern boundary.<br>Sewage works shown approximately 150m to south-east. |
| 1971 | <b>Fifteen small rectangular buildings</b> to north of main building, thought to be pig pens.                                                                                                                                     | <b>'Pig breeding Station'</b> shown 100m to north of site.                                                                        |
| 1984 | Site now labelled <b>'Selby Pig Testing Station'</b> .                                                                                                                                                                            | No significant change.                                                                                                            |
| 1989 | 'Vehicular dip' labelled at site entrance.                                                                                                                                                                                        |                                                                                                                                   |
| 1992 | 'Pig pens' no longer present. Site now labelled 'Pig breeding centre'.                                                                                                                                                            | Sports fields shown immediately to east.                                                                                          |
| 2014 | No significant change.                                                                                                                                                                                                            | A63 Selby bypass now runs immediately beyond site's southern boundary.                                                            |

## 4 ENVIRONMENTAL SETTING

### 4.1 General

4.1.1 Notes describing how the site's environmental setting has been assessed are included in Appendix A to this report. The responses received from Landmark and the Coal Authority are presented in Appendix E. These responses are summarised below, together with the findings of our own "desk study" investigation.

| Issue        | Data reviewed               | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Geology      | 1:50,000 BGS map (Sheet 79) | Drift – Silty fine sand with rare gravel. Solid – Sherwood Sandstone.<br>Shallowest coal seam > 200m depth.<br>Strata dip – 5 degrees to north-east.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Mining       | Coal Authority<br>BGS maps  | This site is located within a Coal Mining Development Low Risk Area (within the defined coalfield, but no known defined risks have been recorded by the Coal Authority; there may still be unrecorded issues). See also Section 4.3.<br>Past and present workings – property is not within the zone of likely physical influence on the surface from past underground workings. Opencast – The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.<br>Mine entries – There are no known coal mine entries within, or within 20m of the site boundary. |
| Quarrying    | Historical OS plans         | A 'gravel pit' is shown approximately 1km to the south-east, no longer shown on plans after 1894. A large 'sand pit' exists about 1km south of site – no longer shown on plans after 1973.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Radon        | BRE Report BR211            | No measures required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Hydrogeology | Envirocheck Report          | Source Protection Zone? Site lies in a groundwater Source Protection Zone (Zone 3).<br>Aquifer (Drift – not present); Principal Aquifer (Solid).<br>Groundwater abstractions? Abstraction borehole present 730m south of site, by Monaghan Mushrooms Ltd, and Gateforth Park Ltd – for Food and Drink: Process Water.<br>Soil leaching potential - High. Pollution incidents? None relating to site.                                                                                                                                                                                                            |
| Hydrology    | Envirocheck Report          | Nearest watercourse(s) – Drain immediately to north of site. Water quality - ?.<br>Pollution incidents? None relating to site.<br>Abstractions? No significant.<br>Discharge consents? On site– Multiple domestic properties discharge sewage to groundwater. Selby Pig Breeding Centre had discharge consent for discharge of effluent into Town Dyke-Selby Dam; revoked in 1997.                                                                                                                                                                                                                              |
| Flood risk   | Environment Agency          | The site lies in Flood Zone 1, where the risk of flooding from rivers or the sea is classified as low.<br>The site area is greater than 1 hectare, therefore a Flood Risk Assessment, focused on the management of surface water run-off, will be required. Development that increases the amount of impermeable surfaces can result in an increase in surface water run-off, which in turn can result in increased flood risk both on site and elsewhere within the catchment.                                                                                                                                 |
| Landfills    | Environment Agency          | None within 500m.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 4.2 Source protection zones (SPZ)

- 4.2.1 The site lies within a Source Protection Zone (SPZ3) for the Sherwood sandstone (principal) aquifer. It is likely that the Environment Agency will request more detail, and at an earlier stage, than usual with respect to drainage design and measures to mitigate pollution (interceptors etc). They may require drainage to be kept at shallowest possible depths. They may also require details of mitigation measures to reduce pollution risks during the construction phase.

## 4.3 Coal & mining

- 4.3.1 A CA mining report states that:
- *The property is not within the zone of likely physical influence on the surface from past underground workings. This means there are no known shallow mineworkings.*
  - *The property is not in the likely zone of influence of any present underground coal workings.*
  - *The property is in an area for which a licence to remove or otherwise work coal using underground methods was granted in October 1994.*
  - *The property is in an area for which notices of entitlement to withdraw support were published in 1994 and 1997.*
- 4.3.2 The Selby coalfield was a large scale deep underground mine complex, with pitheads at Wistow, Stillingfleet, Riccall, North Selby, Whitemoor and Gascoigne Wood. All coal was brought to the surface at Gascoigne Wood, being distributed onwards by rail. Mining peaked in 1993–4 but subsequent loss of subsidy, geological problems, and low UK coal prices made the pits unprofitable and closure was announced in 2002, with mining activity completely ended by 2004.
- 4.3.3 UK Coal generally work on a five-year rolling plan updated annually in March/April. Given closure of the Selby coalfield, it seems highly unlikely that extraction associated with the above licence is included in the current 5 year plan, and it also seems highly unlikely that coal will be extracted from beneath the site in the foreseeable future.
- 4.3.4 It is our understanding that if mining were to proceed in the future (i.e. beyond the current 5 year plan), then UK Coal/The Coal Authority would be liable for damage claims arising from future mining on the site. If mining were scheduled then the onus would be firmly on the developer to take precautions.
- 4.3.5 The foundation recommendations included in this Report do not allow for precautions against future mining and are unlikely to be structurally sound should such mining ever take place within influencing distance of the site. Judgement regarding whether to use conventional footings or rafts would be your own, taking into account the legal standpoint, and understanding the potential risks.
- 4.3.6 Immediately prior to development it would be prudent to have solicitors check the above with UK Coal, but risks appear negligible.

## 5 GROUND INVESTIGATION DESIGN

### 5.1 Anticipated ground conditions & potential issues

5.1.1 Based on the data reviewed in Section 4 (Environmental Setting), anticipated ground conditions are expected to comprise:

| Anticipated condition | Remarks                                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------|
| Made ground           | None of significance expected during this investigation. Possible made ground present in far north of area A. |
| Natural soils         | A veneer of topsoil, overlain by silty sand deposits.                                                         |
| Bedrock               | Sherwood Sandstone bedrock anticipated at relatively shallow depths (perhaps 1m to 3m)                        |
| Mineworkings          | Not anticipated                                                                                               |
| Groundwater           | Expected at relatively shallow depths within Sherwood Sandstone bedrock.                                      |

5.1.2 Based on the data above and that in Sections 2 (Site Description) and 3 (History), potential ground-related issues associated with this site are likely to include:

| Type of issue                            | Specific issue                                  | Remarks                                                                                                 |
|------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Potential on-site contamination sources  | 1. AST<br>2. raw material storage etc           | 1. Possible hydrocarbon contamination<br>2. Ammonia, sulphide, sulphates,                               |
| Potential off-site contamination sources | 1. None significant                             |                                                                                                         |
| Potential geotechnical hazards           | 1. relict buried obstructions<br>2. loose sands | 1. associated with former pig breeding facility buildings<br>2. associated with windblown sand deposits |
| Other potential constraints              | 1. underground and/or overhead utilities        |                                                                                                         |

### 5.2 Preliminary conceptual site model

5.2.1 A preliminary conceptual site model, presented as Drawing No 2123/5 in Appendix B, has been prepared after consideration of all the data presented in Sections 2 to 5.1 inclusive of this report.

5.2.2 An assessment of potential contaminants associated with the former uses has been undertaken with reference to CLR8 and the following DETR Industry Profile: '*Animal and animal products processing works*'. As a consequence of this assessment, anticipated potential contaminants, within soil and/or groundwater include:

- Pathogens
- Metals
- Sulphides
- Phenol
- PAHs
- Dieldrin

5.2.3 Potential pollutant linkages are shown on the preliminary conceptual site model.

- 5.2.4 Activities such as slurry spreading and unregulated burial have all occurred on farmland. Potential pollutants associated with farming activity might include any of the following:

| Agricultural activity                                    | Potential contaminant                       |
|----------------------------------------------------------|---------------------------------------------|
| Slurry pits, manure heaps, septic tanks                  | Methane, metals, nitrates, oxygen depletion |
| Sewage farming, slurry spreading                         | Methane, metals, nitrates, oxygen depletion |
| Carcase burial                                           | Anthrax & other biohazards                  |
| Crop & animal protection                                 | Pesticides & herbicides                     |
| Fuel storage                                             | Hydrocarbons, methane, oxygen depletion     |
| Equipment maintenance                                    | Hydrocarbons, metals                        |
| Waste burial, land levelling, backfilling ponds/quarries | Methane, metals, PAH etc                    |
| Derelict buildings                                       | Asbestos                                    |

### 5.3 Ground investigation design & strategy

- 5.3.1 The preliminary conceptual site model was used as a basis for design of an appropriate ground investigation, the scope of which is summarised below.

| Exploratory holes | Purpose                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TPs 1 to 23       | <ul style="list-style-type: none"> <li>To determine the general nature of soils underlying the site, including the:</li> <li>nature, distribution and thickness of made ground</li> <li>nature, degree and extent of contamination</li> <li>proportion of undesirable elements eg biodegradable matter, foundations etc</li> <li>suitability of the ground for founding structures and highways</li> </ul> |
| Ten TPs           | To determine whether soakaways could be utilised for storm water drainage                                                                                                                                                                                                                                                                                                                                  |

- 5.3.2 Proposed exploratory hole locations were selected to provide a representative view of the strata beneath the site. A nominal 40m grid spacing was proposed. Additional exploratory locations might be scheduled by the site engineer in light of the ground conditions actually encountered.
- 5.3.3 The number of representative samples taken will be reflective of the geological complexity actually encountered. However, in general about 3 samples will be taken from most trial pits.

## 6 FIELDWORK

### 6.1 Objectives

- 6.1.1 The original investigation strategy is outlined in Section 5.3 above.
- 6.1.2 The additional exploratory holes listed below were advanced in light of ground conditions actually encountered.

| Exploratory holes | Purpose                                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TP 24             | To facilitate soakaway testing which was initially planned in TP22, due to unsuitable strata encountered.                                                  |
| BHs 1 to 5        | To retrieve geotechnical data from depth<br>To install monitoring wells across the site in order to determine groundwater levels and assess flow direction |

### 6.2 Exploratory hole location constraints

- 6.2.1 No access was available in within existing buildings or concrete hardstand, due to ongoing operations.

### 6.3 Scope of works

- 6.3.1 Fieldwork was supervised by Lithos between 25<sup>th</sup> and 26<sup>th</sup> of March, and the 27<sup>th</sup> April 2015, and comprised the exploratory holes listed below.

| Technique                   | Exploratory holes                                | Final depth(s) | Remarks                                           |
|-----------------------------|--------------------------------------------------|----------------|---------------------------------------------------|
| Trial pitting (machine dug) | TPs 1 to 24                                      | 1.2m to 3.3m   | Collapse of trial pit walls noted across the site |
| Soakaway tests              | Within TPs 1, 3, 6, 10, 12, 13, 16, 17, 20 & 24. | 1.4m to 2.0m   | Soakaway pits filled with stone                   |

- 6.3.2 Notes describing ground investigation techniques, in-situ testing and sampling are included in Appendix A to this report.
- 6.3.3 Exploratory hole logs are presented in Appendix F to this Report. These logs include details of the:
- Samples taken
  - Descriptions of the solid strata, and any groundwater encountered.
  - Results of the in-situ testing
  - The monitoring wells installed
- 6.3.4 Exploratory hole locations are shown on Drawing No. 2123/6 presented in Appendix B.

## **7 GROUND CONDITIONS**

### **7.1 General**

- 7.1.1 A complete record of strata encountered beneath the proposed development site is given on the various exploratory hole records, presented in Appendix F.

### **7.2 Made ground**

- 7.2.1 Made ground topsoil was encountered in 5 trial pits (TPs 4, 5, 9, 10 & 11), with an average thickness of 300mm, and comprised slightly silty sand, with anthropogenic fragments of brick, concrete, scrap metal and wood.
- 7.2.2 A 900mm thick layer of concrete and brick rubble (comprising cobble and boulder sized fragments) was encountered in the northern corner of TP10. This is likely to have been buried, as a means of 'disposal' of unwanted rubble from farming operations.
- 7.2.3 A 300mm thick concrete slab was also encountered in the eastern extent of TP12 at 0.5m depth. It is possible that this concrete slab is associated with relict concrete hardstand, or perhaps a relict foundation of a pre-existing building.
- 7.2.4 Whilst not encountered during this investigation, the possibility of asbestos sheeting (used as shuttering), and/or fragments of asbestos sheeting within the hardcore beneath concrete slabs, or buried beneath other areas of the site.

### **7.3 Natural ground**

- 7.3.1 Natural ground was encountered in the majority of the exploratory holes, and typically comprised topsoil over red silty sands, with rare subrounded gravel. Weathered Sherwood Sandstone bedrock was encountered in 7 pits, at depths between 1.5m and 3.0m.
- 7.3.2 The red silty sands are likely to be windblown deposits derived from Sherwood Sandstone bedrock. These deposits had an average thickness of around 3m across the site.
- 7.3.3 Weathered Sherwood Sandstone was encountered in all 5 boreholes, and TPs 5 to 9, and 18 to 19. This sandstone bedrock was encountered from a typical depth of 2.1m in the west, 2.2m in the east, and significantly deeper (around 5m) within more central areas of the site.
- 7.3.4 Sherwood Sandstone bedrock was encountered in trial pits in the far west (typically c. 2.6m depth), and far east (typically c. 2.7m depth) of the site (TPs 5 to 9, and 18 & 19). However, bedrock was encountered in cable percussion boreholes from an average depth of 5.4m in the centre of the site.
- 7.3.5 Cohesive drift deposits were encountered in BHs 2, 3 & 5, comprising firm red clay. The clay encountered was in relatively thin bands in each of the aforementioned boreholes, at depths between 1.5m (BH05, 200mm thick) and 3.9m (BH03, 800mm thick). A 600mm thick band of clay was also encountered at 3.0m depth in BH02.
- 7.3.6 The in-situ relative density of the granular deposits on site was established by carrying out Standard Penetration Tests (SPTs) during the drilling of the boreholes; see Section 12.5.
- 7.3.7 Reported blow counts suggest densities predominantly in the 'loose' range, especially within the upper 1.5m. Beyond 1.5m, the granular drift deposits can generally be regarded as 'medium dense', with densities generally increasing with depth.

## 7.4 Visual & olfactory evidence of organic contamination

- 7.4.1 No visual or olfactory evidence of hydrocarbon contamination was encountered in any of the exploratory holes.

## 7.5 Groundwater

- 7.5.1 Groundwater accompanied by running sands was encountered in TPs 18 to 21, at depths of between 0.7m and 1.9m. Water inflow was also noted in TP22 at 1.0m depth, with slight water seepage noted in the base of TP17 at 2.9m.
- 7.5.2 Five groundwater monitoring wells were installed in BHs 1 to 5 and groundwater levels recorded on 18<sup>th</sup> May 2015 are summarised below.

| Hole ID | Response zone<br>(depth range & strata)                  | Groundwater body                                    | Standing water level<br>(m bgl) |
|---------|----------------------------------------------------------|-----------------------------------------------------|---------------------------------|
| BH01    | 1.5m to 4.5m - Vale of York Drift and Sherwood Sandstone | Shallow (drift) and deep in solid sandstone bedrock | 2.4                             |
| BH02    | 1.5m to 4.5m - Vale of York Drift and Sherwood Sandstone |                                                     | 3.2                             |
| BH03    | 1.5m to 4.5m - Vale of York Drift and Sherwood Sandstone |                                                     | 2.9                             |
| BH04    | 1.0m to 4.0m - Vale of York Drift and Sherwood Sandstone |                                                     | 2.7                             |
| BH05    | 1.3m to 3.8m - Vale of York Drift and Sherwood Sandstone |                                                     | 1.5                             |

## 7.6 Stability

- 7.6.1 Stability of excavations within granular drift deposits was generally very poor, with collapse and/or spalling noted in the majority of trial pits.

## 7.7 Revised conceptual ground model (ground conditions)

- 7.7.1 The Preliminary Conceptual Site Model has been revised in light of data obtained during the ground investigation, most notably with respect to:
- The nature and distribution of made ground, including the presence of significant buried obstructions
  - The strength, nature and depth of underlying natural strata
  - The nature and distribution of contamination (based on visual/olfactory evidence only)
- 7.7.2 The revised Conceptual Site Model is presented in Appendix B, as Drawings 2123/5.
- 7.7.3 Further refinement of the Conceptual Site Model is presented in Sections 10.2, where the results of laboratory testing for contaminants have been considered.

### Summary of Ground Conditions

| Hole | Final depth (m) | Depth to Base of (m): |         |                    |                              | Remarks                                                                                |
|------|-----------------|-----------------------|---------|--------------------|------------------------------|----------------------------------------------------------------------------------------|
|      |                 | Made Ground Topsoil   | Topsoil | Vale of York Drift | Weathered Sherwood Sandstone |                                                                                        |
| TP01 | 2.0             |                       | 0.3     | >2.0               | -                            | Spalling of pit walls from 1.0m                                                        |
| TP02 | 3.1             |                       | 0.3     | >3.1               | -                            | Constant collapse from 2.0m                                                            |
| TP03 | 1.7             |                       | 0.5     | >1.7               | -                            | Spalling from 1.0m                                                                     |
| TP04 | 2.6             | 0.4                   | -       | >2.6               | -                            | Complete collapse at 2.6m                                                              |
| TP05 | 3.1             | 0.3                   | -       | 3.0                | >3.1                         | Constant collapse from 1.8m                                                            |
| TP06 | 1.9             |                       | 0.3     | 1.8                | >1.9                         | Spalling from 1.0m                                                                     |
| TP07 | 2.8             |                       | 0.3     | 1.5                | >2.8                         | Spalling from 0.3m                                                                     |
| TP08 | 2.7             |                       | 0.3     | 2.1                | >2.7                         | Spalling from 0.8m                                                                     |
| TP09 | 3.3             | 0.3                   | -       | 2.9                | >3.3                         | Complete collapse at 3.3m                                                              |
| TP10 | 2.0             | 0.2                   | -       | >2                 | -                            | 0.9m thickness of made ground comprising concrete and brick in northern corner of pit  |
| TP11 | 3.1             | 0.4                   | -       | >3.1               | -                            | Complete collapse at 3.1m                                                              |
| TP12 | 2.0             | -                     | 0.4     | >2.0               | -                            | 0.3m thick concrete slab encountered at 0.4m depth is eastern corner of pit            |
| TP13 | 1.7             | -                     | 0.4     | >1.8               | -                            | Spalling from 1.0m                                                                     |
| TP14 | 3.0             | -                     | 0.3     | >3.0               | -                            | Constant collapse from 2.5m                                                            |
| TP15 | 3.0             | -                     | 0.2     | >3.0               | -                            | Constant collapse from 2.7m                                                            |
| TP16 | 1.7             | -                     | 0.3     | >1.7               | -                            | Spalling from 0.5m                                                                     |
| TP17 | 2.0             | -                     | 0.3     | >2.0               | -                            | Slight water seepage at 2.9m                                                           |
| TP18 | 2.6             | -                     | 0.3     | 2.1                | >2.6                         | Running sands at 1.5m, and constant collapse                                           |
| TP19 | 2.6             | -                     | 0.3     | 2.0                | >2.6                         | Spalling from 0.9m, running sands at 1.9m, slight water seepage at 2.6m                |
| TP20 | 1.8             | -                     | 0.3     | >1.8               | -                            | Spalling from 1.0m, running sands at 1.5m                                              |
| TP21 | 1.7             | -                     | 0.2     | >1.7               | -                            | Running sands at 0.7m, constant collapse from 1.6m                                     |
| TP22 | 1.2             | -                     | 0.1     | >1.2               | -                            | Water inflow at 1.0m, complete collapse at 1.2m                                        |
| TP23 | 2.1             | -                     | 0.5     | >2.10              | -                            | Spalling from 1.2m, complete collapse from 2.0m                                        |
| TP24 | 1.6             | -                     | 0.2     | >1.6               | -                            | Spalling from 0.5m                                                                     |
| BH01 | 5.3             | -                     | 0.3     | 3.8                | >5.3                         | SPTs carried out at 0.7m intervals. Groundwater monitoring well installed in borehole. |
| BH02 | 5.6             | -                     | 0.3     | 5.4                | >5.6                         |                                                                                        |
| BH03 | 5.3             | -                     | 0.3     | 4.7                | >5.3                         |                                                                                        |
| BH04 | 4.2             | -                     | 0.3     | 3.0                | >4.2                         |                                                                                        |
| BH05 | 3.9             | -                     | 0.3     | 2.2                | >3.9                         |                                                                                        |

## 8 SOAKAWAY TEST RESULTS

- 8.1 General notes about soakaways, including their location, design, and Lithos' test methodology are presented in Appendix A.
- 8.2 It should be noted that soakaways cannot be allowed to infiltrate into made ground due to the risk of settlement caused by wash out of fine soil particles.
- 8.3 Seventeen soakaway tests were carried out in general accordance with BRE Digest 365<sup>1</sup> "Soakaway Design". The locations of the soakaways are shown on Drawing No. 2123/6 presented in Appendix B to this report.
- 8.4 The calculated infiltration rates for each test are summarised in the Table Below, and copies of these calculations are included in Appendix I.
- 8.5 Infiltration rates for each soakaway test have been calculated (where possible) in accordance with BRE Digest 365. This design takes into account the time for water level in to fall from 75% to 25% of its effective depth. The effective depth is the difference between the starting water level and the soakaway pit base depth.
- 8.6 Where the water level did not fall to 75% effective depth, the test was not considered suitable for calculation of an infiltration rate; this was the case for unsuccessful the tests in TPs 17 (test no. 2), TP20 and TP24 (generally in the north-northeast of site).
- 8.7 Calculated infiltration rates for each successful test are summarised in the Table below, and copies of the associated calculations are presented in Appendix I to this report.

| Hole ID | Final depth (m) | Stratum                                                 | Infiltration Rate (m/s) | Remarks                                                                  |
|---------|-----------------|---------------------------------------------------------|-------------------------|--------------------------------------------------------------------------|
| TP01    | 2.0             | Vale of York Drift (slightly silty fine to medium SAND) | 1.15x10 <sup>-4</sup>   | Pit reached 25% effective depth after 12 mins                            |
| TP01 #2 | -               |                                                         | 5.42x10 <sup>-5</sup>   | Pit reached 25% effective depth after 27 mins                            |
| TP03    | 1.7             |                                                         | 6.80x10 <sup>-5</sup>   | Pit reached 25% effective depth after 16 mins                            |
| TP03 #2 | -               |                                                         | 4.82x10 <sup>-5</sup>   | Pit reached 25% effective depth after 33 mins                            |
| TP03 #3 | -               |                                                         | 2.90x10 <sup>-5</sup>   | Pit reached 25% effective depth after 47 mins                            |
| TP06    | 1.9             |                                                         | 5.30x10 <sup>-6</sup>   | Pit reached 25% effective depth after 178 mins                           |
| TP10    | 2.0             |                                                         | 4.51x10 <sup>-5</sup>   | Pit reached 25% effective depth after 29 mins                            |
| TP10 #2 | -               |                                                         | 4.85x10 <sup>-5</sup>   | Pit reached 25% effective depth after 50 mins                            |
| TP12    | 2.0             |                                                         | 8.37x10 <sup>-5</sup>   | Pit reached 25% effective depth after 14 mins                            |
| TP12 #2 | -               |                                                         | 5.74x10 <sup>-5</sup>   | Pit reached 25% effective depth after 25 mins                            |
| TP13    | 1.7             |                                                         | 2.10x10 <sup>-5</sup>   | Pit reached 25% effective depth after 62 mins                            |
| TP13 #2 | -               |                                                         | 1.32x10 <sup>-5</sup>   | Pit reached 25% effective depth after 107 mins                           |
| TP16    | 1.7             |                                                         | 3.97x10 <sup>-6</sup>   | Pit reached 25% effective depth after 237 mins                           |
| TP17    | 2.0             |                                                         | 1.25x10 <sup>-5</sup>   | Pit reached 25% effective depth after 92 mins                            |
| TP17 #2 | -               |                                                         | n/a                     | Test did not reach 25% effective depth                                   |
| TP20    | 1.8             |                                                         | n/a                     | Test did not reach 25% effective depth<br>Test run for just over 2 hours |
| TP24    | 1.6             |                                                         | n/a                     | Test did not reach 25% effective depth<br>Test run for just over 2 hours |

- 8.8 Drainage Engineers could use the infiltration rates reported above to determine the feasibility of soakaways as a solution for the discharge of surface water run-off. However, regard must be made to seasonal groundwater levels; UK guidance indicates that the seasonally high groundwater table must be at least 1m below the base the soakaway.

<sup>1</sup> BRE Digest 365. Soakaway Design (1991).

- 8.9 Given that the majority of soakaway tests have yielded satisfactory results, groundwater level monitoring over about 12 months is anticipated.
- 8.10 Monitoring to date (1 visit only; see Section 7.5) suggests groundwater lies at depths of between 2.5m to 3.2m in Area A.
- 8.11 Observations made during pitting suggest that standing groundwater is likely to be present at shallow depths in the far north and west of site. Monitoring of BH5, located in this area, recorded groundwater at 1.5m. Unsurprisingly, these are the areas where soakaway tests were unsuccessful.

## 9 CONTAMINATION (ANALYSIS)

### 9.1 General

- 9.1.1 The site has been formerly used as arable farmland and a pig breeding facility.
- 9.1.2 The site's former usage is considered may have given rise to some ground contamination, although no significant made ground was encountered during the ground investigation. However, samples of topsoil have been recovered in order to confirm its suitability for re-use.
- 9.1.3 An assessment of potential contaminants associated with the former uses has been undertaken; see Section 5.2.
- 9.1.4 The presence of a diesel AST within the main pig breeding buildings could well have given rise to some contamination. However this area was inaccessible during this investigation, due to the operational nature of the site. Furthermore, areas where Lithos were notified of the presence of possible buried pig carcasses and asbestos sheet cement were discounted as exploratory hole locations.
- 9.1.5 Where available, Category 4 Screening Levels (C4SL) have also been referenced.
- 9.1.6 In the context of risks to human health associated with residential redevelopment, the Tier 1 Soil Screening Values referenced in this report have been derived via the CLEA default conceptual site model (CSM) used for generating SGVs, but amended, where appropriate, to be more specific to redevelopment within the planning process. The Tier 1 Soil Screening Values used in this report have been derived with reference to a CSM that assumes no clean soil cover will be placed in gardens/landscaped areas (Lithos Scenario A).
- 9.1.7 Generic Note 04 in Appendix A provides further details with respect to current guidance and the interpretation of analytical data are included in Appendix A to this report.

### 9.2 Testing scheduled

- 9.2.1 Areas where Lithos were notified of the presence of possible buried pig carcasses were discounted as exploratory hole locations, and no evidence of animal remains were noted in any of the exploratory holes. Consequently, to date no samples have been tested for pathogens or anthrax. Advice obtained from AHVLA (see Section 2.2) is included in Appendix E.

9.2.2 The site's background was discussed with the UKAS accredited laboratory, Scientific Analytical Services (SAL), where contaminant testing was undertaken. SAL provided the following advice:

- Farmers have been applying pig slurry to land for cropping purposes for generations to provide benefit to the soil in respect of nutrients and organic matter.
- Provided that the soil/land is not overloaded (i.e. slurry incorporated), there should not be anything of unusual concern.
- Zoonotic bacteria do not survive without the host so there should be no concerns in that respect either.
- Pig diets often contain high levels of copper (to promote growth), so the usual suite of metals should deal with that issue.
- Soil samples should be tested for metals, pH, organic matter, ammonia, sulphate, and sulphide. Inclusion of say, one sample, for SVOC to provide assurance.

9.2.3 Based on the above assessment, Lithos submitted a test schedule (summarised in the table below) to a UKAS accredited laboratory.

| Type of sample                      | No. of samples | Determinands                                                                                                             |
|-------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------|
| Topsoil (incl. made ground topsoil) | 20             | pH, water soluble boron, and total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc) |
|                                     | 2              | Total Sulphate                                                                                                           |
|                                     | 2              | Sulphide                                                                                                                 |
|                                     | 5              | Water soluble sulphate, chloride, nitrate and magnesium                                                                  |
|                                     | 20             | Asbestos ID                                                                                                              |
|                                     | 6              | Organo chlorine/phosphorus pesticides                                                                                    |
|                                     | 20             | TOC                                                                                                                      |
|                                     | 20             | Speciated Poly Aromatic Hydrocarbons (PAH)                                                                               |
|                                     | 1              | Semi-Volatile Organic Compounds (sVOC), includes PAHs                                                                    |
|                                     | 2              | Banded Total Petroleum Hydrocarbons (TPH)                                                                                |
|                                     | 2              | Ammonium (ammoniacal Nitrogen)                                                                                           |

9.2.4 Account was taken of previous uses in specific areas, with sVOC, ammonium, sulphate and sulphide analysis concentrated on samples recovered from the vicinity of the sewage tank in the south of Area A, and banded TPH analysis concentrated on samples recovered from areas within relatively close proximity the diesel AST.

### 9.3 Soil contamination results

9.3.1 The soil contamination test results are summarised in the Tables on pages 18 to 20.

9.3.2 Laboratory test certificates as received from the laboratory are presented in Appendix G to this report.

#### Inorganic determinands

9.3.3 Of the 29 samples of ground analysed for inorganic parameters, all can be classified as uncontaminated.

9.3.4 These samples are classified by comparison with Tier 1 Soil Screening Values for an end use including domestic gardens and any area where plants are to be grown (the most sensitive of the proposed end-uses).

### Summary of degree of soils contamination

| Expl Hole | Depth (m) | Material            | Concentrations in mg/kg unless otherwise stated. Results are quoted to 1 decimal place if <10, and whole numbers if >10. Trigger Level Concentrations are shown in <b>BLUE</b> and assume a <b>residential with gardens (and no cover)</b> end-use. |      |     |      |      |       |      |      |     |     |       |          |              |
|-----------|-----------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|------|------|-------|------|------|-----|-----|-------|----------|--------------|
|           |           |                     | pH                                                                                                                                                                                                                                                  | As ∞ | B ~ | Cd ∞ | Cr x | Cu♣\$ | Pb ∞ | Hg * | Ni  | Se  | Zn \$ | Sulphide | Asbestos I.D |
|           |           |                     |                                                                                                                                                                                                                                                     | 37   | 5   | 26   | 3000 | 200   | 200  | 169  | 127 | 350 | 200   |          |              |
| TP04      | 0.1       | Made ground topsoil | 5.8                                                                                                                                                                                                                                                 | 3    | <1  | <1   | 6    | 35    | 18   | <1   | 4   | <3  | 41    | <1       | N.D.         |
| TP05      | 0.1       | Made ground topsoil | 6.8                                                                                                                                                                                                                                                 | 4    | <1  | <1   | 6    | 18    | 22   | <1   | 4   | <3  | 23    | -        | N.D.         |
| TP09      | 0.1       | Made ground topsoil | 7.1                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 7    | 10    | 16   | <1   | 6   | <3  | 57    | -        | N.D.         |
| TP10      | 0.1       | Made ground topsoil | 7.0                                                                                                                                                                                                                                                 | 4    | <1  | <1   | 8    | 20    | 19   | <1   | 5   | <3  | 57    | -        | N.D.         |
| TP11      | 0.1       | Made ground topsoil | 7.0                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 5    | 11    | 24   | <1   | 4   | <3  | 24    | -        | N.D.         |
| TP01      | 0.1       | Topsoil             | 7.8                                                                                                                                                                                                                                                 | 13   | <1  | <1   | 13   | 7     | 18   | <1   | 4   | <3  | 19    | -        | N.D.         |
| TP02      | 0.1       | Topsoil             | 5.1                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 8    | 7     | 19   | <1   | 3   | <3  | 18    | -        | N.D.         |
| TP03      | 0.1       | Topsoil             | 7.1                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 9    | 8     | 23   | <1   | 3   | <3  | 17    | <1       | N.D.         |
| TP06      | 0.1       | Topsoil             | 6.9                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 6    | 7     | 20   | <1   | 4   | <3  | 25    | -        | N.D.         |
| TP07      | 0.1       | Topsoil             | 6.8                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 6    | 7     | 21   | <1   | 4   | <3  | 20    | -        | N.D.         |
| TP08      | 0.1       | Topsoil             | 6.0                                                                                                                                                                                                                                                 | 4    | <1  | <1   | 8    | 9     | 21   | <1   | 5   | <3  | 49    | -        | N.D.         |
| TP12      | 0.1       | Topsoil             | 6.7                                                                                                                                                                                                                                                 | 4    | <1  | <1   | 5    | 8     | 19   | <1   | 4   | <3  | 36    | -        | N.D.         |
| TP13      | 0.1       | Topsoil             | 7.2                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 5    | 9     | 24   | <1   | 4   | <3  | 25    | -        | N.D.         |
| TP15      | 0.1       | Topsoil             | 7.3                                                                                                                                                                                                                                                 | 6    | <1  | <1   | 6    | 13    | 30   | <1   | 5   | <3  | 29    | -        | N.D.         |
| TP16      | 0.1       | Topsoil             | 7.0                                                                                                                                                                                                                                                 | 7    | <1  | <1   | 8    | 16    | 37   | <1   | 6   | <3  | 26    | -        | N.D.         |
| TP17      | 0.1       | Topsoil             | 6.9                                                                                                                                                                                                                                                 | 5    | <1  | <1   | 7    | 11    | 27   | <1   | 5   | <3  | 25    | -        | N.D.         |
| TP18      | 0.1       | Topsoil             | 6.9                                                                                                                                                                                                                                                 | 2    | <1  | <1   | 3    | 4     | 9    | <1   | 2   | <3  | 10    | -        | N.D.         |
| TP21      | 0.2       | Topsoil             | 6.8                                                                                                                                                                                                                                                 | 3    | <1  | <1   | 5    | 7     | 20   | <1   | 3   | <3  | 16    | -        | N.D.         |
| TP20      | 0.1       | Topsoil             | 6.9                                                                                                                                                                                                                                                 | 3    | <1  | <1   | 4    | 6     | 16   | <1   | 3   | <3  | 16    | -        | N.D.         |
| TP23      | 0.1       | Topsoil             | 7.2                                                                                                                                                                                                                                                 | 3    | <1  | <1   | 6    | 8     | 15   | <1   | 5   | <3  | 22    | -        | N.D.         |

| Key |                                                                                                                                            | Source of guidance trigger level                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 36  | Parameter tested for and found to be in excess of Tier 1 concentration.                                                                    | With the exception of those annotated with one of the symbols below ( $\infty$ , \$, ~), all Soil Screening Values in brackets above have been derived using CLEA v1.06. Values assume contaminants located in a sandy loam, with 6% soil organic matter (SOM). |                                                                                                                                                                                                                                                                                                                          |
| 12  | Parameter tested for but not found to be in excess of Tier 1 concentration.                                                                |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
| -   | Parameter not tested for.                                                                                                                  | $\infty$                                                                                                                                                                                                                                                        | Category 4 Screening Level – SP1010, December 2013 (CL:AIRE/Defra).                                                                                                                                                                                                                                                      |
| \$  | Ministry of Agriculture, Fisheries & Food. Code of Practice for Agricultural Practice for the Protection of Soil, 1998.                    | ~                                                                                                                                                                                                                                                               | Engineering judgement (Lithos). Boron is a phytotoxic, although most phytotoxic compounds can pose a risk to human health if sufficient concentrations are present. However, plants represent the most sensitive receptor, and a Tier 1 value which is protective of flora is therefore also protective of human health. |
| ♣   | Tier 1 Value is pH dependent.                                                                                                              |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
| x   | Assumes Cr is CrIII. If demonstrated Cr is CrVI screen would be 21mg/kg.                                                                   |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |
| *   | Assumes mercury present as an inorganic compound (cf elemental metal or within organic compound). See Science Report SC050021/Mercury SGV. |                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                          |

### Summary of degree of soils contamination (organics)

| Expl Hole | Depth (m) | Material            | Concentrations in mg/kg. Results are quoted to 1 decimal place if <10, and whole numbers if >10.<br>Trigger Level Concentrations are shown in <b>BLUE</b> and assume a <b>residential with gardens (and no cover)</b> end use |         |             |                                         |                                         |                                        |
|-----------|-----------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|-----------------------------------------|-----------------------------------------|----------------------------------------|
|           |           |                     | % TOC                                                                                                                                                                                                                         | PAH     |             | TPH - C <sub>6</sub> to C <sub>40</sub> |                                         |                                        |
|           |           |                     |                                                                                                                                                                                                                               | B(a)P ∞ | Naphthalene | GRO~ C <sub>6</sub> to C <sub>10</sub>  | DRO◇ C <sub>10</sub> to C <sub>21</sub> | LRO C <sub>21</sub> to C <sub>40</sub> |
|           |           |                     |                                                                                                                                                                                                                               | 5       | 4           | 15                                      | 151                                     | 1000                                   |
| TP04      | 0.1       | Made ground topsoil | 1.4                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP05      | 0.1       | Made ground topsoil | 0.9                                                                                                                                                                                                                           | <0.1    | <0.1        | <10                                     | 3                                       | 19                                     |
| TP09      | 0.1       | Made ground topsoil | 1.1                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP10      | 0.1       | Made ground topsoil | 2.2                                                                                                                                                                                                                           | 0.1     | <0.1        | -                                       | -                                       | -                                      |
| TP11      | 0.1       | Made ground topsoil | 0.6                                                                                                                                                                                                                           | 0.1     | <0.1        | -                                       | -                                       | -                                      |
| TP01      | 0.1       | Topsoil             | 0.7                                                                                                                                                                                                                           | 0.2     | <0.1        | -                                       | -                                       | -                                      |
| TP02      | 0.1       | Topsoil             | 1.3                                                                                                                                                                                                                           | 0.4     | <0.1        | -                                       | -                                       | -                                      |
| TP03      | 0.1       | Topsoil             | 0.4                                                                                                                                                                                                                           | 0.3     | <0.1        | -                                       | -                                       | -                                      |
| TP06      | 0.1       | Topsoil             | 1.0                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP07      | 0.1       | Topsoil             | 0.7                                                                                                                                                                                                                           | 0.4     | 0.4         | -                                       | -                                       | -                                      |
| TP08      | 0.1       | Topsoil             | 0.9                                                                                                                                                                                                                           | 0.6     | 0.1         | -                                       | -                                       | -                                      |
| TP12      | 0.1       | Topsoil             | 0.5                                                                                                                                                                                                                           | 0.4     | <0.1        | <10                                     | 10                                      | 46                                     |
| TP13      | 0.1       | Topsoil             | 0.7                                                                                                                                                                                                                           | 0.1     | <0.1        | -                                       | -                                       | -                                      |
| TP15      | 0.1       | Topsoil             | 0.9                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP16      | 0.1       | Topsoil             | 0.8                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP17      | 0.1       | Topsoil             | 1.0                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP18      | 0.1       | Topsoil             | 0.7                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP21      | 0.2       | Topsoil             | 1.7                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP20      | 0.1       | Topsoil             | 1.5                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |
| TP23      | 0.1       | Topsoil             | 0.8                                                                                                                                                                                                                           | <0.1    | <0.1        | -                                       | -                                       | -                                      |

| Key |                                                                | Source of Guidance Trigger Level                                                                                                                                       |                                                                    |
|-----|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 0.3 | Parameter tested for but not in excess of Tier 1 concentration | All Soil Screening Values in brackets above have been derived using CLEA v1.06. Values assume contaminants located in a sandy loam, with 6% soil organic matter (SOM). |                                                                    |
| 60  | Parameter tested for and in excess of Tier 1 concentration     | ~                                                                                                                                                                      | Assumes all GRO is aromatic fraction C7 to C8                      |
| -   | Contaminant not tested for                                     | ◇                                                                                                                                                                      | Assumes all DRO is aliphatic fraction C10 to C12                   |
|     |                                                                | ∞                                                                                                                                                                      | Category 4 Screening Level – SP1010, December 2013 (CL:AIRE\Defra) |

### Asbestos

- 9.3.5 No asbestos fibres were identified in any of the 20 samples screened.

### Organic determinands

- 9.3.6 Samples have been classified by comparison with Tier 1 Soil Screening Values. These screening values assume a Soil Organic Matter (SOM) of 6% (equivalent to a TOC of 3.5%). Many organic contaminants are more mobile when the SOM is lower, and consequently lower screening values are then more appropriate for many organic contaminants.
- 9.3.7 In order to check the validity of Tier 1 Soil Screening Values, the average TOC for each common fill type (beyond any areas of obvious hydrocarbon impact) have been determined.

| Fill type           | Typical TOC (%) | Comparison with revised screening value necessary?                                                                                                             |
|---------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topsoil             | 0.9 %           | Yes, but no significant organic contamination was recorded in this soil type. All determinands well below "6%" screening value; most below limit of detection. |
| Made Ground Topsoil | 1.2 %           |                                                                                                                                                                |

### Total Petroleum Hydrocarbons (TPH)

- 9.3.8 Lithos have used the CLEA model to derive risk based screening values for hydrocarbons, in accordance with the methodology detailed by the TPHCWG, and reviewed by a UK workshop of experts with respect to UK adoption of the method.
- 9.3.9 Assessment of TPH would normally be undertaken in accordance with a 3-step approach, (outlined in Generic Note 04 in Appendix A). However, given former uses and the absence of visual/olfactory evidence, only a simple banded TPH was scheduled here (cf full speciation).
- 9.3.10 Although only banded TPH analysis was scheduled here, none of the fractions exceed their respective Tier 1 criteria, even if it is conservatively assumed all of each fraction is either aliphatic or aromatic.

### Poly Aromatic Hydrocarbons (PAH)

- 9.3.11 Speciated PAH analysis has been undertaken in order to determine concentrations of the key "marker" compounds: benzo(a)pyrene (considered the most toxic of the PAHs); and naphthalene (the most mobile and volatile of the PAHs).
- 9.3.12 Speciated analysis has confirmed the absence of significant concentrations of both benzo(a)pyrene and naphthalene in the soils beneath this site.

### Insecticides

- 9.3.13 Of the 6 topsoil samples scheduled for insecticide analysis, (Organochlorine & Organophosphorous Insecticides), 5 yielded results for the various determinands below the laboratory limit of detection (0.01 mg/kg). The topsoil sample in TP02 yielded a slightly elevated level of DDT (an organochlorine pesticide) of 0.18 mg/kg, although this is not considered significant.

## **10 CONTAMINATION (QUALITATIVE RISK ASSESSMENT)**

### **10.1 Summary of significant contamination**

- 10.1.1 Following liaison with AHVLA, the developer will need to consider excavation and disposal of pig carcasses believed to be present in at least two (relatively limited) areas of the site.
- 10.1.2 Topsoil, typically 300mm thick is present in parts of Area A, and the entirety of Area B. Testing suggests this material is suitable for re-use.
- 10.1.3 However, given the possible presence of buried asbestos cement sheeting and pig carcasses, topsoil from Area A will require careful stripping, and it would be prudent to sample the stockpile(s) generated and analyse an appropriate number of samples prior to re-use.
- 10.1.4 A diesel AST situated within the main pig breeding facility buildings also has the potential to give rise to a degree of hydrocarbon contamination. However, this area was inaccessible to investigation.
- 10.1.5 A veneer of made ground should be anticipated beneath buildings and areas of hardstand in Area A, although these areas were largely inaccessible to investigation due to the operational nature of the site. A simple post-demolition trial pit investigation will be required before definitive recommendations are provided. However, at this stage it is considered unlikely that anything more than placement of a 600mm soil cover in garden areas, and perhaps removal of a relatively small volume of fuel contaminated soils will be required.

### **10.2 Revised conceptual ground model (contamination)**

- 10.2.1 The Preliminary Conceptual Site Model has been amended in light of data obtained during the ground investigation, most notably with respect to the distribution of made ground and contaminants.
- 10.2.2 A revised Conceptual Site Model is presented as Drawing No. 2123/7 in Appendix B. The Model includes the contaminants described in Section 10.1 above, and potential pollutant linkages (summarised below in Section 10.3) to receptors.

### **10.3 Environmental setting & end use**

- 10.3.1 As discussed in Section 10.1 above, contamination may exist in the soil beneath existing buildings and concrete hardstand at this site. In order to assess the significance of this contamination, consideration must be given to the site's environmental setting and the proposed end use.
- 10.3.2 The underlying Sherwood Sandstone is classified as a Principal aquifer. The nearest surface watercourse is an un-named drain, immediately north of the site's north/north-western boundary. Therefore, the site's environmental setting is considered to be high.

### **10.4 Waste classification**

- 10.4.1 Some excess arisings may be generated by excavations for foundations, sewers etc.
- 10.4.2 Classification of soils as inert, non-hazardous or hazardous should be undertaken in accordance with the Environment Agency's Technical Guidance WM2<sup>2</sup>, and is quite a complex process. However, all soil arisings generated by excavations at this site are likely to be classified inert.

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<sup>2</sup> Technical Guidance WM2 - Interpretation of the definition and classification of hazardous waste. Environment Agency 2013

- 10.4.3 Off-site disposal to landfill is not recommended. In accordance with the CL:AIRE Code of Practice<sup>3</sup> any excess natural soil arisings should be suitable for Direct Transfer to another development site, for use either as clean cover material, or bulk fill for use, without the need for waste legislation to be applied.
- 10.4.4 Disposal of the made ground off site is generally not considered appropriate, economically viable, nor in line with current Government philosophy regarding sustainable development. However, some excess arisings may be generated by excavations for foundations, sewers etc. Disposal to landfill may be the most practical solution, if redistribution and retention on site is not feasible.
- 10.4.5 Non-hazardous soil waste can go to a non-hazardous landfill facility; no further testing (eg WAC) is required. Lithos typically only include WAC analysis if significant off-site disposal (of soil classified as hazardous waste) is anticipated. Characterisation of stockpiled materials generated during the construction phase is likely to be required if off-site disposal is proposed, and clearly this cannot be undertaken during a pre-development site investigation.
- 10.4.6 It should be noted that classification of soils as inert, non-hazardous or hazardous should be undertaken in accordance with the Environment Agency's Technical Guidance WM2, and is quite a complex process. The comments below are preliminary only and are not based on the more rigorous data review required by WM2.
- 10.4.7 With respect to asbestos, waste soils will be classed hazardous if the soil mass contains more than 0.1% asbestos fibres that are free and dispersed. However, the 2013 edition of WM2 now states that where the waste contains identifiable pieces of asbestos (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then the waste is hazardous if the concentration of asbestos in the pieces alone is 0.1%. If a stockpile of soil contained rare fragments of broken asbestos-cement sheeting, the whole stockpile would be classed as hazardous unless all the fragments could be picked-out (even though the concentration of asbestos in the soil mass might be an orders of magnitude less than 0.1%).
- 10.4.8 All soil arisings generated by excavations at this site are likely to be classified as non-hazardous waste; but it would be prudent to check with landfill operators.

## 11 HAZARDOUS GAS

- 11.1.1 The site is not believed to be affected by sources of hazardous gas generation as it is:
- Not located within 250m of a known former or current landfill site or backfilled feature (eg quarry, pond, canal etc)
  - Neither underlain by shallow mineworkings nor located in an area considered susceptible to mines gas emissions
  - Not underlain by a significant thickness of made ground
  - Not underlain by peat or shallow chalk deposits
- 11.1.2 BRE Report BR211 (2007 Edition) indicates that radon protection measures are not required for new dwellings at the site. Information from Landmark confirms that the site is in an area where less than 1% of homes are estimated to be above the action level, and that radon protection measures are therefore not required.
- 11.1.3 As such, no special precautions against hazardous gas are required on this site.

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<sup>3</sup> The Definition of Waste: Development Industry Code of Practice. CL:AIRE, 2011.

## 12 GEOTECHNICAL TESTING

### 12.1 General

- 12.1.1 A total of 20 samples of natural soil were delivered to a suitably accredited laboratory with a schedule of geotechnical testing drawn up by Lithos.
- 12.1.2 The geotechnical laboratory test results are presented in Appendix I to this report.

### 12.2 Particle size distribution

- 12.2.1 The grading of 4 samples of granular Vale of York drift has been determined by wet sieving.
- 12.2.2 Fines (silt and clay) were found to comprise between 5% and 16% (average 9%) of the material sampled. NHBC Chapter 4.2 considers shrinkable soils to be those containing more than 35% fines and having a Modified Plasticity Index greater than 10%. The granular Vale of York drift encountered can therefore be regarded as non-shrinkable.

### 12.3 Soluble sulphate and pH

- 12.3.1 In accordance with BRE Special Digest 1:2005, Area A can be classified as brownfield with a mobile groundwater regime, and Area B can be classified as greenfield with a mobile groundwater regime.
- 12.3.2 It is envisaged foundations will extend to depths of about 2m through natural strata and samples taken from this depth range have been submitted for pH and water-soluble sulphate (2:1 soil/water extract).
- 12.3.3 The concentrations of sulphate in the aqueous natural soil extracts of 13 samples were determined. The highest water-soluble sulphate concentration and the lowest pH value for each soil type analysed are shown in the Table below.

| Soil type                    | Lowest pH values | Highest soluble sulphate concentration (g/l) |
|------------------------------|------------------|----------------------------------------------|
| Vale of York Drift           | 6.8              | 0.02                                         |
| Weathered Sherwood Sandstone | 7.1              | <0.01                                        |

- 12.3.4 pH values were all above 5.5, therefore concentrations of chloride and nitrate are considered insignificant.
- 12.3.5 In accordance with Tables C1 and C2 of SD1, sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-1.

### 12.4 Standard penetration test (SPT)

- 12.4.1 The in-situ relative density of granular deposits on site was established by carrying out SPTs during the drilling of the cable percussion boreholes. The reported blow counts suggest densities predominantly in the 'loose' range, especially within the uppermost 1.5m. Beyond 1.5m, the granular drift deposits can generally be regarded as 'medium dense', with densities generally increasing with depth.
- 12.4.2 Reported blow counts in BH3 (centre of Area A) suggest the strata remain loose to about 3.5m depth.
- 12.4.3 SPT 'N' values within the cohesive drift deposits confirmed that these deposits can be regarded as 'firm'.

12.4.4 The in-situ strength of weathered Sherwood Sandstone was also established, with SPT 'N' values suggesting that these deposits are 'dense' to 'very dense', with refusal often being reached within this stratum.

12.4.5 The SPT results are summarised in below:

| Stratum                                                            | Typical. SPT N value | Estimated strength or density | Remarks                                                                     |
|--------------------------------------------------------------------|----------------------|-------------------------------|-----------------------------------------------------------------------------|
| Granular Vale of York Drift Deposits (silty sand – uppermost 1.5m) | 6 to 12              | Loose                         |                                                                             |
| Granular Vale of York Drift Deposits (silty sand – below 1.5m)     | 10 to 30             | Medium Dense                  | BH3 (centre of Area A) suggest the strata remain loose to about 3.5m depth. |
| Cohesive Vale of York Drift (clay)                                 | 13                   | Firm                          | Taken from 3 SPT 'N' values only                                            |
| Weathered Sherwood Sandstone                                       | >50                  | Very Dense                    | Refusal often met in these bedrock deposits                                 |

## 13 GEOTECHNICAL ISSUES

### 13.1 Conceptual site model

13.1.1 Natural deposits comprise silty fine sands which are loose to depths of around 1.5m, becoming medium dense beyond this.

13.1.2 Beds of clay, typically 500mm thick, were encountered in 3 of the 29 exploratory holes. These clays can be classified as 'firm'.

13.1.3 Weathered Sherwood sandstone was encountered in all 5 boreholes, and TPs 5 to 9, and 18 to 19. This sandstone bedrock was encountered at a typical depth of 2.1m in the west, 2.2m in the east, and significantly deeper (around 5m) within more central areas of the site.

### 13.2 Mining & quarrying

13.2.1 This site is underlain by Sherwood Sandstone bedrock and the shallowest coal seam lies at least 200m below the surface. Whilst the site lies within a Coal Authority Low Risk area, no significant risks have been identified, and an intrusive mining investigation will not be required.

13.2.2 There are no known quarries on, or within 50m of the site.

### 13.3 Foundation recommendations

#### General

13.3.1 Foundation recommendations assume that development will be two or three storey construction and that line loads will not exceed 90kN/m run. If this is not the case significant alteration to these recommendations will be required.

13.3.2 We have assumed that final development levels will not differ significantly from ground levels existing at the time of investigation. Any digital terrain modelling undertaken or commissioned by the Developer should consider implications for the foundation recommendations outlined below.

- 13.3.3 Made ground is not considered a suitable foundation material and foundations should therefore be taken through these materials into underlying natural strata of adequate bearing capacity.
- 13.3.4 Sub-surface concrete in contact with the made and natural ground should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-1.
- 13.3.5 Subject to anticipated line loads, granular soils from about 1.2m depth might yield sufficient bearing capacity (with tolerable settlements) to enable the adoption of deep strip footings. However, consideration must also be given to excavation stability which was found to be poor during the ground investigation. Foundation excavations will be left open for longer than the trial pits were, and are likely to be unstable at depths in excess of 1.0m, especially if dug during periods wet weather.
- 13.3.6 Founding at shallower depth, say 600mm, whilst desirable from an excavation stability viewpoint, may not provide sufficient bearing capacity due to the lesser depth of (resisting) overburden.
- 13.3.7 Furthermore, loose sands were found to extend to depths in excess of 3m in the centre of Area A (BH3), suggesting variability across the site. If strip footings are considered preferable, it would be prudent to obtain relative density data on a much tighter grid than is provided by the boreholes drilled to date.
- 13.3.8 Given the above, at this stage it is considered prudent to assume that vibro stone columns will provide the most suitable foundation solution for all new dwellings.
- 13.3.9 Following vibratory ground improvement, new houses can be constructed on reinforced concrete strip foundations, founded at a minimum depth of 600mm below the surface of the treated ground.
- 13.3.10 On residential developments, stone columns are typically 500mm to 700mm in diameter at spacings of between 1.5m and 2.0m.
- 13.3.11 The final diameter of the Stone Column depends on the properties of the surrounding soils and may vary with depth in non-homogeneous soils.
- 13.3.12 Typically, the uppermost 3m to 4m of loose ground is treated.
- 13.3.13 NHBC will require footings to be reinforced top and bottom. For a 600mm wide, 300mm thick footing, B503 mesh is likely to provide suitable reinforcement, but further advice should be sought from the Structural Engineer.
- 13.3.14 Unless the ground beneath the whole of each plot footprint is improved, a suspended floor should be constructed; this could be either block & beam, or cast in-situ.
- 13.3.15 In accordance with Chapter 4.6 of NHBC Standards, NHBC should be notified of any proposed vibro ground improvement in advance. Furthermore, the Developer should obtain written confirmation from the specialist contractor that the site is suitable for the proposed ground improvement, and submit this confirmation to NHBC.
- 13.3.16 Stone columns are formed by inserting a hydraulic or electric vibroflot using air as a jetting fluid. The vibrating probe penetrates the soil to the design depth or refusal, and as a result the soil is displaced laterally without producing any spoil.
- 13.3.17 As the probe is lifted the granular fill is deposited into the void by gravity, assisted by the injection of compressed air. The aggregate is then compacted by repeated re-insertion of the vibrating probe, in lifts of 30-50cm, until the aggregates reach the surface.

- 13.3.18 Choice of Top or Bottom feed technique is determined by the stability of the in-situ soils and water level.
- 13.3.19 The specialist vibro contractor should undertake plate loading tests (600mm diameter plate) both before and after installation of the vibro stone columns, in order to demonstrate that the anticipated degree of ground improvement has been achieved. In accordance with NHBC requirements, tests on treated ground should be carried out at a minimum frequency of 1 test per rig per day.
- 13.3.20 The specialist contractor should also provide:
- A detailed schedule of work
  - A programme
  - An indication of what tests are to be carried out on completion of the work, and who will be responsible for these tests
  - The layout and depth of stone columns, and the accuracy to be achieved
  - The factor of safety incorporated into the design
  - The criteria for non-acceptance of the vibrating poker work
  - Calculations and case histories to justify the ground improvement proposals
  - The layout of the stone columns
  - Details of the equipment and process
- 13.3.21 The vibro contractor should be provided with a "specification" detailing the required bearing & settlement characteristics.

## 13.4 Floor slabs

- 13.4.1 It is considered that the natural ground is generally suitable for the use of ground bearing floors. However, ground bearing slabs should not be cast on topsoil or made ground. Where plots are elevated for design reasons, the depth of engineered stone below a ground bearing slab should not exceed 600mm, in accordance with NHBC guidance.
- 13.4.2 It should be noted that NHBC have suffered a significant number of claims resulting from the use of ground bearing floor slabs. Consequently, if ground bearing slabs are proposed, care should be taken correct and careful construction. For example, if fill to the internal face of the foundation excavation is not properly compacted, subsequent settlement can result in cracking of the slab.

## 13.5 Designated concrete mixes

- 13.5.1 The following designated mixes in accordance with BRE Special Digest SD1 and BS 8500: Part 1: 2006 will be suitable for use on this site.

| Application                                                 | DS-1 conditions<br>(natural ground)<br>ACEC Class AC-1 |
|-------------------------------------------------------------|--------------------------------------------------------|
| Reinforced strip/ trench fill footings (mesh reinforcement) | RC28/35                                                |
| Pads, rafts and ground beams                                | RC28/35                                                |
| Unreinforced concrete floor slabs                           | GEN2                                                   |
| In situ reinforced concrete floor slabs                     | RC28/35                                                |

## 13.6 Excavations

- 13.6.1 Based on the results of the investigation it is unlikely that major groundwater flows will be encountered in shallow excavations (less than say 1.5m).
- 13.6.2 However, significant groundwater flows, including running sand, are likely to be encountered in excavations greater than about 1.5m, especially in the north of Area B. Groundwater control over and above normal site pumping practices may be required for such excavations.
- 13.6.3 Shallow excavations in natural ground may remain stable in the short term but if left open for any significant period of time, will require shoring. Shoring will be required in any excavations deeper than about 1.2m due to constant collapse of trial pits noted during the investigation. The developer should beware of over-digging without shoring and creating a "large hole".

## 13.7 Drainage

- 13.7.1 Based on observations made during the investigation, soakaways might provide a suitable drainage solution for surface water run-off at the site. However, CIRIA C697:2007 recommends that soakaways should not be constructed 'in ground where the water table reaches a level within 1 m below the base of the soakaway at any time of the year'; see Section 8.
- 13.7.2 Ground beneath this site has the capacity to absorb surface water run-off and other SUDS options (see CIRIA C697:2007 for further details) include:
- Swales – linear grassed features in which surface water can be stored or conveyed. Where suitable, swales can be designed to allow infiltration.
  - Infiltration basins – vegetated depressions designed to store runoff and infiltrate it gradually into the ground.
  - Pervious Pavements – provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate into subsurface storage, with subsequent infiltration or controlled discharge. Pavement could be porous (water able to infiltrate across entire surface material; e.g. reinforced grass), or permeable (water infiltrates via joints between concrete blocks).
  - Ponds – designed to have permanent pool of water, but with capacity to provide temporary storage controlled discharge.
- 13.7.3 It is recommended that the developer contact Yorkshire Water Services with respect to capacity in existing foul and surface water sewers in the vicinity of the development area.
- 13.7.4 Given the site's location within a groundwater SPZ3, reference should be made to Environment Agency guidance GP3<sup>4</sup>, most notably Position Statements:
- D2 – Underground storage and associated pipework.
  - G8 – Sewerage pipework.
  - G9 - Use of deep infiltration systems for surface water disposal.
  - G12 - Discharge of clean roof water to ground.
  - G13 - Sustainable drainage systems.

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<sup>4</sup> Groundwater protection: Principles and practice (GP3), November 2012.

## 13.8 Highways

- 13.8.1 Based on visual inspection of the natural materials at the site, published tables (Interim Advice Note 73/06 Revision 1 (2009), Chapter 5. Characterisation of Materials Design Guidance For Road Pavement Foundations - Draft HD25) indicates that the natural granular soils deposits should provide a CBR value of at least 5%. This value should be verified prior to or during construction.

## 13.9 External works

- 13.9.1 Any digital terrain modelling undertaken, or commissioned by JSR Farms should be made available to their Engineering Designer prior to issue of an External Works Drawing.

# 14 REDEVELOPMENT ISSUES

## 14.1 General

- 14.1.1 This report has presented options with respect to foundation solutions etc that are considered technically feasible and in line with current good practice. Consequently, we would expect to obtain regulatory approval for whichever option is adopted, although this cannot be guaranteed. Copies of this report should be forwarded to the relevant regulatory authorities (Warranty Provider & Local Authority) for their comment/approval.

## 14.2 Remediation strategy

- 14.2.1 Given the absence of any significant contamination to date, a remediation strategy may not be considered necessary. However, a post-demolition trial pit investigation will be required before definitive recommendations can be provided.
- 14.2.2 At this stage it is considered unlikely that anything more than placement of a 600mm soil cover in garden areas, and perhaps removal of a relatively small volume of fuel contaminated soils will be required.
- 14.2.3 Following liaison with AHVLA, the developer will need to consider excavation and disposal of pig carcasses believed to be present in at least two (relatively limited) areas of the site.
- 14.2.4 Some other preparatory works will be required, most notably:
- Demolition of the existing pig breeding facility buildings
  - General site clearance of surface materials and vegetation
  - Topsoil strip & stockpile
  - Break-up of slabs and hardstand

## 14.3 Health & safety issues - construction workers

- 14.3.1 Access into excavations etc. must be controlled and only undertaken in accordance with the Confined Spaces Regulations 1997. The atmosphere in shored trenches in excess of 1.2m should be monitored for oxygen and hazardous gas (methane & carbon dioxide), prior to personnel entering such excavations. Monitoring should continue whilst personnel are working in deep excavations.
- 14.3.2 Before site operations are started, the necessary COSHH statements and Health & Safety Plan should be drafted in accordance with the CDM regulations.

- 14.3.3 During the remediation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land".

#### **14.4 Control of excavation arisings**

- 14.4.1 It should be ensured that the groundworker understands the need for good materials management. Most notably the importance of not mixing different materials within a given stockpile; i.e. there should be separate stockpiles of: topsoil; grubbed-up concrete hardstand; excess clean, natural soil arisings; general construction waste etc.
- 14.4.2 Further characterisation of stockpiled materials is likely to be required if off-site disposal is proposed. See also comments in Section 10.4 regarding asbestos.

#### **14.5 New utilities**

- 14.5.1 It is strongly recommended that all statutory service bodies are consulted at an early stage with respect to the ground conditions within which they will lay services in order to enable them to assess at an early stage any potential abnormal costs.
- 14.5.2 This site is essentially 'clean', and no previous or current usage of the site or its immediate surroundings is likely to have resulted in ground contamination. Furthermore, no significant made ground was encountered in any of the exploratory holes during the ground investigation. However, it is possible that other contaminants are encountered if a post-demolition site investigation was carried out.
- 14.5.3 Consequently, the use of 'standard' polyethylene water supply pipes should be acceptable, although JSR should consult Yorkshire Water at the earliest opportunity to confirm this.

#### **14.6 Potential development constraints**

- 14.6.1 An overhead BT cable is present in the south-west of area A. An underground BT cable also runs along the southern boundary of Area A, then up the boundary between Areas A and B.
- 14.6.2 Unground electricity is also present in the far south of the site. Various other private utilities such as surface and foul sewers are also present on site.
- 14.6.3 YEDL may seek to restrict changes in site level if the depth of cover above their underground services were adversely affected by any development proposals. This aspect requires further clarification.
- 14.6.4 The site lies within a Source Protection Zone 3 for the Sherwood Sandstone aquifer. It is likely that the Environment Agency will request more detail, and at an earlier stage, than usual with respect to drainage design and measures to mitigate pollution (interceptors etc). They may require drainage to be kept at shallowest, and also require details of mitigation measures to reduce pollution risks during the construction phase.
- 14.6.5 The construction phase groundworker will need to follow good environmental practice to minimise the risks of spillage, leakage etc. with reference, but not limited, to the following documents:
- CIRIA C502 'Environmental Good Practice on Site'
  - EA Pollution Prevention Guidelines. Working at construction and demolition sites: PPG6

## **15 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

### **15.1 General**

- 15.1.1 The site is located approximately 4km west of Selby town Centre, and occupies an area of 4.7 ha.
- 15.1.2 For the purposes of this report, the site has been split into two main sections: Area A has been an operational pig breeding facility from around the 1960s, and Area B appears to have remained undeveloped throughout history.
- 15.1.3 The site is underlain by loose becoming medium dense (beyond around 1.5m) red silty sands down to a typical depth of around 3.8m. Sherwood Sandstone bedrock was encountered at relatively shallow depths in the far east and far west of the site (c. 2.5m), but deeper towards central areas (c. 5m).
- 15.1.4 It is understood that the proposed development currently involves 51 two storey domestic dwellings in Area A.

### **15.2 Hazardous gas**

- 15.2.1 There are no known or suspected areas of landfilling within 250m, and the site is not in area considered susceptible to mines gas, nor is it underlain by shallow mineworkings.
- 15.2.2 The site is in an area where less than 1% of homes are estimated to be above the radon action level.
- 15.2.3 As such, no special precautions against hazardous gas are required.

### **15.3 Contamination & remediation**

- 15.3.1 Topsoil, typically 300mm thick is present in parts of Area A, and the entirety of Area B. Testing suggests this material is suitable for re-use. However, given the possible presence of buried asbestos cement sheeting and pig carcasses, topsoil from Area A will require careful stripping, and it would be prudent to sample the stockpile(s) generated and analyse an appropriate number of samples prior to re-use.
- 15.3.2 A diesel AST situated within the main pig breeding facility buildings also has the potential to give rise to a degree of hydrocarbon contamination. However, this area was inaccessible to investigation.
- 15.3.3 Following liaison with AHVLA, the developer will need to consider excavation and disposal of pig carcasses believed to be present in at least two (relatively limited) areas of the site.
- 15.3.4 A veneer of made ground should be anticipated beneath buildings and areas of hardstand in Area A, although these areas were largely inaccessible to investigation due to the operational nature of the site. A simple post-demolition trial pit investigation will be required before definitive recommendations are provided. However, at this stage it is considered unlikely that anything more than placement of a 600mm soil cover in garden areas, and perhaps removal of a relatively small volume of fuel contaminated soils will be required.

## **15.4 Foundations**

- 15.4.1 At this stage it is considered prudent to assume that vibro stone columns will provide the most suitable foundation solution for all new dwellings.
- 15.4.2 Following vibratory ground improvement, new houses can be constructed on reinforced concrete strip foundations, founded at a minimum depth of 600mm below the surface of the treated ground.

## **15.5 Flooding**

- 15.5.1 The EA indicate that the site is not located within an indicative floodplain.

## **15.6 Drainage**

- 15.6.1 Soakaways might provide a suitable drainage solution for surface water run-off in some areas of the site.
- 15.6.2 However, soakaways should not be constructed 'in ground where the water table reaches a level within 1 m below the base of the soakaway at any time of the year'. This should be confirmed by the results of groundwater monitoring over a period of 12 months.

## **15.7 Highways**

- 15.7.1 Granular soils should yield CBR values of at least 5%; this should be verified prior to or during road construction.

## **15.8 Further works**

- 15.8.1 Post-demolition trial pitting in areas of existing hardstand and buildings.
- 15.8.2 If strip footings are considered, it would be prudent to obtain relative density data on a much tighter grid than is provided by the boreholes drilled to date.

**Appendix A**

**General Notes**

#### General

Third party information obtained from the British Geological Survey (BGS), the Coal Authority, the Local Authority etc is presented in the "Search Responses" Appendix of this Geoenvironmental Report.

#### Geology, mining & quarrying

In order to establish the geological setting of a site, Lithos refer to BGS maps for the area, and the relevant geological memoir. Further information is sourced from the Local Authority and by reference to current and historical OS plans. A coal mining report is obtained from the Coal Authority (CA).

In July 2011, the CA formalised their requirements in relation to planning applications and introduced some new terminology. The CA, using its extensive records has prepared plans for all coalfield Local Planning Authorities, which effectively refines the defined coalfield areas into areas of higher risk (known as the Coal Mining Development Referral Area) and lower risk (known as the Standing Advice Area). The Coal Mining Development Referral Areas contain a range of specific mining legacy risks to the surface, including mine entries; shallow coal workings; workable coal seam outcrops; mine gas; geological features; and previous surface mining sites. The Standing Advice Area is the remainder of the defined coalfield. In this area no known defined risks have been recorded; although there may still be unrecorded issues.

#### Landfills

Lithos obtain data from the Landmark Information Group, the Environment Agency and the Local Authority with respect to known areas of landfilling within 250m of the proposed development site. Reference is also made to historical OS plans, which are inspected for evidence of backfilled quarries, railway cuttings, colliery spoil tips etc.

#### Radon

Radon is a colourless, odourless gas, which is radioactive. It is formed in strata that contain uranium and radium (most notably granite), and can move through fissures eventually discharging to atmosphere, or the spaces under and within buildings. Where radon occurs in high concentrations, it can pose a risk to health.

In order to assess potential risks associated with radon gas, Lithos refer to BRE Report BR211, 2007: "Radon: guidance on protective measures for new buildings", and to information from the BGS / HPA (Health Protection Agency) radon potential dataset provided by the Landmark Information Group. The level of protection needed is site-specific and is determined by reference to the maps contained in Annex A of BR211. These maps are derived from the Radon Atlas of England and Wales (2007), and indicate the highest radon potential within each 1km grid square.

Each 1km grid square is classified on the basis of the percentage of existing homes within that grid square estimated to have radon concentrations above the Action Level (average annual radon concentration of 200 Bq.m-3), as follows:

- Unshaded grid squares where less than 3% of homes are estimated to be above the Action Level, and no radon protection is required in new dwellings
- Light grey shaded grid squares where between 3% & 10% of homes are estimated to be above the Action Level, and basic radon protection is required in new dwellings
- Dark grey shaded grid squares where greater than 10% of homes are estimated to be above the Action Level, and full radon protection is required
- Sites where either basic or full radon protective measures are required (i.e. Where greater than 3% of homes are estimated to be above the Action Level) are referred to as Radon Affected Areas

BR211 provides a preliminary indication of the measures required for a particular site, as the Annex A maps indicate the highest geological radon potential within each 1km grid square, but in many cases the radon potential varies considerably within the grid square. The Landmark information is more site-specific and therefore may allow the adoption of a lower level of protection than that indicated in the Annex A maps. Alternatively, a BR211 Radon Report can be obtained from the BGS in order to provide more site-specific information.

It should be noted that in July 2010 the Health Protection Agency (HPA) published new advice (Document RCE-15: "Limitation of Human Exposure to Radon"), in which they recommend that all new buildings, extensions, conversions & refurbished buildings in the UK include (at least) basic radon protective measures. The HPA also widened the definition of Radon Affected Areas to include areas where greater than 1% of homes are estimated to be above the Action Level.

### Generic notes – geoenvironmental Investigations

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#### Hydrogeology

Lithos obtain information from the Environment Agency (EA) and the Landmark Information Group with respect to:

- groundwater quality
- recorded pollution incidents
- licensed groundwater abstractions

From April 2010 the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply), but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone

The maps display the following aquifer designations:

Principal Aquifers: These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary Aquifers: These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:

- Secondary A - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
- Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers
- Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

Unproductive Strata: These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Note: The maps only display the principal and secondary aquifers as coloured areas. All uncoloured areas on the bedrock designation map will be unproductive strata. However, for uncoloured areas on the superficial (drift) designation map it is not possible to distinguish between areas of unproductive strata and areas where no drift is present. To do this, it is necessary to consult the published geological survey maps.

For the purposes of our Groundwater Protection Policy the following default position applies, unless there is site specific information to the contrary:

- If no superficial (drift) aquifers are shown, the bedrock designation is adopted
- In areas where the bedrock designation shows unproductive strata (the uncoloured areas) the superficial designation is adopted
- In all other areas, the more sensitive of the two designations is used (e.g. If secondary drift overlies principal bedrock, an overall designation of principal is assumed)

The EA have also designated Source Protection Zones, which are based on proximity to a groundwater source (springs, wells and abstraction boreholes). The size of a Source Protection Zone is a function of the aquifer, volume of groundwater abstracted and the effective rainfall, and may vary from tens to several thousand hectares.

#### Hydrology

Lithos obtain information from the Environment Agency and the Landmark Information Group with respect to:

- surface water quality
- recorded pollution incidents
- licensed abstractions (groundwater & surface waters)
- licensed discharge consents
- site susceptibility to flooding

### Generic notes – geoenvironmental Investigations

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The EA have set water quality targets for all rivers. These targets are known as River Quality Objectives (RQOs). The water quality classification scheme used to set RQO planning targets is known as the River Ecosystem scheme. The scheme comprises five classes (RE1 to RE5) which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers.

General Quality Assessment (GQA) grades reflect actual water quality. They are based on the most recent analytical testing undertaken by the EA. There are six GQA grades (denoted A to F) defined by the concentrations of biochemical oxygen demand, total ammonia and dissolved oxygen.

The susceptibility of a site to flooding is assessed by reference to a Flood Map on the Environment Agency's website. These maps provide show natural floodplains - areas potentially at risk of flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

There are two different kinds of area shown on the Flood Map:

1. Dark blue areas could be flooded by the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or by a river by a flood that has a 1% (1 in 100) or greater chance of happening each year
2. Light blue areas show the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements

The maps also show all flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, or floods from the sea with a 0.5% (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.

The Agency's assessment of the likelihood of flooding from rivers and the sea at any location is based on the presence and effect of all flood defences, predicted flood levels, and ground levels.

It should also be noted that as the floodplain shown is the 1 in 100 year (or 1 in 200 year as appropriate), areas outside this may be flooded by more extreme floods (e.g. the 1 in 1000 year flood). Also, parts of the areas shown at risk of flooding will be flooded by lesser floods (e.g. the 1 in 5 year flood). In some places due to the shape of the river valley, the smaller floods will flood a very similar extent to larger floods but to a lesser depth.

If a site falls within a floodplain, it is recommended that a flood survey be undertaken by a specialist consultant who can advise on appropriate mitigating measures; ie raising slab levels, provision of storage etc.

### COMAH & explosive sites

Lithos obtain information from the Landmark Information Group with respect to COMAH or explosive sites within 1km of the proposed development site. Lithos's report refers to any that are present, and recommends that the Client seeks further advice from the HSE.

Areas around COMAH sites (chemical plants etc) are zoned with respect to the implementation of emergency plans. The HSE are a statutory consultee to the local planning authority for all COMAH sites. The COMAH site may have to revise its emergency action plan if development occurs. This might be quite straightforward or could entail significant expenditure. Consequently, the COMAH site may object to a proposed development (although it is the Local Authority who have final say, and they are likely to place more weight on advice from the HSE).

### Preliminary conceptual ground model

The site's environmental setting (and proposed end use) is used by Lithos to assess the significance of any contamination encountered during the subsequent ground investigation

Assessment of contaminated land is based on an evaluation of pollutant linkages (source-pathway-receptor). Contaminants within the near surface strata represent a potential source of pollution. The environment (most notably groundwater), site workers and end users are potential targets.

Potential pollutant linkages are shown on a preliminary conceptual site model, presented as a Drawing in an Appendix to this Geoenvironmental Report. The preliminary model is revised in light of data arising from the subsequent ground investigation.

#### General

Lithos Ground Investigations are undertaken in accordance with current UK guidance including:

- BS5930:1999 "Code of practice for site investigation"
- BS10175:2011 "Code of practice for the identification of potentially contaminated sites"
- "Technical Aspects of Site Investigation" – EA R&D Technical Report P5-065/TR (2000)
- "Development of appropriate soil sampling strategies for land contamination" – EA R&D Technical Report P5-066/TR (2001)
- Contaminated Land Reports 1 to 6, most notably CLR Report No. 4 "Sampling strategies for contaminated land"
- "Guidance on the protection of housing on contaminated land" – NHBC & EA R&D Publication 66 (2000)
- AGS: 1996 "Guide to the selection of Geotechnical Soil Laboratory Testing"

Exploratory hole logs are presented in Appendices to this Geoenvironmental Report. These logs include details of the:

- Investigation technique adopted
- Samples taken
- Descriptions of the solid strata, and any groundwater encountered.
- Results of any in-situ testing
- Any gas\groundwater monitoring well installed

#### Exploratory hole locations

Exploratory hole locations are selected by Lithos, prior to commencement of fieldwork, to provide a representative view of the strata beneath the site and to target potential contaminant sources identified during the preliminary investigation (desk study). Additional exploratory locations are often determined by the site engineer in light of the ground conditions actually encountered; this enables better delineation of the depth and lateral extent of organic contamination, poor ground, relict structures etc.

#### Investigation techniques

Ground conditions can be investigated by a number of techniques; the procedures used are in general accordance with BS5930: 1999 and BS1377: 1990. Techniques most commonly used by Lithos include:

- Machine excavated trial pits, usually equipped with a backactor and a 0.6m wide bucket.
- Cable percussive (Shell & Auger) boreholes, typically using 150mm diameter tools and casing.
- Window or Windowless Sampling boreholes. Constraints associated with existing buildings, operations and underground service runs can render some sites partly or wholly inaccessible to a mechanical excavator. In such circumstances, window sampling is often the most appropriate technique. A window sampling drilling rig can be manoeuvred in areas of restricted access and results in minimal disturbance of the ground (a 150mm diameter tarmac/concrete core can be lifted and put to one side). However, it should be noted that window sampling allows only a limited inspection of the ground (especially made ground with a significant proportion of coarse material).
- Rotary percussive open-hole probeholes are typically drilled using a tricone rock roller bit with air as the flushing medium. Probeholes are generally lined through made ground with temporary steel casing to prevent hole collapse.

Where installed, gas\groundwater monitoring wells typically comprise a lower slotted section, surrounded by a filter pack of 10 mm non-calcareous gravel and an upper plain section surrounded in part by a bentonite seal and in part by gravel or arisings. The top of the plain pipe is cut off below ground level and the monitoring well protected by a square, stopcock type manhole cover set in concrete, or the plain pipe is cut off just above ground level and the well protected by 100mm diameter steel borehole helmet set in concrete. Monitoring well details, including the location of the response zone and bentonite seal are presented on the relevant exploratory hole logs.

#### In-situ testing

Where relative densities of granular materials given on the trial pit and window sample logs are based on visual inspection only, they do not relate to any specific bearing capacities.

The relative densities of granular materials encountered in cable percussive boreholes are based on Standard Penetration Test (SPT) results. SPTs are carried out boreholes, in accordance with BS 1377 1990, Part 9 Section 3.3. Where full penetration (600mm) is not possible, N values are calculated by linear extrapolation and are shown on the logs as  $N^* = x$ . The strength of cohesive deposits is determined using a hand shear vane.

Shear strength test results reported on trial pit logs are considered to be more reliable than those reported on window sample logs. Significant sample disturbance occurs during window sampling and consequently shear strength results on disturbed window samples are generally lower than results obtained during trial pitting, in-situ or in large excavated blocks.

### Generic notes – geoenvironmental investigations

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#### Sampling

Typically Lithos collect at least three soil samples from each exploratory hole, although in practice a greater number are often taken. The collection of a sufficient number of samples provides a sound basis upon which to schedule laboratory analysis, ensuring:

- A sufficient number of samples from each (common) site material are tested
- Horizontal and vertical coverage of the site is adequate, thereby providing a robust data set for use in the conceptual ground model
- Any localised, significant, but non-pervasive conditions are considered

Made ground and natural soils encountered in the field during a ground investigation often contain a significant proportion of coarse grained material (e.g. brick etc). Soil samples obtained during most investigations are often only truly representative of the in-situ soil mass where there is an absence of particles coarser than medium gravel; i.e the entire soil mass would pass a 20mm sieve.

Representative bulk samples of the **soil mass** are retrieved from coarse soils for specific geotechnical tests (most notably grading and compaction); this typically requires the collection of at least 10kg of soil, and occasionally >50kg. However, in the context of assessing land contamination, it is generally accepted that samples should be representative of the **soil matrix** of the stratum from which they are taken. Consequently, truly representative samples of coarse soils for subsequent contaminant analysis are not obtained - only the finer fraction is placed in sample containers. Coarse constituents not sampled would typically comprise any 'particles' with an average diameter greater than about 20mm (i.e. coarse gravel, cobble and boulder).

At present, neither ISO/IEC 17025 nor MCERTS specify sample pre-treatment with respect to stone removal. Unsurprisingly therefore UKAS accredited testing laboratories do not adopt the same approach to stones<sup>1</sup> – some crush and test the "as received" soil, whilst others sieve out stones and analyse only the residual soil (the sieve size used varies depending on the laboratory).

In essence, samples taken from coarser soils for contaminant analysis are "screened" by the geoenvironmental engineer in the field, and often sieved again by the laboratory during sample preparation. Geoenvironmental engineers do not typically re-calculate soil mass contaminant concentrations by taking account of the unsampled coarse fraction. Likewise, laboratories that remove stones typically report contaminant concentrations based on the dry weight of soil passing the sieve. In the context of land contamination and human health risk assessment, this is considered reasonable, because it is the soil matrix which is of greatest concern. Stones are unlikely to:

- Provide a significant source for plant uptake (consumption of vegetables)
- Remain on vegetables after washing (consumption of vegetables)
- Be eaten (accidentally by an adult, or deliberately by a child)
- Be whipped-up by the wind for dust generation (inhalation)
- Stick to the skin for any length of time (dermal contact)
- Yield toxic vapour (inhalation)

Consequently, Lithos instruct labs to remove all stones >10mm, and to report the results as dry-weight based on the mass of matrix tested. However, the laboratory are given site-specific instruction where coarse stones are coated in say oil, or impregnated with mobile contaminants such as diesel. Where the stones are predominantly natural, or inert (e.g. brick, concrete etc), removal will clearly result in higher reported concentrations, than if the stones were crushed and added to the matrix.

Where the stones include a significant proportion of contaminant-rich material (e.g. slag, fragments of galvanised metal etc) an argument could be made for crushing and analysing. However, provided the stones are stable (i.e. unlikely to disintegrate or degrade) they should not pose a significant risk to human health for the reasons stated above.

Sometimes it is necessary to obtain samples that are not representative of the wider soil matrix, for example when investigating localised, significant, but non-pervasive conditions. Any such unrepresentative samples are annotated with the suffix '\*' (eg 2D\*, or 4G\*). Lithos' site engineer describes both the unrepresentative sample, and the soil mass from which it was been taken.

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<sup>1</sup> Mark Perrin. Stoned – Sample Preparation for Soils Analysis. Ground Engineering, April 2007.

### Generic notes – geoenvironmental investigations

**Sample Containers (for contaminant analysis).** Samples of soil for contaminant testing are placed into appropriate containers (see below). Soil samples for organic analysis are stored in cool boxes, at a temperature of approximately 4°C, until delivery to the selected laboratory.

| Anticipated testing                           | Container(s)                                                         |
|-----------------------------------------------|----------------------------------------------------------------------|
| pH & metals only                              | 1 kg plastic tub                                                     |
| organics (TPH, PAH) etc only                  | 500ml wide-necked glass jar. Vial required if TPH is to include GRO. |
| VOCs (incl. naphthalene and/or GRO) only      | Glass vial & 1kg plastic tub                                         |
| pH & metals, and organics                     | 1 litre wide-necked glass jar & 1kg plastic tub                      |
| pH & metals, and organics (incl. VOCs or GRO) | Glass vial; 1 litre wide-necked glass jar; & 1kg plastic tub         |

**Sample Containers (for geotechnical analysis).** The majority of samples are only scheduled for PI and sulphate testing, for which 500g of sample is required (a full 0.5-litre plastic tub). However, bulk bags are taken where scheduling of compaction or grading tests is proposed.

### Groundwater

Where encountered during fieldwork, groundwater is recorded on exploratory hole logs. If monitoring wells are installed, groundwater levels are also recorded on one or more occasions after completion of the fieldwork. Long-term monitoring of standpipes or piezometers is always recommended if water levels are likely to have a significant effect on earthworks or foundation design.

It should be borne in mind that the rapid excavation rates used during a ground investigation may not allow the establishment of equilibrium water levels. Water levels are likely to fluctuate with season/rainfall and could be substantially higher at wetter times of the year than those found during this investigation.

### Description of strata

Soils encountered during an Lithos investigation are described (logged) in general accordance with BS 5930. The descriptions and depth of strata encountered are presented on the exploratory hole logs and summarised in the Ground Conditions section within the main body of text. The materials encountered in the trial pits are logged, samples taken, and tests performed on the in-situ materials in the excavation faces, to depths of up to 1.2m; below this depth these operations are conducted at the surface on disturbed samples recovered from the excavation.

### Key to exploratory hole logs

Keys to logs are presented in the Appendix(ces) containing the logs. There are two Keys – Symbols & Legends and Terms & Definitions.

#### General

Soil samples are delivered to the laboratory for testing along with a schedule of testing drawn up by Lithos. All tests are carried out in accordance with BS 1377:1990. The following laboratory testing is routinely carried out on a selection of samples:

- Atterberg limits & moisture contents
- Soluble sulphate & pH

The additional tests are typically only scheduled where significant earthworks regrade is anticipated:

- Grading
- Compaction tests
- Particle density

The test results are presented as received in an Appendix to this Geoenvironmental Report.

#### Atterberg limits & moisture content

The Liquid and Plastic Limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test. These tests enable determination of an average Plasticity Index (PI) for each "type" of clay, although judgement is applied where variable results are reported.

PI can be related to shrinkability (low, medium or high) and then to minimum founding depth. Lithos typically only consider a soil to be shrinkable if the proportion finer than 63µm is >35%. PI results are compared against guidance given in the NHBC Standards, Chapter 4.2 (revised April 2003), which advocates the use of modified Plasticity Index (I'p), defined as:

$$I'p = Ip * (\% < 425\mu m / 100)$$

ie if PI is 30%, but the soil contains 80% < 425µm, then:  $I'p = 30 * 80/100 = 24\%$ .

It should be noted that in accordance with the requirements of BS 1377, the % passing the 425µm sieve is routinely reported by testing labs. Lithos apply engineering judgment where PI results are spread over a range of classifications. Consideration is given to:

- The average values for each particular soil type (ie differentiate between residual soil and alluvium),
- The number of results in each class and
- The actual values

Unless the judgment strongly indicates otherwise, Lithos typically adopt a conservative approach and recommend assumption of the higher classification.

#### Soluble sulphate and pH

Sulphates in soil and groundwater are the chemical agents most likely to attack sub-surface concrete, resulting in expansion and softening of the concrete to a mush. Another common cause of concrete deterioration is groundwater acidity.

The rate of chemical attack depends on the concentration of aggressive ions and their replenishment at the reaction surface. The rate of replenishment is related to the presence and mobility of groundwater.

Lithos refer to BRE Special Digest 1 (SD1) "Concrete in aggressive ground. Part 1: Assessing the aggressive chemical environment" (2005). SD 1 provides definitions of:

- The nature of the site (greenfield, brownfield or pyritic)
- The groundwater regime (static, mobile or highly mobile)
- The design sulphate class (DC class) and
- The aggressive chemical environment for concrete (ACEC class)

Lithos reports clearly state each of the above for the site being considered.

The concentrations of sulphate in aqueous soil/fill extracts are determined in the laboratory using the gravimetric method. The results are expressed in terms of SO<sub>4</sub> for direct comparison with BS 5328:1997. The pH value of each sample was determined by the electrometric method.

SD1 also discusses determination of "representative" sulphate concentration from a number of tests. Essentially if <10 samples of a given soil-type have been tested, the highest measured sulphate concentration should be taken. If >10 samples have been tested, the mean of the highest 20% of the sulphate test results can be taken. With respect to groundwater, the highest sulphate concentration should always be taken.

With respect to pH (soil & groundwater) the value used is the lowest value if <10 samples have been tested and the mean of the lowest 20% if >10 samples have been tested.

#### Determination of analytical suite

An assessment of potential contaminants associated with the former usages of the site is undertaken with reference to CLR 8 "Potential contaminants for the assessment of land" and the relevant DETR Industry Profile(s).

#### Common Contaminants

Common **Inorganic** Contaminants include:

- metals, most notably cadmium, copper, chromium, mercury, lead, nickel, and zinc.
- semi-metals, most notably arsenic, selenium, and (water soluble) boron
- non-metals, most notably sulphur
- inorganic anions, most notably cyanides (free & complex), sulphates, sulphides, and nitrates.

With respect to the terminology used by most analytical laboratories:

Total cyanide = Free cyanide + Complex cyanide

Total cyanide (CN) is determined by acid extraction; whereas free cyanide is the water soluble fraction.

Complex cyanide is "bound" in compounds and is hard to breakdown. Laboratory determination of complex CN involves subjecting the sample to uv digestion for determination of both free and total CN.

Thiocyanate (SCN) is a different species combined with sulphur.

Elemental sulphur (S) and free sulphur are the same. Total sulphur is all forms, including that present in sulphates (SO<sub>4</sub>), sulphides etc

There are 2 forms of chromium (Cr), chromium VI and chromium III. Chromium VI is the more toxic of these. In soils, total chromium is determined by a strong aqua regia acid digestion. Chromium VI is an empirical method based on a water extract test.

Common **Organic** Contaminants include hydrocarbons, phenols, and polychlorinated biphenyls.

Petroleum hydrocarbons are a mixture of hydrocarbons produced from the distillation of crude oil. They include aliphatics (alkanes, alkenes and cycloalkanes), aromatics (single or multi benzene ringed compounds) and hydrocarbon-like compounds containing minor amounts of oxygen, sulphur or nitrogen.

Petroleum hydrocarbons can be grouped based on the carbon number range:-

- GRO – Gasoline Range Organics (typically C<sub>6</sub> to C<sub>10</sub>). Also referred to as PRO – Petroleum Range Organics
- DRO – Diesel Range Organics (typically C<sub>10</sub> to C<sub>28</sub>)
- LRO - Lubricating Oil Range Organics (typically C<sub>28</sub> to C<sub>40</sub>)
- MRO – Mineral Oil Range Organics (typically C<sub>18</sub> to C<sub>44</sub>)

However, it should be borne in mind that the terms "GRO" and "DRO" analysis are purely descriptive terms, the exact definition of which varies.

Total Petroleum Hydrocarbons (TPH) is also a poorly defined term; some testing laboratories regard TPH as hydrocarbons ranging from C<sub>5</sub>-C<sub>40</sub>, whereas other define TPH as C<sub>10</sub>-C<sub>30</sub>.

The composition of a TPH plume migrating through the ground can vary significantly; this is primarily dictated by the nature of the source (eg petrol, diesel, engine oil etc). Furthermore, different hydrocarbons are affected differently by weathering processes, and this can result in further variation in the chemical composition of the TPH.

Gasoline contains light aliphatic hydrocarbons (especially within the C<sub>4</sub> to C<sub>5</sub> range) that will rapidly evaporate. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene and xylenes, referred to as BTEX. Small amounts of polyaromatic hydrocarbons (PAHs) such as benzo(a)pyrene may also be present.

Diesel and light fuel oils have higher molecular weights than gasoline. Consequently, they are less volatile and less water soluble. About 25 to 35% is composed of aromatic hydrocarbons. BTEX concentrations are generally low.

Heavy Fuel Oils are typically dark in colour and considerably more viscous than water. They contain 15 to 40% aromatic hydrocarbons. Polar nitrogen, sulphur and oxygen-containing compounds (NSO) compounds are also present.

Lubricating Oils are relatively viscous and insoluble in groundwater. They may contain 10 to 30% aromatics, including the heavier PAHs. NSO compounds are also common.

Polycyclic Aromatic Hydrocarbons (PAHs) have more than two fused benzene rings as a structural characteristic. PAH compounds are present in both petrol and diesel, although in significantly lower concentrations than in coal tars. Certain PAH compounds are carcinogenic (Benzo(a)pyrene) and/or mobile in the environment (naphthalene).

### Generic notes – geoenvironmental investigations

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Semi-Volatile Organic Compounds (sVOCs) include a variety of compounds, which as the names suggest have relatively low boiling points; however, VOC's are much more volatile than sVOC's. Examples of VOC's include benzene, chloroform and toluene; sVOC's include phenol, florene. Both groups of chemicals are readily absorbed through skin and some, such as benzene, are believed to be linked to tumour growth.

Phenols are compounds that have a hydroxyl group attached to an aromatic ring (ie include a benzene ring and an -OH group). Most are colourless solids. A solution of phenol in water is known as carbolic acid, and is a powerful antiseptic. However, phenol vapour is toxic, and skin contact can result in burns.

Polychlorinated Biphenyls (PCBs) were used in pre-1974 transformers as dielectric fluids. PCB's are of increasing toxicity relative to the degree of chlorination. Acute symptoms of PCB poisoning are irritation of the respiratory tract leading to coughing and shortness of breath. Nausea, vomiting and abdominal pain are caused by ingestion of PCB's.

Dioxins and furans (polychlorinated dibenzodioxins and polychlorinated dibenzofurans) are some of the most toxic chemicals known; in the environment, they tend to bio-accumulate in the food chain. Dioxin is a general term that describes a group of hundreds of chemicals that are highly persistent in the environment. The most toxic compound is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD.

Dioxin is formed by burning chlorine-based chemical compounds with hydrocarbons. The major source of dioxin in the environment comes from waste-burning incinerators and also from backyard burn-barrels. Dioxin pollution is also affiliated with paper mills which use chlorine bleaching in their process and with the production of Polyvinyl Chloride (PVC) plastics and with the production of certain chlorinated chemicals (like many pesticides).

### Methods of Analysis (Organic Compounds)

TPH by GC-FID is a more refined analytical technique which only detects hydrocarbons (aliphatic and aromatic) in the range C10 to C40 (volatiles, heavy tars, humic material and sulphur are not detected). The laboratory can provide a breakdown of the TPH results into diesel range organics (DRO) and heavier lubricating oil range organics (LRO).

GRO (PRO) by GC-FID analysis detects the more volatile C6-C9 hydrocarbons (aliphatic and aromatic), including those organic compounds present in petrol.

Speciated VOC (by GC-MS) analysis quantifies the concentrations of 30 USA-EPA priority compounds. These include chlorinated alkanes and alkenes (in the molecular weight range chloroethane to tetrachloroethane); trimethylbenzenes; dichlorobenzenes; and the 4 BTEX compounds (benzene, ethyl-benzene, toluene & xylene).

Speciated sVOC by (GC-MS) analysis quantifies the concentrations of a variety of organic compounds, including the 16 USA-EPA priority PAHs, phenols, 7 USA EPA priority PCB congeners, herbicides & pesticides.

Note: PAHs are hydrocarbons and consequently (where present) will be picked-up when scheduling TPH. by GC-FID. Naphthalene (the lightest PAH) is also one of the 58 US EPA VOCs.

Speciated TPH by GC-FID provides a "banded" TPH, initially split into aromatic and aliphatic fractions and then further divided into fraction specific carbon bandings based upon behavioural characteristics.

Note: Risk assessment models require physiochemical properties (solubilities, toxicities etc) of compounds in order to model their behaviour in the environment. These physiochemical properties cannot be derived from a single "TPH", "GRO" or "DRO" value. However, the carbon banded fractions can be used in risk assessment models.

### Current UK guidance

The UK approach to contaminated land is set out in Contaminated Land Report No. 11 (2004) "Model Procedures for the Management of Land Contamination". The approach is based upon risk assessment, where risk is defined as the combination of the probability of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

In the context of land contamination, there are three essential elements to any risk: (1) a contaminant source, (2) a receptor (eg controlled water or people) and (3) a pathway linking the (1) and (2). Risk can only exist where all three elements combine to create a pollutant linkage. Risk assessment requires the formulation of a conceptual model which supports the identification and assessment of pollutant linkages.

Lithos adopt a tiered approach to risk assessment, consistent with UK guidance and best practice. The initial step of such a risk assessment (or Tier 1) is the comparison of site data with appropriate UK guidance levels, Lithos risk-derived screening values, or remedial targets. It should be noted that exceedance of Tier 1 does not necessarily mean that remedial action will be required.

## Generic notes – geoenvironmental investigations

## Soil screening values used by Lithos

In March 2002 DEFRA and the Environment Agency published a series of technical papers (R&D Publications CLR 7, 8, 9 and 10) outlining the UK approach to the assessment of risk to human health from land contamination. In 2008 CLR 7, 9 and 10 and all corresponding SGV and Tox reports were withdrawn and superseded by new guidance including:

- Guidance on Comparing Soil Contamination Data with a Critical Concentration - CL:AIRE and CIEH, May 2008
- Evaluation of models for predicting plant uptake of chemicals from soil - Science Report – SC050021/SR
- Human health toxicological assessment of contaminants in soil - Science Report: SC050021/SR2
- Updated technical background to the CLEA model - Science Report: SC050021/SR3
- CLEA Software (Version 1.05) Handbook Science report: SC050021/SR4
- Compilation of data for priority organic pollutants for derivation of Soil Guideline Values - Science Report: SC050021/SR7

The approach set out in these documents represents current scientific knowledge and thinking; and includes the Contaminated Land Exposure Model (CLEAv1.06). The Environment Agency are in the process of using this updated approach to regenerate a selection of Soil Guideline Values (SGVs).

CLEA SGVs were derived for standard land use scenarios predominantly in the context of Part IIA, using a conceptual site model (CSM) defined in SR3. Lithos have incorporated amendments to the CSM used to derive SGVs, that more accurately reflect redevelopment within the planning regime; consequently, Lithos have not adopted any published SGV as a screening value.

The CLEA conceptual site model assumes a source located in a sandy loam, with 6% soil organic matter (SOM) - equivalent to 3.5% total organic carbon (TOC). Lithos consider it reasonable to adopt the CLEA default TOC for made ground. However, where the average TOC value for a particular soil type is significantly lower than the 3.5%, evaluation of Lithos Screening Values should be undertaken and a site specific risk assessment will usually be required. Other CLEA default characteristics adopted by Lithos are:

| Sandy Loam characteristics (source) | Default values adopted |
|-------------------------------------|------------------------|
| Total porosity (fraction)           | 0.53                   |
| Water filled porosity (fraction)    | 0.33                   |
| Air filled porosity (fraction)      | 0.2                    |

Lithos have derived Screening Values for four different CSMs (scenarios); these are:

- A - Residential with gardens, but no cover (or only up to 300mm)
- B - Residential with gardens and 600mm 'clean' cover
- C - Residential apartments with landscaping (i.e. no home grown produce)
- D - Commercial/industrial with landscaping

The **exposure** pathways considered for each scenario are detailed in the table below.

| Scenario | Land use                                                             | Pathways                                                                                                                                                                                                                                                                       | Justification                                                                                                                                                                                                                                   |
|----------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A        | Residential with garden, but no cover (or only up to 300mm)          | <ul style="list-style-type: none"> <li>• Direct ingestion of soil</li> <li>• Dermal contact</li> <li>• Consumption of vegetables and soil attached to vegetables</li> <li>• Inhalation of indoor vapours and dust</li> <li>• Inhalation of outdoor vapours and dust</li> </ul> | Minimal cover – insufficient to break any pathways therefore all exposure pathways are relevant.                                                                                                                                                |
| B        | Residential with garden minimum 600mm cover                          | <ul style="list-style-type: none"> <li>• Inhalation of indoor vapours</li> <li>• Inhalation of outdoor vapours</li> </ul>                                                                                                                                                      | The 600mm cover removes the risk from all pathways other than inhalation.                                                                                                                                                                       |
| C        | Residential apartments with landscaped areas and minimum 300mm cover | <ul style="list-style-type: none"> <li>• Direct ingestion of soil</li> <li>• Dermal contact</li> <li>• Inhalation of indoor vapours and dust</li> <li>• Inhalation of outdoor vapours and dust</li> </ul>                                                                      | All pathways applicable due to possible exposure from landscaped areas. However consumption of home grown produce not included as unlikely to be grown in landscaped areas. Where vegetables are to be grown site specific QRA may be required. |
| D        | Commercial/ industrial with landscaped areas no cover                | <ul style="list-style-type: none"> <li>• Direct ingestion of soil</li> <li>• Dermal contact</li> <li>• Inhalation of indoor vapours and dust</li> <li>• Inhalation of outdoor vapours and dust</li> </ul>                                                                      | All pathways applicable due to possible exposure from landscaped areas. Assumed the commercial development consists of offices to provide a conservative assessment.                                                                            |

## Generic notes – geoenvironmental investigations

Lithos have assumed the source of contamination is directly below the building foundations i.e. a depth to source of 0.15m as opposed to the CLEA default of 0.65m. This assumption provides for a more conservative approach than the UK default. This adjustment has been included to account for sites where made ground is re-engineered to enable new buildings to be established on raft foundations. In such situations contamination may lie directly beneath the foundation.

The Soil Screening Values referred to in this document are **not** intended to be used when considering potential risks associated with:

- Existing land uses in the context of Part IIA of the Environment Protection Act 1990;
- End uses such as allotments, sports fields, children's playgrounds, care homes, hospitals etc; and
- Controlled waters

In December 2013 Defra published the results of research project SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. The objective of this project was provide technical guidance in support of Defra's revised Statutory Guidance for Part 2A of the Environmental Protection Act 1990 (Part 2A). The revised Statutory Guidance, published in April 2012, introduced a new four-category system for classifying land under Part 2A where Category 1 includes land where the level of risk is clearly unacceptable, and Category 4 includes land where the level of risk posed is acceptably low. Project SP1010 aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- Demonstration of the methodology, via derivation of C4SLs for 6 substances – arsenic, cadmium, chromium IV, lead, benzene & benzo(a)pyrene.

The methodology for deriving both the previous Soil Guideline Values and the new Category 4 Screening Levels is based on the Environment Agency's Contaminated Land Exposure Assessment (CLEA) methodology. Development of Category 4 Screening Levels has been achieved by modifying the toxicological and/or exposure parameters used within CLEA (while maintaining current exposure parameters).

The Part 2A Statutory Guidance was developed on the basis that Category 4 Screening Levels could be used under the planning regime. However, policy responsibility for the National Planning Policy Framework falls to the Department for Communities and Local Government. Defra anticipate that, where they exist, C4SLs will be used as generic screening criteria, and Lithos consider C4SLs to be suitable for use as Tier 1 Screening Values. Lithos have discussed this matter with both NHBC and YAHFAC (collection of Yorkshire & Humberside local authorities) and received confirmation that they are satisfied with this approach.

With respect to **inorganic** determinands, Lithos derived Tier 1 values for the four Scenarios A to D are presented below:

| Inorganic contaminant | Source | Tier 1 assessment criteria (mg/kg) for Scenarios A to D |       |        |                                                                                                         |        |        | Comments/notes                                                                           |
|-----------------------|--------|---------------------------------------------------------|-------|--------|---------------------------------------------------------------------------------------------------------|--------|--------|------------------------------------------------------------------------------------------|
|                       |        | SGV*                                                    | C4SL* | A      | B                                                                                                       | C      | D      |                                                                                          |
| As                    | CLEA   | 32                                                      | 37    | 37     | Use (A) in SI Report for initial "screen".<br><br>If >5 x A, then consider increase of cover to 1,000mm | 40     | 640    | C4SL adopted                                                                             |
| Cd                    | CLEA   | 10                                                      | 26    | 26     |                                                                                                         | 149    | 410    | C4SL adopted                                                                             |
| Cr                    | CLEA   |                                                         |       | 3,000  |                                                                                                         | 3,000  | 30,000 | Assumes Cr is CrIII.                                                                     |
| Pb                    | CLEA   | 450                                                     | 200   | 200    |                                                                                                         | 310    | 2,330  | C4SL adopted                                                                             |
| Ni                    | CLEA   | 130                                                     |       | 127    |                                                                                                         | 127    | 1,700  | Assessment of health risk only                                                           |
| Se                    | CLEA   | 350                                                     |       | 350    |                                                                                                         | 595    | 13,000 |                                                                                          |
| Hg                    | CLEA   | 170                                                     |       | 169    |                                                                                                         | 238    | 3,640  | Assumes in an inorganic compound                                                         |
| B                     | Lithos |                                                         |       | 5      |                                                                                                         | 5      | 5      | Based on phytotoxic risks as plants are the more sensitive receptor (Cu is pH dependant) |
| Cu                    | DoE    |                                                         |       | 80-200 |                                                                                                         | 80-200 | 80-200 |                                                                                          |
| Zn                    | DoE    |                                                         |       | 200    |                                                                                                         | 200    | 200    |                                                                                          |
| Cyanide               | CLEA   |                                                         |       | 527    |                                                                                                         | 530    | 14,000 |                                                                                          |

\* For a residential end use

## Generic notes – geoenvironmental investigations

With respect to **organic** determinands, Lithos derived Tier 1 values for the four Scenarios A to D are presented below:

| Organic contaminant<br>(all sourced via CLEA) | Tier 1 assessment criteria (mg/kg) for Scenarios A to D |       |       |       |       |        | Comments/notes                                |
|-----------------------------------------------|---------------------------------------------------------|-------|-------|-------|-------|--------|-----------------------------------------------|
|                                               | SGV*                                                    | C4SL* | A     | B     | C     | D      |                                               |
| Benzene                                       | 0.33                                                    | 0.87  | 0.87  | 0.87  | 3.3   | 98     | C4SL adopted                                  |
| Toluene                                       | 610                                                     |       | 497   | 1,440 | 1,690 | 4,360  |                                               |
| Ethyl Benzene                                 | 350                                                     |       | 240   | 416   | 498   | 2,840  |                                               |
| Xylenes                                       | 240                                                     |       | 127   | 146   | 183   | 2,620  |                                               |
| Phenol                                        | 420                                                     |       | 412   | 2,360 | 557   | 38,700 |                                               |
| PCBs                                          |                                                         |       | 1.7   | 1.8   | 1.8   | 1.8    | Based on toxicity of EC7.                     |
| Benzo(a)pyrene                                |                                                         | 5     | 5     | 25    | 5.3   | 76     | C4SL adopted. Where source is not a coal tar. |
| Naphthalene                                   |                                                         |       | 4     | 4     | 5     | 430    |                                               |
| Gasoline Range Organics                       |                                                         |       | 15    | 16    | 21    | 1,000  | See 3-step assessment of TPH below.           |
| Diesel Range Organics                         |                                                         |       | 151   | 153   | 232   | 5,000  |                                               |
| Lubricating Range Org                         |                                                         |       | 1,000 | 5,000 | 1,000 | 5,000  |                                               |

\* For a residential end use

Note: **PAH** cannot be assessed as a single "total" value, as each individual PAH compound has different toxicity and mobility in the environment. Speciated analysis is required to determine the concentrations of the various compounds, most notably the key PAHs: benzo(a)pyrene (considered the most toxic of the PAHs); and Naphthalene (the most mobile and volatile of the PAHs).

Similarly, **TPH** cannot be assessed as a single "total" value, and reference has been made to the Environment Agency's document P5-080/TR3, "The UK approach for evaluating human health risks from petroleum hydrocarbons in soils". This document supports the assumptions and recommendations made by the US Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG). The TPHCWG have broken down "TPH" into thirteen representative constituent fractions or "EC Bandings". The TPHCWG have derived a series of physiochemical and toxicological parameters for each of the thirteen bandings.

The significance of speciated TPH results can be assessed by following the 3 steps outlined in the tables below.

| Step                                                                                                         | Result | Action                                 |
|--------------------------------------------------------------------------------------------------------------|--------|----------------------------------------|
| 1. Consider indicator compounds: Are BTEX, naphthalene, benzo(a)pyrene above their respective Tier 1 values? | Yes    | Remediation or DQRA required           |
|                                                                                                              | No     | Proceed to Step 2                      |
| 2. Consider individual TPH fractions: are they above respective screening values?                            | Yes    | Remediation or DQRA required           |
|                                                                                                              | No     | Proceed to Step 3                      |
| 3. Assess Cumulative effects: Is the calculated Hazard Index for each source >1                              | Yes    | Remediation or DQRA required           |
|                                                                                                              | No     | TPH compounds pose no significant risk |

#### Step 1 - Assessing indicator compounds

| TPH fraction<br>Indicator<br>compound | End use specific screening value (mg/kg) |                                 |                           |                            |
|---------------------------------------|------------------------------------------|---------------------------------|---------------------------|----------------------------|
|                                       | A: Residential no cover                  | B: Residential with 600mm cover | C: Residential no gardens | D: Commercial \ industrial |
| Benzene                               | 0.87                                     | 0.87                            | 3.3                       | 98                         |
| Toluene                               | 497                                      | 1,440                           | 1,690                     | 4,360                      |
| Ethyl Benzene                         | 240                                      | 416                             | 498                       | 2,840                      |
| Xylenes                               | 127                                      | 146                             | 183                       | 2,620                      |
| Naphthalene                           | 4                                        | 4                               | 5                         | 430                        |

## Generic notes – geoenvironmental investigations

## Step 2 - Assessing individual TPH fractions

| TPH fraction    |     | End use specific screening value (mg/kg) |                                 |                                |                           |
|-----------------|-----|------------------------------------------|---------------------------------|--------------------------------|---------------------------|
|                 |     | A: Residential no cover                  | B: Residential with 600mm cover | C: Residential with no gardens | D: Commercial/ industrial |
| Aliphatic 5-6   | GRO | 41                                       | 41                              | 63                             | 5,000 <sup>^</sup>        |
| Aliphatic 6-8   | GRO | 123                                      | 123                             | 191                            |                           |
| Aliphatic 8-10  | GRO | 30                                       | 31                              | 48                             |                           |
| Aliphatic 10-12 | DRO | 151                                      | 153                             | 232                            |                           |
| Aliphatic 12-16 | DRO | 500 <sup>^</sup>                         | 500 <sup>^</sup>                | 500 <sup>^</sup>               |                           |
| Aliphatic 16-21 | DRO | 1,000 <sup>^</sup>                       | 5,000 <sup>#</sup>              | 1,000 <sup>^</sup>             |                           |
| Aliphatic 21-35 | LRO | 1,000 <sup>^</sup>                       | 5,000 <sup>#</sup>              | 1,000 <sup>^</sup>             |                           |
| Aromatic 5-7    | GRO | 52                                       | 56                              | 72                             | 1,000 <sup>^</sup>        |
| Aromatic 7-8    | GRO | 15                                       | 16                              | 21                             |                           |
| Aromatic 8-10   | GRO | 47                                       | 50                              | 77                             |                           |
| Aromatic 10-12  | DRO | 212                                      | 282                             | 390                            |                           |
| Aromatic 12-16  | DRO | 683                                      | 1,000 <sup>*</sup>              | 1,000 <sup>*</sup>             |                           |
| Aromatic 16-21  | DRO | 1,000 <sup>^</sup>                       | 5,000 <sup>#</sup>              | 1,000 <sup>^</sup>             |                           |
| Aromatic 21-35  | LRO | 1,000 <sup>^</sup>                       | 5,000 <sup>#</sup>              | 1,000 <sup>^</sup>             |                           |

\* Calculated Screening Value exceeded soil saturation limit and could indicate free product, therefore calculated soil saturation limit adopted as a target

<sup>^</sup> Calculated Screening Value close to soil saturation limit, screening value selected by Lithos considering visual and olfactory impacts.

<sup>#</sup> Five times the screening value for Scenario A.

## Step 3 - Assessing Cumulative Effects

$$HI = \sum_{F_i=1}^{36} HQ F_i = \frac{\text{Measured concentration } F_i \text{ (mg kg}^{-1}\text{)}}{SGV F_i \text{ (mg kg}^{-1}\text{)}}$$

where  $HI$  = Hazard Index  
 $HQ$  = Hazard Quotient  
 $F_i$  = Fraction  $i$   
 $SGV$  = Soil Guideline Value

## Other screening values used by Lithos

Tier 1 risk assessment of **hazardous gas** is undertaken through reference to the following documents (and further information is presented in Generic Note No. 5 – Hazardous Gas):

- Approved Document C, Building Regulations 2000
- Boyle & Witherington (2007) – Guidance on evaluation on development proposals on sites where methane and carbon dioxide are present, incorporating "traffic lights". Report Ref. 10627-R01-(02), for NHBC
- CIRIA C665 (2006) – Assessing risks posed by hazardous ground gases to buildings
- BS 8485:2007 – Code of Practice for the characterisation & remediation from ground gas in affected developments

With respect to the assessment of potential **phytotoxic effects** of contaminants, Lithos refer to "The Soil Code" (MAFF, 1998) for copper and zinc. The CLEA SGV is adopted for nickel due to its human health effects.

The potential risk to **building materials** is considered through reference to relevant BRE Digests, with particular emphasis on BRE Special Digest 1, 'Concrete in aggressive ground', 2005.

With respect to the interpretation of the **calorific values**, at present there are no accepted methods to assess whether a sample is combustible and under what circumstances it might smoulder. Some guidance is given in ICRL Note 61/84 "Notes on the fire hazards of contaminated land" which states that:

*"In general ... it seems likely that materials whose CV's exceed 10MJ/kg are almost certainly combustible, while those with values below 2MJ/kg are unlikely to burn".*

## Generic notes – geoenvironmental investigations

Tier 1 **groundwater** risk assessments are undertaken by comparing leachate or groundwater concentrations with the appropriate water quality standard. Tier 1 Screening Values have been discussed with the Environment Agency, and typically those in **bold** below are adopted.

| Analyte                | Source of Tier 1 Screening Value (µg/l)       |                               |                           |                           |
|------------------------|-----------------------------------------------|-------------------------------|---------------------------|---------------------------|
|                        | Surface Water (Abstraction for Drinking) 1996 | Water Supply Regulations 2000 | Water Framework Directive | Environment Agency Advice |
| Arsenic                | 50                                            | 10                            | <b>50</b>                 |                           |
| Selenium               | 10                                            | <b>10</b>                     |                           |                           |
| Cadmium                | 5                                             | 5                             | <b>1.5</b>                |                           |
| Chromium               | 50                                            | 50                            | <b>32</b>                 |                           |
| Copper                 | 50                                            | 2,000                         | <b>28</b>                 |                           |
| Lead                   | 50                                            | 10                            | <b>7.2</b>                |                           |
| Nickel                 |                                               | 20                            | <b>20</b>                 |                           |
| Zinc                   | 3,000                                         |                               | <b>125</b>                |                           |
| Boron                  |                                               | <b>1,000</b>                  |                           |                           |
| Mercury                | 1                                             | 1                             | <b>0.07</b>               |                           |
| Petroleum Hydrocarbons |                                               |                               |                           | <b>10</b>                 |
| 1,1,1-Trichloroethane  |                                               |                               | <b>100</b>                |                           |
| 1,1 Dichloroethane     |                                               |                               |                           | <b>100</b>                |
| 1,2-Dichloroethane     |                                               | 3                             | <b>10</b>                 |                           |
| 1,1-Dichloroethene     |                                               |                               |                           | <b>100</b>                |
| Benzene                |                                               | 1                             | <b>10</b>                 |                           |
| Ethylbenzene           |                                               |                               |                           | <b>10</b>                 |
| Tetrachloroethene      |                                               | 10                            | <b>10</b>                 |                           |
| Toluene                |                                               |                               | <b>50</b>                 |                           |
| Trichloroethene        |                                               | 10                            | <b>10</b>                 |                           |
| Vinyl Chloride         |                                               | <b>0.5</b>                    |                           |                           |
| Trichloromethane       |                                               |                               | <b>2.5</b>                |                           |
| Xylenes                |                                               |                               | <b>30</b>                 |                           |
| Chloroethane           |                                               |                               |                           | <b>100</b>                |

## Waste classification &amp; WAC

In the context of waste soils generated by remediation and/or groundworks activities on brownfield sites, the following definitions (from the Landfill Regulations 2002) apply:

- Inert (e.g. uncontaminated 'natural' soil, bricks, concrete, tiles & ceramics)
- Non-Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances, but at concentrations below prescribed thresholds)
- Hazardous (e.g. soil excavated from a contaminated site which contains dangerous substances at concentrations above prescribed thresholds)

Dangerous substances include compounds containing a variety of determinants commonly found in contaminated soils on brownfield sites, for example arsenic, lead, chromium, benzene etc.

Landfill operators require Waste Acceptance Criteria (WAC) laboratory data, if soil waste is classified as **hazardous**, and such waste must have been subjected to pre-treatment. However, subject to WAC testing it may be possible to classify it as stable, non-reactive hazardous waste, which can be placed within a dedicated cell within the non-hazardous landfill.

Lithos typically only include WAC analysis in site investigation proposals and reports, if significant off-site disposal (of soil classified as hazardous waste) is anticipated, for example where redevelopment proposals include basement construction etc. If off-site disposal of soils classified as hazardous waste during redevelopment is anticipated, then WAC analysis should be scheduled at an early stage in the remediation programme. However, organic compounds (BTEX, TPH, PAH etc) are the most common contaminants that result in soils being classed as hazardous, and these contaminants can often be dealt with by alternative technologies (eg by bioremediation or stabilisation) and consequently retention on site is often possible.

It should be noted that **non-hazardous** soil waste can go to a non-hazardous landfill facility; no further testing (eg WAC) is required.

#### Possible action in event of Tier 1 exceedance

Should any of the Tier 1 criteria detailed above be exceeded, then three potential courses of action are available. (The first is only applicable in terms of human health, but the second and third could also be applied to groundwater or landfill gas).

1. Undertake further statistical analysis following the approach set out in "Guidance on Comparing Soil Contamination Data with a Critical Concentration - CL:AIRE and CIEH, May 2008" in order to determine whether contaminant concentrations of inorganic contaminants within soil\fill actually present a risk (only applicable to assessing the risk to human health).
2. Carry out a more detailed quantitative risk assessment in order to determine whether contamination risks actually exist.
3. Based on a qualitative risk assessment, advocate an appropriate level of remediation to "break" the pollutant linkage - for example the removal of the contaminated materials or the provision of a clean cover.

Prior to undertaking any statistical analysis the issue of the **averaging area** requires further consideration. The CL:AIRE\CIEH document still refers to CLR 7, which suggests averaging area should reflect receptor behaviour and therefore might be a single garden, or an open area used by the local community as a play area. This approach to averaging areas is considered applicable within the context of Part IIA of the Environmental Protection Act (EPA) 1990, in terms of an existing residential development.

However, Lithos consider the concept of a single garden as an averaging area to be inappropriate with respect to brownfield redevelopment, which is regulated by the planning regime. In this context, contamination across the entire site needs to be characterised by reference to the Conceptual Site Model. Consequently, Lithos gather and analyse sample results by fill type, and/or by former use in a given sub-area of the site, before undertaking statistical analysis; ie the averaging area is associated with the extent of a particular fill type, or an area affected by spillage\leakage.

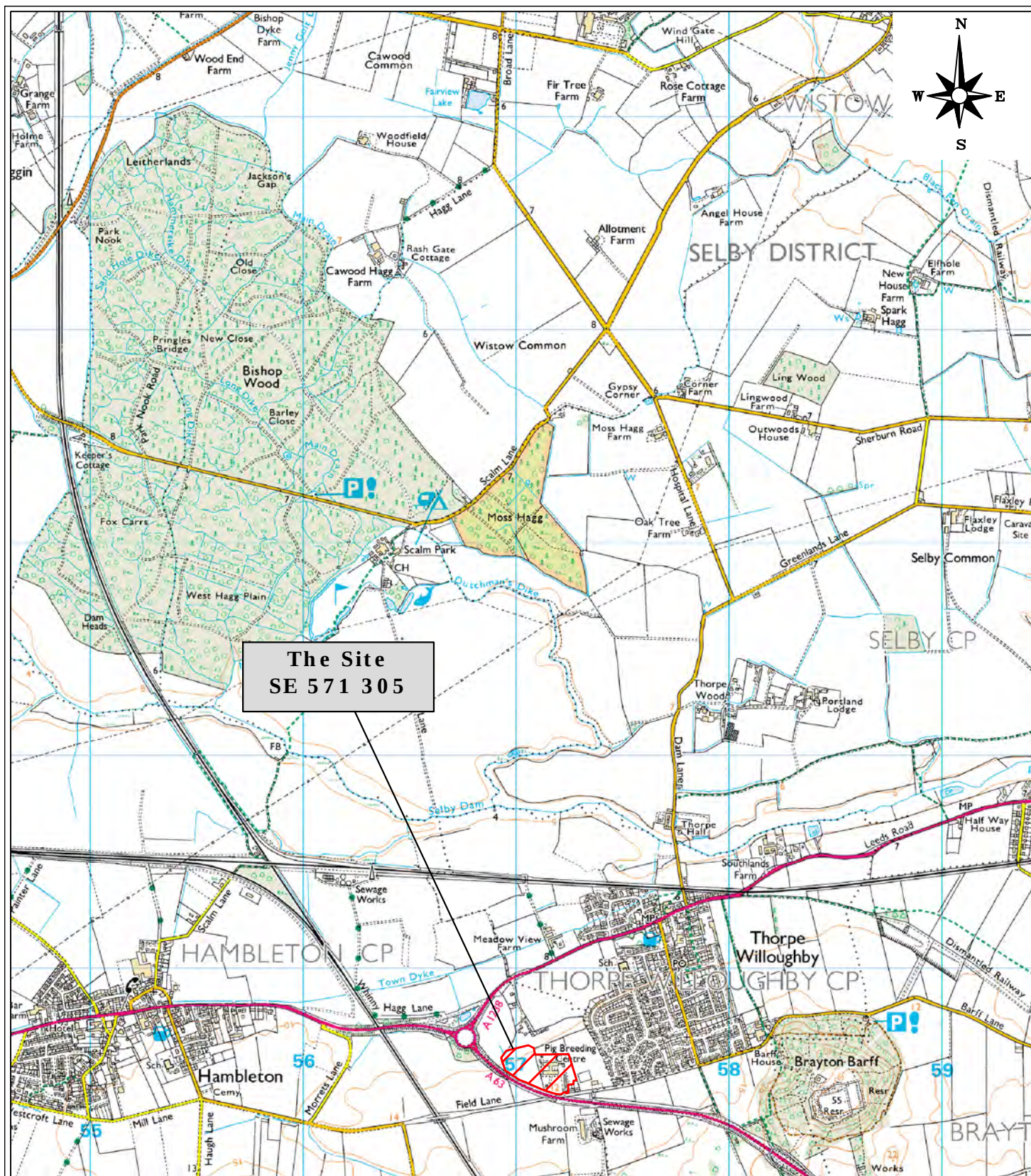
In terms of brownfield redevelopment, this is considered a more appropriate methodology which provides a more representative sample population for statistical analysis. As such the entire site is considered in terms of the proposed end use, be this residential with, or without gardens.

Analysis by soil\fill type is appropriate for essentially immobile contaminants associated with a particular fill type, for example arsenic in colliery spoil, metals in ash & clinker, sulphate in plaster-rich demolition rubble etc.

Analysis by former use is appropriate where more mobile contaminants have entered the ground, for example diesel associated with leakage from a former fuel tank, downward migration of leachable metals through granular materials, various soluble contaminants present in a wastewater leaking into the ground via a fractured sewer etc. In these circumstances, it may be appropriate to undertake statistical analysis of sample results from a variety of different soil\fill types. However, consideration would have to be given to factors such as porosity which might influence impregnation of a mobile contaminant into the soil mass; ie contamination would normally be more pervasive and significant in granular soils than cohesive soils.

## Appendix B

### Drawings



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JSR FARMS (via  
Procters)

FIELD LANE, THORPE  
WILLOUGHBY

SITE LOCATION  
PLAN

DRAWN NKH DATE 29/4/15

CHECKED REG DATE 29/4/15

STATUS FOR COMMENT ☐ DRAFT ☐  
FOR APPROVAL ☐ FINAL ☒

SCALE 1:25,000 SHEET A4 DRAWING NO. 2123/1



NOTES

— APPROXIMATE SITE BOUNDARY

REPRODUCED FROM WARD PC  
DRAWING REFERENCE R33189  
SK25/06/13-R

| REV. | DESCRIPTION | DATE |
|------|-------------|------|
|------|-------------|------|

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CLIENT

JSR FARMS (via Procters)

JOB TITLE

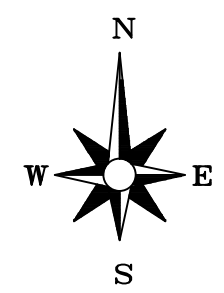
FIELD LANE, THORPE  
WILLOUGHBY

DRAWING TITLE

PROPOSED SITE LAYOUT

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| SCALE | not to scale | SHEET | A3 | DRAWING NO. | 2123/2 | REVISION |  |
|-------|--------------|-------|----|-------------|--------|----------|--|



| NOTES |                                          |      |
|-------|------------------------------------------|------|
|       | GRASS & OVERGROWN AREAS                  |      |
|       | BUILDING                                 |      |
|       | CONCRETE HARDSTAND                       |      |
|       | APPROXIMATE SITE BOUNDARY                |      |
|       | UNDERGROUND ELECTRIC                     |      |
|       | UNDERGROUND BT                           |      |
|       | OVERHEAD BT                              |      |
|       | POSSIBLE PIG CARCASS BURIAL PIT LOCATION |      |
|       | DIESEL STORAGE TANK                      |      |
|       | FEEDING SILOS                            |      |
|       | TANK DISCHARGE POOL                      |      |
| REV.  | DESCRIPTION                              | DATE |



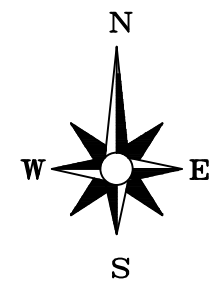
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JOB TITLE  
  
FIELD LANE, THORPE WILLOUGHBY

DRAWING TITLE  
  
SITE FEATURES

|                 |                 |                                                |          |
|-----------------|-----------------|------------------------------------------------|----------|
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|                 |                 | FINAL <input checked="" type="checkbox"/>      |          |
| SCALE<br>1:1250 | SHEET<br>A3     | DRAWING NO.<br>2123/3                          | REVISION |



NOTES

-  GRASS & OVERGROWN AREAS
-  BUILDING
-  CONCRETE HARDSTAND
-  APPROXIMATE SITE BOUNDARY
-  LOCATION & ORIENTATION OF PHOTOGRAPH

| REV. | DESCRIPTION | DATE |
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|      |             |      |



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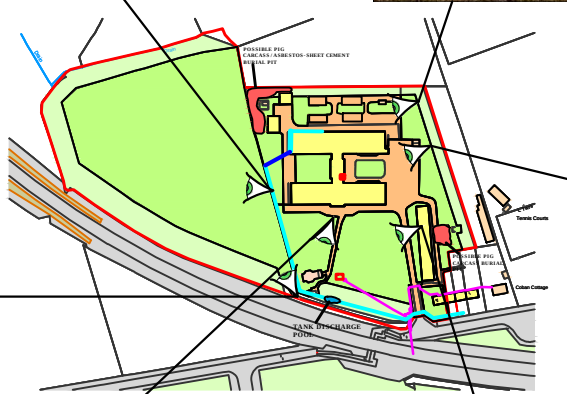
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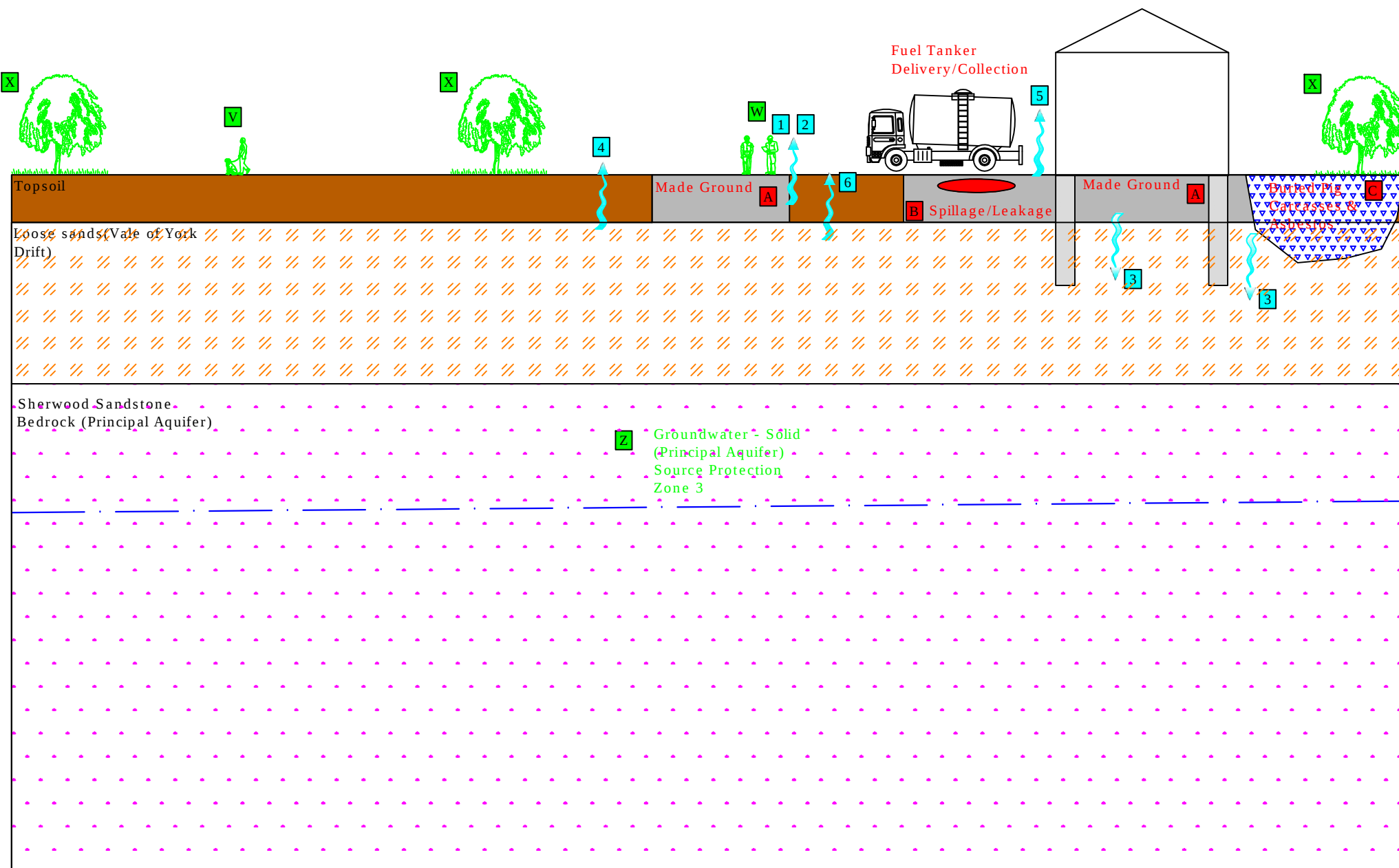
FIELD LANE, THORPE  
WILLOUGHBY

DRAWING TITLE

SITE PHOTOGRAPHS

|              |         |              |                                     |
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| REG          | 29/4/15 | DRAFT        | <input type="checkbox"/>            |
|              |         | FINAL        | <input checked="" type="checkbox"/> |
| SCALE        | SHEET   | DRAWING NO.  | REVISION                            |
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| SOURCES  |                                              |
|----------|----------------------------------------------|
| <b>A</b> | MADE GROUND (INORGANICS)                     |
| <b>B</b> | LEAKAGE \ SPILLAGE (ORGANICS)                |
| <b>C</b> | BURIED PIG CARCASSES / ASBESTOS SHEET CEMENT |

| PATHWAYS |                          |
|----------|--------------------------|
| <b>1</b> | DERMAL CONTACT           |
| <b>2</b> | INGESTION \ INHALATION   |
| <b>3</b> | LEACHING OF CONTAMINANTS |
| <b>4</b> | UPTAKE BY PLANTS         |
| <b>5</b> | VOLATILISATION           |
| <b>6</b> | MIGRATION OF GAS         |

| RECEPTORS |                       |
|-----------|-----------------------|
| <b>V</b>  | END USERS (RESIDENTS) |
| <b>W</b>  | SITE WORKERS          |
| <b>X</b>  | VEGETATION            |
| <b>Y</b>  | SURFACE WATERS        |
| <b>Z</b>  | GROUNDWATER           |

| NOTES |             |      |
|-------|-------------|------|
|       |             |      |
| REV.  | DESCRIPTION | DATE |



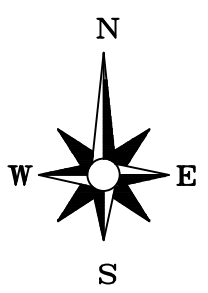
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|--------------------------|
| JSR FARMS (via Procters) |

| JOB TITLE                     |
|-------------------------------|
| FIELD LANE, THORPE WILLOUGHBY |

| DRAWING TITLE                     |
|-----------------------------------|
| PRELIMINARY CONCEPTUAL SITE MODEL |

|              |         |              |                                     |
|--------------|---------|--------------|-------------------------------------|
| DRAWN        | DATE    | STATUS       |                                     |
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| SCALE        | SHEET   | DRAWING NO.  | REVISION                            |
| Not to scale | A3      | 2123/5       |                                     |



**NOTES**

- BOREHOLE LOCATION
- TRIAL PIT LOCATION
- SOAKAWAY TEST LOCATION
- APPROXIMATE SITE BOUNDARY
- UNDERGROUND ELECTRIC
- UNDERGROUND BT
- OVERHEAD BT
- APPROXIMATE / INFERRED SEWER LOCATIONS

| REV. | DESCRIPTION | DATE |
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DRAWING TITLE

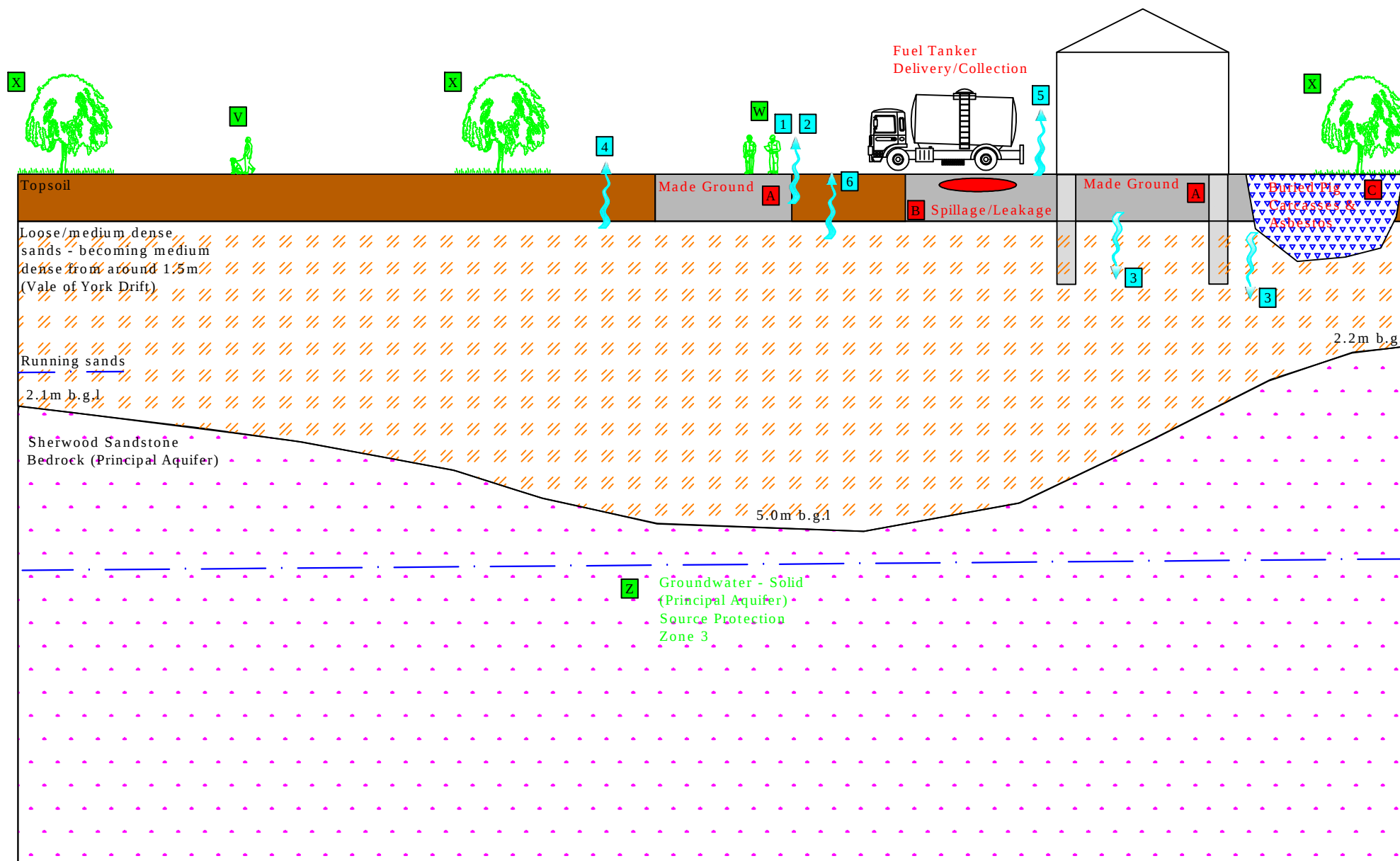
EXPLORATORY HOLE LOCATIONS

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|---------|---------|-------------------------------------------|
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| CHECKED | DATE    | FOR APPROVAL <input type="checkbox"/>     |
| REG     | 29/4/15 | DRAFT <input type="checkbox"/>            |
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| SCALE  | SHEET | DRAWING NO. | REVISION |
|--------|-------|-------------|----------|
| 1:1250 | A3    | 2123/6      |          |

West

East



### SOURCES

- A** MADE GROUND (INORGANICS)
- B** LEAKAGE \ SPILLAGE (ORGANICS)
- C** BURIED PIG CARCASSES / ASBESTOS SHEET CEMENT

### PATHWAYS

- 1** DERMAL CONTACT
- 2** INGESTION \ INHALATION
- 3** LEACHING OF CONTAMINANTS
- 4** UPTAKE BY PLANTS
- 5** VOLATILISATION
- 6** MIGRATION OF GAS

### RECEPTORS

- V** END USERS (RESIDENTS)
- W** SITE WORKERS
- X** VEGETATION
- Y** SURFACE WATERS
- Z** GROUNDWATER

### NOTES

| REV. | DESCRIPTION | DATE |
|------|-------------|------|
|------|-------------|------|



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### CLIENT

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### JOB TITLE

FIELD LANE, THORPE  
WILLOUGHBY

### DRAWING TITLE

REVISED CONCEPTUAL SITE  
MODEL

|         |         |                                           |
|---------|---------|-------------------------------------------|
| DRAWN   | DATE    | STATUS                                    |
| NKH     | 29/4/15 | FOR COMMENT <input type="checkbox"/>      |
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|--------------|-------|-------------|----------|
| SCALE        | SHEET | DRAWING NO. | REVISION |
| Not to scale | A3    | 2123/7      |          |

## Appendix C

### Commission

002/2123/IMC

20<sup>th</sup> February 2015

Mr N Procter  
Prospect House  
4a George Street  
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York  
YO42 2DF



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LS22 5DZ

*T 01937 545 330  
E [info@lithos.co.uk](mailto:info@lithos.co.uk)*

Dear Nick

### **Thorpe Willoughby – Land off Field Lane**

Further to your recent invitation, please find attached our proposal for undertaking a site investigation on the above land. We understand that the proposed development will include about 50 traditional 2 storey domestic dwellings with associated gardens, POS and adoptable roads and sewers, together with a play area and nature trail.

We understand that your proposed development has planning permission (Appeal Ref. APP/N2739/A/14/2216522). With respect to ground, the planning consent includes a number of Conditions; most notably Condition 13 which requires a Desk Study & Site Investigation, and if necessary a Remediation Strategy. Conditions 14 & 15 should only apply if significant contamination is found and remediation works are necessary. Condition 10 requires soakaway tests. The work outlined in this proposal should enable discharge of Condition 13.

Review of drawings and information supplied suggests that the site consists of a two adjacent parcels of land located beside the A63 Selby By-Pass, north of Field Lane. The areas are:

- **Area 'A'** to the east comprising piggery, sheds, roads and hardstanding (~2.6 Ha); possible future development this Area has Outline Planning Consent.
- **Area 'B'** to the west comprising an open field with tree-lined perimeter (~2.1 Ha); (currently this Area does not have any planning consent).

It is apparent from viewing mapping data that the land overall is relatively flat / level.

Area A comprises a specialist pig breeding enterprise and includes a range of large single and two-storey buildings, open storage and associated service roads and hardstanding. The land is accessed off Field Lane.

Brief review of Old Maps and Environment Agency data suggests the site:

- has been a pig breeding Station from around the 1940s; prior to that site was open fields;
- is not located within 250m of a known landfill site; and,
- lies within a groundwater Source Protection Zone (SPZ3).

Brief examination of the relevant geological map and BGS borehole records suggests that Sherwood Sandstone bedrock (probably weathered to a sand) will be present at shallow depth, although it is possible that a thin veneer of Glacial Sands & Gravels may be present.

This site is located within a Coal Mining Development Low Risk Area (within the defined coalfield, but no known defined risks have been recorded by the Coal Authority; there may still be unrecorded issues), therefore a mining report will be obtained (however, an intrusive mining investigation is considered highly unlikely to be required).

We understand you have requested a quotation for ground investigation covering two scenarios, i.e. Scenario 1 - Area 'A' *alone*, and Scenario 2 - Area 'A' and Area 'B' *combined*.

Our site investigation proposal allows for the following works:

**Desk Study:** An examination of historical Ordnance Survey plans will be made to determine whether any past land uses have had any effect on the proposed development. Additionally, published geological plans of the area will be examined. The desk study would cover both areas of the site at no additional cost.

**Fieldwork:** We have allowed for one day of trial pitting in each parcel of land. All trial pits will be supervised and logged by an experienced geoenvironmental engineer.

Soakaway testing will also be carried out in at least 5 pits (each Area) in order to assess suitability of the ground for house and highway surface water drainage.

In line with current UK guidance, (most notably BRE365 and CIRIA C697:2007) soakaways should not be advocated where the seasonally high groundwater table lies within 1m of the soakaway base. Consequently, assuming the initial soakaway tests yield satisfactory results, groundwater monitoring wells should be installed to depths of around 4m in about 5 boreholes.

Monitoring well design (depth, drilling technique etc) would best be determined after completion of the pitting, since it might be that (relatively cheap) window sample boreholes will suffice. However, it is quite possible that a groundwater investigation will also be required, and this would probably necessitate the drilling of deeper (more expensive) rotary boreholes into bedrock. At this stage, it would be prudent to allow £2,000 to £4,000 (cost dependent on drilling technique required).

Given the potential for excavation instability, we have allowed for the import limestone chippings (75mm, single size) to site a day or so before the soakaway testing (10 tonnes temporarily stockpiled close to Field Lane). We will then use the JCB to dig holes and cart stone to fill those considered potentially unstable (in order to prevent collapse during test). We will leave stone at least 500mm below ground level, so that the pits can be reinstated with topsoil. However, we will have to 'lose' the surplus subsoil arisings somewhere on site; probably close to a boundary hedge.

Representative soil samples of natural and man-made ground will be taken during the works. In-situ shear strengths of any cohesive soils encountered will be determined by the use of a hand-held shear vane.

We will make every effort to compact arisings and 'sweep' them over each pit. However, you should be aware that on completion of the investigation, "graves" of spoil (each about 3m long by 1m wide) unsuitable for trafficking, will be left up to 400mm proud at each trial pit location.

If the pitting encounters significant thicknesses of made ground or very soft/loose deposits (neither considered likely), boreholes may be required to obtain geotechnical data from greater depth. We will advise you of any need for boreholes within 2 days of completion of the pitting.

The desk study may highlight other potential problems with the site such as landfill gas, quarrying, shallow mining or soil contamination. It may therefore be necessary to carry out additional works, but we will inform you prior to undertaking any such work and provide revised a cost estimate.

**Soils Testing:** This will comprise routine geotechnical soils analysis, typical of that normally required for greenfield sites. Although no allowance has been made for in-situ or laboratory CBR testing, CBR values will be estimated from the strata descriptions and classification test results, where appropriate (i.e. if no significant regrading or reworking of made ground is proposed).

Area 'A' is presently used as a piggery with associated buildings and roads etc. Chemical testing requirements are typically higher in such areas, where storage of agricultural chemicals, disturbed ground, fuel and vehicular use may have occurred. Appropriate chemical analyses, based on our knowledge of the site's history, have been allowed for; this will comprise 15 samples for a suite including heavy metals, TPH, speciated PAH and pesticides.

Area 'B' is understood to be essentially greenfield, and therefore testing of potentially contaminated samples would only be required if made ground is encountered in exploratory holes. However, we have allowed for analysis of 6 samples of topsoil to confirm its suitability for re-use.

It is assumed the site is free of animal burial sites, although the possibility should be discussed with the occupier and any site records in their possession must be obtained before proceeding.

**Reporting & Timescales:** In order to provide you with sufficient information to enable assessment of abnormal costs at the earliest opportunity we will issue a concise overview report within 3 days of fieldwork completion.

On completion of the desk study, fieldwork and laboratory testing a comprehensive bound, factual and interpretative report will be issued. This will contain detailed engineering records, laboratory test results, copies of all relevant correspondence and drawings of the site. The report will include qualitative risk assessment with respect to both controlled waters and human health.

The report will also provide technically feasible options for redevelopment of the site with housing, including consideration of foundation types.

Fieldwork could be commenced within 2 weeks of receipt of your written instruction to proceed. Our comprehensive geoenvironmental appraisal report will be issued within 4 weeks of fieldwork completion.

Copies of the final report(s) will be issued to the relevant regulatory authorities on receipt of written instruction from yourselves.

**Invoicing:** The attached proposals provide a breakdown of the costs associated with this project, for both scenarios as requested. This breakdown is for information only and the proposal can be regarded as a lump sum price of either:

- plus VAT (for Area 'A' alone), or
- plus VAT (for Areas A & B together).

Variation will only occur in the event that a given item is not undertaken or that substantial additional works are recommended, in which case we will inform you immediately, provide costs for the required works, and seek your prior consent.

Our proposal allows for submission of the report to the Local Authority and NHBC, and for submission of a single piece of subsequent correspondence with each regulator to address any queries they may have. Any further meetings, correspondence etc, would be chargeable.

We will submit our invoice for this project with the final report.

**Health, Safety & Welfare:** The works outlined above will be carried out in accordance with Lithos' task- and site- specific Risk Assessments and Method Statements.

Details of welfare will be included within the Method Statements, however, this investigation is expected to be completed within 2 working days and therefore it is not considered reasonably practicable to provide formal welfare facilities, and our proposal makes no allowance for so doing.

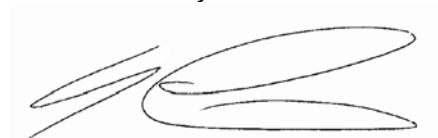
Utility plans are required in order to protect operatives from the hazards associated with striking buried services and avoid potentially substantial disruption\repair costs. We will make every effort not to damage any services (including review of utility plans and use of a CAT detector).

Most developers have copies of the necessary utility plans (including electricity, gas, water, drainage & telecom), and it would be appreciated if you could forward these prior to the proposed fieldworks. However, if you do not have the necessary plans, Lithos will obtain them direct from each of the utility companies.

**Terms & Conditions:** This work will be undertaken in accordance with our Standard Terms and Conditions, a copy of which are enclosed.

It is hoped the above is sufficient for your present needs. However, should you require any further information, please contact the undersigned.

Yours sincerely

A handwritten signature in black ink, appearing to read 'I Cairns', written over a light blue rectangular background.

Iain Cairns  
Engineer  
**for and on behalf of**  
**LITHOS CONSULTING LIMITED**

011/2123/REG

8th April 2015

Mr N Procter  
Prospect House  
4a George Street  
Pocklington  
York  
YO42 2DF



Registered in England 07068066

Parkhill  
Wetherby  
West Yorkshire  
LS22 5DZ

T 01937 545 330

[www.lithos.co.uk](http://www.lithos.co.uk)

Dear Nick

### Thorpe Willoughby – supplementary borehole investigation

Further to issue of our Preliminary Findings and recent discussion, please find attached our proposal for undertaking the recommended supplementary borehole investigation. These boreholes are recommended because:

- It would be prudent to confirm safe bearing capacities through in-situ SPT testing to enable definitive foundation advice; and
- CIRIA C697:2007 recommends that soakaways should not be constructed 'in ground where the water table reaches a level within 1m below the base of the soakaway at any time of the year'. Given that the majority of the soakaway tests yielded satisfactory results, consideration should be given to the installation of groundwater wells to depths of around 4.5m in 3 boreholes, and subsequent groundwater level monitoring over about 12 months.

If we restrict this additional work to Area A only, 3 cable percussion boreholes to depths of around 4.5m should suffice. All boreholes will be supervised and logged by an experienced geoenvironmental engineer. On completion of the fieldwork findings will be assimilated into our comprehensive bound, factual and interpretative report.

The attached proposal provides a breakdown of the costs associated with this project. This breakdown is for information only and the proposal can be regarded as a lump sum price of plus VAT. We will submit our invoice for this project with the final report.

I have also attached a proposal for boreholes in both Areas A & B; total of 5 boreholes ).

Fieldwork could be commenced within 3 weeks of receipt of your written instruction to proceed. Our comprehensive geoenvironmental appraisal report will be issued within a week of fieldwork completion.

**Terms & conditions:** This work will be undertaken in accordance with our Standard Terms and Conditions, a copy of which are enclosed.

It is hoped the above is sufficient for your present needs. However, should you require any further information, please contact the undersigned.

Yours sincerely

A handwritten signature in black ink, appearing to read "Mark Perrin".

Mark Perrin  
Director

**for and on behalf of  
LITHOS CONSULTING LIMITED**



**From:** Philip Huxtable [Philip.Huxtable@jsr.co.uk]  
**Sent:** 07 March 2015 09:34  
**To:** Nick Procter  
**Subject:** Lithos Consulting - Thorpe Willoughby

Nick

Further to my oral instruction, I confirm you are to appoint Lithos Consulting of Parkhill, Walton Road, Wetherby to undertake site investigations for both areas A & B as per their quotation 002/2123/IMC dated 20/02/2015 in the amended sum as provided by you of £ plus VAT.

For clarity all invoices should be sent by Lithos Consulting for my attention to JSR Farms Ltd, Southburn Offices, Southburn, Driffield, East Yorkshire, YO25 9ED.

I have asked Steve Cook to clarify the 'site rules' to ensure any work undertaken does not compromise our health protocols.

Kind regards

*Philip*

Philip Huxtable MBPR (Agric)  
Director of Arable Production - JSR Farms Ltd  
Property Director - JSR Farming Group  
Company Secretary - JSR Genetics Ltd  
eMail: [philip.huxtable@jsr.co.uk](mailto:philip.huxtable@jsr.co.uk)  
direct dial: +44 (0) 1377 227702  
mobile: +44 (0) 7970 097511

This email has been scanned for all viruses. For details of our privacy policy please follow the link:

<http://www.jsrfarms.com/information/privacy-policy>

## **Appendix D**

### **Historical OS Plans**



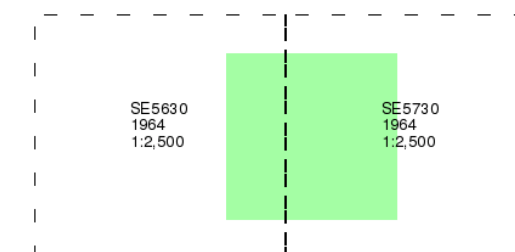
## Ordnance Survey Plan

Published 1964

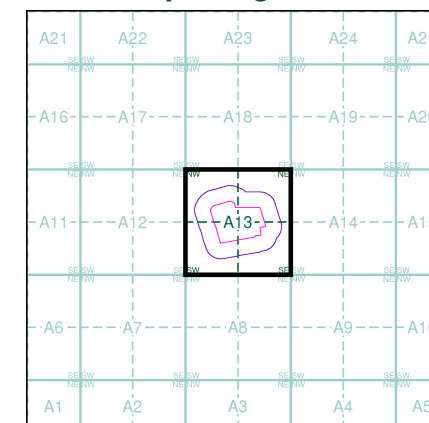
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

### Map Name(s) and Date(s)



### Historical Map - Segment A13



### Order Details

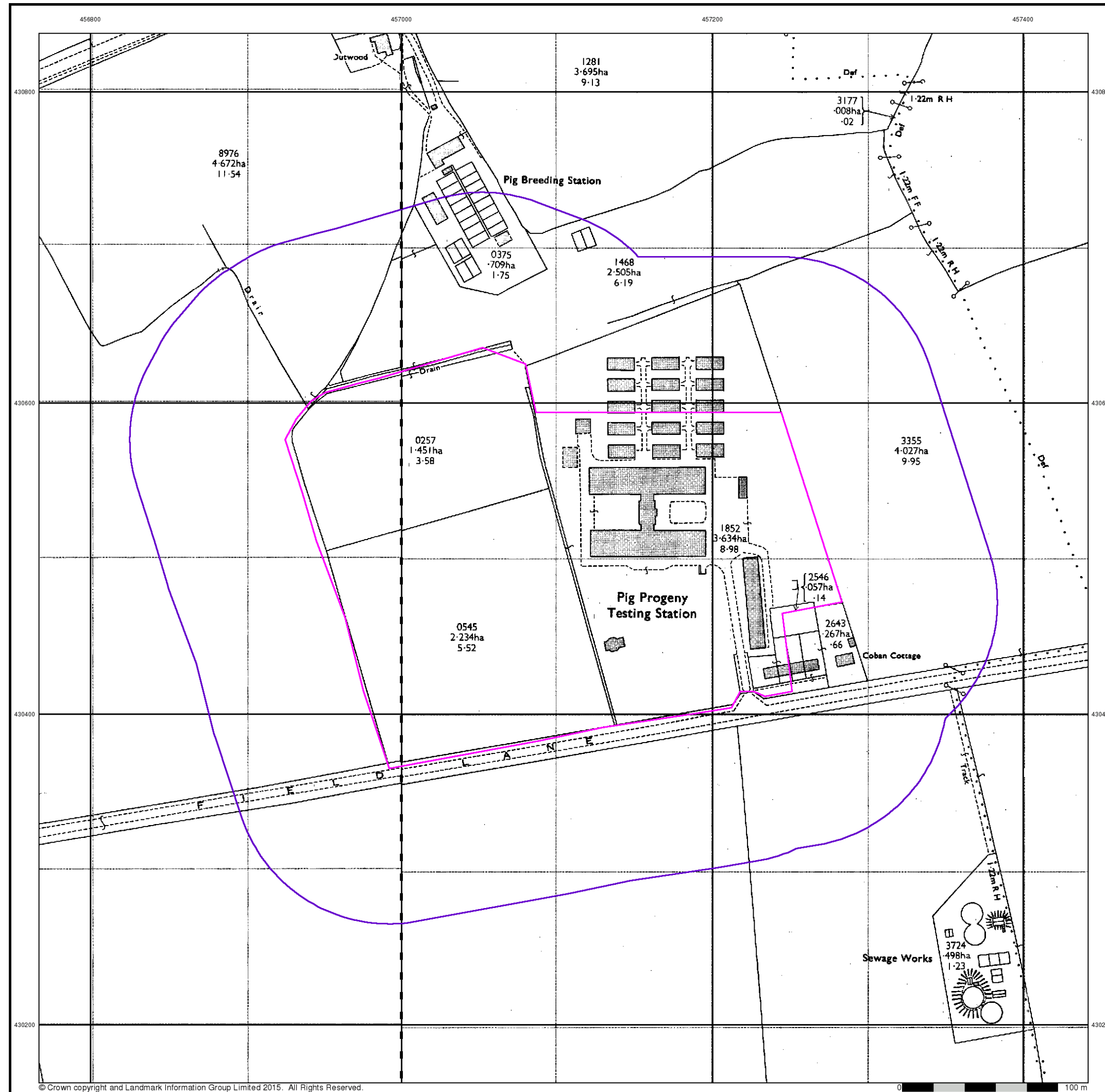
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Customer Ref: 2123  
National Grid Reference: 457100, 430500  
Slice: A  
Site Area (Ha): 6.65  
Search Buffer (m): 100

### Site Details

N s d s Centre, Field Lane, Thorpe Willoughby, Selby, YO8 9NL



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Fax: 0844 844 9951  
Web: www.envirocheck.co.uk



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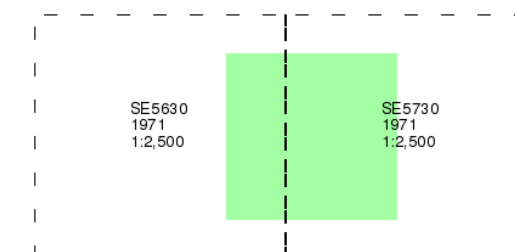
## Ordnance Survey Plan

Published 1971

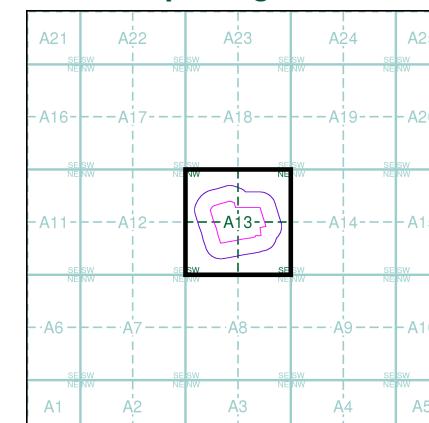
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

## Map Name(s) and Date(s)



## Historical Map - Segment A13



## Order Details

Order Number: 65277120\_1\_1  
Customer Ref: 2123  
National Grid Reference: 457100, 430500  
Slice: A  
Site Area (Ha): 6.65  
Search Buffer (m): 100

## Site Details

N s d s Centre, Field Lane, Thorpe Willoughby, Selby, YO8 9NL



Tel: 0844 844 9952  
Fax: 0844 844 9951  
Web: [www.envirocheck.co.uk](http://www.envirocheck.co.uk)

## **Appendix E**

### **Search Responses & other Correspondence**

## Envirocheck<sup>®</sup> Report:

### Datasheet

#### Order Details:

**Order Number:**

65277120\_1\_1

**Customer Reference:**

2123

**National Grid Reference:**

457100, 430500

**Slice:**

A

**Site Area (Ha):**

6.65

**Search Buffer (m):**

1000

#### Site Details:

N s d s Centre, Field Lane  
Thorpe Willoughby  
Selby  
YO8 9NL

#### Client Details:

Mr N Hay  
Lithos Consulting Ltd  
Parkhill  
Walton Road  
Wetherby  
LS22 5DZ

#### Prepared For:

Lithos Consulting  
Parkhill  
Walton Road  
Wetherby  
West Yorkshire  
LS22 5DZ

| Report Section        | Page Number |
|-----------------------|-------------|
| Summary               | -           |
| Agency & Hydrological | 1           |
| Waste                 | 22          |
| Hazardous Substances  | -           |
| Geological            | 23          |
| Industrial Land Use   | 30          |
| Sensitive Land Use    | 31          |
| Data Currency         | 32          |
| Data Suppliers        | 36          |
| Useful Contacts       | 37          |

## Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination. For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.

In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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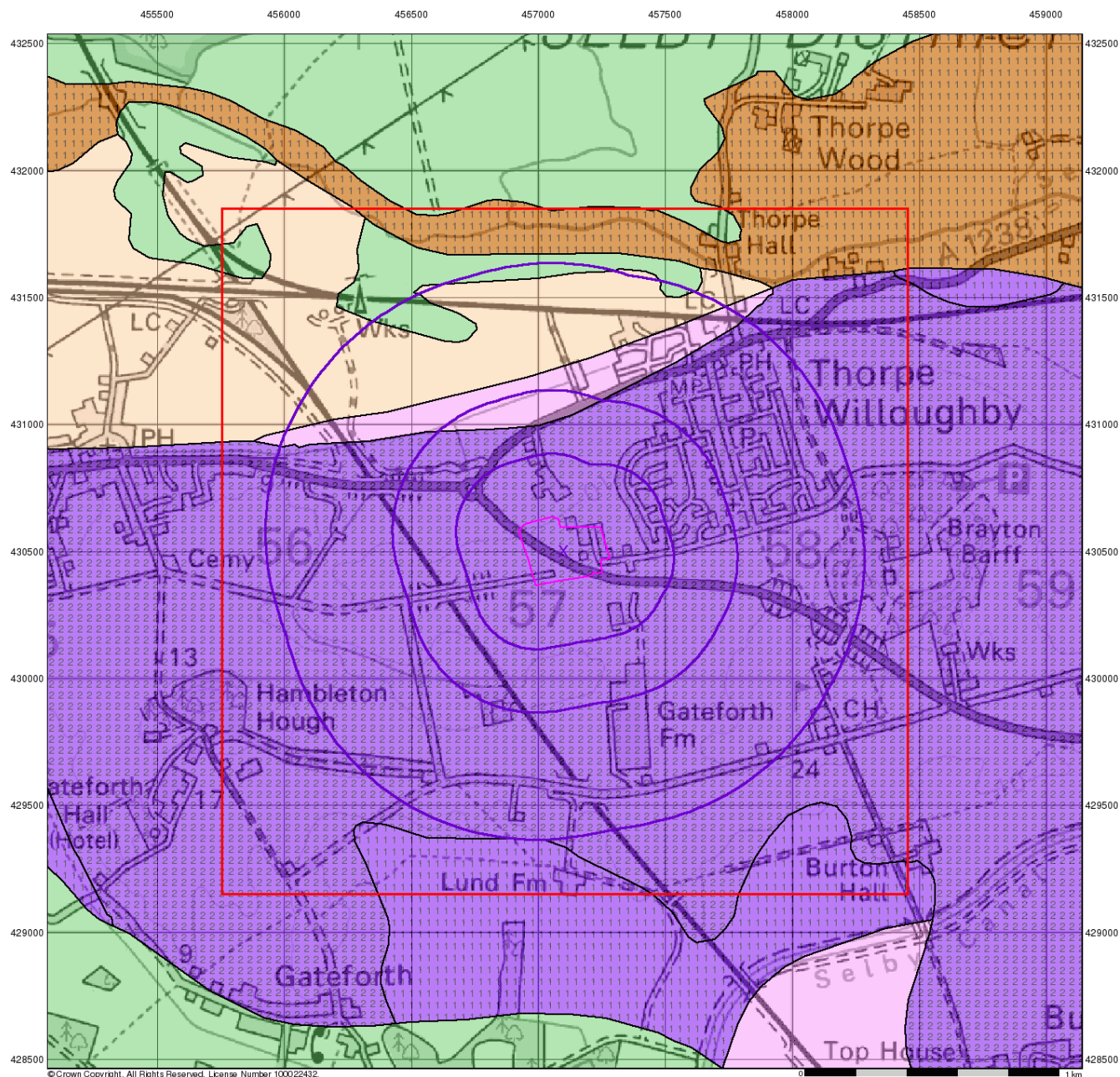
Information supplied from a joint dataset compiled by The British Geological Survey and Public Health England.

## Report Version v49.0

| Data Type                                                     | Page Number | On Site | 0 to 250m | 251 to 500m | 501 to 1000m (*up to 2000m) |
|---------------------------------------------------------------|-------------|---------|-----------|-------------|-----------------------------|
| <b>Agency &amp; Hydrological</b>                              |             |         |           |             |                             |
| Contaminated Land Register Entries and Notices                |             |         |           |             |                             |
| Discharge Consents                                            | pg 1        |         | 7         | 7           | 6                           |
| Enforcement and Prohibition Notices                           |             |         |           |             |                             |
| Integrated Pollution Controls                                 |             |         |           |             |                             |
| Integrated Pollution Prevention And Control                   |             |         |           |             |                             |
| Local Authority Integrated Pollution Prevention And Control   |             |         |           |             |                             |
| Local Authority Pollution Prevention and Controls             | pg 6        |         |           |             | 2                           |
| Local Authority Pollution Prevention and Control Enforcements |             |         |           |             |                             |
| Nearest Surface Water Feature                                 | pg 6        | Yes     |           |             |                             |
| Pollution Incidents to Controlled Waters                      | pg 6        |         |           |             | 2                           |
| Prosecutions Relating to Authorised Processes                 |             |         |           |             |                             |
| Prosecutions Relating to Controlled Waters                    |             |         |           |             |                             |
| Registered Radioactive Substances                             |             |         |           |             |                             |
| River Quality                                                 |             |         |           |             |                             |
| River Quality Biology Sampling Points                         |             |         |           |             |                             |
| River Quality Chemistry Sampling Points                       |             |         |           |             |                             |
| Substantiated Pollution Incident Register                     |             |         |           |             |                             |
| Water Abstractions                                            | pg 6        |         |           |             | 3 (*48)                     |
| Water Industry Act Referrals                                  |             |         |           |             |                             |
| Groundwater Vulnerability                                     | pg 19       | Yes     | n/a       | n/a         | n/a                         |
| Bedrock Aquifer Designations                                  | pg 19       | Yes     | n/a       | n/a         | n/a                         |
| Superficial Aquifer Designations                              |             |         | n/a       | n/a         | n/a                         |
| Source Protection Zones                                       | pg 19       | 1       |           |             |                             |
| Extreme Flooding from Rivers or Sea without Defences          |             |         |           | n/a         | n/a                         |
| Flooding from Rivers or Sea without Defences                  |             |         |           | n/a         | n/a                         |
| Areas Benefiting from Flood Defences                          |             |         |           | n/a         | n/a                         |
| Flood Water Storage Areas                                     |             |         |           | n/a         | n/a                         |
| Flood Defences                                                |             |         |           | n/a         | n/a                         |
| Detailed River Network Lines                                  | pg 20       |         |           | Yes         | n/a                         |
| Detailed River Network Offline Drainage                       | pg 21       | Yes     | Yes       | Yes         | n/a                         |

| Data Type                                                           | Page Number | On Site | 0 to 250m | 251 to 500m | 501 to 1000m<br>(*up to 2000m) |
|---------------------------------------------------------------------|-------------|---------|-----------|-------------|--------------------------------|
| <b>Waste</b>                                                        |             |         |           |             |                                |
| BGS Recorded Landfill Sites                                         | pg 22       |         |           |             | 1                              |
| Historical Landfill Sites                                           | pg 22       |         |           |             | 1                              |
| Integrated Pollution Control Registered Waste Sites                 |             |         |           |             |                                |
| Licensed Waste Management Facilities (Landfill Boundaries)          |             |         |           |             |                                |
| Licensed Waste Management Facilities (Locations)                    |             |         |           |             |                                |
| Local Authority Recorded Landfill Sites                             | pg 22       |         |           |             | 1                              |
| Registered Landfill Sites                                           |             |         |           |             |                                |
| Registered Waste Transfer Sites                                     |             |         |           |             |                                |
| Registered Waste Treatment or Disposal Sites                        |             |         |           |             |                                |
| <b>Hazardous Substances</b>                                         |             |         |           |             |                                |
| Control of Major Accident Hazards Sites (COMAH)                     |             |         |           |             |                                |
| Explosive Sites                                                     |             |         |           |             |                                |
| Notification of Installations Handling Hazardous Substances (NIHHS) |             |         |           |             |                                |
| Planning Hazardous Substance Consents                               |             |         |           |             |                                |
| Planning Hazardous Substance Enforcements                           |             |         |           |             |                                |
| <b>Geological</b>                                                   |             |         |           |             |                                |
| BGS 1:625,000 Solid Geology                                         | pg 23       | Yes     | n/a       | n/a         | n/a                            |
| BGS Estimated Soil Chemistry                                        | pg 23       | Yes     | Yes       | Yes         | Yes                            |
| BGS Recorded Mineral Sites                                          |             |         |           |             |                                |
| BGS Urban Soil Chemistry                                            |             |         |           |             |                                |
| BGS Urban Soil Chemistry Averages                                   |             |         |           |             |                                |
| Brine Compensation Area                                             |             |         | n/a       | n/a         | n/a                            |
| Coal Mining Affected Areas                                          | pg 29       | Yes     | n/a       | n/a         | n/a                            |
| Mining Instability                                                  | pg 29       | Yes     | n/a       | n/a         | n/a                            |
| Man-Made Mining Cavities                                            |             |         |           |             |                                |
| Natural Cavities                                                    |             |         |           |             |                                |
| Non Coal Mining Areas of Great Britain                              |             |         |           | n/a         | n/a                            |
| Potential for Collapsible Ground Stability Hazards                  | pg 29       | Yes     |           | n/a         | n/a                            |
| Potential for Compressible Ground Stability Hazards                 |             |         |           | n/a         | n/a                            |
| Potential for Ground Dissolution Stability Hazards                  |             |         |           | n/a         | n/a                            |
| Potential for Landslide Ground Stability Hazards                    | pg 29       | Yes     |           | n/a         | n/a                            |
| Potential for Running Sand Ground Stability Hazards                 | pg 29       |         | Yes       | n/a         | n/a                            |
| Potential for Shrinking or Swelling Clay Ground Stability Hazards   |             |         |           | n/a         | n/a                            |
| Radon Potential - Radon Affected Areas                              |             |         | n/a       | n/a         | n/a                            |
| Radon Potential - Radon Protection Measures                         |             |         | n/a       | n/a         | n/a                            |

| Data Type                            | Page Number | On Site | 0 to 250m | 251 to 500m | 501 to 1000m<br>(*up to 2000m) |
|--------------------------------------|-------------|---------|-----------|-------------|--------------------------------|
| <b>Industrial Land Use</b>           |             |         |           |             |                                |
| Contemporary Trade Directory Entries | pg 30       |         | 1         | n/a         | n/a                            |
| Fuel Station Entries                 | pg 30       |         |           |             | 1                              |
| <b>Sensitive Land Use</b>            |             |         |           |             |                                |
| Areas of Adopted Green Belt          |             |         |           |             |                                |
| Areas of Unadopted Green Belt        |             |         |           |             |                                |
| Areas of Outstanding Natural Beauty  |             |         |           |             |                                |
| Environmentally Sensitive Areas      |             |         |           |             |                                |
| Forest Parks                         |             |         |           |             |                                |
| Local Nature Reserves                |             |         |           |             |                                |
| Marine Nature Reserves               |             |         |           |             |                                |
| National Nature Reserves             |             |         |           |             |                                |
| National Parks                       |             |         |           |             |                                |
| Nitrate Sensitive Areas              |             |         |           |             |                                |
| Nitrate Vulnerable Zones             | pg 31       | 2       |           |             | 1                              |
| Ramsar Sites                         |             |         |           |             |                                |
| Sites of Special Scientific Interest |             |         |           |             |                                |
| Special Areas of Conservation        |             |         |           |             |                                |
| Special Protection Areas             |             |         |           |             |                                |



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## Groundwater Vulnerability

### General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

### Agency and Hydrological

#### Geological Classes

**Major Aquifer (Highly Permeable)**

**Minor Aquifer (Variably Permeable)**

**Non Aquifer (Negligibly Permeable)**

**Water or Sea**

**Drift Deposit**

#### Soil Classes

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

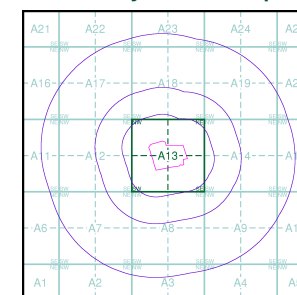
Low

High (H) 1, 2, 3, U

Intermediate (I) 1, 2

Low

### Site Sensitivity Context Map - Slice A



### Order Details

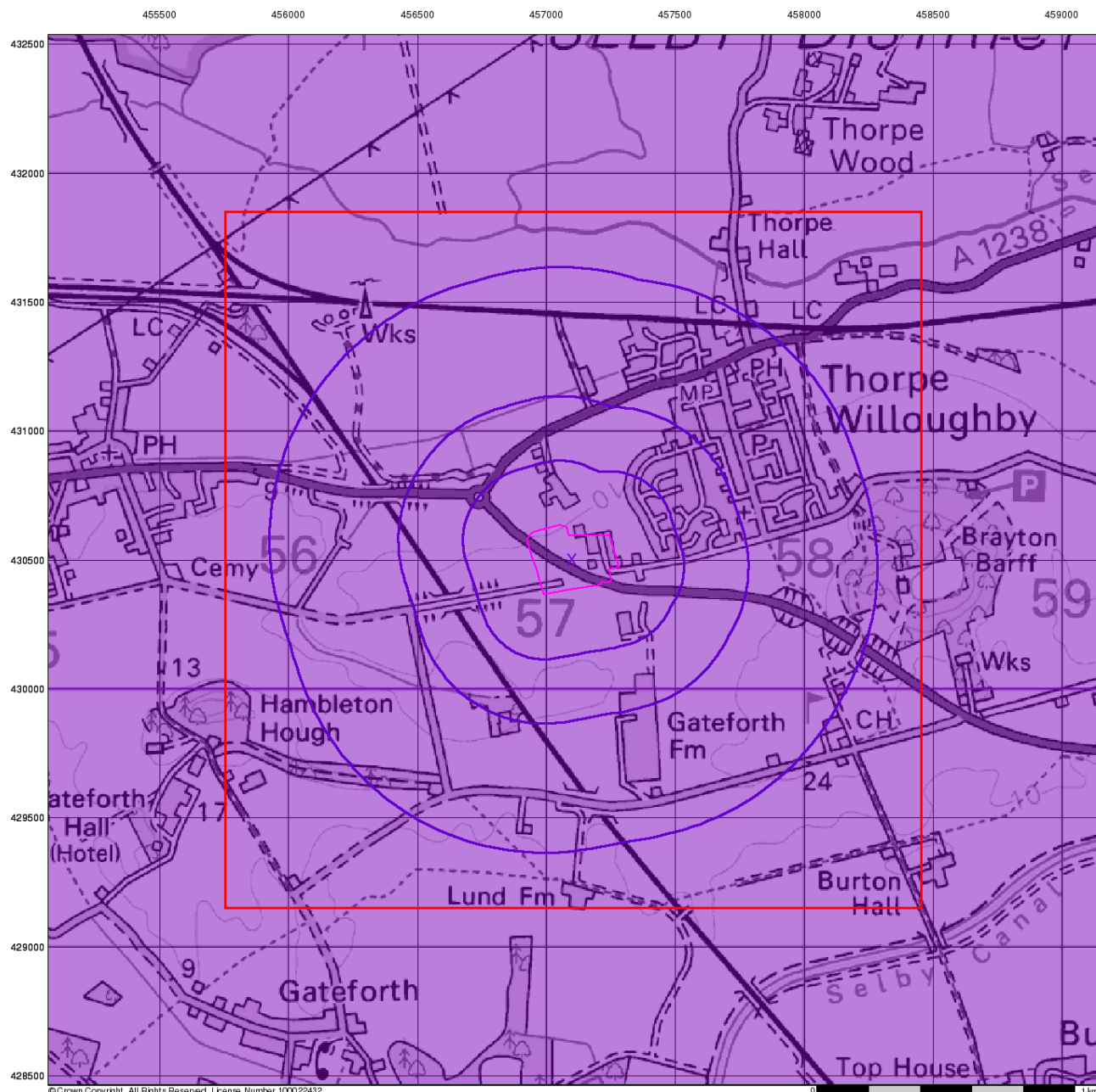
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 National Grid Reference: 457100, 430500  
 Slice: A  
 Site Area (Ha): 6.65  
 Search Buffer (m): 1000

### Site Details

N s d s Centre, Field Lane, Thorpe Willoughby, Selby, YO8 9NL



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## Bedrock Aquifer Designation

### General

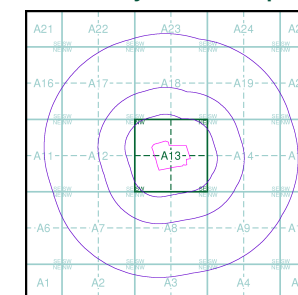
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

### Agency and Hydrological

#### Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

### Site Sensitivity Context Map - Slice A



### Order Details

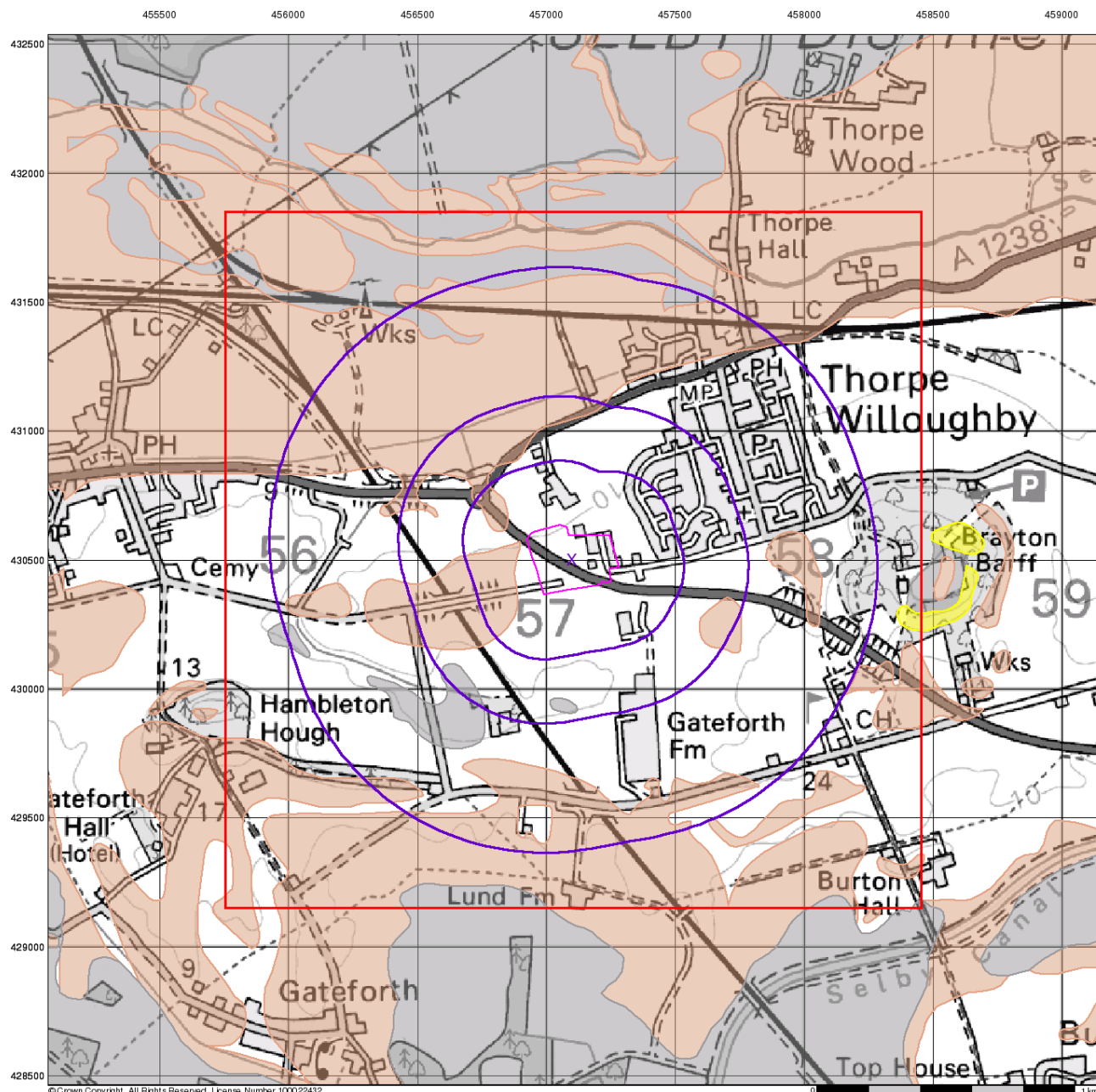
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 Site Area (Ha): 6.65  
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## Superficial Aquifer Designation

### General

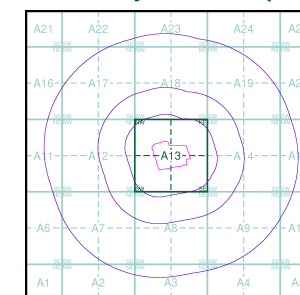
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

### Agency and Hydrological

#### Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

### Site Sensitivity Context Map - Slice A



### Order Details

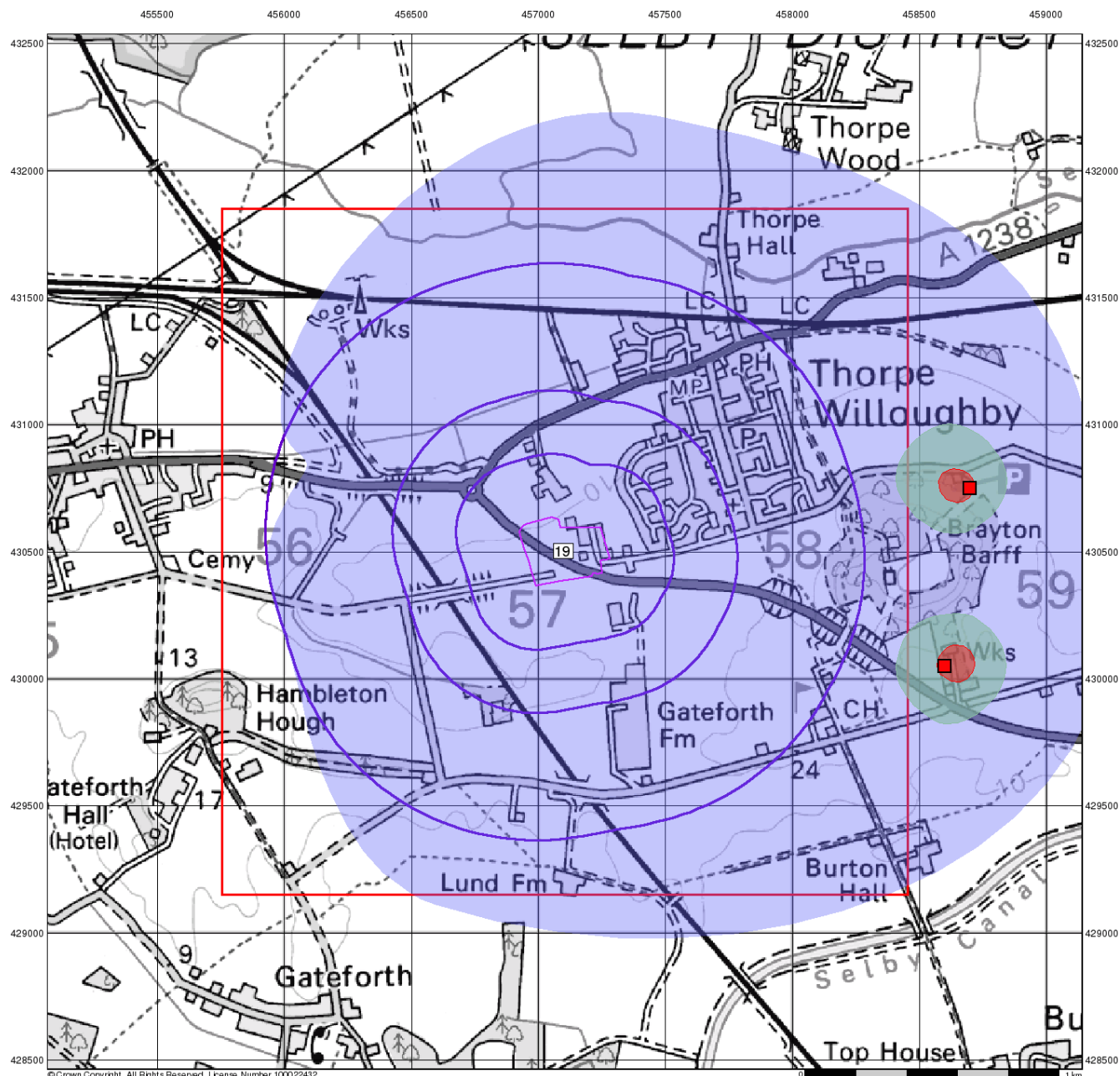
Order Number: 65277120\_1\_1  
 Customer Ref: 2123  
 National Grid Reference: 457100, 430500  
 Slice: A  
 Site Area (Ha): 6.65  
 Search Buffer (m): 1000

### Site Details

N s d s Centre, Field Lane, Thorpe Willoughby, Selby, YO8 9NL



Tel: 0844 844 9952  
 Fax: 0844 844 9951  
 Web: www.envirocheck.co.uk



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## Source Protection Zones

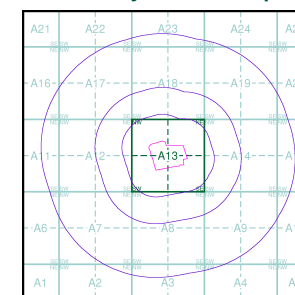
### General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

### Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

### Site Sensitivity Context Map - Slice A



### Order Details

Order Number: 65277120\_1\_1  
 Customer Ref: 2123  
 National Grid Reference: 457100, 430500  
 Slice: A  
 Site Area (Ha): 6.65  
 Search Buffer (m): 1000

### Site Details

N s d s Centre, Field Lane, Thorpe Willoughby, Selby, YO8 9NL



Tel: 0844 844 9952  
 Fax: 0844 844 9951  
 Web: www.envirocheck.co.uk



# The Coal Authority

## Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG  
Website: [www.groundstability.com](http://www.groundstability.com) Phone: 0345 762 6848 DX 716176 MANSFIELD 5

**LANDMARK INFORMATION GROUP  
LIMITED  
SOWTON INDUSTRIAL ESTATE  
ABBAY COURT  
UNIT 5/7 EAGLE WAY  
EXETER  
DEVON  
EX2 7HY**

Our reference: **51000799537001**  
Your reference: **65277120\_2**  
Date of your enquiry: **10 March 2015**  
Date we received your enquiry: **10 March 2015**  
Date of issue: **10 March 2015**

This report is for the property described in the address below and the attached plan.

## Non-Residential Coal Authority Mining Report

**SITE AT N S D S CENTRE, FIELD LANE, THORPE WILLOUGHBY, SELBY, NORTH YORKSHIRE,**

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

|                             |                    |
|-----------------------------|--------------------|
| Coal mining                 | See comments below |
| Brine Compensation District | No                 |

## Information from the Coal Authority

### Underground coal mining

#### Past

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground workings.

#### Present

The property is not in the likely zone of influence of any present underground coal workings.

#### Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is in an area for which a licence to remove or otherwise work coal using underground methods was granted in October 1994.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

### **Mine entries**

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

### **Coal mining geology**

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

### **Opencast coal mining**

#### **Past**

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

#### **Present**

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

#### **Future**

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

### **Coal mining subsidence**

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

### **Mine gas**

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

### **Hazards related to coal mining**

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

### **Withdrawal of support**

The property is in an area for which notices of entitlement to withdraw support were published in 1994, 1997.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

### **Working facilities orders**

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

### **Payments to owners of former copyhold land**

The property is in an area for which a relevant notice (or notices) dated 1997 has (or have) been published under the Coal Industry Act 1975/Coal Industry Act 1994. However, no notice of a retained interest has been given.

### **Comments on Coal Authority information**

Where development proposals are being considered, technical advice should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas.

### ***Information from the Cheshire Brine Subsidence Compensation Board***

The property lies outside the Cheshire Brine Compensation District.

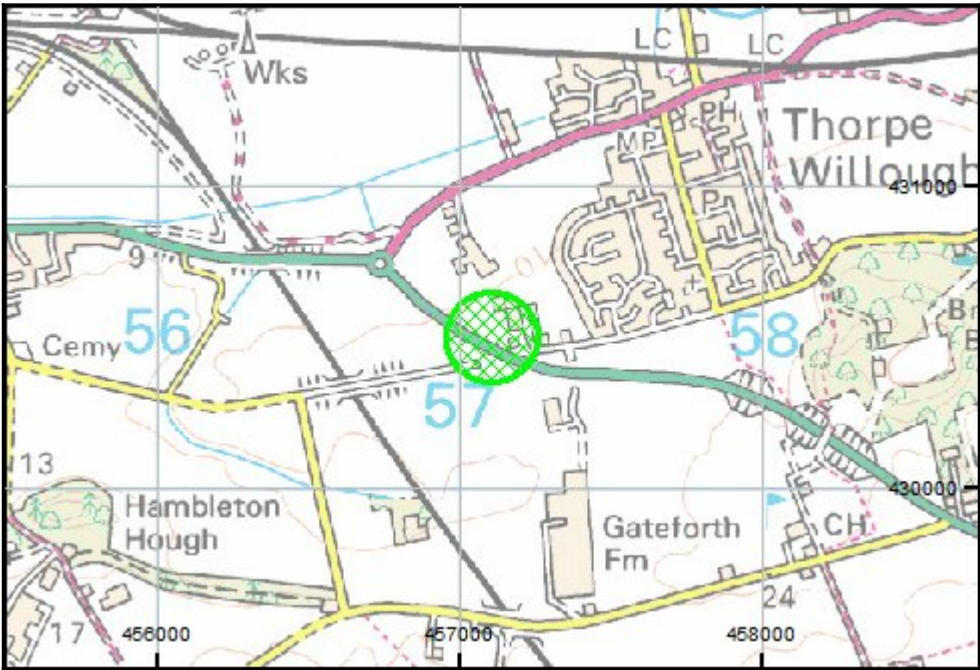
### ***Additional Remarks***

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006. The Coal Authority owns the copyright in this report. The information we have used to write this report is protected by our database right. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

Location map



Approximate position of property

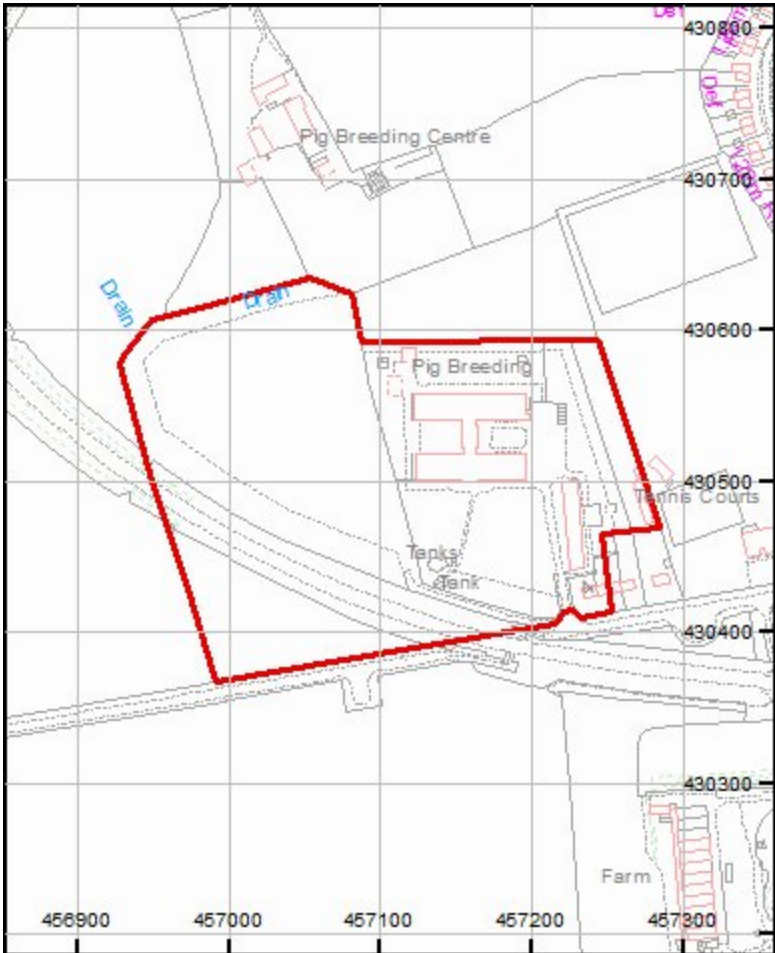


Enquiry boundary

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Key

Approximate position of enquiry boundary shown



## Reg

---

**From:** Reg  
**Sent:** 19 May 2015 08:01  
**To:** Reg  
**Subject:** Thorpe Willoughby - Site Inv - Pig Breeding Centre

**From:** Stephenson, John (APHA) [<mailto:John.Stephenson@apha.gsi.gov.uk>]  
**Sent:** 11 March 2015 15:26  
**To:** Nathaniel Hay  
**Cc:** Alexander, Susan (AHVLA)  
**Subject:** Thorpe Willoughby - Site Inv - Pig Breeding Centre

Dear Nat,

In regards to your email enquiry on the above site, we have no records of any mass burial sites from the 2001 Foot & Mouth outbreak.

Prior to that outbreak we do not hold any records to refer to. As it was not illegal to bury animal carcasses prior to that date, there may well be remains of animals buried on this site which have died of natural causes.

Please note that it is illegal to dig up any carcase or part of a carcase under the Animal Health Act 1981, you should cease work and contact this office immediately if you come across any such remains in the course of your operations. An Officer from the AHVLA will then visit the site and advise on the safe disposal of the remains and issue you with a licence to authorise this. Advice will also be given on the cleansing and disinfection of any machinery used. No carcase should be touched by hand unless protective clothing is worn.

Please refer to the enclosed copy of the Code of Practice relating to precautions to prevent the spread of animal and poultry diseases.

<<Code of Practice.doc>>

Cheers,

John

**John Stephenson**

**Animal Health Officer**

**Animal and Plant Health Agency (APHA)**

Telephone: 0300 3031324 | Mobile: 07768 462082 | Email: [john.stephenson@apha.gsi.gov.uk](mailto:john.stephenson@apha.gsi.gov.uk)  
Website: [www.gov.uk/apha](http://www.gov.uk/apha) | Twitter: [@APHAgovuk](https://twitter.com/APHAgovuk) | Facebook: [aphagov](https://www.facebook.com/aphagov)

Address: APHA, Whitley Road, Longbenton, Newcastle upon Tyne, NE12 9SE

Animal and Plant Health Agency (APHA)

# **Precautions to Prevent the Spread of Animal & Poultry Disease**

## **Code of Practice for Civil Engineers, Surveyors & Contractors**

There are a number of animal and poultry diseases, which are highly infectious either to other animals or to man. Usually these can be transmitted only by contact with infected livestock, but they can also be carried on boots or clothing. The only way of preventing the spread of these diseases is first to avoid contact with farm animals (including poultry), and second to ensure that the farmers own precautions are carefully observed.

The following precautions will minimise the risk of spreading disease:

1. Always consult the farmer before entry onto his land. This will give him the opportunity to remove livestock temporarily from the fields concerned or to draw attention to special precautions, which need to be taken on his farm.
2. Avoid all contact with animals and keep strictly to the route or area agreed with the farmer.
3. The work site and access roads should be secured by a stock proof fence to ensure that livestock cannot escape from their premises. This is important where work such as the construction of roads or the laying of pipelines are carried out over or adjacent to land on which livestock are or may be kept.
4. If it is necessary to go onto land which is or has been occupied by livestock, either wear suitable robust footwear which is capable of being cleansed and disinfected\* before entry and on leaving or over-boots which can be cleansed and disinfected. This need not apply where such land is traversed only within a working area totally enclosed by the contractor.
5. Buildings occupied or used by livestock should not be entered without the express permission of the farmer. When such entry is necessary, wear robust footwear which is capable of being cleansed and disinfected\* before entry and on leaving or over-boots which can be cleansed and disinfected and protective over-garments which should be cleansed and disinfected before entry and on leaving.
6. Close all gates and avoid damage to fences, hedges and walls in order to prevent livestock from straying.
7. Do not leave polythene bags, paint tins or other litter where animals can get to them. This applies particularly to discarded food such as meat sandwiches or pies which may carry infectious agents harmful to animals.
8. Contractors are reminded that paragraphs 1-7 of this code in no way supersede the appropriate clauses as detailed in the current British Standards Institution's Code Of Practice (CP 2010 Part 1 Installation of Pipelines Inland).

---

\* Boots and other articles cannot be properly disinfected if they are caked with dirt; they must be cleaned first. The only disinfectants to be used should be those which carry a citation on the label stating that they have been approved by DEFRA. They must be used at the correct dilution, kept clean and regularly replenished.

If there is any doubt about the precautions, which should be taken in particular circumstances, contact the Duty Vet (details below). In the case of major works they should in any event be consulted to ascertain whether any particular disease restrictions apply to the area.

In addition to these general precautions there are some occasions when special care will be needed:

### **Foot & Mouth Disease**

If an outbreak of this very highly infectious disease occurs there will be widespread publicity in the area concerned. Civil engineers, surveyors and contractors who are engaged on work which may take them on to farm land in the Infected Area should immediately contact the Duty Vet for advice.

### **Newcastle Disease (Fowl Pest), Swine Fever or Swine Vesicular Disease**

Premises on which these diseases are present will carry a notice on the farm gate. Before entering the farm, advice should be sought from the Duty Vet.

### **Carcase Burial Pits**

Animals, which have been slaughtered during outbreaks of certain disease, are often buried in pits. It is illegal to dig up such carcasses. Where there is prior knowledge that burial pits may exist in an area the Duty Vet may be able to help in locating them. If in the course of civil engineering operations such a pit is encountered work should be stopped and the Duty Vet informed immediately.

The advice given in this Code is without prejudice to any special requirements, contractual or otherwise, of the farmer or his agent.

Duty Vet Contact details;

**Tel: 0300 3031324**

**Animal & Plant Health Agency**

**Whitley Road**

**Longbenton**

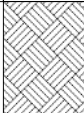
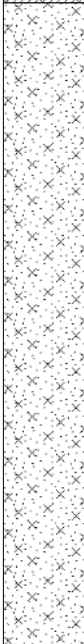
**Newcastle upon Tyne**

**NE12 9SE**

**Appendix F**  
**Exploratory Hole Logs**

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP01</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.00          |                                            | Logged<br>NKH      |  |

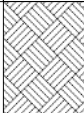
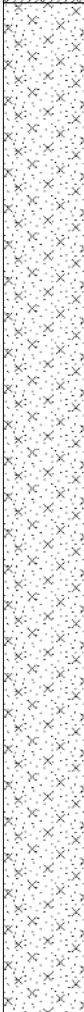
  

| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                   |                                                 |
|--------------|-----------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
|              | Depth                       | Type | Results |           |           |                                                                                    |                                                                                                                                       |                                                 |
|              | 0.10                        | J    |         | 0.30      |           |   | TOPSOIL: Light brown fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                       |                                                 |
|              |                             |      |         |           |           |  | ?Loose red slightly silty fine to medium SAND with rare subangular to subrounded gravel of mixed lithologies.<br>(VALE OF YORK DRIFT) |                                                 |
|              | 1.00                        | T    |         |           |           |                                                                                    |                                                                                                                                       | <i>From 1.0m, slight spalling of pit walls.</i> |
|              | 1.50                        | B    |         | 2.00      |           |                                                                                    |                                                                                                                                       |                                                 |
|              |                             |      |         |           |           |                                                                                    |                                                                                                                                       | End of pit at 2.00 m                            |
|              |                             |      |         |           |           |                                                                                    |                                                                                                                                       | 3                                               |
|              |                             |      |         |           |           |                                                                                    |                                                                                                                                       | 4                                               |

|                                                                                                                                                                                                                                                                                                              |  |                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                                                                   |  |                                                                                       |

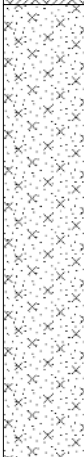
|                                                                                  |  |  |  |                                                    |  |                                                            |                                            |                                |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------------------------------------------|--------------------------------------------|--------------------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                                                            | Trialpit No<br><b>TP02</b><br>Sheet 1 of 1 |                                |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level:                                     |                                            | Date<br>25/03/2015             |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):<br>Depth <input type="text" value="3.10"/> |                                            | Scale<br>1:20<br>Logged<br>NKH |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  |                                                            |                                            |                                |  |

| Water Strike | Samples and In Situ Testing |      |         | Depth (m)    | Level (m) | Legend                                                                              | Stratum Description                                                                                                                 |  |
|--------------|-----------------------------|------|---------|--------------|-----------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--|
|              | Depth                       | Type | Results |              |           |                                                                                     |                                                                                                                                     |  |
|              | 0.10                        | J    |         | 0.30         |           |    | TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets. (TOPSOIL)                                         |  |
|              | 0.50                        | T    |         |              |           |   | ?Loose red slightly silty fine to medium SAND with rare subrounded fine to medium gravel of mixed lithologies. (VALE OF YORK DRIFT) |  |
|              | 0.90                        | T    |         |              |           |                                                                                     |                                                                                                                                     |  |
|              | 2.70                        | T    |         |              |           |                                                                                     |                                                                                                                                     |  |
|              | 3.10                        | T    |         | 3.00<br>3.10 |           |  | ?Loose red-brown slightly silty fine to medium SAND. (VALE OF YORK DRIFT)                                                           |  |
|              |                             |      |         |              |           |                                                                                     | <i>At 3.1m, complete collapse.</i><br>End of pit at 3.10 m                                                                          |  |

Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion.

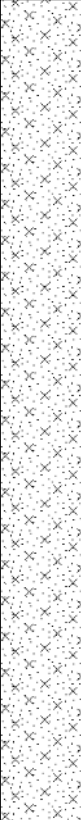
Stability:



|                                                                                                                                                                                                                                                                                                            |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------|---------|-------------------------------|--------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                                            |                             |       |         | <h1>Trial Pit Log</h1>        |              |                                                                                   |                                                                                                                                                                                    | Trialpit No<br><b>TP03</b><br>Sheet 1 of 1                                                                                                                                                                        |  |
| Project Name: Field Lane, Thorpe Willoughby                                                                                                                                                                                                                                                                |                             |       |         | Project No.<br>2123           |              | Co-ords: -<br>Level:                                                              |                                                                                                                                                                                    | Date<br>26/03/2015                                                                                                                                                                                                |  |
| Location: Thorpe Willoughby                                                                                                                                                                                                                                                                                |                             |       |         | Dimensions (m):<br>Depth 1.70 |              | <div></div>                                                                       |                                                                                                                                                                                    | Scale<br>1:20                                                                                                                                                                                                     |  |
| Client: JSR Farms                                                                                                                                                                                                                                                                                          |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    | Logged<br>NKH                                                                                                                                                                                                     |  |
| Water<br>Strike                                                                                                                                                                                                                                                                                            | Samples and In Situ Testing |       |         | Depth<br>(m)                  | Level<br>(m) | Legend                                                                            | Stratum Description                                                                                                                                                                |                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                                                                                                            | Depth                       | Type  | Results |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                                                                                                            | 0.10                        | J,K&T |         | 0.50                          |              |  | TOPSOIL: Brown slightly silty slightly gravelly fine to medium SAND with occasional rootlets. Gravel is subangular to subrounded fine to medium of mixed lithologies.<br>(TOPSOIL) |                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                                                                                                            | 1.50                        | T     |         |                               |              |                                                                                   |                                                                                                  | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to medium gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)<br><br><i>From 1.0m, slight spalling of pit walls.</i> |  |
|                                                                                                                                                                                                                                                                                                            |                             |       |         | 1.70                          |              |                                                                                   | End of pit at 1.70 m                                                                                                                                                               |                                                                                                                                                                                                                   |  |
| <div>1</div> <div>2</div> <div>3</div> <div>4</div>                                                                                                                                                                                                                                                        |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |
| Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |
| Stability:                                                                                                                                                                                                                                                                                                 |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                       |                             |       |         |                               |              |                                                                                   |                                                                                                                                                                                    |                                                                                                                                                                                                                   |  |

|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|-------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP04</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.60           |                                            | Logged<br>NKH      |  |

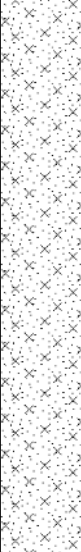
| Water Strike | Samples and In Situ Testing |       |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                                                                                                       |  |
|--------------|-----------------------------|-------|---------|-----------|-----------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|              | Depth                       | Type  | Results |           |           |                                                                                    |                                                                                                                                                                                                                                           |  |
|              | 0.10                        | J,K&T |         | 0.40      |           |   | MADE GROUND TOPSOIL: Dark brown slightly silty slightly gravelly fine to medium SAND with occasional organic material. Gravel is angular to subrounded fine to coarse comprising brick, concrete and mixed natural lithologies. (TOPSOIL) |  |
|              | 0.80                        | T     |         |           |           |  | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to medium gravel of mixed lithologies. (VALE OF YORK DRIFT)                                                                                   |  |
|              | 2.50                        | T     |         |           |           |                                                                                    | At 2.6m, complete collapse of pit walls.                                                                                                                                                                                                  |  |
|              |                             |       |         | 2.60      |           |                                                                                    | End of pit at 2.60 m                                                                                                                                                                                                                      |  |

|                                                                                                                                                                                                                                                              |  |                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:     1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                   |  |                                                                                       |

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP05</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>3.10          |                                            | Logged<br>NKH      |  |

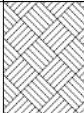
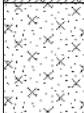
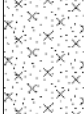
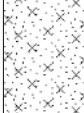
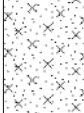
| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m)                                                                           | Legend                                                                                                                                                                                                | Stratum Description                                                                                                                                                                                                     |  |
|--------------|-----------------------------|------|---------|-----------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|              | Depth                       | Type | Results |           |                                                                                     |                                                                                                                                                                                                       |                                                                                                                                                                                                                         |  |
|              | 0.10                        | J&T  |         | 0.30      |                                                                                     |                                                                                                                      | MADE GROUND TOPSOIL: Light brown slightly silty slightly gravelly SAND with occasional rootlets. Gravel is angular to rounded fine to coarse of brick, cement, wood, sandstone and mixed natural lithologies. (TOPSOIL) |  |
|              | 0.80                        | T    |         |           |   | ?Loose brown-red slightly silty fine to medium SANND with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. Rare 230mm diameter subangular cobble. (VALE OF YORK DRIFT) |                                                                                                                                                                                                                         |  |
|              | 2.30                        | T    |         |           |                                                                                     | From 1.8m, constant collapse of pit walls.                                                                                                                                                            |                                                                                                                                                                                                                         |  |
|              | 3.10                        | T    |         |           |  | ?Medium dense red gravelly fine to medium SAND. Gravel is predominantly angular/tabular coarse sandstone. (WEATHERED SHERWOOD SANDSTONE)<br>End of pit at 3.10 m                                      |                                                                                                                                                                                                                         |  |

|                                                                                                                                                                                                                                                            |  |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                 |  |                                                                                       |

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP06</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>1.90          |                                            | Logged<br>NKH      |  |

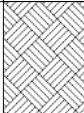
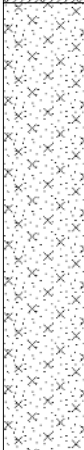
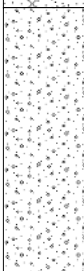
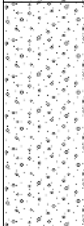
| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                      |
|--------------|-----------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                       | Type | Results |           |           |                                                                                    |                                                                                                                                                          |
|              | 0.10                        | J    |         | 0.30      |           |   | TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                           |
|              |                             |      |         |           |           |   | ?Loose slightly silty fine to medium SAND with occasional fine to coarse subangular to subrounded gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)   |
|              | 1.00                        | T    |         |           |           |   | From 1.0m, slight spalling of pit walls.                                                                                                                 |
|              | 1.70                        | B    |         | 1.80      |           |   | ?Medium dense slightly gravelly fine to medium SAND. Gravel is predominantly angular/tabular fine to coarse sandstone.<br>(WEATHERED SHERWOOD SANDSTONE) |
|              |                             |      |         | 1.90      |           |  | End of pit at 1.90 m                                                                                                                                     |

|            |  |                                                                                                                                                                                                                                                                                                   |  |
|------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Remarks:   |  | 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |  |
| Stability: |  |                                                                                                                                                                                                              |  |

|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|-------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP07</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.80           |                                            | Logged<br>NKH      |  |

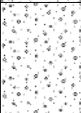
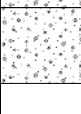
| Water<br>Strike | Samples and In Situ Testing |      |         | Depth<br>(m) | Level<br>(m) | Legend                                                                              | Stratum Description                                                                                                                                          |   |
|-----------------|-----------------------------|------|---------|--------------|--------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                 | Depth                       | Type | Results |              |              |                                                                                     |                                                                                                                                                              |   |
|                 | 0.10                        | J    |         | 0.30         |              |    | TOPSOIL: Light brown slightly silty fine SAND with occasional rootlets.<br>(TOPSOIL)                                                                         |   |
|                 |                             |      |         |              |              |   | ?Loose red-brown slightly silty fine to medium SAND.<br>(VALE OF YORK DRIFT)<br><i>From 0.3m, slight spalling of pit walls.</i>                              |   |
|                 | 0.80                        | T    |         | 1.50         |              |  | ?Medium dense red slightly gravelly fine to medium SAND. Gravel is predominantly angular/tabular fine to coarse sandstone.<br>(WEATHERED SHERWOOD SANDSTONE) | 2 |
|                 | 1.60                        | T    |         |              |              |  | ?Medium dense very gravelly fine to coarse SAND. Gravel is predominantly angular/tabular fine to coarse sandstone.<br>(WEATHERED SHERWOOD SANDSTONE)         |   |
|                 | 2.20                        | T    |         | 2.20         |              |                                                                                     |                                                                                                                                                              | 3 |
|                 | 2.70                        | T    |         | 2.80         |              |                                                                                     | End of pit at 2.80 m                                                                                                                                         |   |
|                 |                             |      |         |              |              |                                                                                     |                                                                                                                                                              | 4 |

|                                                                                                                                                                                                                                                                    |  |                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:    1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                         |  |                                                                                       |

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP08</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.70          |                                            | Logged<br>NKH      |  |

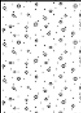
| Water Strike                                               | Samples and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                         |
|------------------------------------------------------------|-----------------------------|------|---------|-----------|-----------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | Depth                       | Type | Results |           |           |                                                                                     |                                                                                                                                                             |
|                                                            | 0.10                        | J    |         | 0.30      |           |    | TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                              |
|                                                            | 0.50                        | T    |         |           |           |    | ?Loose red slightly silty fine to coarse SAND with occasional subangular to subrounded fine to medium gravely of mixed lithologies.<br>(VALE OF YORK DRIFT) |
|                                                            | 1.20                        | T    |         |           |           |                                                                                     | <i>From 0.8m, slight spalling of pit walls.</i>                                                                                                             |
|                                                            | 2.10                        | T    |         | 2.10      |           |  | ?Medium dense red gravelly fine to medium SAND. Gravel is predominantly angular/tabular fine to coarse sandstone.<br>(WEATHERED SHERWOOD SANDSTONE)         |
|                                                            | 2.70                        | T    |         | 2.70      |           |  | ?Medium dense red very gravelly fine to medium SAND. Gravel is predominantly angular/tabular fine to coarse sandstone.<br>(WEATHERED SHERWOOD SANDSTONE)    |
| <div style="text-align: right;">End of pit at 2.70 m</div> |                             |      |         |           |           |                                                                                     |                                                                                                                                                             |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                        |  |                                                                                       |

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|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP09</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>3.30          |                                            | Logged<br>NKH      |  |

| Water Strike | Samples and In Situ Testing |       |         | Depth (m) | Level (m)                                                                                                                                                                                                                                                                                                             | Legend                                                                                                                                                                                                                                                                                            | Stratum Description                                                                                                                                                                                                                                                                                                                                                    |
|--------------|-----------------------------|-------|---------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                       | Type  | Results |           |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |
|              | 0.10                        | J,K&T |         | 0.30      |                                                                                                                                                                                                                                                                                                                       |  MADE GROUND TOPSOIL: Light brown slightly silty gravelly fine to medium SAND. Gravel is angular to rounded fine to coarse of mixed lithologies, including sandstone, brick, scrap metal and concrete. (TOPSOIL) | <div style="position: relative; height: 600px;"> <div style="position: absolute; top: 0; right: 0; width: 20px; height: 20px; border: 1px solid black; text-align: center; line-height: 20px;">1</div> <div style="position: absolute; bottom: 0; right: 0; width: 20px; height: 20px; border: 1px solid black; text-align: center; line-height: 20px;">4</div> </div> |
|              | 0.60                        | T     |         |           |  ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. Rare subrounded cobbles. (VALE OF YORK DRIFT)<br><i>From 0.5m, slight spalling of pit walls.</i> |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |
|              | 1.50                        | T     |         |           |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |
|              | 3.00                        | T     |         | 2.90      |                                                                                                                                                                                                                                                                                                                       |  ?Medium dense red slightly cobbly gravelly SAND. Gravel is predominantly angular/tabular fine to coarse sandstone. (WEATHERED SHERWOOD SANDSTONE)<br><i>At 3.3m, complete collapse.</i>                       | 3                                                                                                                                                                                                                                                                                                                                                                      |
|              |                             |       |         | 3.30      |                                                                                                                                                                                                                                                                                                                       | <div style="border-top: 1px dashed black; padding-top: 5px;">           End of pit at 3.30 m         </div>                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                        |

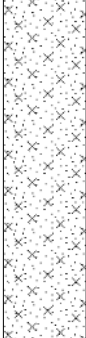
  

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| Remarks:   | 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |
| Stability: |                                                                                                                                                                                                                                                 |



|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
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|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP10</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.00           |                                            | Logged<br>NKH      |  |

| Water Strike | Samples and In Situ Testing |       |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                                                                                                                                                                                                    |
|--------------|-----------------------------|-------|---------|-----------|-----------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                       | Type  | Results |           |           |                                                                                    |                                                                                                                                                                                                                                                                                                                                        |
|              | 0.10                        | J,K&T |         | 0.20      |           |   | MADE GROUND TOPSOIL: Brown slightly silty gravelly fine to medium SAND. Gravel is angular to subangular fine to coarse of mixed lithologies, including sandstone, concrete and brick.<br>(TOPSOIL)<br>MADE GROUND: Grey slightly sandy angular cobbles of concrete and brick.<br>(GRANULAR MADE GROUND)<br><i>At 0.4m, land drain.</i> |
|              |                             |       |         | 1.10      |           |  |                                                                                                                                                                                                                                                                                                                                        |
|              | 1.90                        | B     |         | 2.00      |           |                                                                                    | ?Loose red slightly silty fine to medium SAND.<br>(VALE OF YORK DRIFT)                                                                                                                                                                                                                                                                 |
|              |                             |       |         |           |           |                                                                                    | End of pit at 2.00 m                                                                                                                                                                                                                                                                                                                   |

|            |  |                                                                                                                                                                                                                                                                                                   |  |
|------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Remarks:   |  | 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |  |
| Stability: |  |                                                                                                                                                                                                              |  |

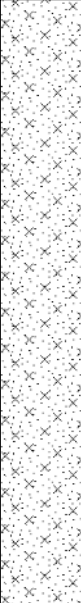
|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|-------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP11</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>25/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>3.10           |                                            | Logged<br>NKH      |  |

| Water Strike | Samples and In Situ Testing |       |         | Depth (m) | Level (m)                                                                                                                                                                                                                                                                                           | Legend                                                                                                                                                                                                                                                                                                               | Stratum Description |  |
|--------------|-----------------------------|-------|---------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--|
|              | Depth                       | Type  | Results |           |                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                      |                     |  |
|              | 0.10                        | J,K&T |         | 0.40      |                                                                                                                                                                                                                                                                                                     |  MADE GROUND TOPSOIL: Light brown slightly silty slightly gravelly fine to medium SAND with occasional rootlets. Gravel is angular to subrounded fine to coarse of mixed lithologies, including wood, brick and concrete. (TOPSOIL) |                     |  |
|              | 0.60                        | T     |         |           |  ?Loose brown-red slightly silty fine to medium SAND with occasional angular to subrounded fine to coarse gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)<br><i>From 0.6m, slight spalling of pit walls.</i> | 1                                                                                                                                                                                                                                                                                                                    |                     |  |
|              | 1.20                        | T     |         |           |                                                                                                                                                                                                                                                                                                     | 2                                                                                                                                                                                                                                                                                                                    |                     |  |
|              | 2.00                        | T     |         |           |                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                      |                     |  |
|              | 3.00                        | T     |         | 3.10      |                                                                                                                                                                                                                                                                                                     | <i>From 3.0m, constant collapse.</i><br><i>At 3.1m, complete collapse.</i>                                                                                                                                                                                                                                           | 3                   |  |
|              |                             |       |         |           |                                                                                                                                                                                                                                                                                                     | End of pit at 3.10 m                                                                                                                                                                                                                                                                                                 | 4                   |  |

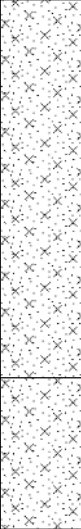
  

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| Remarks:    1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                  |  |                                                                                       |

|                                                                                                                                                                                                                                                                 |                             |      |         |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                       |
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|                                                                                                                                                                                 |                             |      |         | <h1>Trial Pit Log</h1>        |              |                                                                                   | Trialpit No<br><b>TP12</b><br>Sheet 1 of 1                                                                                                                                               |                                                                                                                                                                                                                       |
| Project Name: Field Lane, Thorpe Willoughby                                                                                                                                                                                                                     |                             |      |         | Project No.<br>2123           |              | Co-ords: -<br>Level:                                                              |                                                                                                                                                                                          | Date<br>25/03/2015                                                                                                                                                                                                    |
| Location: Thorpe Willoughby                                                                                                                                                                                                                                     |                             |      |         | Dimensions (m):<br>Depth 2.00 |              |                                                                                   | Scale<br>1:20<br>Logged<br>NKH                                                                                                                                                           |                                                                                                                                                                                                                       |
| Client: JSR Farms                                                                                                                                                                                                                                               |                             |      |         |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                       |
| Water<br>Strike                                                                                                                                                                                                                                                 | Samples and In Situ Testing |      |         | Depth<br>(m)                  | Level<br>(m) | Legend                                                                            | Stratum Description                                                                                                                                                                      |                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                 | Depth                       | Type | Results |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                 | 0.10                        | J    |         | 0.40                          |              |  | TOPSOIL: Light brown slightly silty slightly gravelly fine to medium SAND with occasional rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies.<br>(TOPSOIL) |                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                 | 1.50                        | T    |         |                               |              |                                                                                   |                                                                                                        | ?Loose red slightly silty fine to medium SAND.<br>(VALE OF YORK DRIFT)<br><i>At 0.4m, a 0.3mm thick concrete slab was encountered in eastern corner of trial pit.</i><br><br><i>From 1.0m, spalling of pit walls.</i> |
|                                                                                                                                                                                                                                                                 |                             |      |         | 2.00                          |              |                                                                                   | End of pit at 2.00 m                                                                                                                                                                     |                                                                                                                                                                                                                       |
| <div>1</div> <div>2</div> <div>3</div> <div>4</div>                                                                                                                                                                                                             |                             |      |         |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                       |
| Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Backfilled with materials arising upon completion. |                             |      |         |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                                                       |
| Stability:                                                                                                                                                                                                                                                      |                             |      |         |                               |              |                                                                                   |                                                                                                                                                                                          |                                                                                                                                  |

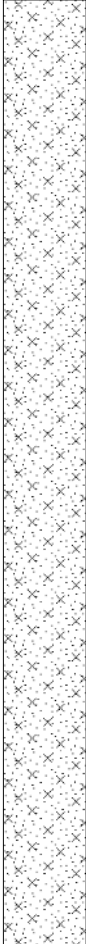
|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|-------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP13</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>1.70           |                                            | Logged<br>NKH      |  |

| Water<br>Strike | Samples and In Situ Testing |      |         | Depth<br>(m) | Level<br>(m) | Legend                                                                             | Stratum Description                                                                                                                                                             |                                          |
|-----------------|-----------------------------|------|---------|--------------|--------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                 | Depth                       | Type | Results |              |              |                                                                                    |                                                                                                                                                                                 |                                          |
|                 | 0.10                        | J    |         | 0.40         |              |   | TOPSOIL: Brown slightly silty slightly gravelly fine to medium SAND with occasional rootlets. Gravel is angular to subrounded fine to coarse of mixed lithologies.<br>(TOPSOIL) | <div style="text-align: center;">1</div> |
|                 | 0.80                        | T    |         |              |              |                                                                                    | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse of mixed lithologies.<br>(VALE OF YORK DRIFT)                             |                                          |
|                 | 1.50                        | T    |         | 1.40         |              |  | ?Loose red gravelly fine to medium SAND. Gravel is angular to subrounded fine to coarse of mixed lithologies. Occasional subrounded cobbles.<br>(VALE OF YORK DRIFT)            |                                          |
|                 |                             |      |         | 1.80         |              |                                                                                    | End of pit at 1.70 m                                                                                                                                                            | <div style="text-align: center;">3</div> |
|                 |                             |      |         |              |              |                                                                                    |                                                                                                                                                                                 | <div style="text-align: center;">4</div> |

|                                                                                                                                                                                                                                                                                                                |  |                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:     1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                                                                     |  |                                                                                       |

|                                                                                                                                                                                                                                                          |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|---------|------------------------|--------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------|
|                                                                                                                                                                          |                             |      |         | <h1>Trial Pit Log</h1> |              |                                                                                     |                                                                                                                                                                                | Trialpit No<br><b>TP14</b><br>Sheet 1 of 1 |                                                     |
| Project Name: Field Lane, Thorpe Willoughby                                                                                                                                                                                                              |                             |      |         | Project No.<br>2123    |              | Co-ords: -<br>Level:                                                                |                                                                                                                                                                                | Date<br>25/03/2015                         |                                                     |
| Location: Thorpe Willoughby                                                                                                                                                                                                                              |                             |      |         |                        |              | Dimensions (m):<br>Depth 3.00                                                       |                                                                                                                                                                                | Scale<br>1:20                              |                                                     |
| Client: JSR Farms                                                                                                                                                                                                                                        |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                | Logged<br>NKH                              |                                                     |
| Water<br>Strike                                                                                                                                                                                                                                          | Samples and In Situ Testing |      |         | Depth<br>(m)           | Level<br>(m) | Legend                                                                              | Stratum Description                                                                                                                                                            |                                            |                                                     |
|                                                                                                                                                                                                                                                          | Depth                       | Type | Results |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
|                                                                                                                                                                                                                                                          | 0.10                        | J    |         | 0.30                   |              |    | TOPSOIL: Dark brown slightly silty gravelly fine to medium SAND with occasional rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies.<br>(TOPSOIL) |                                            | <div>1</div> <div>2</div> <div>3</div> <div>4</div> |
|                                                                                                                                                                                                                                                          | 0.40                        | T    |         |                        |              |   | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                    |                                            |                                                     |
|                                                                                                                                                                                                                                                          | 1.00                        | T    |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
|                                                                                                                                                                                                                                                          | 2.00                        | T    |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
|                                                                                                                                                                                                                                                          |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
|                                                                                                                                                                                                                                                          |                             |      |         | 2.80                   |              |  | ?Loose clayey red fine to medium SAND.<br>(VALE OF YORK DRIFT)                                                                                                                 |                                            | 3                                                   |
|                                                                                                                                                                                                                                                          |                             |      |         | 3.00                   |              |  | From 2.8m, strata becoming damp.<br>At 3.0m, complete collapse.                                                                                                                |                                            |                                                     |
| End of pit at 3.00 m                                                                                                                                                                                                                                     |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
| Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |
| Stability:                                                                                                                                                                                                                                               |                             |      |         |                        |              |                                                                                     |                                                                                                                                                                                |                                            |                                                     |

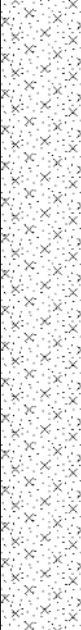






|                                                                                  |  |  |  |                        |  |                         |                                            |                    |  |
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|  |  |  |  | <h1>Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP17</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123    |  | Co-ords:    -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                        |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                        |  | Depth<br>2.00           |                                            | Logged<br>NKH      |  |

| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                                                                                                                                                                                                                    | Stratum Description                                                                                                                                              |   |
|--------------|-----------------------------|------|---------|-----------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                       | Type | Results |           |           |                                                                                                                                                                                                                                                                           |                                                                                                                                                                  |   |
|              | 0.10                        | J    |         | 0.30      |           |  TOPSOIL: Brown slightly silty slightly gravelly fine to medium SAND with occasional organic material. Gravel is angular to subrounded fine to coarse of mixed lithologies.<br>(TOPSOIL) | ?Loose red slightly silty slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies.<br>(VALE OF YORK DRIFT) |   |
|              |                             |      |         |           |           |                                                                                                                                                                                                                                                                           |                                                                                                                                                                  |   |
|              |                             |      |         | 2.00      |           |                                                                                                                                                                                         | From 0.9m, slight spalling of pit walls.                                                                                                                         | 1 |
|              |                             |      |         |           |           |                                                                                                                                                                                                                                                                           | At 2.9m, slight water seepage.                                                                                                                                   | 2 |
|              |                             |      |         |           |           |                                                                                                                                                                                                                                                                           | End of pit at 2.00 m                                                                                                                                             | 3 |
|              |                             |      |         |           |           |                                                                                                                                                                                                                                                                           |                                                                                                                                                                  | 4 |

|                                                                                                                                                                                                                                                                                                               |  |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:    1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                                                                    |  |                                                                                       |

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP18</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.60          |                                            | Logged<br>NKH      |  |

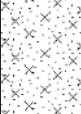
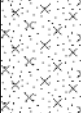
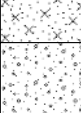
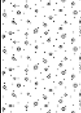
| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m)                                                                                                                                                                                                                                                                                                  | Legend                                                                                                                                                                                                                                                                                                          | Stratum Description |
|--------------|-----------------------------|------|---------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|              | Depth                       | Type | Results |           |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                 |                     |
|              | 0.10                        | J    |         | 0.30      |                                                                                                                                                                                                                                                                                                            |  TOPSOIL: Brown-grey silty slightly gravelly fine to medium SAND with occasional. Gravel is angular to subrounded fine to coarse of mixed lithologies. (TOPSOIL)                                                               | 1                   |
|              | 0.80                        | T    |         |           |  ?Loose mottled red-grey slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. (VALE OF YORK DRIFT)<br><i>From 0.5m, slight spalling of pit walls.</i> |                                                                                                                                                                                                                                                                                                                 |                     |
|              | 1.60                        | T    |         | 1.50      |                                                                                                                                                                                                                                                                                                            |  ?Loose red slightly silty fine to medium SAND with rare subangular to subrounded fine to medium gravel of mixed lithologies. (VALE OF YORK DRIFT)<br><i>At 1.5m, running sands.</i><br><i>From 1.5m, constant collapse.</i> | 2                   |
|              | 2.20                        | T    |         | 2.10      |                                                                                                                                                                                                                                                                                                            |  ?Medium dense red slightly gravelly fine to coarse SAND. Gravel is predominantly angular/tabular fine to coarse sandstone. (WEATHERED SHERWOOD SANDSTONE)                                                                   | 3                   |
|              |                             |      |         | 2.30      |                                                                                                                                                                                                                                                                                                            |  ?Medium dense red very gravelly fine to coarse SAND. Gravel is angular/tabular fine to coarse sandstone. (WEATHERED SHERWOOD SANDSTONE)                                                                                     |                     |
|              |                             |      |         | 2.60      |                                                                                                                                                                                                                                                                                                            | End of pit at 2.60 m                                                                                                                                                                                                                                                                                            |                     |

|                                                                                                                                                                                                                                                      |  |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent during excavation. 3. The sides of the trial pit spalled during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                           |  |                                                                                       |

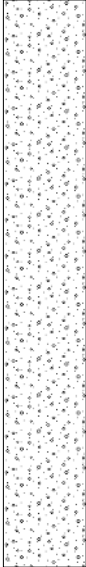
|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP19</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>2.60          |                                            | Logged<br>NKH      |  |

| Water<br>Strike | Samples and In Situ Testing |      |         | Depth<br>(m) | Level<br>(m) | Legend                                                                              | Stratum Description                                                                                                                                                                     |   |
|-----------------|-----------------------------|------|---------|--------------|--------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                 | Depth                       | Type | Results |              |              |                                                                                     |                                                                                                                                                                                         |   |
|                 | 0.10                        | J    |         |              |              |    | TOPSOIL: Dark brown slightly gravelly slightly silty fine to medium SAND with occasional rootlets. Gravel is angular to subrounded fine to coarse of mixed lithologies.<br>(TOPSOIL)    |   |
|                 | 0.40                        | T    |         | 0.30         |              |    | ?Loose orange-grey slightly silty fine to medium SAND with some angular to subrounded fine to coarse gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                               |   |
|                 |                             |      |         | 0.60         |              |    | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse gravel.<br>(VALE OF YORK DRIFT)                                                   |   |
|                 |                             |      |         |              |              |                                                                                     | <div style="border: 1px solid black; padding: 2px;">From 0.9m, slight spalling of pit walls.</div>                                                                                      | 1 |
|                 | 1.70                        | T    |         |              |              |   |                                                                                                                                                                                         |   |
|                 |                             |      |         | 2.00         |              |  | <div style="border: 1px solid black; padding: 2px;">At 1.9m, running sands.</div>                                                                                                       |   |
|                 |                             |      |         | 2.20         |              |  | ?Medium dense red slightly silty fine to coarse SAND with some angular/tabular fine to coarse gravel of sandstone. Rare angular cobbles of sandstone.<br>(WEATHERED SHERWOOD SANDSTONE) | 2 |
|                 | 2.50                        | T    |         |              |              |  | ?Medium dense red fine to coarse SAND with some angular/tabular gravel and occasional cobbles of sandstone.<br>(WEATHERED SHERWOOD SANDSTONE)                                           |   |
|                 |                             |      |         | 2.60         |              |                                                                                     | <div style="border: 1px solid black; padding: 2px;">At 2.6m, slight water seepage.</div>                                                                                                |   |
|                 |                             |      |         |              |              |                                                                                     | End of pit at 2.60 m                                                                                                                                                                    | 3 |
|                 |                             |      |         |              |              |                                                                                     |                                                                                                                                                                                         | 4 |

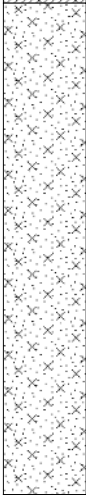
  

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:   1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                                    |  |                                                                                       |

|                                                                                                                                                                                                                                                                                                        |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|---------|-------------------------------|--------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--|
|                                                                                                                                                                                                                        |                             |      |         | <h1>Trial Pit Log</h1>        |              |                                                                                    | Trialpit No<br><b>TP20</b><br>Sheet 1 of 1                                                                                                                                                 |                    |  |
| Project Name: Field Lane, Thorpe Willoughby                                                                                                                                                                                                                                                            |                             |      |         | Project No.<br>2123           |              | Co-ords: -<br>Level:                                                               |                                                                                                                                                                                            | Date<br>26/03/2015 |  |
| Location: Thorpe Willoughby                                                                                                                                                                                                                                                                            |                             |      |         | Dimensions (m):<br>Depth 1.80 |              |                                                                                    | Scale<br>1:20<br>Logged<br>NKH                                                                                                                                                             |                    |  |
| Client: JSR Farms                                                                                                                                                                                                                                                                                      |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
| Water<br>Strike                                                                                                                                                                                                                                                                                        | Samples and In Situ Testing |      |         | Depth<br>(m)                  | Level<br>(m) | Legend                                                                             | Stratum Description                                                                                                                                                                        |                    |  |
|                                                                                                                                                                                                                                                                                                        | Depth                       | Type | Results |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
|                                                                                                                                                                                                                                                                                                        | 0.10                        | J    |         | 0.30                          |              |   | TOPSOIL: Dark brown-black slightly silty slightly gravelly fine to medium SAND with occasional rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies.<br>(TOPSOIL) |                    |  |
|                                                                                                                                                                                                                                                                                                        |                             |      |         |                               |              |                                                                                    | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                 |                    |  |
|                                                                                                                                                                                                                                                                                                        |                             |      |         |                               |              |  | From 1.0m, slight spalling of pit walls.                                                                                                                                                   |                    |  |
|                                                                                                                                                                                                                                                                                                        |                             |      |         |                               |              |                                                                                    | At 1.5m, running sands.                                                                                                                                                                    |                    |  |
|                                                                                                                                                                                                                                                                                                        | 1.70                        | B    |         | 1.80                          |              |                                                                                    | End of pit at 1.80 m                                                                                                                                                                       |                    |  |
| <div>1</div> <div>2</div> <div>3</div> <div>4</div>                                                                                                                                                                                                                                                    |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
| Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent during excavation. 3. The sides of the trial pit spalled slightly during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
| Stability:                                                                                                                                                                                                                                                                                             |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |
|                                                                                                                                                                                                                   |                             |      |         |                               |              |                                                                                    |                                                                                                                                                                                            |                    |  |

|                                                                                  |  |  |  |                                                    |  |                        |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                        | Trialpit No<br><b>TP21</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:   -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:   Thorpe Willoughby                                                    |  |  |  |                                                    |  | Dimensions (m):        |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>1.70          |                                            | Logged<br>NKH      |  |

| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m)                                                                                                                                                                                                                                               | Legend                                                                                                                                                                               | Stratum Description                     |
|--------------|-----------------------------|------|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
|              | Depth                       | Type | Results |           |                                                                                                                                                                                                                                                         |                                                                                                                                                                                      |                                         |
|              | 0.10                        | J    |         | 0.20      |                                                                                                                                                                                                                                                         |  TOPSOIL: Dark brown-black damp very silty fine SAND with occasional organic material.<br>(TOPSOIL) | <div style="text-align: right;">1</div> |
|              |                             |      |         |           |  ?Loose mottled grey-orange slightly silty fine to medium SAND with rare subangular to subrounded fine to medium gravel of mixed lithologies.<br>(VALE OF YORK DRIFT) |                                                                                                                                                                                      |                                         |
|              | 1.50                        | T    |         | 1.50      |                                                                                                                                                                                                                                                         | ?Loose red slightly silty fine to medium SAND with rare subangular to subrounded fine to medium gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                 |                                         |
|              | 1.70                        | T    |         | 1.70      |                                                                                                                                                                                                                                                         | At 1.6m, constant collapse.<br>At 1.7m, complete collapse.<br>End of pit at 1.70 m                                                                                                   |                                         |
|              |                             |      |         |           |                                                                                                                                                                                                                                                         |                                                                                                                                                                                      | <div style="text-align: right;">2</div> |
|              |                             |      |         |           |                                                                                                                                                                                                                                                         |                                                                                                                                                                                      | <div style="text-align: right;">3</div> |
|              |                             |      |         |           |                                                                                                                                                                                                                                                         |                                                                                                                                                                                      | <div style="text-align: right;">4</div> |

|                                                                                                                                                                                                                                                          |  |                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|
| Remarks:     1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |  |  |
| Stability:                                                                                                                                                                                                                                               |  |                                                                                       |

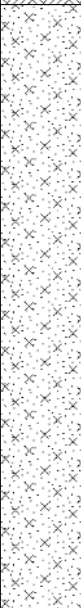
|                                                                                  |  |  |  |                                                    |  |                         |                                            |                    |  |
|----------------------------------------------------------------------------------|--|--|--|----------------------------------------------------|--|-------------------------|--------------------------------------------|--------------------|--|
|  |  |  |  | <h1 style="text-align: center;">Trial Pit Log</h1> |  |                         | Trialpit No<br><b>TP22</b><br>Sheet 1 of 1 |                    |  |
| Project Name:     Field Lane, Thorpe Willoughby                                  |  |  |  | Project No.<br>2123                                |  | Co-ords:    -<br>Level: |                                            | Date<br>26/03/2015 |  |
| Location:    Thorpe Willoughby                                                   |  |  |  |                                                    |  | Dimensions (m):         |                                            | Scale<br>1:20      |  |
| Client:       JSR Farms                                                          |  |  |  |                                                    |  | Depth<br>1.20           |                                            | Logged<br>NKH      |  |

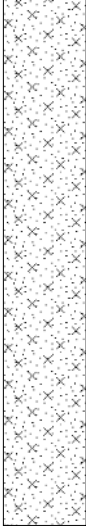
  

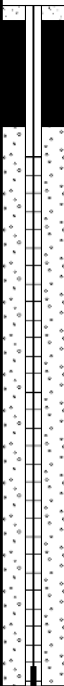
| Water Strike | Samples and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                          |   |
|--------------|-----------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---|
|              | Depth                       | Type | Results |           |           |                                                                                   |                                                                                              |   |
|              |                             |      |         | 0.10      |           |  | TOPSOIL: Dark brown-black slightly sandy SILT with occasional organic material.<br>(TOPSOIL) |   |
|              |                             |      |         |           |           |  | ?Loose dark brown-black damp slightly sandy SILT.<br>(VALE OF YORK DRIFT)                    |   |
|              |                             |      |         |           |           |                                                                                   | At 1.0m, water inflow.                                                                       | 1 |
|              |                             |      |         |           |           |                                                                                   | At 1.2m, complete collapse.                                                                  |   |
|              |                             |      |         | 1.20      |           |                                                                                   | End of pit at 1.20 m                                                                         |   |
|              | 1.70                        | T    |         |           |           |                                                                                   |                                                                                              | 2 |
|              |                             |      |         |           |           |                                                                                   |                                                                                              | 3 |
|              |                             |      |         |           |           |                                                                                   |                                                                                              | 4 |

|            |                                                                                                                                                                                                                                             |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remarks:   | 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |
| Stability: |                                                                                                                                                        |

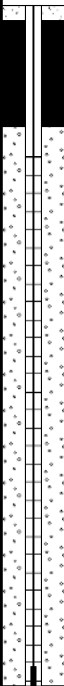
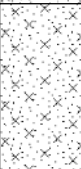
|                                                                                                                                                                                                                                                          |                             |      |         |                               |              |                                                                                     |                                                                                                                                                                       |                                                                                                                                                         |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|---------|-------------------------------|--------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                          |                             |      |         | <h1>Trial Pit Log</h1>        |              |                                                                                     | Trialpit No<br><b>TP23</b><br>Sheet 1 of 1                                                                                                                            |                                                                                                                                                         |  |
| Project Name: Field Lane, Thorpe Willoughby                                                                                                                                                                                                              |                             |      |         | Project No.<br>2123           |              | Co-ords: -<br>Level:                                                                |                                                                                                                                                                       | Date<br>26/03/2015                                                                                                                                      |  |
| Location: Thorpe Willoughby                                                                                                                                                                                                                              |                             |      |         | Dimensions (m):<br>Depth 2.10 |              |                                                                                     | Scale<br>1:20<br>Logged<br>NKH                                                                                                                                        |                                                                                                                                                         |  |
| Client: JSR Farms                                                                                                                                                                                                                                        |                             |      |         |                               |              |                                                                                     |                                                                                                                                                                       |                                                                                                                                                         |  |
| Water<br>Strike                                                                                                                                                                                                                                          | Samples and In Situ Testing |      |         | Depth<br>(m)                  | Level<br>(m) | Legend                                                                              | Stratum Description                                                                                                                                                   |                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                          | Depth                       | Type | Results |                               |              |                                                                                     |                                                                                                                                                                       |                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                          | 0.10                        | J    |         | 0.50                          |              |    | TOPSOIL: Brown slightly silty slightly gravelly fine SAND with occasional rootlets. Gravel is subangular to subrounded fine to coarse of mixed lithologies. (TOPSOIL) |                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                          | 1.20                        | T    |         |                               |              |                                                                                     |                                                                                     | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to medium gravel of mixed lithologies. (VALE OF YORK DRIFT) |  |
|                                                                                                                                                                                                                                                          |                             |      |         | 2.10                          |              |  | From 1,2m, slight spalling of pit walls.                                                                                                                              |                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                          |                             |      |         |                               |              |                                                                                     | At 2.0m, complete collapse.                                                                                                                                           |                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                          |                             |      |         |                               |              |                                                                                     | End of pit at 2.10 m                                                                                                                                                  |                                                                                                                                                         |  |
| Remarks: 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit collapsed during excavation. 4. Backfilled with materials arising upon completion. |                             |      |         |                               |              |                                                                                     |                                                                                                                                                                       |                                                                                                                                                         |  |
| Stability:                                                                                                                                                                                                                                               |                             |      |         |                               |              |                                                                                     |                                                                                                                                                                       |                                                                    |  |

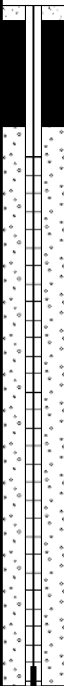
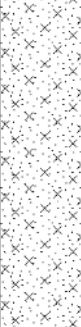
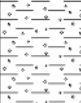
|                                                                                  |                             |      |         |                                                                                                                                                                                                                                                                                          |              |                                                                                    |                                                                                                                                                                                                            |                    |                                                                                       |  |
|----------------------------------------------------------------------------------|-----------------------------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------|--|
|  |                             |      |         | <h1>Trial Pit Log</h1>                                                                                                                                                                                                                                                                   |              |                                                                                    | Trialpit No<br><b>TP24</b><br>Sheet 1 of 1                                                                                                                                                                 |                    |                                                                                       |  |
| Project Name: Field Lane, Thorpe Willoughby                                      |                             |      |         | Project No.<br>2123                                                                                                                                                                                                                                                                      |              | Co-ords: -<br>Level:                                                               |                                                                                                                                                                                                            | Date<br>26/03/2015 |                                                                                       |  |
| Location: Thorpe Willoughby                                                      |                             |      |         | Dimensions (m):<br>Depth 1.60                                                                                                                                                                                                                                                            |              |                                                                                    | Scale<br>1:20<br>Logged<br>NKH                                                                                                                                                                             |                    |                                                                                       |  |
| Client: JSR Farms                                                                |                             |      |         |                                                                                                                                                                                                                                                                                          |              |                                                                                    |                                                                                                                                                                                                            |                    |                                                                                       |  |
| Water<br>Strike                                                                  | Samples and In Situ Testing |      |         | Depth<br>(m)                                                                                                                                                                                                                                                                             | Level<br>(m) | Legend                                                                             | Stratum Description                                                                                                                                                                                        |                    |                                                                                       |  |
|                                                                                  | Depth                       | Type | Results |                                                                                                                                                                                                                                                                                          |              |                                                                                    |                                                                                                                                                                                                            |                    |                                                                                       |  |
|                                                                                  |                             |      |         | 0.20                                                                                                                                                                                                                                                                                     |              |   | TOPSOIL: Dark brown slightly silty slightly gravelly fine SAND with occasional rootlets. Gravel is angular to subrounded fine to coarse of mixed lithologies. (TOPSOIL)                                    |                    |                                                                                       |  |
|                                                                                  |                             |      |         |                                                                                                                                                                                                                                                                                          |              |  | ?Loose red slightly silty fine to medium SAND with occasional subangular to subrounded fine to coarse gravel of mixed lithologies. (VALE OF YORK DRIFT)<br><i>From 0.5m, slight spalling of pit walls.</i> |                    |                                                                                       |  |
|                                                                                  | 1.40                        | T    |         | 1.60                                                                                                                                                                                                                                                                                     |              |                                                                                    | <i>At 1.6m, slight collapse.</i><br>End of pit at 1.60 m                                                                                                                                                   |                    |                                                                                       |  |
| Remarks:                                                                         |                             |      |         | 1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during excavation. 3. The sides of the trial pit spalled during excavation. 4. Soakaway test carried out in trial pit. 5. Backfilled with materials arising upon completion. |              |                                                                                    |                                                                                                                                                                                                            |                    |  |  |
| Stability:                                                                       |                             |      |         |                                                                                                                                                                                                                                                                                          |              |                                                                                    |                                                                                                                                                                                                            |                    |                                                                                       |  |

|    |                           |                             |        | <h1>Borehole Log</h1>          |              |                  | Borehole No.<br><b>BH01</b><br>Sheet 1 of 1                                                                                                                                                                                                                                                                                                                                              |                     |   |
|------------------------------------------------------------------------------------|---------------------------|-----------------------------|--------|--------------------------------|--------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---|
| Project Name: Field Lane, Thorpe Willoughby                                        |                           |                             |        | Project No.<br>2123            |              | Co-ords: -       |                                                                                                                                                                                                                                                                                                                                                                                          | Hole Type<br>CP     |   |
| Location: Thorpe Willoughby                                                        |                           |                             |        | Level:                         |              | Scale<br>1:50    |                                                                                                                                                                                                                                                                                                                                                                                          |                     |   |
| Client: JSR Farms                                                                  |                           |                             |        | Dates: 27/04/2015 - 27/04/2015 |              | Logged By<br>NKH |                                                                                                                                                                                                                                                                                                                                                                                          |                     |   |
| Well                                                                               | Water Strikes             | Samples and In Situ Testing |        |                                | Depth (m)    | Level (m)        | Legend                                                                                                                                                                                                                                                                                                                                                                                   | Stratum Description |   |
|                                                                                    |                           | Depth (m)                   | Type   | Results                        |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          |                     |   |
|  |                           |                             |        |                                | 0.30         |                  |  TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                                                                                                                                                                         |                     |   |
|                                                                                    |                           | 0.70<br>0.70 - 1.15         | D      | N=6 (1,1/1,1,2,2)              |              |                  |  Loose red slightly silty fine SAND.<br>(VALE OF YORK DRIFT)                                                                                                                                                                                                                                            | 1                   |   |
|                                                                                    |                           | 1.40<br>1.40 - 1.85         | D      | N=34 (5,7/7,8,9,10)            | 1.40         |                  |  Medium dense red slightly silty fine to medium SAND with occasional subangular to subrounded fine to medium gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                                                                                                                       | 2                   |   |
|                                                                                    |                           | 2.10<br>2.10 - 2.55         | D      | N=13 (3,3/3,3,3,4)             |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          | 3                   |   |
|                                                                                    |                           | 2.80<br>2.80 - 3.25         | D      | N=19 (5,4/5,5,4,5)             | 3.50<br>3.80 |                  |                                                                                                                                                                                                                                                                                                                                                                                          | 4                   |   |
|                                                                                    |                           | 4.80<br>4.80<br>4.80 - 5.25 | D<br>D | 75 (5,8/10,15,50,)             | 5.25         |                  |  Medium dense very sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies.<br>(VALE OF YORK DRIFT)<br>Weak thinly bedded weathered SANDSTONE.<br>Recovered as fine to coarse SAND with occasional angular fine to coarse weakly cemented gravel.<br>(WEATHERED SHERWOOD SANDSTONE) | 5                   |   |
|                                                                                    | End of borehole at 5.25 m |                             |        |                                |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          |                     | 6 |
|                                                                                    |                           |                             |        |                                |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          |                     | 7 |
|                                                                                    |                           |                             |        |                                |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          |                     | 8 |
|                                                                                    |                           |                             |        |                                |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          |                     | 9 |
|                                                                                    |                           |                             |        |                                |              |                  |                                                                                                                                                                                                                                                                                                                                                                                          | 10                  |   |

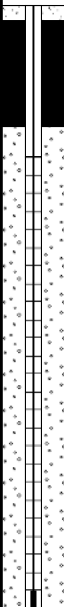
Remarks  
 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling.



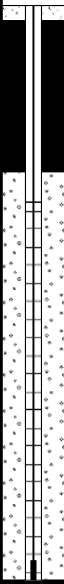
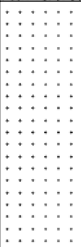
|                                                       |               |                             |        |                    | <h1>Borehole Log</h1>          |           |                                                                                                                                                                                                                                                                                               | Borehole No.<br><b>BH02</b><br>Sheet 1 of 1 |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------|--------|--------------------|--------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------|
| Project Name: Field Lane, Thorpe Willoughby                                                                                           |               |                             |        |                    | Project No.<br>2123            |           | Co-ords: -                                                                                                                                                                                                                                                                                    |                                             | Hole Type<br>CP                                                                       |
| Location: Thorpe Willoughby                                                                                                           |               |                             |        |                    | Level:                         |           |                                                                                                                                                                                                                                                                                               | Scale<br>1:50                               |                                                                                       |
| Client: JSR Farms                                                                                                                     |               |                             |        |                    | Dates: 27/04/2015 - 27/04/2015 |           |                                                                                                                                                                                                                                                                                               | Logged By<br>NKH                            |                                                                                       |
| Well                                                                                                                                  | Water Strikes | Samples and In Situ Testing |        |                    | Depth (m)                      | Level (m) | Legend                                                                                                                                                                                                                                                                                        | Stratum Description                         |                                                                                       |
|                                                                                                                                       |               | Depth (m)                   | Type   | Results            |                                |           |                                                                                                                                                                                                                                                                                               |                                             |                                                                                       |
|                                                     |               |                             |        |                    | 0.30                           |           |  TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                                                                              |                                             |                                                                                       |
|                                                                                                                                       |               | 0.70<br>0.70 - 1.15         | D      | N=10 (2,3/2,2,3,3) |                                |           |  Loose red slightly silty fine SAND.<br>(VALE OF YORK DRIFT)                                                                                                                                                 | 1                                           |                                                                                       |
|                                                                                                                                       |               | 1.40<br>1.40 - 1.85         | D      | N=9 (2,2/3,2,2,2)  |                                |           |                                                                                                                                                                                                                                                                                               | 2                                           |                                                                                       |
|                                                                                                                                       |               | 2.10<br>2.10 - 2.55         | D      | N=4 (1,1/1,1,1,1)  |                                |           |                                                                                                                                                                                                                                                                                               | 3                                           |                                                                                       |
|                                                                                                                                       |               | 2.80<br>2.80 - 3.25         | D      | N=6 (1,1/1,2,1,2)  | 3.00                           |           |  Firm red fissured very sandy CLAY.<br>(VALE OF YORK DRIFT)                                                                                                                                                 | 4                                           |                                                                                       |
|                                                                                                                                       |               | 3.50<br>3.50 - 3.95         | D      | N=12 (3,3/3,3,3,3) | 3.60                           |           |  Medium dense red slightly silty fine to medium SAND with rare subangular medium gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                                                      | 5                                           |                                                                                       |
|                                                                                                                                       |               | 4.30<br>4.30 - 4.75         | D      | N=12 (2,2/3,3,3,3) | 4.30                           |           |  Medium dense red slightly silty fine to coarse SAND.<br>(VALE OF YORK DRIFT)                                                                                                                              | 6                                           |                                                                                       |
|                                                                                                                                       |               | 5.30<br>5.30<br>5.30 - 5.55 | D<br>D | 67 (8,8/17,50,,)   | 5.40<br>5.55                   |           |  Weak thinly bedded weathered SANDSTONE.<br>Recovered as fine to coarse SAND with occasional angular fine to coarse weakly cemented gravel.<br>(WEATHERED SHERWOOD SANDSTONE)<br>End of borehole at 5.55 m | 7                                           |                                                                                       |
|                                                                                                                                       |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                                                               | 8                                           |                                                                                       |
|                                                                                                                                       |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                                                               | 9                                           |                                                                                       |
|                                                                                                                                       |               |                             |        |                    |                                |           | 10                                                                                                                                                                                                                                                                                            |                                             |                                                                                       |
| Remarks<br>1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                                                               |                                             |  |

|                                                       |               |                             |      | <h1>Borehole Log</h1>          |           |                  |                                                                                                                                                                                                                                                                  | Borehole No.<br><b>BH03</b><br>Sheet 1 of 1 |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------|------|--------------------------------|-----------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------|
| Project Name: Field Lane, Thorpe Willoughby                                                                                           |               |                             |      | Project No.<br>2123            |           | Co-ords: -       |                                                                                                                                                                                                                                                                  | Hole Type<br>CP                             |                                                                                       |
| Location: Thorpe Willoughby                                                                                                           |               |                             |      | Level:                         |           | Scale<br>1:50    |                                                                                                                                                                                                                                                                  |                                             |                                                                                       |
| Client: JSR Farms                                                                                                                     |               |                             |      | Dates: 27/04/2015 - 27/04/2015 |           | Logged By<br>NKH |                                                                                                                                                                                                                                                                  |                                             |                                                                                       |
| Well                                                                                                                                  | Water Strikes | Samples and In Situ Testing |      |                                | Depth (m) | Level (m)        | Legend                                                                                                                                                                                                                                                           | Stratum Description                         |                                                                                       |
|                                                                                                                                       |               | Depth (m)                   | Type | Results                        |           |                  |                                                                                                                                                                                                                                                                  |                                             |                                                                                       |
|                                                     |               |                             |      |                                | 0.30      |                  |  TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                                                 |                                             |                                                                                       |
|                                                                                                                                       |               | 0.70<br>0.70 - 1.15         | D    | N=12 (3,3/3,3,3,3)             |           |                  |  Medium dense red-brown slightly silty fine SAND.<br>(VALE OF YORK DRIFT)                                                                                                       | 1                                           |                                                                                       |
|                                                                                                                                       |               | 1.40<br>1.40 - 1.85         | D    | N=17 (3,3/4,4,5,4)             |           |                  |                                                                                                                                                                                                                                                                  | 2                                           |                                                                                       |
|                                                                                                                                       |               | 2.10<br>2.10 - 2.55         | D    | N=11 (2,2/3,3,3,2)             | 2.50      |                  |                                                                                                                                                                                                                                                                  |                                             |                                                                                       |
|                                                                                                                                       |               | 2.90<br>2.90 - 3.35         | D    | N=7 (2,2/1,2,2,2)              |           |                  |  Loose red-brown slightly silty fine SAND.<br>(VALE OF YORK DRIFT)                                                                                                             | 3                                           |                                                                                       |
|                                                                                                                                       |               | 3.60<br>3.60 - 4.05         | D    | N=12 (2,2/2,3,3,4)             | 3.60      |                  |  Medium dense red-brown slightly silty fine to medium SAND.<br>(VALE OF YORK DRIFT)                                                                                           | 4                                           |                                                                                       |
|                                                                                                                                       |               |                             |      |                                | 3.90      |                  |  Firm red fissured CLAY with occasional gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                                                                  |                                             |                                                                                       |
|                                                                                                                                       |               |                             |      |                                | 4.70      |                  |  Weak thinly bedded weathered SANDSTONE.<br>Recovered as fine to coarse SAND with occasional angular fine to coarse weakly cemented gravel.<br>(WEATHERED SHERWOOD SANDSTONE) | 5                                           |                                                                                       |
|                                                                                                                                       |               | 5.00<br>5.00<br>5.00 - 5.30 | D    | 138 (10,12/18,50,70,)          | 5.30      |                  | End of borehole at 5.30 m                                                                                                                                                                                                                                        | 6                                           |                                                                                       |
|                                                                                                                                       |               |                             |      |                                |           |                  |                                                                                                                                                                                                                                                                  | 7                                           |                                                                                       |
|                                                                                                                                       |               |                             |      |                                |           |                  |                                                                                                                                                                                                                                                                  |                                             | 8                                                                                     |
|                                                                                                                                       |               |                             |      |                                |           |                  |                                                                                                                                                                                                                                                                  |                                             | 9                                                                                     |
|                                                                                                                                       |               |                             |      |                                |           |                  |                                                                                                                                                                                                                                                                  |                                             | 10                                                                                    |
| Remarks<br>1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. |               |                             |      |                                |           |                  |                                                                                                                                                                                                                                                                  |                                             |  |

|                                                                                  |  |  |  |  |                                |  |                  |                                             |                 |
|----------------------------------------------------------------------------------|--|--|--|--|--------------------------------|--|------------------|---------------------------------------------|-----------------|
|  |  |  |  |  | <h1>Borehole Log</h1>          |  |                  | Borehole No.<br><b>BH04</b><br>Sheet 1 of 1 |                 |
| Project Name: Field Lane, Thorpe Willoughby                                      |  |  |  |  | Project No.<br>2123            |  | Co-ords: -       |                                             | Hole Type<br>CP |
| Location: Thorpe Willoughby                                                      |  |  |  |  | Level:                         |  | Scale<br>1:50    |                                             |                 |
| Client: JSR Farms                                                                |  |  |  |  | Dates: 27/04/2015 - 27/04/2015 |  | Logged By<br>NKH |                                             |                 |

| Well                                                                               | Water Strikes | Samples and In Situ Testing |        |                          | Depth (m) | Level (m) | Legend                                                                                                                                                                                                                                                          | Stratum Description |  |
|------------------------------------------------------------------------------------|---------------|-----------------------------|--------|--------------------------|-----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--|
|                                                                                    |               | Depth (m)                   | Type   | Results                  |           |           |                                                                                                                                                                                                                                                                 |                     |  |
|  |               |                             |        |                          | 0.30      |           |  TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                                                |                     |  |
|                                                                                    |               | 0.70<br>0.70 - 1.15         | D      | N=13 (2,2/3,3,3,4)       |           |           |  Loose red very clayey fine SAND with rare subrounded fine gravel.<br>(VALE OF YORK DRIFT)                                                                                     | 1                   |  |
|                                                                                    |               | 1.40<br>1.40 - 1.85         | D      | N=9 (1,2/2,2,2,3)        | 1.20      |           |  Loose red slightly silty fine SAND.<br>(VALE OF YORK DRIFT)                                                                                                                   |                     |  |
|                                                                                    |               | 2.10<br>2.10 - 2.55         | D      | N=32 (3,4/5,8,9,10)      | 2.10      |           |  Medium dense red slightly silty fine to medium SAND.<br>(VALE OF YORK DRIFT)                                                                                                  | 2                   |  |
|                                                                                    |               | 2.80<br>2.80 - 3.25         | D      | N=54<br>(5,7/9,10,15,20) | 3.00      |           |  Weak thinly bedded weathered SANDSTONE.<br>Recovered as fine to coarse SAND with occasional angular fine to coarse weakly cemented gravel.<br>(WEATHERED SHERWOOD SANDSTONE) | 3                   |  |
|                                                                                    |               | 3.80<br>3.80<br>3.80 - 4.25 | D<br>D | 100 (25,50/50,50,,)      | 4.20      |           | End of borehole at 4.20 m                                                                                                                                                                                                                                       | 4                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 5                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 6                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 7                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 8                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 9                   |  |
|                                                                                    |               |                             |        |                          |           |           |                                                                                                                                                                                                                                                                 | 10                  |  |

|                                                                                                                                       |  |  |  |  |  |  |  |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|---------------------------------------------------------------------------------------|
| Remarks<br>1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling. |  |  |  |  |  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|---------------------------------------------------------------------------------------|

|    |               |                             |        |                    | <h1>Borehole Log</h1>          |           |                                                                                                                                                                                                                                                              | Borehole No.<br><b>BH05</b><br>Sheet 1 of 1 |                 |  |
|------------------------------------------------------------------------------------|---------------|-----------------------------|--------|--------------------|--------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------|--|
| Project Name: Field Lane, Thorpe Willoughby                                        |               |                             |        |                    | Project No.<br>2123            |           | Co-ords: -                                                                                                                                                                                                                                                   |                                             | Hole Type<br>CP |  |
| Location: Thorpe Willoughby                                                        |               |                             |        |                    | Level:                         |           | Scale<br>1:50                                                                                                                                                                                                                                                |                                             |                 |  |
| Client: JSR Farms                                                                  |               |                             |        |                    | Dates: 27/04/2015 - 27/04/2015 |           | Logged By<br>NKH                                                                                                                                                                                                                                             |                                             |                 |  |
| Well                                                                               | Water Strikes | Samples and In Situ Testing |        |                    | Depth (m)                      | Level (m) | Legend                                                                                                                                                                                                                                                       | Stratum Description                         |                 |  |
|                                                                                    |               | Depth (m)                   | Type   | Results            |                                |           |                                                                                                                                                                                                                                                              |                                             |                 |  |
|  |               |                             |        |                    | 0.30                           |           |  TOPSOIL: Light brown slightly silty fine to medium SAND with occasional rootlets.<br>(TOPSOIL)                                                                             |                                             |                 |  |
|                                                                                    |               | 0.70<br>0.70 - 1.15         | D      | N=7 (1,2/2,1,2,2)  |                                |           |  Loose brown-red slightly silty fine SAND with occasional subangular to subrounded gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                                     | 1                                           |                 |  |
|                                                                                    |               | 1.40<br>1.40 - 1.85         | D      | N=14 (1,2/3,3,4,4) | 1.50<br>1.70                   |           |  Firm red fissured CLAY.<br>(VALE OF YORK DRIFT)                                                                                                                            |                                             |                 |  |
|                                                                                    |               | 2.30<br>2.30 - 2.52         | D      | 120 (8,12/50,70,,) | 2.20                           |           |  Medium dense red slightly silty fine to medium SAND with occasional subangular to subrounded gravel of mixed lithologies.<br>(VALE OF YORK DRIFT)                          | 2                                           |                 |  |
|                                                                                    |               | 3.40<br>3.40<br>3.40 - 3.80 | D<br>D | 0 (60,/,,)         | 3.85                           |           |  Weak thinly bedded weathered SANDSTONE. Recovered as fine to coarse SAND with occasional angular fine to coarse weakly cemented gravel.<br>(WEATHERED SHERWOOD SANDSTONE) | 3                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           | End of borehole at 3.85 m                                                                                                                                                                                                                                    |                                             | 4               |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 5                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 6                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 7                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 8                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 9                                           |                 |  |
|                                                                                    |               |                             |        |                    |                                |           |                                                                                                                                                                                                                                                              | 10                                          |                 |  |

Remarks  
 1. Prior to drilling a Cable Avoidance Tool (CAT) survey was carried out. 2. Groundwater was not apparent during drilling.



## **Appendix G**

### **Chemical Results**

# Scientific Analysis Laboratories Ltd

## Certificate of Analysis

Hadfield House  
Hadfield Street  
Cornbrook  
Manchester  
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Tel : 0161 874 2400  
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Scientific Analysis Laboratories is a  
limited company registered in England and  
Wales (No 2514788) whose address is at  
Hadfield House, Hadfield Street, Manchester M16 9FE

**Report Number:** 466496-1

**Date of Report:** 13-Apr-2015

**Customer:** Lithos Consulting Ltd.  
Parkhill  
Walton Road  
Wetherby  
West Yorkshire  
LS22 5DZ

**Customer Contact:** Mr Nathaniel Hay

**Customer Job Reference:** 2123

**Customer Purchase Order:** PO9134/2123/NKH

**Customer Site Reference:** Field Lane, Thorpe Willoughby

**Date Job Received at SAL:** 27-Mar-2015

**Date Analysis Started:** 01-Apr-2015

**Date Analysis Completed:** 13-Apr-2015

The results reported relate to samples received in the laboratory  
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation  
This report should not be reproduced except in full without the written approval of the laboratory  
Tests covered by this certificate were conducted in accordance with SAL SOPs  
All results have been reviewed in accordance with QP22



Report checked  
and authorised by :  
Chris Murphy  
Project Manager

Issued by :  
Chris Murphy  
Project Manager





|                                             |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
|---------------------------------------------|--|--------|-------------|--------------------|-------|--------------------|--|--------------------|--|--------------------|--|--------------------|--|--------------------|--|--------------------|--|----|--|
| SAL Reference: 466496                       |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| Project Site: Field Lane, Thorpe Willoughby |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| Customer Reference: 2123                    |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| Soil                                        |  |        |             | Analysed as Soil   |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| MCERTS Preparation                          |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| SAL Reference                               |  |        |             | 466496 036         |       | 466496 039         |  | 466496 042         |  | 466496 043         |  | 466496 046         |  | 466496 051         |  | 466496 056         |  |    |  |
| Customer Sample Reference                   |  |        |             | TP08 3             |       | TP11 2             |  | TP11 5             |  | TP12 2             |  | TP14 2             |  | TP16 2             |  | TP19 3             |  |    |  |
| Depth                                       |  |        |             | 1.2                |       | 0.6                |  | 3.0                |  | 1.5                |  | 0.4                |  | 1.1                |  | 1.7                |  |    |  |
| Sample Description                          |  |        |             | VALE OF YORK DRIFT |       | VALE OF YORK DRIFT |  | VALE OF YORK DRIFT |  | VALE OF YORK DRIFT |  | VALE OF YORK DRIFT |  | VALE OF YORK DRIFT |  | VALE OF YORK DRIFT |  |    |  |
| Date Sampled                                |  |        |             | 25-MAR-2015        |       | 25-MAR-2015        |  | 25-MAR-2015        |  | 25-MAR-2015        |  | 25-MAR-2015        |  | 25-MAR-2015        |  | 25-MAR-2015        |  |    |  |
| Type                                        |  |        |             | Sandy Soil         |       | Sandy Soil         |  | Sandy Soil         |  | Sandy Soil         |  | Sandy Soil         |  | Sandy Soil         |  | Sandy Soil         |  |    |  |
|                                             |  |        |             |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| Determinand                                 |  | Method | Test Sample | LOD                | Units |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| MCERTS Classification                       |  | T143   | AR          |                    |       |                    |  |                    |  |                    |  |                    |  |                    |  |                    |  |    |  |
| Moisture @ 105 C                            |  | T162   | AR          | 0.1                | %     | 8.0                |  | 12                 |  | 10                 |  | 5.3                |  | 11                 |  | 7.9                |  | 14 |  |

|                                             |        |             |                  |       |                    |                    |                              |                              |                              |  |
|---------------------------------------------|--------|-------------|------------------|-------|--------------------|--------------------|------------------------------|------------------------------|------------------------------|--|
| SAL Reference: 466496                       |        |             |                  |       |                    |                    |                              |                              |                              |  |
| Project Site: Field Lane, Thorpe Willoughby |        |             |                  |       |                    |                    |                              |                              |                              |  |
| Customer Reference: 2123                    |        |             |                  |       |                    |                    |                              |                              |                              |  |
| Soil                                        |        |             | Analysed as Soil |       |                    |                    |                              |                              |                              |  |
| MCERTS Preparation                          |        |             |                  |       |                    |                    |                              |                              |                              |  |
| SAL Reference                               |        |             |                  |       | 466496 057         | 466496 060         | 466496 062                   | 466496 065                   | 466496 066                   |  |
| Customer Sample Reference                   |        |             |                  |       | TP21 2             | TP23 2             | TP05 4                       | TP07 5                       | TP08 4                       |  |
| Depth                                       |        |             |                  |       | 1.5                | 1.2                | 3.1                          | 2.7                          | 2.1                          |  |
| Sample Description                          |        |             |                  |       | VALE OF YORK DRIFT | VALE OF YORK DRIFT | WEATHERED SHERWOOD SANDSTONE | WEATHERED SHERWOOD SANDSTONE | WEATHERED SHERWOOD SANDSTONE |  |
| Date Sampled                                |        |             |                  |       | 25-MAR-2015        | 25-MAR-2015        | 25-MAR-2015                  | 25-MAR-2015                  | 25-MAR-2015                  |  |
| Type                                        |        |             |                  |       | Sandy Soil         | Sandy Soil         | Sandy Soil                   | Sandy Soil                   | Sandy Soil                   |  |
| Determinand                                 | Method | Test Sample | LOD              | Units |                    |                    |                              |                              |                              |  |
| MCERTS Classification                       | T143   | AR          |                  |       |                    |                    |                              |                              |                              |  |
| Moisture @ 105 C                            | T162   | AR          | 0.1              | %     | 23                 | 18                 | 13                           | 7.9                          | 8.9                          |  |

|                                             |        |             |     |                  |             |             |             |                     |                     |             |             |
|---------------------------------------------|--------|-------------|-----|------------------|-------------|-------------|-------------|---------------------|---------------------|-------------|-------------|
| SAL Reference: 466496                       |        |             |     |                  |             |             |             |                     |                     |             |             |
| Project Site: Field Lane, Thorpe Willoughby |        |             |     |                  |             |             |             |                     |                     |             |             |
| Customer Reference: 2123                    |        |             |     |                  |             |             |             |                     |                     |             |             |
| Soil                                        |        |             |     | Analysed as Soil |             |             |             |                     |                     |             |             |
| Lithos pH and metals                        |        |             |     |                  |             |             |             |                     |                     |             |             |
| SAL Reference                               |        |             |     |                  | 466496 001  | 466496 002  | 466496 003  | 466496 004          | 466496 005          | 466496 006  | 466496 007  |
| Customer Sample Reference                   |        |             |     |                  | TP01 1      | TP02 1      | TP03 1      | TP04 1              | TP05 1              | TP06 1      | TP07 1      |
| Depth                                       |        |             |     |                  | 0.1         | 0.1         | 0.1         | 0.1                 | 0.1                 | 0.1         | 0.1         |
| Sample Description                          |        |             |     |                  | TOPSOIL     | TOPSOIL     | TOPSOIL     | MADE GROUND TOPSOIL | MADE GROUND TOPSOIL | TOPSOIL     | TOPSOIL     |
| Date Sampled                                |        |             |     |                  | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015         | 25-MAR-2015         | 25-MAR-2015 | 25-MAR-2015 |
| Type                                        |        |             |     |                  | Topsoil     | Topsoil     | Topsoil     | Topsoil             | Topsoil             | Topsoil     | Topsoil     |
| Determinand                                 | Method | Test Sample | LOD | Units            |             |             |             |                     |                     |             |             |
| pH                                          | T7     | AR          |     |                  | 7.8         | 5.1         | 7.1         | 5.8                 | 6.8                 | 6.9         | 6.8         |
| Arsenic                                     | T6     | M40         | 2   | mg/kg            | 13          | 5           | 5           | 3                   | 4                   | 5           | 5           |
| Boron (water-soluble)                       | T6     | AR          | 1   | mg/kg            | <1          | <1          | <1          | <1                  | <1                  | <1          | <1          |
| Cadmium                                     | T6     | M40         | 1   | mg/kg            | <1          | <1          | <1          | <1                  | <1                  | <1          | <1          |
| Chromium                                    | T6     | M40         | 1   | mg/kg            | 13          | 8           | 9           | 6                   | 6                   | 6           | 6           |
| Chromium (trivalent)                        | T85    | AR          | 2   | mg/kg            | 13          | 8           | 9           | 6                   | 6                   | 6           | 6           |
| Chromium VI                                 | T6     | AR          | 1   | mg/kg            | <1          | <1          | <1          | <1                  | <1                  | <1          | <1          |
| Copper                                      | T6     | M40         | 1   | mg/kg            | 7           | 7           | 8           | 35                  | 18                  | 7           | 7           |
| Lead                                        | T6     | M40         | 1   | mg/kg            | 18          | 19          | 23          | 18                  | 22                  | 20          | 21          |
| Mercury                                     | T6     | M40         | 1   | mg/kg            | <1          | <1          | <1          | <1                  | <1                  | <1          | <1          |
| Nickel                                      | T6     | M40         | 1   | mg/kg            | 4           | 3           | 3           | 4                   | 4                   | 4           | 4           |
| Selenium                                    | T6     | M40         | 3   | mg/kg            | <3          | <3          | <3          | <3                  | <3                  | <3          | <3          |
| Zinc                                        | T6     | M40         | 1   | mg/kg            | 19          | 18          | 17          | 41                  | 23                  | 25          | 20          |

|                                                                                                                       |                  |
|-----------------------------------------------------------------------------------------------------------------------|------------------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123 |                  |
| <b>Soil</b><br><b>Lithos pH and metals</b>                                                                            | Analysed as Soil |

| SAL Reference             |        |             |     |       | 466496 008  |     | 466496 009          |     | 466496 010          |     | 466496 011          |  | 466496 012  |  | 466496 013  |  | 466496 015  |  |
|---------------------------|--------|-------------|-----|-------|-------------|-----|---------------------|-----|---------------------|-----|---------------------|--|-------------|--|-------------|--|-------------|--|
| Customer Sample Reference |        |             |     |       | TP08 1      |     | TP09 1              |     | TP10 1              |     | TP11 1              |  | TP12 1      |  | TP13 1      |  | TP15 1      |  |
| Depth                     |        |             |     |       | 0.1         |     | 0.1                 |     | 0.1                 |     | 0.1                 |  | 0.1         |  | 0.1         |  | 0.1         |  |
| Sample Description        |        |             |     |       | TOPSOIL     |     | MADE GROUND TOPSOIL |     | MADE GROUND TOPSOIL |     | MADE GROUND TOPSOIL |  | TOPSOIL     |  | TOPSOIL     |  | TOPSOIL     |  |
| Date Sampled              |        |             |     |       | 25-MAR-2015 |     | 25-MAR-2015         |     | 25-MAR-2015         |     | 25-MAR-2015         |  | 25-MAR-2015 |  | 25-MAR-2015 |  | 25-MAR-2015 |  |
| Type                      |        |             |     |       | Topsoil     |     | Topsoil             |     | Topsoil             |     | Topsoil             |  | Topsoil     |  | Topsoil     |  | Topsoil     |  |
| Determinand               | Method | Test Sample | LOD | Units |             |     |                     |     |                     |     |                     |  |             |  |             |  |             |  |
| pH                        | T7     | AR          |     |       | 6.0         | 7.1 | 7.0                 | 7.0 | 6.7                 | 7.2 | 7.3                 |  |             |  |             |  |             |  |
| Arsenic                   | T6     | M40         | 2   | mg/kg | 4           | 5   | 4                   | 5   | 4                   | 5   | 6                   |  |             |  |             |  |             |  |
| Boron (water-soluble)     | T6     | AR          | 1   | mg/kg | <1          | <1  | <1                  | <1  | <1                  | <1  | <1                  |  |             |  |             |  |             |  |
| Cadmium                   | T6     | M40         | 1   | mg/kg | <1          | <1  | <1                  | <1  | <1                  | <1  | <1                  |  |             |  |             |  |             |  |
| Chromium                  | T6     | M40         | 1   | mg/kg | 8           | 7   | 8                   | 5   | 5                   | 5   | 6                   |  |             |  |             |  |             |  |
| Chromium (trivalent)      | T85    | AR          | 2   | mg/kg | 8           | 7   | 8                   | 5   | 5                   | 5   | 6                   |  |             |  |             |  |             |  |
| Chromium VI               | T6     | AR          | 1   | mg/kg | <1          | <1  | <1                  | <1  | <1                  | <1  | <1                  |  |             |  |             |  |             |  |
| Copper                    | T6     | M40         | 1   | mg/kg | 9           | 10  | 20                  | 11  | 8                   | 9   | 13                  |  |             |  |             |  |             |  |
| Lead                      | T6     | M40         | 1   | mg/kg | 21          | 16  | 19                  | 24  | 19                  | 24  | 30                  |  |             |  |             |  |             |  |
| Mercury                   | T6     | M40         | 1   | mg/kg | <1          | <1  | <1                  | <1  | <1                  | <1  | <1                  |  |             |  |             |  |             |  |
| Nickel                    | T6     | M40         | 1   | mg/kg | 5           | 6   | 5                   | 4   | 4                   | 4   | 5                   |  |             |  |             |  |             |  |
| Selenium                  | T6     | M40         | 3   | mg/kg | <3          | <3  | <3                  | <3  | <3                  | <3  | <3                  |  |             |  |             |  |             |  |
| Zinc                      | T6     | M40         | 1   | mg/kg | 49          | 57  | 57                  | 24  | 36                  | 25  | 29                  |  |             |  |             |  |             |  |

|                                                                                                                       |                  |
|-----------------------------------------------------------------------------------------------------------------------|------------------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123 |                  |
| <b>Soil</b><br><b>Lithos pH and metals</b>                                                                            | Analysed as Soil |

| SAL Reference             |        |             |     |       | 466496 016  | 466496 017  | 466496 018  | 466496 020  | 466496 021  | 466496 022  |
|---------------------------|--------|-------------|-----|-------|-------------|-------------|-------------|-------------|-------------|-------------|
| Customer Sample Reference |        |             |     |       | TP16 1      | TP17 1      | TP18 1      | TP21 1      | TP20 1      | TP23 1      |
| Depth                     |        |             |     |       | 0.1         | 0.1         | 0.1         | 0.2         | 0.1         | 0.1         |
| Sample Description        |        |             |     |       | TOPSOIL     | TOPSOIL     | TOPSOIL     | TOPSOIL     | TOPSOIL     | TOPSOIL     |
| Date Sampled              |        |             |     |       | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 |
| Type                      |        |             |     |       | Topsoil     | Topsoil     | Topsoil     | Topsoil     | Topsoil     | Topsoil     |
| Determinand               | Method | Test Sample | LOD | Units |             |             |             |             |             |             |
| pH                        | T7     | AR          |     |       | 7.0         | 6.9         | 6.9         | 6.8         | 6.9         | 7.2         |
| Arsenic                   | T6     | M40         | 2   | mg/kg | 7           | 5           | 2           | 3           | 3           | 3           |
| Boron (water-soluble)     | T6     | AR          | 1   | mg/kg | <1          | <1          | <1          | <1          | <1          | <1          |
| Cadmium                   | T6     | M40         | 1   | mg/kg | <1          | <1          | <1          | <1          | <1          | <1          |
| Chromium                  | T6     | M40         | 1   | mg/kg | 8           | 7           | 3           | 5           | 4           | 6           |
| Chromium (trivalent)      | T85    | AR          | 2   | mg/kg | 8           | 7           | 3           | 5           | 4           | 6           |
| Chromium VI               | T6     | AR          | 1   | mg/kg | <1          | <1          | <1          | <1          | <1          | <1          |
| Copper                    | T6     | M40         | 1   | mg/kg | 16          | 11          | 4           | 7           | 6           | 8           |
| Lead                      | T6     | M40         | 1   | mg/kg | 37          | 27          | 9           | 20          | 16          | 15          |
| Mercury                   | T6     | M40         | 1   | mg/kg | <1          | <1          | <1          | <1          | <1          | <1          |
| Nickel                    | T6     | M40         | 1   | mg/kg | 6           | 5           | 2           | 3           | 3           | 5           |
| Selenium                  | T6     | M40         | 3   | mg/kg | <3          | <3          | <3          | <3          | <3          | <3          |
| Zinc                      | T6     | M40         | 1   | mg/kg | 26          | 25          | 10          | 16          | 16          | 22          |

|                                                                                                                                                                                   |               |                    |            |              |             |             |                     |                     |             |             |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|--------------|-------------|-------------|---------------------|---------------------|-------------|-------------|------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123<br><br><b>Soil</b> Analysed as Soil<br><b>Miscellaneous</b> |               |                    |            |              |             |             |                     |                     |             |             |      |
| <b>SAL Reference</b>                                                                                                                                                              |               |                    |            | 466496 001   | 466496 002  | 466496 003  | 466496 004          | 466496 005          | 466496 006  | 466496 007  |      |
| <b>Customer Sample Reference</b>                                                                                                                                                  |               |                    |            | TP01 1       | TP02 1      | TP03 1      | TP04 1              | TP05 1              | TP06 1      | TP07 1      |      |
| <b>Depth</b>                                                                                                                                                                      |               |                    |            | 0.1          | 0.1         | 0.1         | 0.1                 | 0.1                 | 0.1         | 0.1         |      |
| <b>Sample Description</b>                                                                                                                                                         |               |                    |            | TOPSOIL      | TOPSOIL     | TOPSOIL     | MADE GROUND TOPSOIL | MADE GROUND TOPSOIL | TOPSOIL     | TOPSOIL     |      |
| <b>Date Sampled</b>                                                                                                                                                               |               |                    |            | 25-MAR-2015  | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015         | 25-MAR-2015         | 25-MAR-2015 | 25-MAR-2015 |      |
| <b>Type</b>                                                                                                                                                                       |               |                    |            | Topsoil      | Topsoil     | Topsoil     | Topsoil             | Topsoil             | Topsoil     | Topsoil     |      |
| <b>Determinand</b>                                                                                                                                                                | <b>Method</b> | <b>Test Sample</b> | <b>LOD</b> | <b>Units</b> |             |             |                     |                     |             |             |      |
| Ammoniacal nitrogen                                                                                                                                                               | T22           | AR                 | 5          | mg/kg        | -           | -           | <5                  | <5                  | -           | -           | -    |
| Asbestos ID                                                                                                                                                                       | T27           | AR                 |            |              | N.D.        | N.D.        | N.D.                | N.D.                | N.D.        | N.D.        | N.D. |
| Retained on 10mm sieve                                                                                                                                                            | T2            | M40                | 0.1        | %            | <0.1        | <0.1        | <0.1                | <0.1                | <0.1        | <0.1        | <0.1 |
| (Water Soluble) SO4 expressed as SO4                                                                                                                                              | T242          | AR                 | 0.01       | g/l          | -           | -           | -                   | <0.01               | <0.01       | -           | -    |
| SO4(Total)                                                                                                                                                                        | T6            | M40                | 0.01       | %            | -           | -           | 0.03                | 0.04                | -           | -           | -    |
| Sulphide                                                                                                                                                                          | T546          | AR                 | 1          | mg/kg        | -           | -           | <1                  | <1                  | -           | -           | -    |
| pH                                                                                                                                                                                | T7            | AR                 |            |              | 7.8         | 5.1         | 7.1                 | 5.8                 | 6.8         | 6.9         | 6.8  |

|                                                                                                                                                                                   |               |                    |            |              |                     |                     |                     |             |             |             |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|--------------|---------------------|---------------------|---------------------|-------------|-------------|-------------|------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123<br><br><b>Soil</b> Analysed as Soil<br><b>Miscellaneous</b> |               |                    |            |              |                     |                     |                     |             |             |             |      |
| <b>SAL Reference</b>                                                                                                                                                              |               |                    |            | 466496 008   | 466496 009          | 466496 010          | 466496 011          | 466496 012  | 466496 013  | 466496 015  |      |
| <b>Customer Sample Reference</b>                                                                                                                                                  |               |                    |            | TP08 1       | TP09 1              | TP10 1              | TP11 1              | TP12 1      | TP13 1      | TP15 1      |      |
| <b>Depth</b>                                                                                                                                                                      |               |                    |            | 0.1          | 0.1                 | 0.1                 | 0.1                 | 0.1         | 0.1         | 0.1         |      |
| <b>Sample Description</b>                                                                                                                                                         |               |                    |            | TOPSOIL      | MADE GROUND TOPSOIL | MADE GROUND TOPSOIL | MADE GROUND TOPSOIL | TOPSOIL     | TOPSOIL     | TOPSOIL     |      |
| <b>Date Sampled</b>                                                                                                                                                               |               |                    |            | 25-MAR-2015  | 25-MAR-2015         | 25-MAR-2015         | 25-MAR-2015         | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 |      |
| <b>Type</b>                                                                                                                                                                       |               |                    |            | Topsoil      | Topsoil             | Topsoil             | Topsoil             | Topsoil     | Topsoil     | Topsoil     |      |
| <b>Determinand</b>                                                                                                                                                                | <b>Method</b> | <b>Test Sample</b> | <b>LOD</b> | <b>Units</b> |                     |                     |                     |             |             |             |      |
| Asbestos ID                                                                                                                                                                       | T27           | AR                 |            |              | N.D.                | N.D.                | N.D.                | N.D.        | N.D.        | N.D.        | N.D. |
| Retained on 10mm sieve                                                                                                                                                            | T2            | M40                | 0.1        | %            | <0.1                | <0.1                | <0.1                | <0.1        | <0.1        | <0.1        | <0.1 |
| (Water Soluble) SO4 expressed as SO4                                                                                                                                              | T242          | AR                 | 0.01       | g/l          | -                   | <0.01               | <0.01               | <0.01       | -           | -           | -    |
| pH                                                                                                                                                                                | T7            | AR                 |            |              | 6.0                 | 7.1                 | 7.0                 | 7.0         | 6.7         | 7.2         | 7.3  |

|                                                                                                                                                                                   |               |                    |            |              |             |             |             |             |             |                    |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|--------------|-------------|-------------|-------------|-------------|-------------|--------------------|-------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123<br><br><b>Soil</b> Analysed as Soil<br><b>Miscellaneous</b> |               |                    |            |              |             |             |             |             |             |                    |       |
| <b>SAL Reference</b>                                                                                                                                                              |               |                    |            | 466496 016   | 466496 017  | 466496 018  | 466496 020  | 466496 021  | 466496 022  | 466496 031         |       |
| <b>Customer Sample Reference</b>                                                                                                                                                  |               |                    |            | TP16 1       | TP17 1      | TP18 1      | TP21 1      | TP20 1      | TP23 1      | TP05 2             |       |
| <b>Depth</b>                                                                                                                                                                      |               |                    |            | 0.1          | 0.1         | 0.1         | 0.2         | 0.1         | 0.1         | 0.8                |       |
| <b>Sample Description</b>                                                                                                                                                         |               |                    |            | TOPSOIL      | TOPSOIL     | TOPSOIL     | TOPSOIL     | TOPSOIL     | TOPSOIL     | VALE OF YORK DRIFT |       |
| <b>Date Sampled</b>                                                                                                                                                               |               |                    |            | 25-MAR-2015  | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015 | 25-MAR-2015        |       |
| <b>Type</b>                                                                                                                                                                       |               |                    |            | Topsoil      | Topsoil     | Topsoil     | Topsoil     | Topsoil     | Topsoil     | Sandy Soil         |       |
| <b>Determinand</b>                                                                                                                                                                | <b>Method</b> | <b>Test Sample</b> | <b>LOD</b> | <b>Units</b> |             |             |             |             |             |                    |       |
| Asbestos ID                                                                                                                                                                       | T27           | AR                 |            |              | N.D.        | N.D.        | N.D.        | N.D.        | N.D.        | N.D.               | -     |
| Retained on 10mm sieve                                                                                                                                                            | T2            | M40                | 0.1        | %            | <0.1        | <0.1        | <0.1        | <0.1        | <0.1        | <0.1               | <0.1  |
| (Water Soluble) SO4 expressed as SO4                                                                                                                                              | T242          | AR                 | 0.01       | g/l          | -           | -           | -           | -           | -           | -                  | <0.01 |
| pH                                                                                                                                                                                | T7            | AR                 |            |              | 7.0         | 6.9         | 6.9         | 6.8         | 6.9         | 7.2                | 7.5   |









|                                                                                                                                      |  |                  |             |             |       |             |     |                     |     |                     |     |             |  |             |  |
|--------------------------------------------------------------------------------------------------------------------------------------|--|------------------|-------------|-------------|-------|-------------|-----|---------------------|-----|---------------------|-----|-------------|--|-------------|--|
| <div><div>SAL Reference: 466496</div><div>Project Site: Field Lane, Thorpe Willoughby</div><div>Customer Reference: 2123</div></div> |  |                  |             |             |       |             |     |                     |     |                     |     |             |  |             |  |
| Soil                                                                                                                                 |  | Analysed as Soil |             |             |       |             |     |                     |     |                     |     |             |  |             |  |
| TOC                                                                                                                                  |  |                  |             |             |       |             |     |                     |     |                     |     |             |  |             |  |
| SAL Reference                                                                                                                        |  | 466496 001       |             | 466496 002  |       | 466496 003  |     | 466496 004          |     | 466496 005          |     | 466496 006  |  | 466496 007  |  |
| Customer Sample Reference                                                                                                            |  | TP01 1           |             | TP02 1      |       | TP03 1      |     | TP04 1              |     | TP05 1              |     | TP06 1      |  | TP07 1      |  |
| Depth                                                                                                                                |  | 0.1              |             | 0.1         |       | 0.1         |     | 0.1                 |     | 0.1                 |     | 0.1         |  | 0.1         |  |
| Sample Description                                                                                                                   |  | TOPSOIL          |             | TOPSOIL     |       | TOPSOIL     |     | MADE GROUND TOPSOIL |     | MADE GROUND TOPSOIL |     | TOPSOIL     |  | TOPSOIL     |  |
| Date Sampled                                                                                                                         |  | 25-MAR-2015      |             | 25-MAR-2015 |       | 25-MAR-2015 |     | 25-MAR-2015         |     | 25-MAR-2015         |     | 25-MAR-2015 |  | 25-MAR-2015 |  |
| Type                                                                                                                                 |  | Topsoil          |             | Topsoil     |       | Topsoil     |     | Topsoil             |     | Topsoil             |     | Topsoil     |  | Topsoil     |  |
| Determinand                                                                                                                          |  | Method           | Test Sample | LOD         | Units |             |     |                     |     |                     |     |             |  |             |  |
| Total Organic Carbon                                                                                                                 |  | T21              | M40         | 0.1         | %     | 0.7         | 1.3 | 0.4                 | 1.4 | 0.9                 | 1.0 | 0.7         |  |             |  |

|                                                                                                  |  |                  |             |             |       |                     |  |                     |  |                     |  |             |  |             |  |             |  |     |  |
|--------------------------------------------------------------------------------------------------|--|------------------|-------------|-------------|-------|---------------------|--|---------------------|--|---------------------|--|-------------|--|-------------|--|-------------|--|-----|--|
| SAL Reference: 466496<br>Project Site: Field Lane, Thorpe Willoughby<br>Customer Reference: 2123 |  |                  |             |             |       |                     |  |                     |  |                     |  |             |  |             |  |             |  |     |  |
| Soil<br>TOC                                                                                      |  | Analysed as Soil |             |             |       |                     |  |                     |  |                     |  |             |  |             |  |             |  |     |  |
| SAL Reference                                                                                    |  |                  |             | 466496 008  |       | 466496 009          |  | 466496 010          |  | 466496 011          |  | 466496 012  |  | 466496 013  |  | 466496 015  |  |     |  |
| Customer Sample Reference                                                                        |  |                  |             | TP08 1      |       | TP09 1              |  | TP10 1              |  | TP11 1              |  | TP12 1      |  | TP13 1      |  | TP15 1      |  |     |  |
| Depth                                                                                            |  |                  |             | 0.1         |       | 0.1                 |  | 0.1                 |  | 0.1                 |  | 0.1         |  | 0.1         |  | 0.1         |  |     |  |
| Sample Description                                                                               |  |                  |             | TOPSOIL     |       | MADE GROUND TOPSOIL |  | MADE GROUND TOPSOIL |  | MADE GROUND TOPSOIL |  | TOPSOIL     |  | TOPSOIL     |  | TOPSOIL     |  |     |  |
| Date Sampled                                                                                     |  |                  |             | 25-MAR-2015 |       | 25-MAR-2015         |  | 25-MAR-2015         |  | 25-MAR-2015         |  | 25-MAR-2015 |  | 25-MAR-2015 |  | 25-MAR-2015 |  |     |  |
| Type                                                                                             |  |                  |             | Topsoil     |       | Topsoil             |  | Topsoil             |  | Topsoil             |  | Topsoil     |  | Topsoil     |  | Topsoil     |  |     |  |
| Determinand                                                                                      |  | Method           | Test Sample | LOD         | Units |                     |  |                     |  |                     |  |             |  |             |  |             |  |     |  |
| Total Organic Carbon                                                                             |  | T21              | M40         | 0.1         | %     | 0.9                 |  | 1.1                 |  | 2.2                 |  | 0.6         |  | 0.5         |  | 0.7         |  | 0.9 |  |

|                                                                                                  |  |                  |             |             |       |             |     |             |     |             |     |             |  |
|--------------------------------------------------------------------------------------------------|--|------------------|-------------|-------------|-------|-------------|-----|-------------|-----|-------------|-----|-------------|--|
| SAL Reference: 466496<br>Project Site: Field Lane, Thorpe Willoughby<br>Customer Reference: 2123 |  |                  |             |             |       |             |     |             |     |             |     |             |  |
| Soil<br>TOC                                                                                      |  | Analysed as Soil |             |             |       |             |     |             |     |             |     |             |  |
| SAL Reference                                                                                    |  | 466496 016       |             | 466496 017  |       | 466496 018  |     | 466496 020  |     | 466496 021  |     | 466496 022  |  |
| Customer Sample Reference                                                                        |  | TP16 1           |             | TP17 1      |       | TP18 1      |     | TP21 1      |     | TP20 1      |     | TP23 1      |  |
| Depth                                                                                            |  | 0.1              |             | 0.1         |       | 0.1         |     | 0.2         |     | 0.1         |     | 0.1         |  |
| Sample Description                                                                               |  | TOPSOIL          |             | TOPSOIL     |       | TOPSOIL     |     | TOPSOIL     |     | TOPSOIL     |     | TOPSOIL     |  |
| Date Sampled                                                                                     |  | 25-MAR-2015      |             | 25-MAR-2015 |       | 25-MAR-2015 |     | 25-MAR-2015 |     | 25-MAR-2015 |     | 25-MAR-2015 |  |
| Type                                                                                             |  | Topsoil          |             | Topsoil     |       | Topsoil     |     | Topsoil     |     | Topsoil     |     | Topsoil     |  |
| Determinand                                                                                      |  | Method           | Test Sample | LOD         | Units |             |     |             |     |             |     |             |  |
| Total Organic Carbon                                                                             |  | T21              | M40         | 0.1         | %     | 0.8         | 1.0 | 0.7         | 1.7 | 1.5         | 0.8 |             |  |

| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123<br><br><b>Soil</b> Analysed as Soil<br><b>Semi-Volatile Organic Compounds (USEPA 625)</b> |               |                    |            |                            |                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|----------------------------|----------------------|
| <b>SAL Reference</b>                                                                                                                                                                                            |               |                    |            | <b>466496 004</b>          |                      |
| <b>Customer Sample Reference</b>                                                                                                                                                                                |               |                    |            | <b>TP04 1</b>              |                      |
| <b>Depth</b>                                                                                                                                                                                                    |               |                    |            | <b>0.1</b>                 |                      |
| <b>Sample Description</b>                                                                                                                                                                                       |               |                    |            | <b>MADE GROUND TOPSOIL</b> |                      |
| <b>Date Sampled</b>                                                                                                                                                                                             |               |                    |            | <b>25-MAR-2015</b>         |                      |
| <b>Type</b>                                                                                                                                                                                                     |               |                    |            | <b>Topsoil</b>             |                      |
| <b>Determinand</b>                                                                                                                                                                                              | <b>Method</b> | <b>Test Sample</b> | <b>LOD</b> | <b>Units</b>               |                      |
| 1,2,4-Trichlorobenzene                                                                                                                                                                                          | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 1,2-Dichlorobenzene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 1,3-Dichlorobenzene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 1,4-Dichlorobenzene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,4,5-Trichlorophenol                                                                                                                                                                                           | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,4,6-Trichlorophenol                                                                                                                                                                                           | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,4-Dichlorophenol                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,4-Dimethylphenol                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,4-Dinitrophenol                                                                                                                                                                                               | T207          | M105               | 0.1        | mg/kg                      | <sup>(36)</sup> <0.5 |
| 2,4-Dinitrotoluene                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2,6-Dinitrotoluene                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-Chloronaphthalene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-Chlorophenol                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-methyl phenol                                                                                                                                                                                                 | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-Methylnaphthalene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-Nitroaniline                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 2-Nitrophenol                                                                                                                                                                                                   | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 3-Nitroaniline                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <sup>(36)</sup> <0.5 |
| 3/4-Methylphenol                                                                                                                                                                                                | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 4-Bromophenyl phenylether                                                                                                                                                                                       | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 4-Chloro-3-methylphenol                                                                                                                                                                                         | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 4-Chloroaniline                                                                                                                                                                                                 | T207          | M105               | 0.1        | mg/kg                      | <sup>(36)</sup> <0.5 |
| 4-Chlorophenyl phenylether                                                                                                                                                                                      | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 4-Nitroaniline                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| 4-Nitrophenol                                                                                                                                                                                                   | T207          | M105               | 0.1        | mg/kg                      | <sup>(36)</sup> <0.5 |
| Acenaphthene                                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Acenaphthylene                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Anthracene                                                                                                                                                                                                      | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Azobenzene                                                                                                                                                                                                      | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Benzo(a)Anthracene                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <b>0.1</b>           |
| Benzo(a)Pyrene                                                                                                                                                                                                  | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Benzo(b/k)Fluoranthene                                                                                                                                                                                          | T207          | M105               | 0.1        | mg/kg                      | <b>0.2</b>           |
| Benzo(ghi)Perylene                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Bis (2-chloroethoxy) methane                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Bis (2-chloroethyl) ether                                                                                                                                                                                       | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Bis (2-chloroisopropyl) ether                                                                                                                                                                                   | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Bis (2-ethylhexyl)phthalate                                                                                                                                                                                     | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Butyl benzylphthalate                                                                                                                                                                                           | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Carbazole                                                                                                                                                                                                       | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Chrysene                                                                                                                                                                                                        | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Di-n-butylphthalate                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Di-n-octylphthalate                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Dibenzo(ah)Anthracene                                                                                                                                                                                           | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Dibenzofuran                                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Diethyl phthalate                                                                                                                                                                                               | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Dimethyl phthalate                                                                                                                                                                                              | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Fluoranthene                                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                      | <b>0.3</b>           |
| Fluorene                                                                                                                                                                                                        | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Hexachlorobenzene                                                                                                                                                                                               | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Hexachlorobutadiene                                                                                                                                                                                             | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Hexachlorocyclopentadiene                                                                                                                                                                                       | T207          | M105               | 0.1        | mg/kg                      | <sup>(36)</sup> <0.5 |
| Hexachloroethane                                                                                                                                                                                                | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Indeno(123-cd)Pyrene                                                                                                                                                                                            | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Isophorone                                                                                                                                                                                                      | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |
| Naphthalene                                                                                                                                                                                                     | T207          | M105               | 0.1        | mg/kg                      | <0.1                 |

|                                                                                                                                                                                                                 |               |                    |            |                                    |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|------------------------------------|------------|
| <b>SAL Reference:</b> 466496<br><b>Project Site:</b> Field Lane, Thorpe Willoughby<br><b>Customer Reference:</b> 2123<br><br><b>Soil</b> Analysed as Soil<br><b>Semi-Volatile Organic Compounds (USEPA 625)</b> |               |                    |            |                                    |            |
| <b>SAL Reference</b>                                                                                                                                                                                            |               |                    |            | <b>466496 004</b>                  |            |
| <b>Customer Sample Reference</b>                                                                                                                                                                                |               |                    |            | <b>TP04 1</b>                      |            |
| <b>Depth</b>                                                                                                                                                                                                    |               |                    |            | <b>0.1</b>                         |            |
| <b>Sample Description</b>                                                                                                                                                                                       |               |                    |            | <b>MADE<br/>GROUND<br/>TOPSOIL</b> |            |
| <b>Date Sampled</b>                                                                                                                                                                                             |               |                    |            | <b>25-MAR-2015</b>                 |            |
| <b>Type</b>                                                                                                                                                                                                     |               |                    |            | <b>Topsoil</b>                     |            |
| <b>Determinand</b>                                                                                                                                                                                              | <b>Method</b> | <b>Test Sample</b> | <b>LOD</b> | <b>Units</b>                       |            |
| Nitrobenzene                                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                              | <0.1       |
| Pentachlorophenol                                                                                                                                                                                               | T207          | M105               | 0.1        | mg/kg                              | <0.1       |
| Phenanthrene                                                                                                                                                                                                    | T207          | M105               | 0.1        | mg/kg                              | <b>0.1</b> |
| Phenol                                                                                                                                                                                                          | T207          | M105               | 0.1        | mg/kg                              | <0.1       |
| Pyrene                                                                                                                                                                                                          | T207          | M105               | 0.1        | mg/kg                              | <b>0.4</b> |

## Index to symbols used in 466496-1

| Value | Description                                                                                                                                                           |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| M40   | Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.                                                          |
| AR    | As Received                                                                                                                                                           |
| M105  | Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C |
| N.D.  | Not Detected                                                                                                                                                          |
| 36    | LOD Raised due to low Matrix spike recovery                                                                                                                           |
| 2     | LOD Raised Due to Matrix Interference                                                                                                                                 |
| S     | Analysis was subcontracted                                                                                                                                            |
| M     | Analysis is MCERTS accredited                                                                                                                                         |
| U     | Analysis is UKAS accredited                                                                                                                                           |
| N     | Analysis is not UKAS accredited                                                                                                                                       |

## Notes

Asbestos was subcontracted to REC Asbestos

## Method Index

| Value | Description                         |
|-------|-------------------------------------|
| T6    | ICP/OES                             |
| T22   | Titration                           |
| T42   | PID                                 |
| T8    | GC/FID                              |
| T1    | GC/MS (HR)                          |
| T143  | Process                             |
| T251  | 2:1 Extraction/ICP/OES              |
| T21   | OX/IR                               |
| T7    | Probe                               |
| T546  | Colorimetry (CF)                    |
| T207  | GC/MS (MCERTS)                      |
| T27   | PLM                                 |
| T162  | Grav (1 Dec) (105 C)                |
| T2    | Grav                                |
| T16   | GC/MS                               |
| T85   | Calc                                |
| T206  | GC/FID (MCERTS)                     |
| T242  | 2:1 Extraction/ICP/OES (TRL 447 T1) |
| T710  | 2:1 Extraction / Discrete Analyser  |

## Accreditation Summary

| Determinand                          | Method | Test Sample | LOD  | Units | Symbol | SAL References                                                              |
|--------------------------------------|--------|-------------|------|-------|--------|-----------------------------------------------------------------------------|
| Ammoniacal nitrogen                  | T22    | AR          | 5    | mg/kg | N      | 003-004                                                                     |
| Asbestos ID                          | T27    | AR          |      |       | SU     | 001-013,015-018,020-022                                                     |
| Retained on 10mm sieve               | T2     | M40         | 0.1  | %     | N      | 001-013,015-018,020-022,031,036,039,042-043,046,051,056-057,060,062,065-066 |
| SO4(Total)                           | T6     | M40         | 0.01 | %     | N      | 003-004                                                                     |
| Sulphide                             | T546   | AR          | 1    | mg/kg | N      | 003-004                                                                     |
| (Water soluble) Cl-                  | T710   | AR          | 0.01 | g/l   | N      | 004-005,009-011                                                             |
| (Water soluble) Mg                   | T251   | AR          | 1    | mg/l  | N      | 004-005,009-011                                                             |
| (Water soluble) NO3                  | T710   | AR          | 0.01 | g/l   | N      | 004-005,009-011                                                             |
| (Water Soluble) SO4 expressed as SO4 | T242   | AR          | 0.01 | g/l   | N      | 004-005,009-011,031,036,039,042-043,046,051,056-057,060,062,065-066         |
| Naphthalene                          | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Acenaphthylene                       | T207   | M105        | 0.1  | mg/kg | U      | 001-013,015-018,020-022                                                     |
| Acenaphthene                         | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Fluorene                             | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Phenanthrene                         | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Anthracene                           | T207   | M105        | 0.1  | mg/kg | U      | 001-013,015-018,020-022                                                     |
| Fluoranthene                         | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Pyrene                               | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Benzo(a)Anthracene                   | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Chrysene                             | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Benzo(b)fluoranthene                 | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Benzo(k)fluoranthene                 | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Benzo(a)Pyrene                       | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Indeno(123-cd)Pyrene                 | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Dibenzo(ah)Anthracene                | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Benzo(ghi)Perylene                   | T207   | M105        | 0.1  | mg/kg | M      | 001-013,015-018,020-022                                                     |
| PAH(total)                           | T207   | M105        | 0.1  | mg/kg | U      | 001-013,015-018,020-022                                                     |
| Gasoline Range Organics              | T42    | AR          | 10   | mg/kg | N      | 005,012                                                                     |
| TPH (C10-C12)                        | T206   | M105        | 1    | mg/kg | M      | 005,012                                                                     |
| TPH (C12-C16)                        | T206   | M105        | 1    | mg/kg | M      | 005,012                                                                     |
| TPH (C16-C21)                        | T206   | M105        | 1    | mg/kg | M      | 005,012                                                                     |
| TPH (C21-C35)                        | T206   | M105        | 1    | mg/kg | M      | 005,012                                                                     |
| TPH (C35-C40)                        | T8     | M105        | 1    | mg/kg | N      | 005,012                                                                     |
| TPH (Sum of Bands)                   | T85    | M105        |      |       | N      | 005,012                                                                     |
| pH                                   | T7     | AR          |      |       | M      | 001-013,015-018,020-022,031,036,039,042-043,046,051,056-057,060,062,065-066 |
| Arsenic                              | T6     | M40         | 2    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Boron (water-soluble)                | T6     | AR          | 1    | mg/kg | N      | 001-013,015-018,020-022                                                     |
| Cadmium                              | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Chromium                             | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Chromium (trivalent)                 | T85    | AR          | 2    | mg/kg | N      | 001-013,015-018,020-022                                                     |
| Chromium VI                          | T6     | AR          | 1    | mg/kg | N      | 001-013,015-018,020-022                                                     |
| Copper                               | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Lead                                 | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Mercury                              | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Nickel                               | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Selenium                             | T6     | M40         | 3    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| Zinc                                 | T6     | M40         | 1    | mg/kg | M      | 001-013,015-018,020-022                                                     |
| MCERTS Classification                | T143   | AR          |      |       | M      | 001-013,015-018,020-022,031,036,039,042-043,046,051,056-057,060,062,065-066 |
| Moisture @ 105 C                     | T162   | AR          | 0.1  | %     | N      | 001-013,015-018,020-022,031,036,039,042-043,046,051,056-057,060,062,065-066 |
| Aldrin                               | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Chlordane                            | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| DDD                                  | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| DDE                                  | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| DDT                                  | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Dieldrin                             | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Endosulphan                          | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Endrin                               | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Heptachlor                           | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Heptachlor epoxide                   | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Hexachlorobenzene                    | T1     | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Hexachlorocyclohexane                | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Azinphos methyl                      | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Diazinon                             | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Dichlorvos                           | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Dimethoate                           | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Fenitrothion                         | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Malathion                            | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |
| Mevinphos                            | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021                                                         |

| Determinand                   | Method | Test Sample | LOD  | Units | Symbol | SAL References          |
|-------------------------------|--------|-------------|------|-------|--------|-------------------------|
| Parathion                     | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021     |
| Pirimiphos methyl             | T16    | AR          | 0.01 | mg/kg | U      | 002,010,017-018,021     |
| 1,2,4-Trichlorobenzene        | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 1,2-Dichlorobenzene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 1,3-Dichlorobenzene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 1,4-Dichlorobenzene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2,4,5-Trichlorophenol         | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2,4,6-Trichlorophenol         | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2,4-Dichlorophenol            | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2,4-Dimethylphenol            | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2,4-Dinitrophenol             | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2,4-Dinitrotoluene            | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2,6-Dinitrotoluene            | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 2-Chloronaphthalene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2-Chlorophenol                | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2-methyl phenol               | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2-Methylnaphthalene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2-Nitroaniline                | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 2-Nitrophenol                 | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 3-Nitroaniline                | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 3/4-Methylphenol              | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 4-Bromophenyl phenylether     | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 4-Chloro-3-methylphenol       | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 4-Chloroaniline               | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 4-Chlorophenyl phenylether    | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| 4-Nitroaniline                | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| 4-Nitrophenol                 | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Azobenzene                    | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Benzo(b,k)Fluoranthene        | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Bis (2-chloroethoxy) methane  | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Bis (2-chloroethyl) ether     | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Bis (2-chloroisopropyl) ether | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Bis (2-ethylhexyl)phthalate   | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Butyl benzylphthalate         | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Carbazole                     | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Di-n-butylphthalate           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Di-n-octylphthalate           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Dibenzofuran                  | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Diethyl phthalate             | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Dimethyl phthalate            | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Hexachlorobenzene             | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Hexachlorobutadiene           | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Hexachlorocyclopentadiene     | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Hexachloroethane              | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Isophorone                    | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Nitrobenzene                  | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Pentachlorophenol             | T207   | M105        | 0.1  | mg/kg | U      | 004                     |
| Phenol                        | T207   | M105        | 0.1  | mg/kg | M      | 004                     |
| Total Organic Carbon          | T21    | M40         | 0.1  | %     | N      | 001-013,015-018,020-022 |

**Appendix H**  
**Geotechnical Results**



# LABORATORY REPORT



4043

**Contract Number: PSL15/1580**

Client's Reference:

Report Date: 09 April 2015

Client Name: Lithos Consulting  
Parkhill  
Walton Road  
Wetherby  
North Yorkshire  
LS22 5DZ

**For the attention of: Nathaniel Hay/Mark Perrin**

Contract Title: Field Lane, Thorpe Willoughby

Date Received: 27/3/2015

Date Commenced: 27/3/2015

Date Completed: 9/4/2015

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson  
(Director)

A Watkins  
(Director)

M Beastall  
(Laboratory Manager)

D Lambe  
(Senior Technician)

S Royle  
(Senior Technician)

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Page 1 of

## SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

## Professional Soils Laboratory

|                                                                                       |          |                                                                                       |          |                                                                                       |          |
|---------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------|----------|
| Compiled by                                                                           | Date     | Checked by                                                                            | Date     | Approved by                                                                           | Date     |
|  | 09/04/15 |  | 09/04/15 |  | 09/04/15 |
| FIELD LANE, THORPE WILLOUGHBY.                                                        |          |                                                                                       |          | Contract No: PSL15/1580                                                               |          |
|                                                                                       |          |                                                                                       |          | Client Ref: 2123                                                                      |          |

# Particle Size Distribution Test

BS1377 : Part 2 : 1990

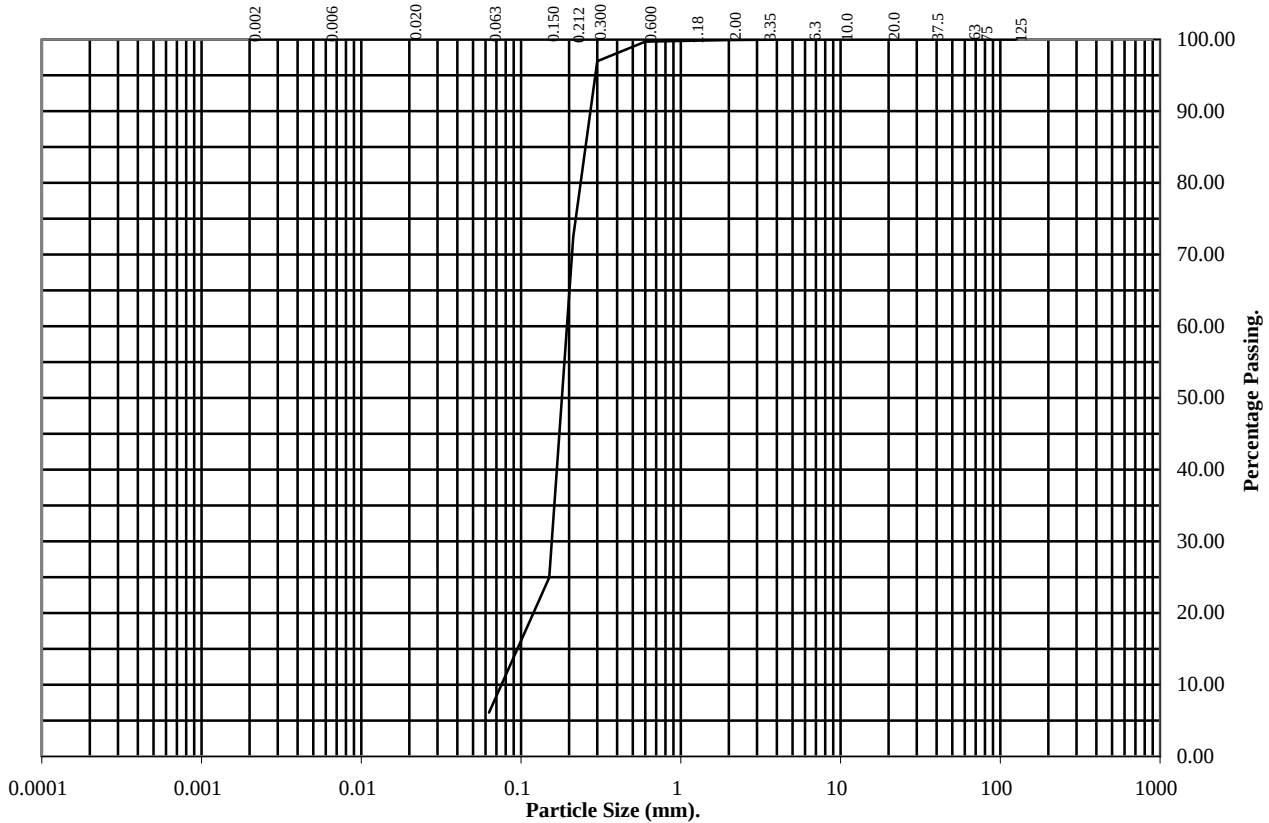
Wet Sieve, Clause 9.2

Hole Number: TP01

Depth (m): 1.50

Sample Number: 3

Sample Type: B



| BS Test Sieve | Percentage Passing |
|---------------|--------------------|
| 125           | 100                |
| 75            | 100                |
| 63            | 100                |
| 37.5          | 100                |
| 20            | 100                |
| 10            | 100                |
| 6.3           | 100                |
| 3.35          | 100                |
| 2             | 100                |
| 1.18          | 100                |
| 0.6           | 100                |
| 0.3           | 97                 |
| 0.212         | 72                 |
| 0.15          | 25                 |
| 0.063         | 6                  |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 0                |
| Sand          | 94               |
| Silt / Clay   | 6                |

## Remarks:

See summary of soil descriptions.

| Checked By   | Date     | Approved By  | Date     |
|--------------|----------|--------------|----------|
| <i>H. S.</i> | 09/04/15 | <i>H. S.</i> | 09/04/15 |

**PSL**

Professional Soils Laboratory

FIELD LANE, THORPE WILLOUGHBY.

Contract No.:  
PSL15/1580

# Particle Size Distribution Test

BS1377 : Part 2 : 1990

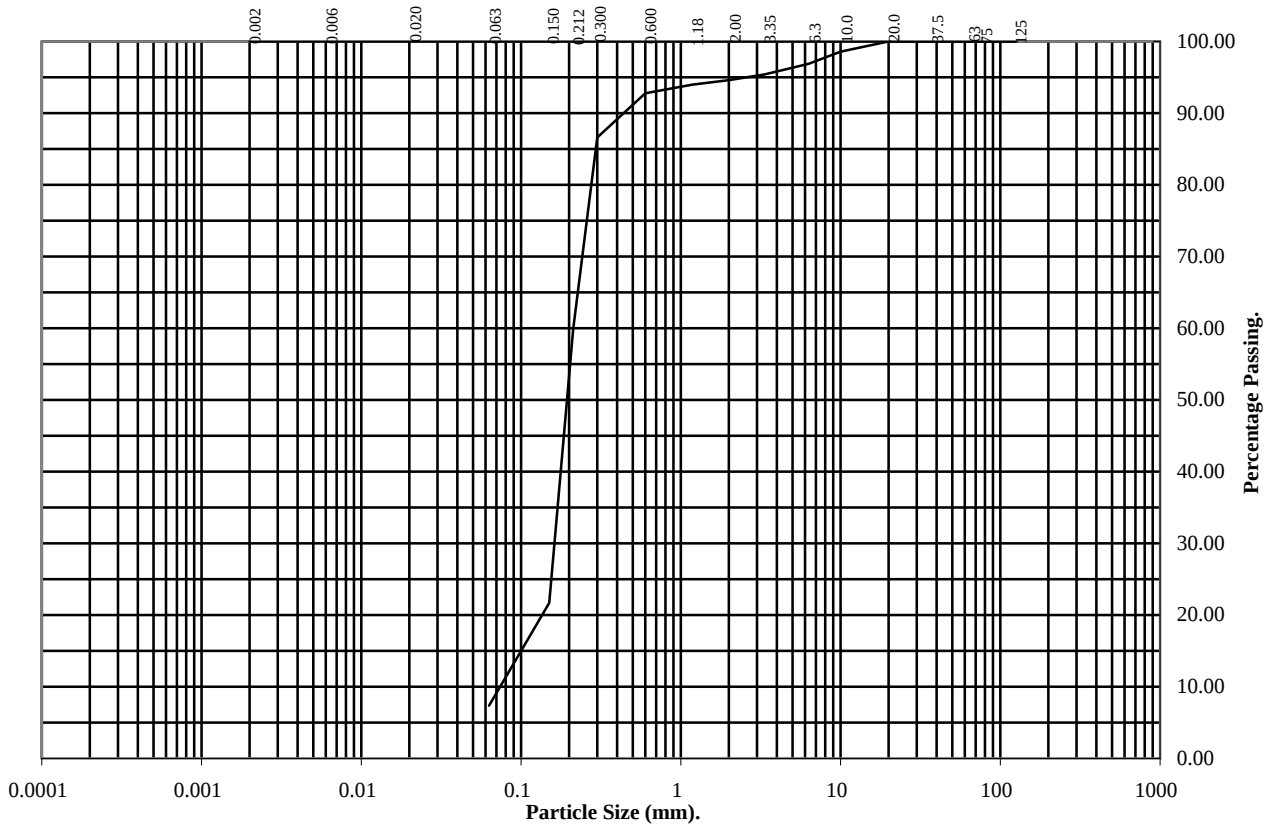
Wet Sieve, Clause 9.2

Hole Number: TP06

Depth (m): 1.70

Sample Number: 3

Sample Type: B



| BS Test Sieve | Percentage Passing |
|---------------|--------------------|
| 125           | 100                |
| 75            | 100                |
| 63            | 100                |
| 37.5          | 100                |
| 20            | 100                |
| 10            | 99                 |
| 6.3           | 97                 |
| 3.35          | 95                 |
| 2             | 95                 |
| 1.18          | 94                 |
| 0.6           | 93                 |
| 0.3           | 87                 |
| 0.212         | 60                 |
| 0.15          | 22                 |
| 0.063         | 7                  |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 5                |
| Sand          | 88               |
| Silt / Clay   | 7                |

## Remarks:

See summary of soil descriptions.

| Checked By   | Date     | Approved By  | Date     |
|--------------|----------|--------------|----------|
| <i>H. S.</i> | 09/04/15 | <i>H. S.</i> | 09/04/15 |

**PSL**

Professional Soils Laboratory

FIELD LANE, THORPE WILLOUGHBY.

Contract No.:  
PSL15/1580

# Particle Size Distribution Test

BS1377 : Part 2 : 1990

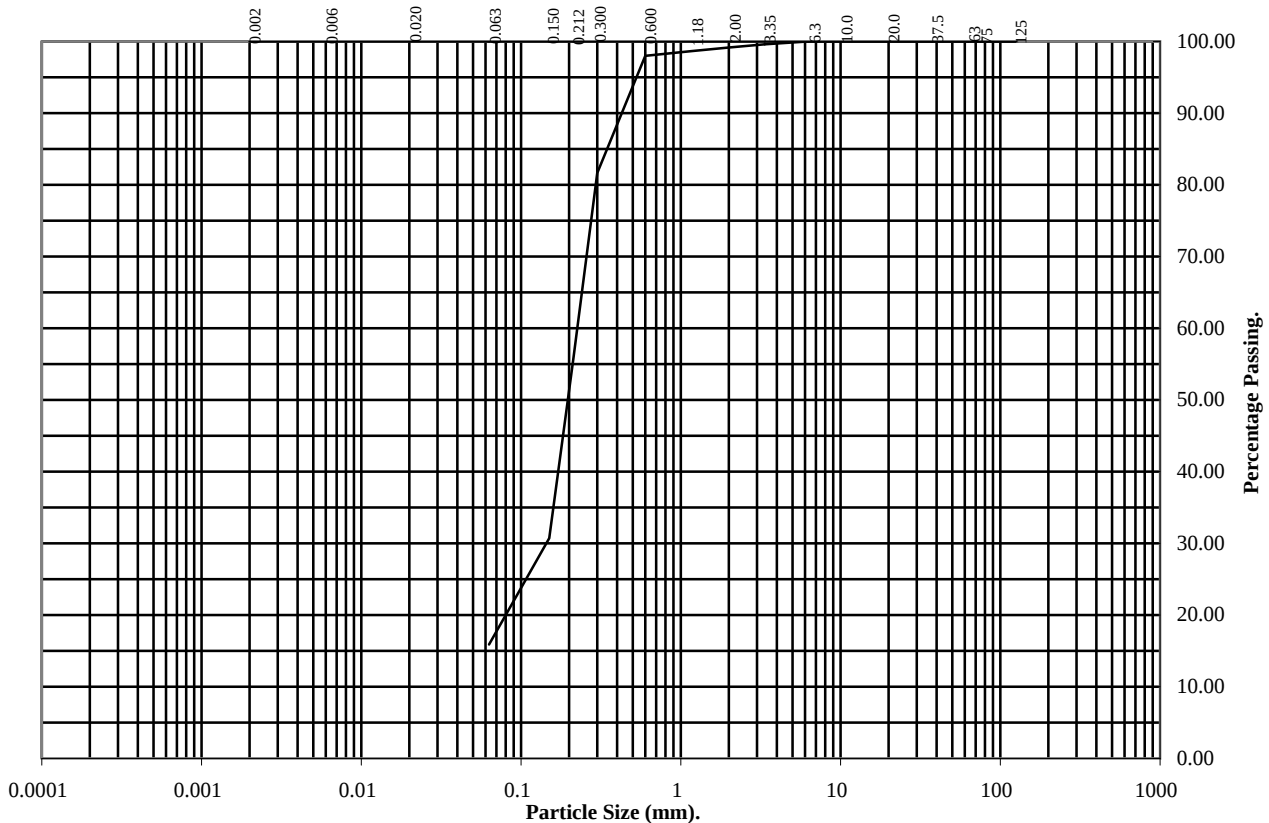
Wet Sieve, Clause 9.2

Hole Number: TP16

Depth (m): 1.30

Sample Number: 3

Sample Type: B



| BS Test Sieve | Percentage Passing |
|---------------|--------------------|
| 125           | 100                |
| 75            | 100                |
| 63            | 100                |
| 37.5          | 100                |
| 20            | 100                |
| 10            | 100                |
| 6.3           | 100                |
| 3.35          | 100                |
| 2             | 99                 |
| 1.18          | 99                 |
| 0.6           | 98                 |
| 0.3           | 82                 |
| 0.212         | 56                 |
| 0.15          | 31                 |
| 0.063         | 16                 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 1                |
| Sand          | 83               |
| Silt / Clay   | 16               |

**Remarks:**  
See summary of soil descriptions.

| Checked By   | Date     | Approved By  | Date     |
|--------------|----------|--------------|----------|
| <i>H. S.</i> | 09/04/15 | <i>H. S.</i> | 09/04/15 |

# Particle Size Distribution Test

BS1377 : Part 2 : 1990

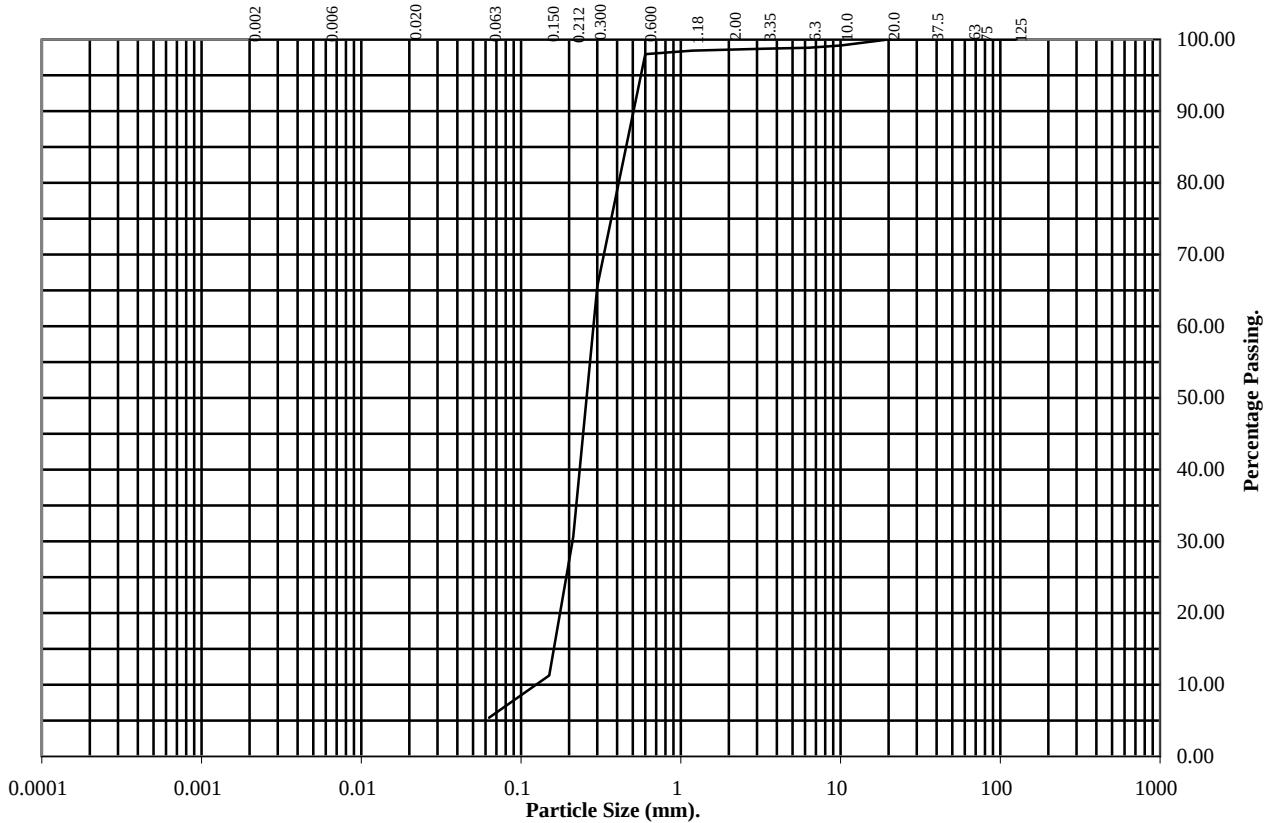
Wet Sieve, Clause 9.2

Hole Number: TP20

Depth (m): 1.70

Sample Number: 2

Sample Type: B



| BS Test Sieve | Percentage Passing |
|---------------|--------------------|
| 125           | 100                |
| 75            | 100                |
| 63            | 100                |
| 37.5          | 100                |
| 20            | 100                |
| 10            | 99                 |
| 6.3           | 99                 |
| 3.35          | 99                 |
| 2             | 99                 |
| 1.18          | 98                 |
| 0.6           | 98                 |
| 0.3           | 66                 |
| 0.212         | 31                 |
| 0.15          | 11                 |
| 0.063         | 5                  |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles       | 0                |
| Gravel        | 1                |
| Sand          | 94               |
| Silt / Clay   | 5                |

## Remarks:

See summary of soil descriptions.

| Checked By   | Date     | Approved By  | Date     |
|--------------|----------|--------------|----------|
| <i>H. S.</i> | 09/04/15 | <i>H. S.</i> | 09/04/15 |

**PSL**

Professional Soils Laboratory

FIELD LANE, THORPE WILLOUGHBY.

Contract No.:  
PSL15/1580

**Appendix I**  
**Soakaway Test Results**



LITHOS  
CONSULTING

|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP01 | WITH STONE |
| Test No.      | 1    |            |

[illegible]

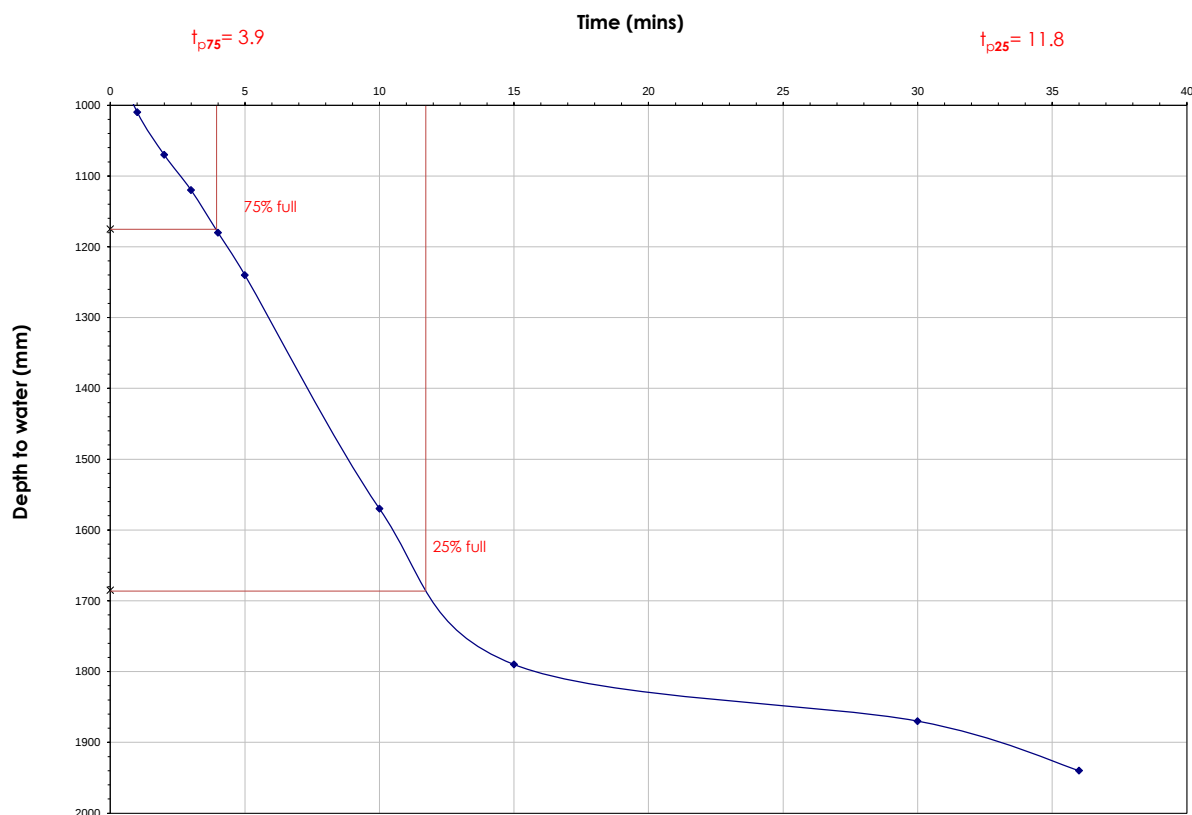
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.13 | 2130 |
| Width              | = | 0.77 | 770  |
| Depth              | = | 1.94 | 1940 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1685 | 1.69 |
| 0.50                     | = | 1430 | 1.43 |
| 0.75                     | = | 1175 | 1.18 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 920  |
| Depth at end of test (mm)   | = | 1940 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.6401   |
| $C_{p50}$ - 50% internal surface area inc. base | = | 4.5981   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.836451 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p,75}$ (min)     | = | 3.90  |
| $t_{p,25}$ (min)     | = | 11.80 |

Soil infiltration rate,  $f$ , (m/s) =  $1.15\text{E-}04$



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|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP01 | WITH STONE |
| Test No.      | 2    |            |

[illegible]

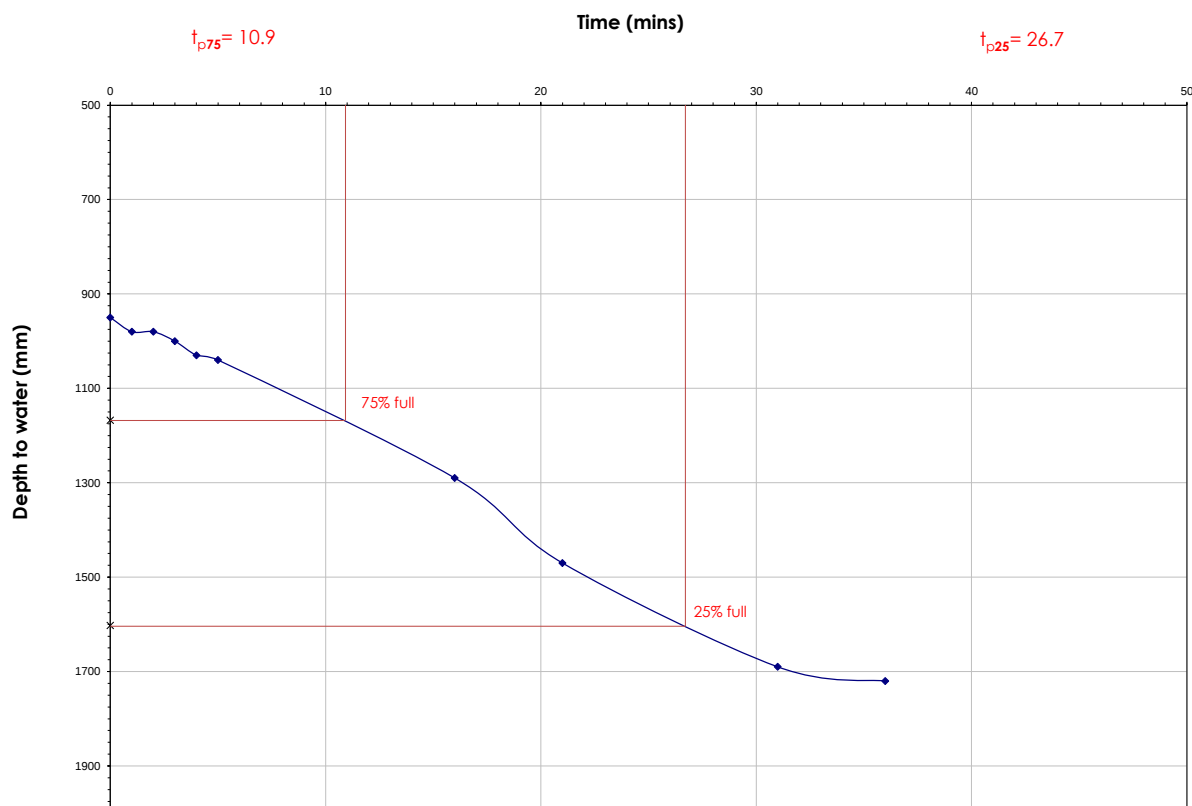
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.13 | 2130 |
| Width              | = | 0.77 | 770  |
| Depth              | = | 1.82 | 1820 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1602.5 | 1.60 |
| 0.50                     | = | 1385   | 1.39 |
| 0.75                     | = | 1167.5 | 1.17 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 950  |
| Depth at end of test (mm)   | = | 1720 |

|                                                 |   |           |
|-------------------------------------------------|---|-----------|
| Base area of pit                                | = | 1.6401    |
| $A_{p50}$ - 50% internal surface area inc. base | = | 4.1631    |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.7134435 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p.75}$ (min)     | = | 10.90 |
| $t_{p.25}$ (min)     | = | 26.70 |



Soil infiltration rate,  $f$ , (m/s) =  $5.42\text{E-}05$

# SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

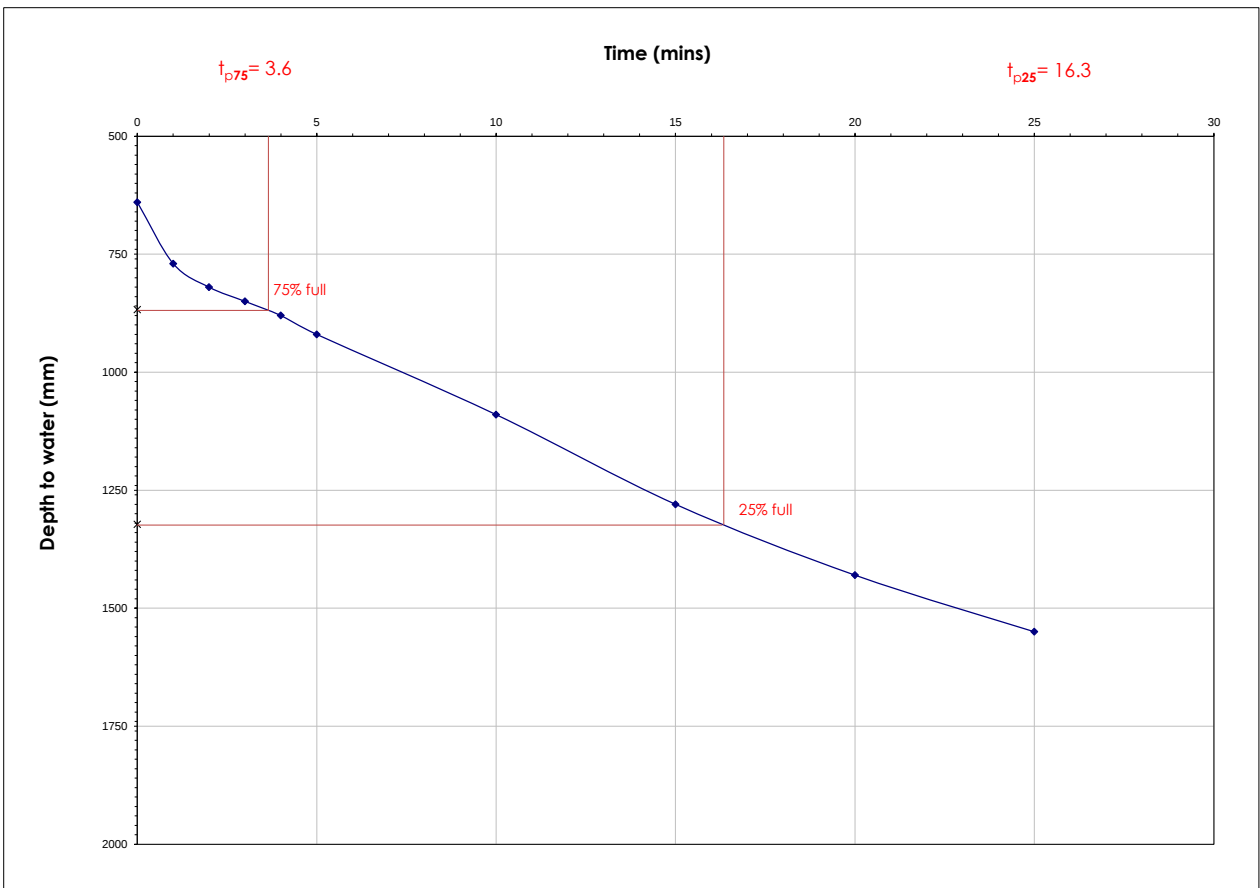
|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP03 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 08:46 | 0           | 0.64                             | 640  |
| 08:47 | 1           | 0.77                             | 770  |
| 08:48 | 2           | 0.82                             | 820  |
| 08:49 | 3           | 0.85                             | 850  |
| 08:50 | 4           | 0.88                             | 880  |
| 08:51 | 5           | 0.92                             | 920  |
| 08:56 | 10          | 1.09                             | 1090 |
| 09:01 | 15          | 1.28                             | 1280 |
| 09:06 | 20          | 1.43                             | 1430 |
| 09:11 | 25          | 1.55                             | 1550 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

| SOAKAWAY TRIAL PIT                                     |   |        |          |
|--------------------------------------------------------|---|--------|----------|
| Dimensions                                             |   | (m)    | (mm)     |
| Length                                                 | = | 2.09   | 2090     |
| Width                                                  | = | 0.76   | 760      |
| Depth                                                  | = | 1.55   | 1550     |
| Effective Depth (% full)                               |   | (mm)   | (m)      |
| 0.25                                                   | = | 1322.5 | 1.32     |
| 0.50                                                   | = | 1095   | 1.10     |
| 0.75                                                   | = | 867.5  | 0.87     |
| Depth at start of test (mm)                            |   | =      | 640      |
| Depth at end of test (mm)                              |   | =      | 1550     |
| Base area of pit                                       |   | =      | 1.5884   |
| a <sub>p50</sub> - 50% internal surface area inc. base |   | =      | 4.1819   |
| V <sub>p75-25</sub> - Volume 75 - 25%                  |   | =      | 0.722722 |
| Read from the graph:                                   |   |        |          |
| t <sub>p75</sub> (min)                                 | = | 3.60   |          |
| t <sub>p25</sub> (min)                                 | = | 16.30  |          |



|                                             |
|---------------------------------------------|
| Soil infiltration rate, f, (m/s) = 6.80E-05 |
|---------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP03 | WITH STONE |
| Test No.      | 2    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 09:12 | 0           | 0.55                             | 550  |
| 09:13 | 1           | 0.57                             | 570  |
| 09:14 | 2           | 0.60                             | 600  |
| 09:15 | 3           | 0.61                             | 610  |
| 09:16 | 4           | 0.63                             | 630  |
| 09:17 | 5           | 0.64                             | 640  |
| 09:22 | 10          | 0.70                             | 700  |
| 09:27 | 15          | 0.79                             | 790  |
| 09:47 | 35          | 1.31                             | 1310 |
| 09:58 | 46          | 1.51                             | 1510 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

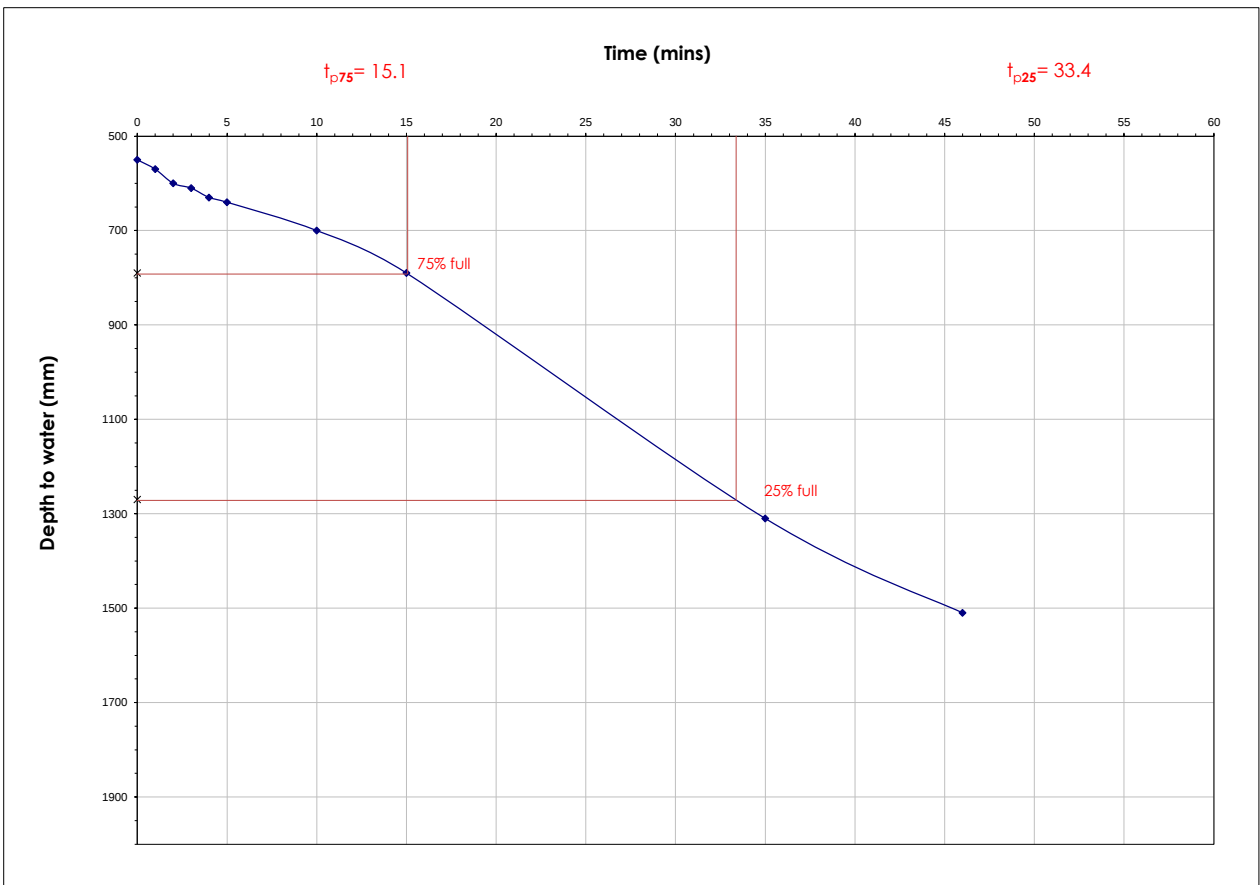
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.09 | 2090 |
| Width              | = | 0.76 | 760  |
| Depth              | = | 1.51 | 1510 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1270 | 1.27 |
| 0.50                     | = | 1030 | 1.03 |
| 0.75                     | = | 790  | 0.79 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 550  |
| Depth at end of test (mm)   | = | 1510 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.5884   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.3244   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.762432 |

| Read from the graph: |   |       |  |
|----------------------|---|-------|--|
| $t_{p75}$ (min)      | = | 15.10 |  |
| $t_{p25}$ (min)      | = | 33.40 |  |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 4.82E-05 |
|------------------------------------------------|



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|                      |             |                   |
|----------------------|-------------|-------------------|
| <b>Trial Pit No.</b> | <b>TP03</b> | <b>WITH STONE</b> |
| <b>Test No.</b>      | <b>3</b>    |                   |

[illegible]

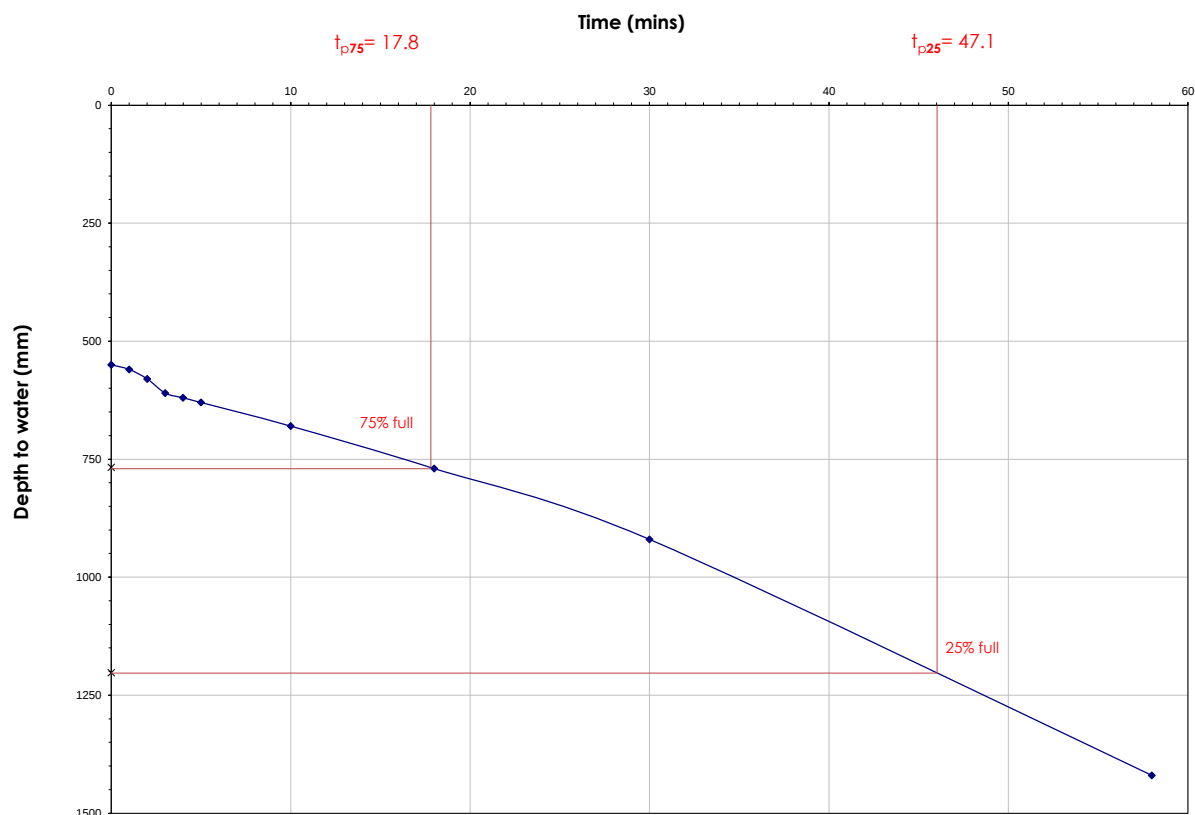
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.09 | 2090 |
| Width              | = | 0.76 | 760  |
| Depth              | = | 1.42 | 1420 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1202.5 | 1.20 |
| 0.50                     | = | 985    | 0.99 |
| 0.75                     | = | 767.5  | 0.77 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 550  |
| Depth at end of test (mm)   | = | 1420 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.5884   |
| $A_{p50}$ - 50% internal surface area inc. base | = | 4.0679   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.690954 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p.75}$ (min)     | = | 17.80 |
| $t_{p.25}$ (min)     | = | 47.10 |



Soil infiltration rate,  $f$ , (m/s) =  $2.90\text{E-}05$

# SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP06 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 12:40 | 0           | 0.93                             | 930  |
| 12:41 | 1           | 0.96                             | 960  |
| 12:42 | 2           | 0.97                             | 970  |
| 12:43 | 3           | 0.99                             | 990  |
| 12:44 | 4           | 1.00                             | 1000 |
| 12:45 | 5           | 1.01                             | 1010 |
| 12:50 | 10          | 1.06                             | 1060 |
| 12:55 | 15          | 1.11                             | 1110 |
| 13:14 | 34          | 1.24                             | 1240 |
| 13:25 | 45          | 1.28                             | 1280 |
| 13:42 | 62          | 1.35                             | 1350 |
| 14:06 | 86          | 1.43                             | 1430 |
| 14:48 | 128         | 1.55                             | 1550 |
| 15:22 | 162         | 1.62                             | 1620 |
| 15:47 | 187         | 1.68                             | 1680 |
| 15:57 | 197         | 1.69                             | 1690 |
| 16:02 | 202         | 1.70                             | 1700 |
|       |             |                                  |      |
|       |             |                                  |      |

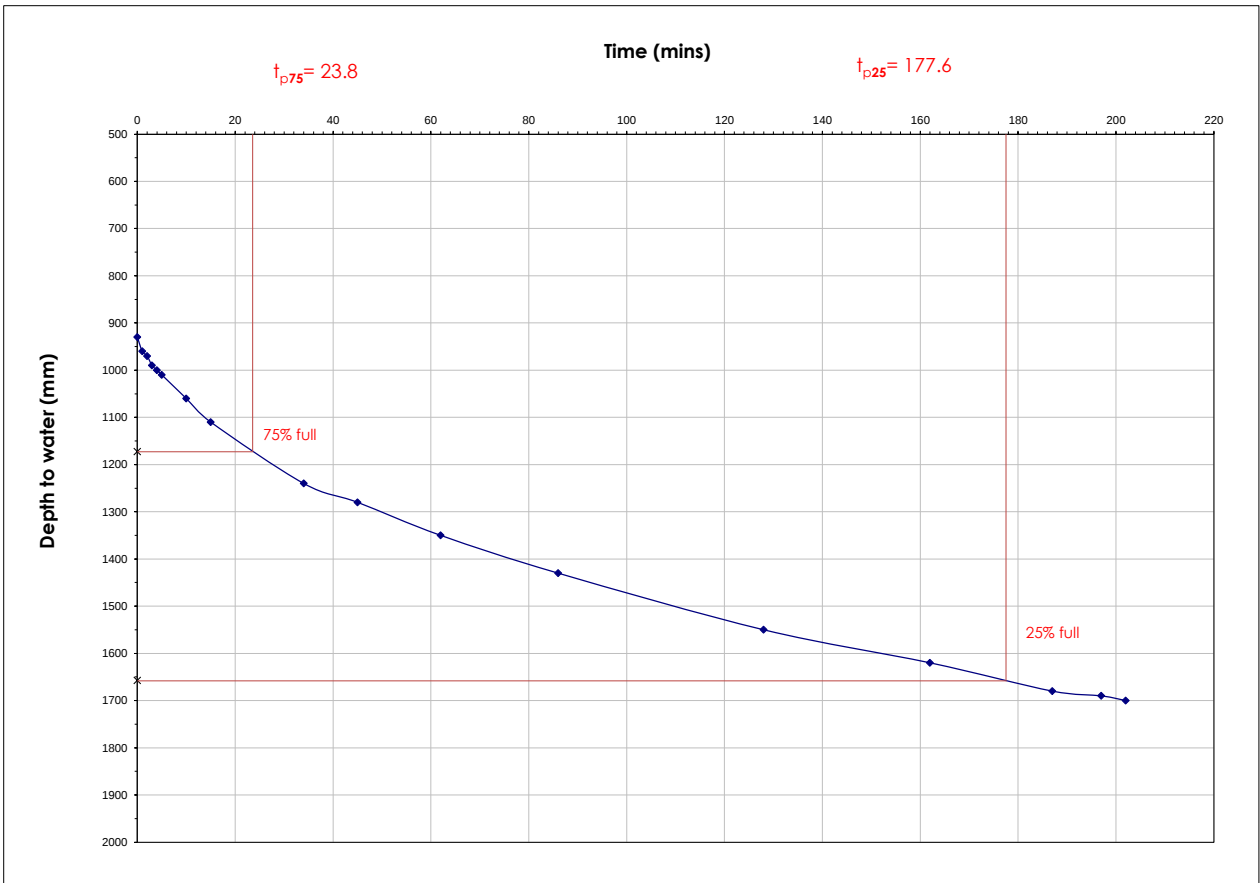
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.02 | 2020 |
| Width              | = | 0.65 | 650  |
| Depth              | = | 1.90 | 1900 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1657.5 | 1.66 |
| 0.50                     | = | 1415   | 1.42 |
| 0.75                     | = | 1172.5 | 1.17 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 930  |
| Depth at end of test (mm)   | = | 1700 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.313    |
| $a_{p50}$ - 50% internal surface area inc. base | = | 3.9029   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.636805 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p75}$ (min)      | = | 23.8  |
| $t_{p25}$ (min)      | = | 177.6 |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 5.30E-06 |
|------------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP10 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time<br>(min) | Depth to water from ground level |      |
|-------|----------------------|----------------------------------|------|
|       |                      | (m)                              | (mm) |
| 13:07 | 0                    | 0.76                             | 760  |
| 13:08 | 1                    | 0.82                             | 820  |
| 13:09 | 2                    | 0.84                             | 840  |
| 13:10 | 3                    | 0.87                             | 870  |
| 13:11 | 4                    | 0.89                             | 890  |
| 13:12 | 5                    | 0.91                             | 910  |
| 13:17 | 10                   | 1.10                             | 1100 |
| 13:23 | 16                   | 1.36                             | 1360 |
| 13:40 | 33                   | 1.75                             | 1750 |
| 13:52 | 45                   | 1.87                             | 1870 |
| 14:07 | 60                   | 1.90                             | 1900 |
| 14:14 | 67                   | 1.99                             | 1990 |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |

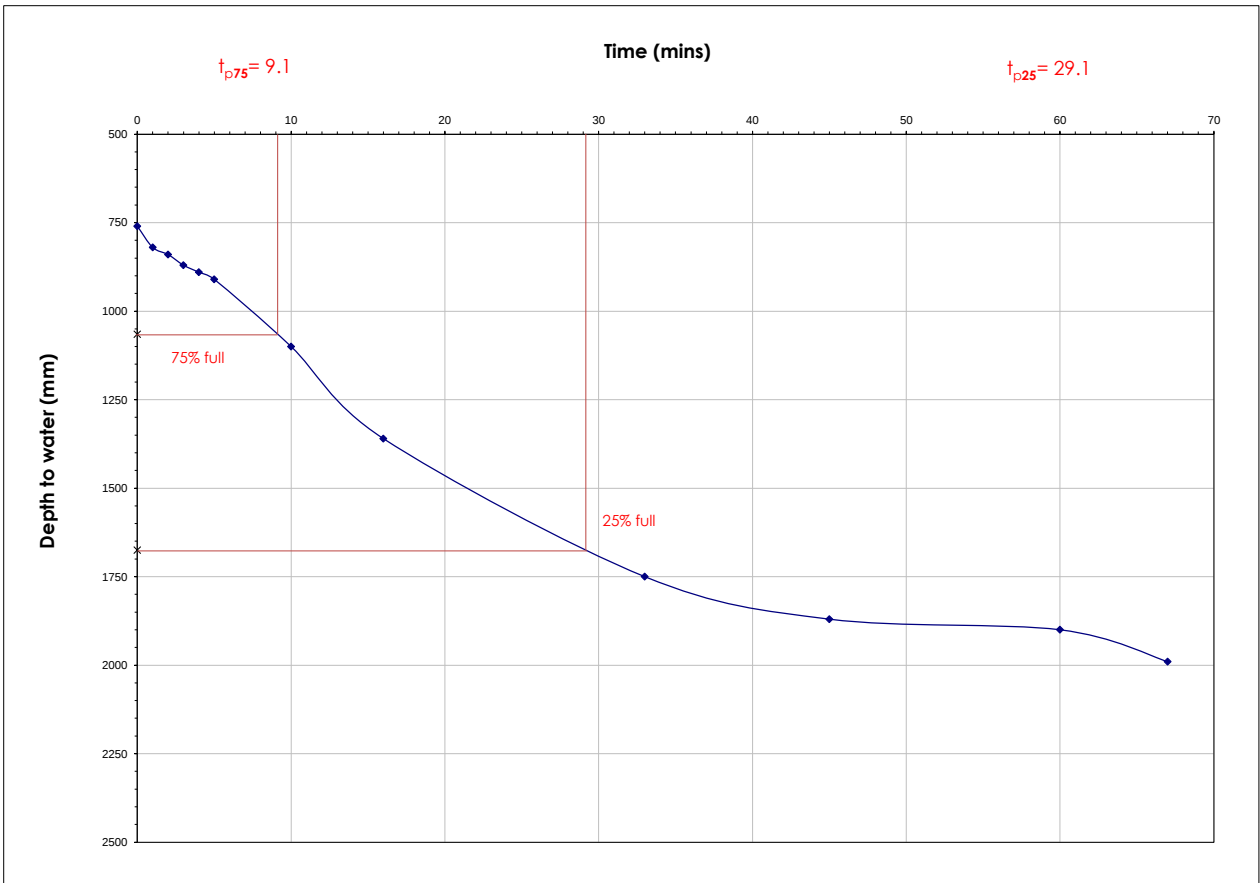
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.17 | 2170 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.98 | 1980 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1675 | 1.68 |
| 0.50                     | = | 1370 | 1.37 |
| 0.75                     | = | 1065 | 1.07 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 760  |
| Depth at end of test (mm)   | = | 1990 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.4539   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.9187   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.886879 |

| Read from the graph: |   |       |  |
|----------------------|---|-------|--|
| $t_{p75}$ (min)      | = | 9.10  |  |
| $t_{p25}$ (min)      | = | 29.10 |  |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 4.51E-05 |
|------------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP10 | WITH STONE |
| Test No.      | 2    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 14:21 | 0           | 0.70                             | 700  |
| 14:22 | 1           | 0.73                             | 730  |
| 14:23 | 2           | 0.75                             | 750  |
| 14:24 | 3           | 0.78                             | 780  |
| 14:25 | 4           | 0.79                             | 790  |
| 14:26 | 5           | 0.80                             | 800  |
| 14:31 | 10          | 0.84                             | 840  |
| 14:34 | 20          | 0.88                             | 880  |
| 14:43 | 30          | 0.98                             | 980  |
| 14:54 | 40          | 1.19                             | 1190 |
| 15:19 | 50          | 1.61                             | 1610 |
| 15:41 | 60          | 1.92                             | 1920 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

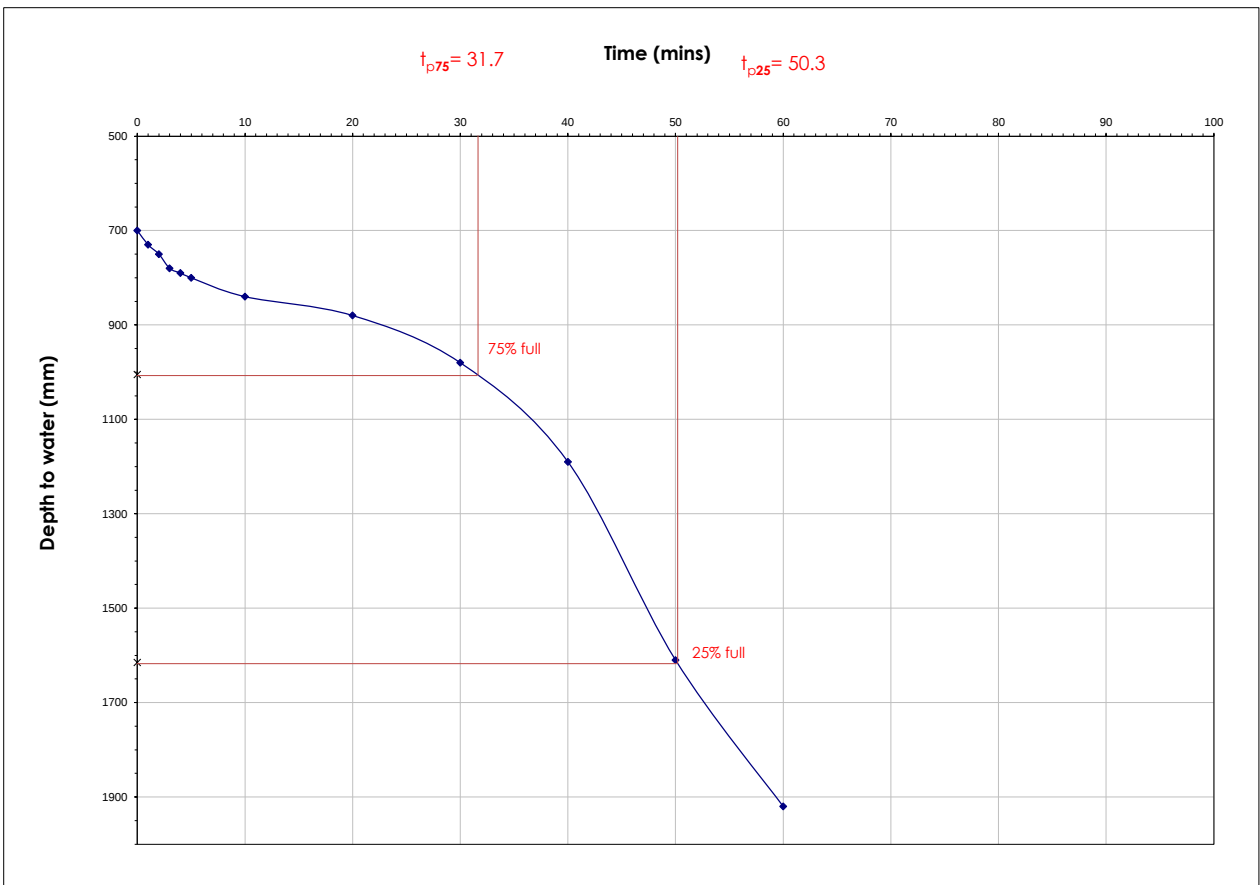
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.17 | 2170 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.92 | 1920 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1615 | 1.62 |
| 0.50                     | = | 1310 | 1.31 |
| 0.75                     | = | 1005 | 1.01 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 700  |
| Depth at end of test (mm)   | = | 1920 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.4539   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.9187   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.886879 |

| Read from the graph: |   |       |  |
|----------------------|---|-------|--|
| $t_{p75}$ (min)      | = | 31.70 |  |
| $t_{p25}$ (min)      | = | 50.30 |  |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 4.85E-05 |
|------------------------------------------------|



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|                      |             |                   |
|----------------------|-------------|-------------------|
| <b>Trial Pit No.</b> | <b>TP12</b> | <b>WITH STONE</b> |
| <b>Test No.</b>      | <b>1</b>    |                   |

[illegible]

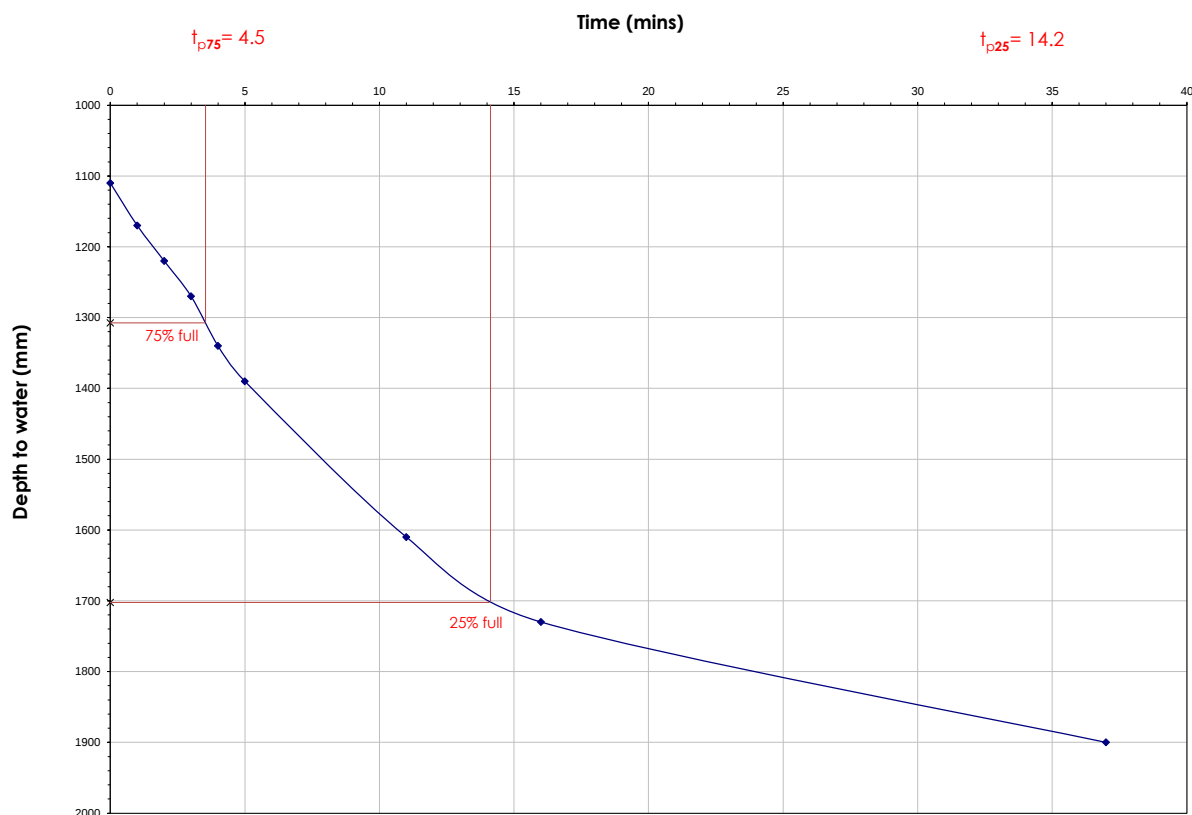
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.36 | 2360 |
| Width              | = | 0.72 | 720  |
| Depth              | = | 1.90 | 1900 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1702.5 | 1.70 |
| 0.50                     | = | 1505   | 1.51 |
| 0.75                     | = | 1307.5 | 1.31 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 1110 |
| Depth at end of test (mm)   | = | 1900 |

|                                                        |   |          |
|--------------------------------------------------------|---|----------|
| Base area of pit                                       | = | 1.6992   |
| C <sub>p50</sub> - 50% internal surface area inc. base | = | 4.1324   |
| V <sub>p75-25</sub> - Volume 75 - 25%                  | = | 0.671184 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p,75}$ (min)     | = | 4.50  |
| $t_{p,25}$ (min)     | = | 14.20 |



**Soil infiltration rate,  $f$ , (m/s) = 8.37E-05**



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|                      |             |                   |
|----------------------|-------------|-------------------|
| <b>Trial Pit No.</b> | <b>TP12</b> | <b>WITH STONE</b> |
| <b>Test No.</b>      | <b>2</b>    |                   |

[illegible]

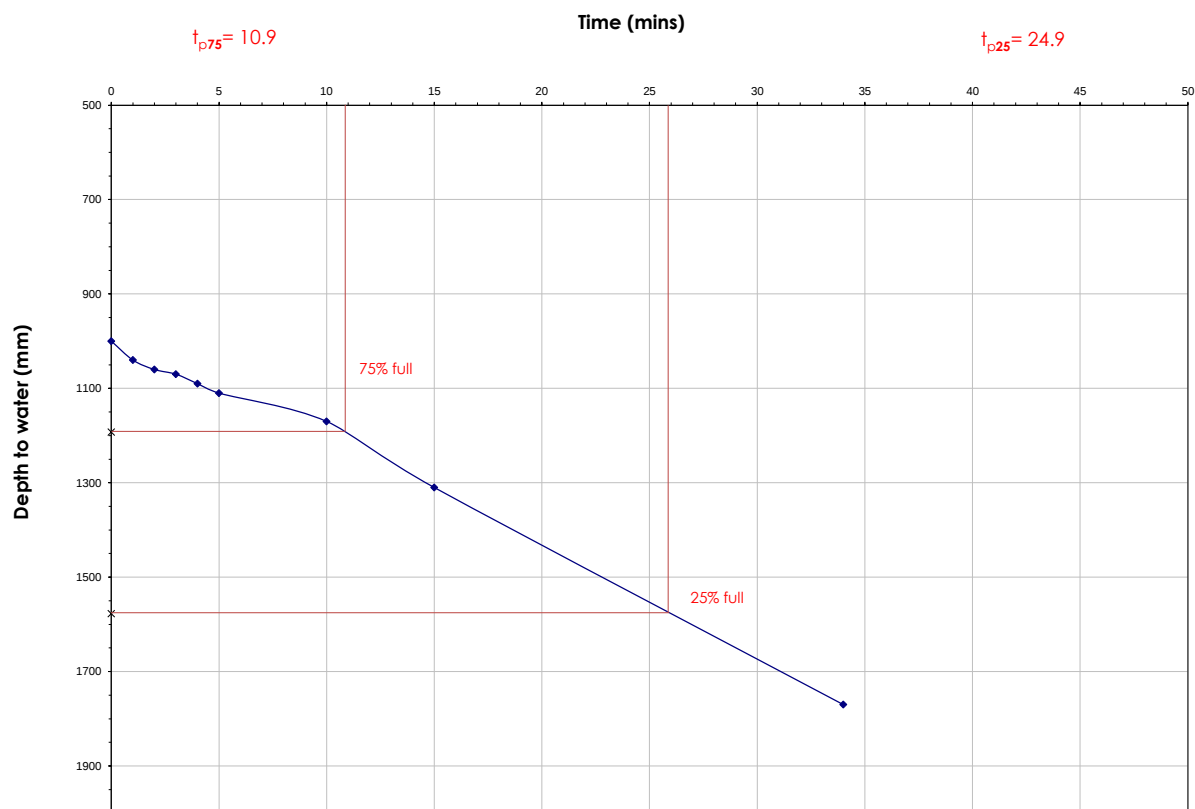
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.36 | 2360 |
| Width              | = | 0.72 | 720  |
| Depth              | = | 1.77 | 1770 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1577.5 | 1.58 |
| 0.50                     | = | 1385   | 1.39 |
| 0.75                     | = | 1192.5 | 1.19 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 1000 |
| Depth at end of test (mm)   | = | 1770 |

|                                                        |   |          |
|--------------------------------------------------------|---|----------|
| Base area of pit                                       | = | 1.6992   |
| C <sub>p50</sub> - 50% internal surface area inc. base | = | 4.0708   |
| V <sub>p75-25</sub> - Volume 75 - 25%                  | = | 0.654192 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p.75}$ (min)     | = | 10.90 |
| $t_{p.25}$ (min)     | = | 24.90 |



Soil infiltration rate,  $f$ , (m/s) = 5.74E-05

# SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |
|---------------|------|
| Trial Pit No. | TP13 |
| Test No.      | 1    |

| Time  | Elpsed Time<br>(min) | Depth to water from ground level |      |
|-------|----------------------|----------------------------------|------|
|       |                      | (m)                              | (mm) |
| 09:33 | 0                    | 0.80                             | 800  |
| 09:34 | 1                    | 0.83                             | 830  |
| 09:35 | 2                    | 0.84                             | 840  |
| 09:36 | 3                    | 0.86                             | 860  |
| 09:37 | 4                    | 0.87                             | 870  |
| 09:35 | 5                    | 0.88                             | 880  |
| 09:43 | 10                   | 0.93                             | 930  |
| 09:51 | 18                   | 0.99                             | 990  |
| 10:16 | 43                   | 1.27                             | 1270 |
| 10:36 | 63                   | 1.53                             | 1530 |
| 10:54 | 81                   | 1.79                             | 1790 |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |
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|       |                      |                                  |      |
|       |                      |                                  |      |
|       |                      |                                  |      |

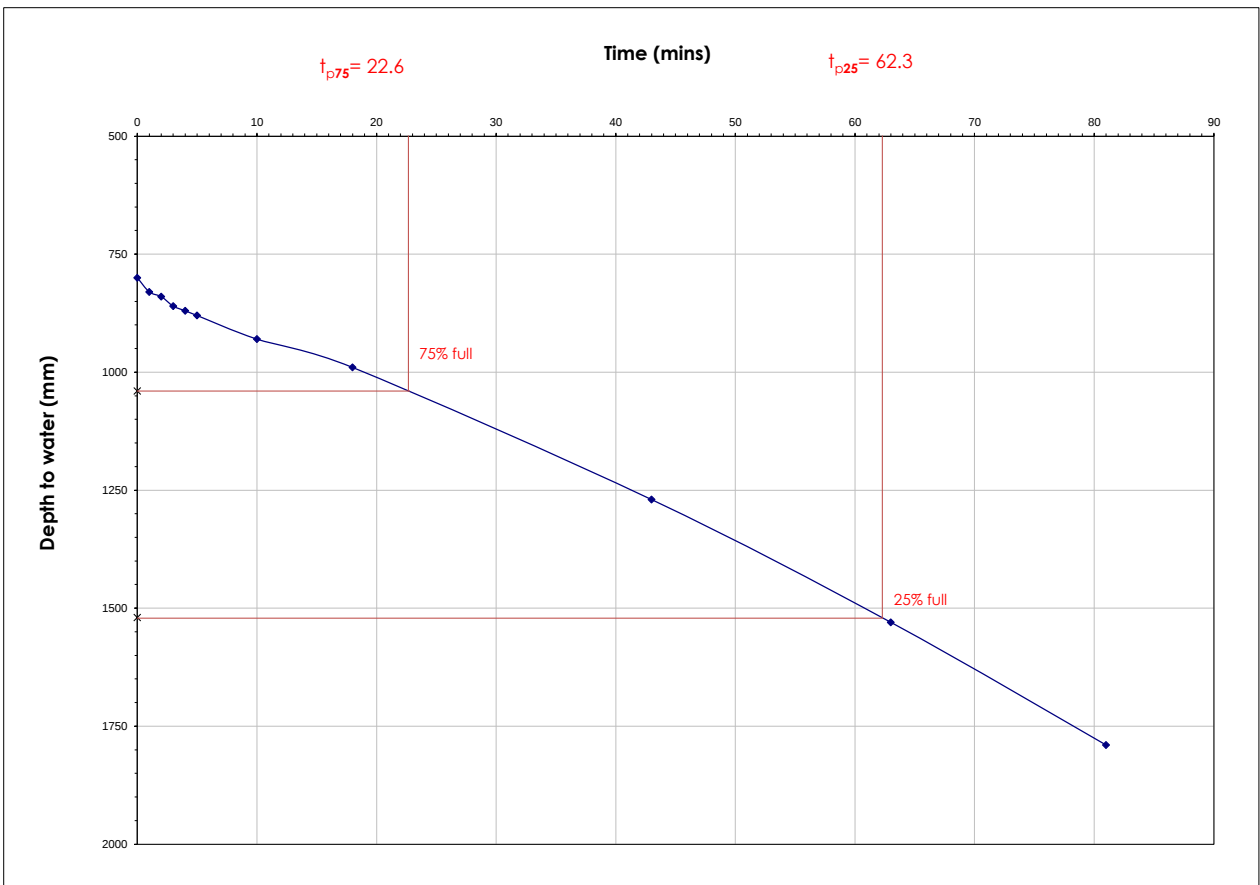
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.18 | 2180 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.76 | 1760 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1520 | 1.52 |
| 0.50                     | = | 1280 | 1.28 |
| 0.75                     | = | 1040 | 1.04 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 800  |
| Depth at end of test (mm)   | = | 1790 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.4606   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.1966   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.701088 |

| Read from the graph: |   |       |  |
|----------------------|---|-------|--|
| $t_{p75}$ (min)      | = | 22.60 |  |
| $t_{p25}$ (min)      | = | 62.30 |  |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 2.10E-05 |
|------------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP13 | WITH STONE |
| Test No.      | 2    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 11:08 | 0           | 0.71                             | 710  |
| 11:09 | 1           | 0.72                             | 720  |
| 11:10 | 2           | 0.74                             | 740  |
| 11:11 | 3           | 0.74                             | 740  |
| 11:12 | 4           | 0.75                             | 750  |
| 11:13 | 5           | 0.77                             | 770  |
| 11:18 | 10          | 0.79                             | 790  |
| 11:23 | 15          | 0.82                             | 820  |
| 11:31 | 23          | 0.87                             | 870  |
| 11:58 | 51          | 0.99                             | 990  |
| 12:26 | 78          | 1.13                             | 1130 |
| 12:49 | 101         | 1.39                             | 1390 |
| 13:16 | 128         | 1.60                             | 1600 |
| 13:35 | 147         | 1.69                             | 1690 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

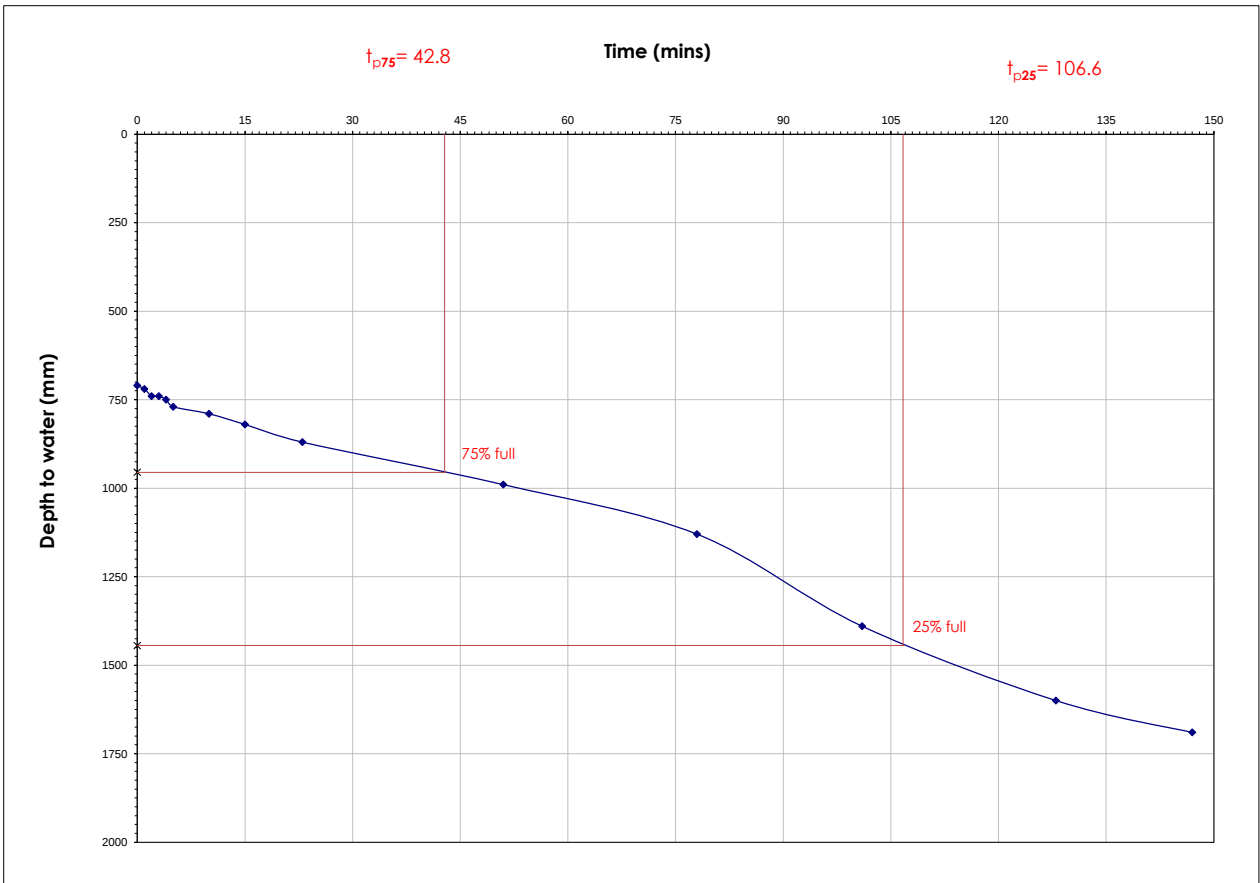
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.18 | 2180 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.69 | 1690 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1445 | 1.45 |
| 0.50                     | = | 1200 | 1.20 |
| 0.75                     | = | 955  | 0.96 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 710  |
| Depth at end of test (mm)   | = | 1690 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.4606   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.2536   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.715694 |

| Read from the graph: |   |        |  |
|----------------------|---|--------|--|
| $t_{p75}$ (min)      | = | 42.80  |  |
| $t_{p25}$ (min)      | = | 106.60 |  |



|                                       |          |
|---------------------------------------|----------|
| Soil infiltration rate, $f$ , (m/s) = | 1.32E-05 |
|---------------------------------------|----------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP16 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 10:40 | 0           | 0.52                             | 520  |
| 10:41 | 1           | 0.56                             | 560  |
| 10:42 | 2           | 0.59                             | 590  |
| 10:43 | 3           | 0.62                             | 620  |
| 10:44 | 4           | 0.63                             | 630  |
| 10:45 | 5           | 0.65                             | 650  |
| 10:50 | 10          | 0.71                             | 710  |
| 10:56 | 16          | 0.74                             | 740  |
| 11:16 | 36          | 0.86                             | 860  |
| 11:36 | 56          | 0.94                             | 940  |
| 12:01 | 81          | 1.00                             | 1000 |
| 12:23 | 103         | 1.06                             | 1060 |
| 12:47 | 127         | 1.10                             | 1100 |
| 13:13 | 153         | 1.13                             | 1130 |
| 13:30 | 170         | 1.17                             | 1170 |
| 14:30 | 230         | 1.27                             | 1270 |
| 14:45 | 245         | 1.31                             | 1310 |
| 14:58 | 258         | 1.33                             | 1330 |
| 15:05 | 265         | 1.35                             | 1350 |

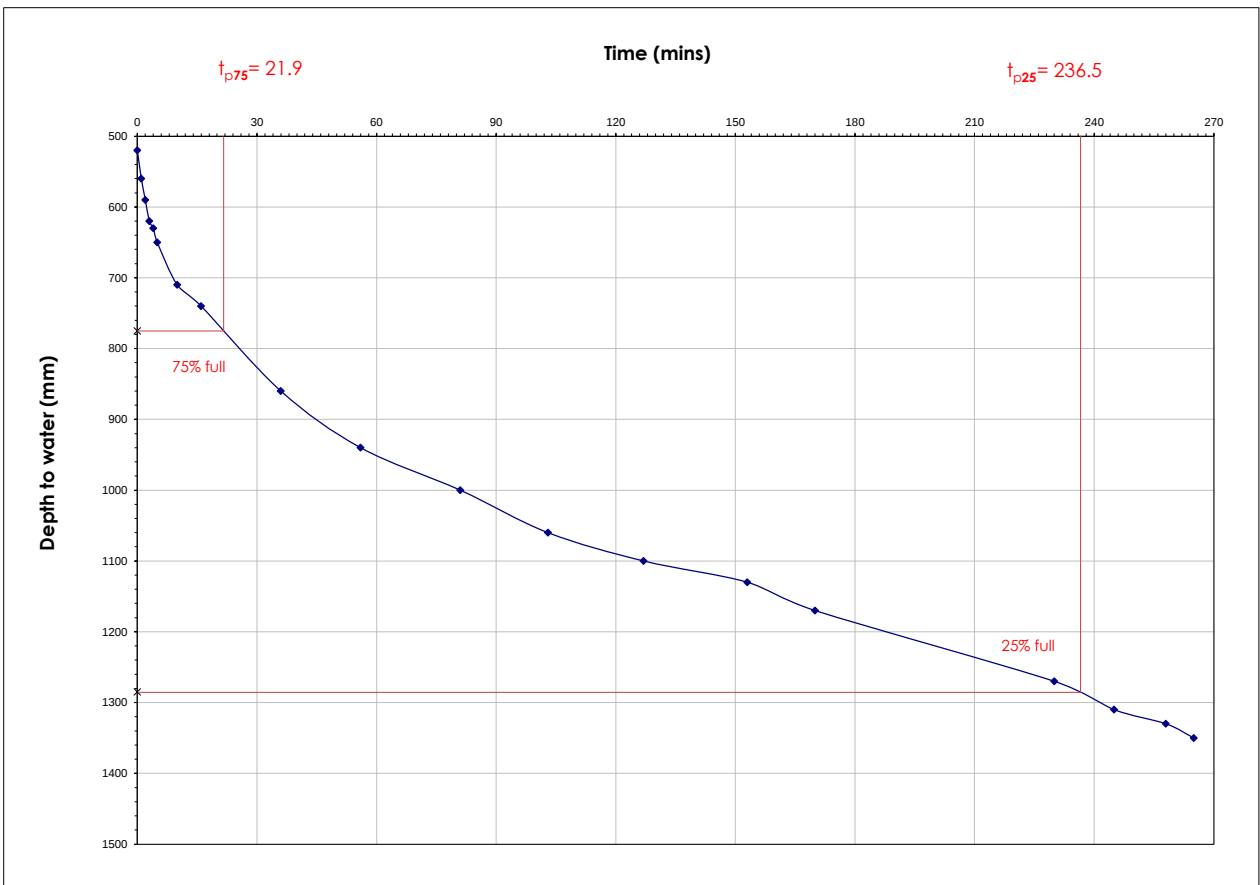
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 1.97 | 1970 |
| Width              | = | 0.69 | 690  |
| Depth              | = | 1.54 | 1540 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1285 | 1.29 |
| 0.50                     | = | 1030 | 1.03 |
| 0.75                     | = | 775  | 0.78 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 520  |
| Depth at end of test (mm)   | = | 1350 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.3593   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.0725   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.693243 |

| Read from the graph: |   |        |  |
|----------------------|---|--------|--|
| $t_{p75}$ (min)      | = | 21.90  |  |
| $t_{p25}$ (min)      | = | 236.50 |  |



|                                                |
|------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = 3.97E-06 |
|------------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP17 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 11:34 | 0           | 0.95                             | 950  |
| 11:35 | 1           | 0.98                             | 980  |
| 11:36 | 2           | 1.00                             | 1000 |
| 11:37 | 3           | 1.01                             | 1010 |
| 11:38 | 4           | 1.02                             | 1020 |
| 11:39 | 5           | 1.02                             | 1020 |
| 11:42 | 8           | 1.05                             | 1050 |
| 11:44 | 10          | 1.05                             | 1050 |
| 11:49 | 15          | 1.08                             | 1080 |
| 12:04 | 30          | 1.18                             | 1180 |
| 12:25 | 51          | 1.40                             | 1400 |
| 12:50 | 76          | 1.55                             | 1550 |
| 13:09 | 95          | 1.60                             | 1600 |
| 13:31 | 117         | 1.64                             | 1640 |
| 13:44 | 130         | 1.66                             | 1660 |
| 14:04 | 150         | 1.66                             | 1660 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

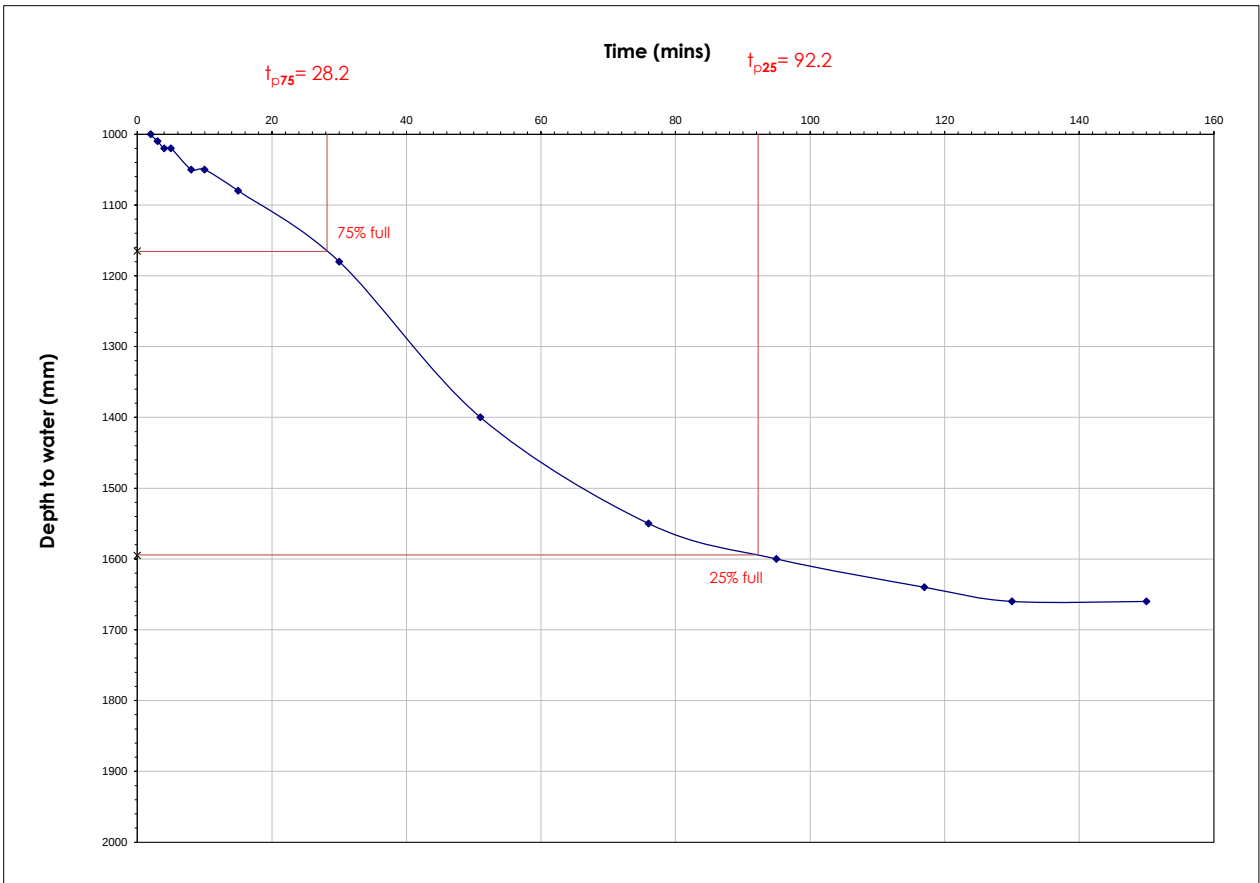
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.10 | 2100 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.81 | 1810 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1595 | 1.60 |
| 0.50                     | = | 1380 | 1.38 |
| 0.75                     | = | 1165 | 1.17 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 950  |
| Depth at end of test (mm)   | = | 1660 |

|                                                 |   |         |
|-------------------------------------------------|---|---------|
| Base area of pit                                | = | 1.407   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 3.7892  |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.60501 |

| Read from the graph: |   |       |
|----------------------|---|-------|
| $t_{p75}$ (min)      | = | 28.20 |
| $t_{p25}$ (min)      | = | 92.20 |



|                                                  |
|--------------------------------------------------|
| Soil infiltration rate, $f$ , (m/s) = $1.25E-05$ |
|--------------------------------------------------|

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP17 | WITH STONE |
| Test No.      | 2    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 14:10 | 0           | 0.77                             | 770  |
| 14:11 | 1           | 0.78                             | 780  |
| 14:12 | 2           | 0.79                             | 790  |
| 14:13 | 3           | 0.80                             | 800  |
| 14:14 | 4           | 0.81                             | 810  |
| 14:15 | 5           | 0.82                             | 820  |
| 14:20 | 10          | 0.85                             | 850  |
| 14:25 | 20          | 0.88                             | 880  |
| 14:40 | 30          | 0.94                             | 940  |
| 14:56 | 40          | 1.01                             | 1010 |
| 15:02 | 50          | 1.04                             | 1040 |
| 15:10 | 60          | 1.07                             | 1070 |
| 15:15 | 90          | 1.09                             | 1090 |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

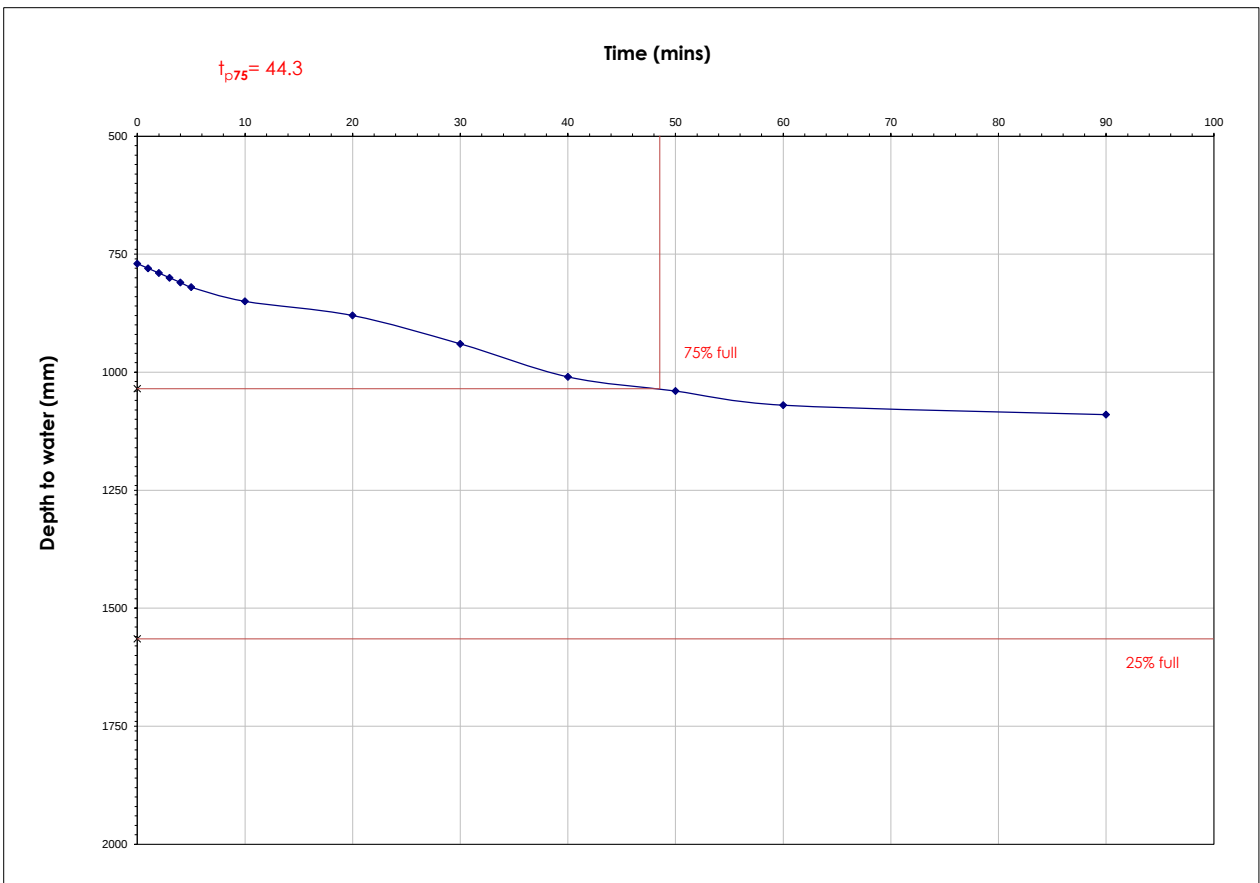
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 2.16 | 2160 |
| Width              | = | 0.67 | 670  |
| Depth              | = | 1.83 | 1830 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1565 | 1.57 |
| 0.50                     | = | 1300 | 1.30 |
| 0.75                     | = | 1035 | 1.04 |

|                             |   |      |
|-----------------------------|---|------|
| Depth at start of test (mm) | = | 770  |
| Depth at end of test (mm)   | = | 1090 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.4472   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 4.447    |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.767016 |

| Read from the graph: |   |  |
|----------------------|---|--|
| $t_{p75}$ (min)      | = |  |
| $t_{p25}$ (min)      | = |  |



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP20 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 12:11 | 0           | 0.74                             | 740  |
| 12:12 | 1           | 0.76                             | 760  |
| 12:13 | 2           | 0.76                             | 760  |
| 12:14 | 3           | 0.76                             | 760  |
| 12:15 | 4           | 0.76                             | 760  |
| 12:17 | 6           | 0.77                             | 770  |
| 12:38 | 31          | 0.78                             | 780  |
| 13:04 | 57          | 0.79                             | 790  |
| 13:21 | 74          | 0.80                             | 800  |
| 13:54 | 107         | 0.82                             | 820  |
| 14:30 | 143         | 0.82                             | 820  |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

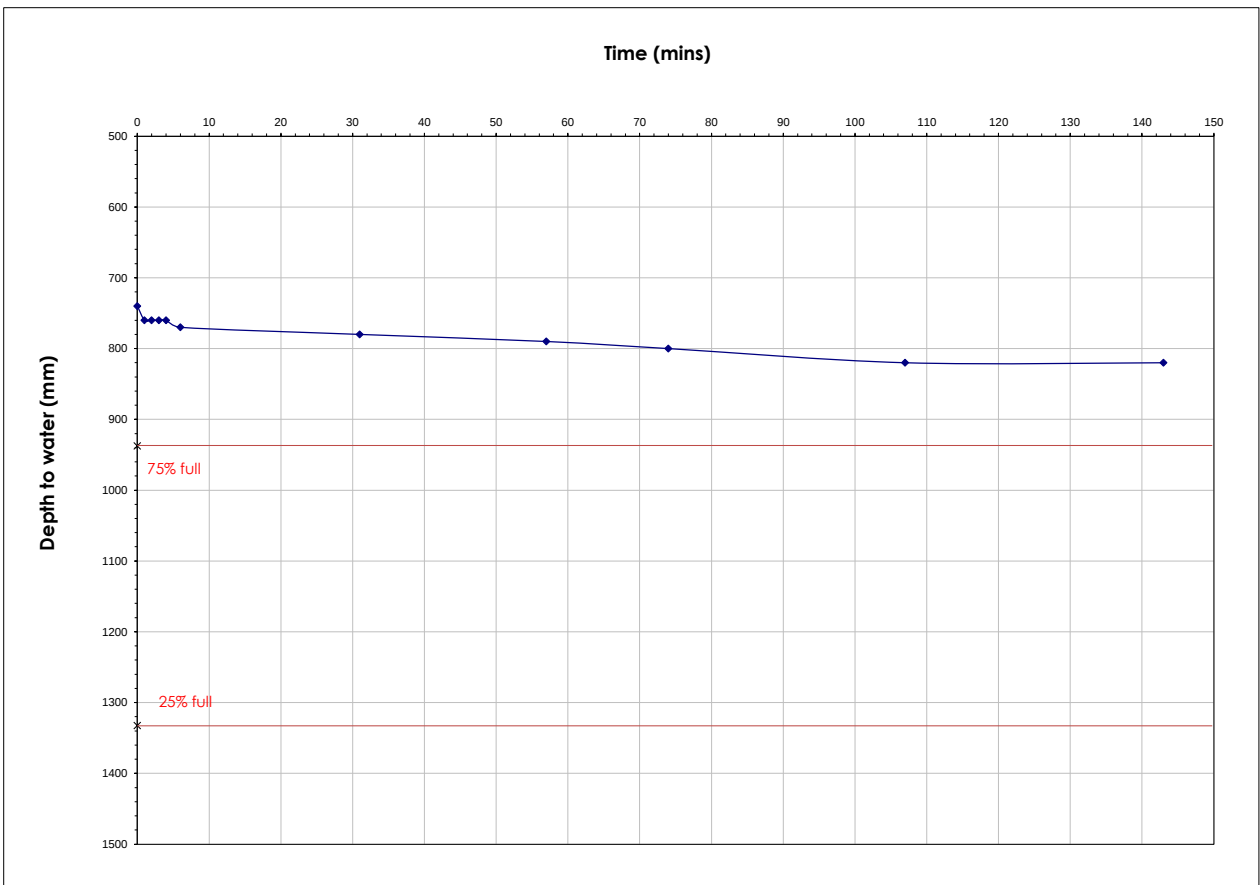
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 1.86 | 1860 |
| Width              | = | 0.62 | 620  |
| Depth              | = | 1.53 | 1530 |

| Effective Depth (% full) |   | (mm)   | (m)  |
|--------------------------|---|--------|------|
| 0.25                     | = | 1332.5 | 1.33 |
| 0.50                     | = | 1135   | 1.14 |
| 0.75                     | = | 937.5  | 0.94 |

|                             |   |     |
|-----------------------------|---|-----|
| Depth at start of test (mm) | = | 740 |
| Depth at end of test (mm)   | = | 820 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.1532   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 3.1124   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.455514 |

| Read from the graph: |   |  |
|----------------------|---|--|
| $t_{p75}$ (min)      | = |  |
| $t_{p25}$ (min)      | = |  |



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate

SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365: 1991

|           |                               |
|-----------|-------------------------------|
| Client:   | Procters                      |
| Job Name: | Field Lane, Thorpe Willoughby |
| Job No.:  | 2123                          |



|               |      |            |
|---------------|------|------------|
| Trial Pit No. | TP24 | WITH STONE |
| Test No.      | 1    |            |

| Time  | Elpsed Time | Depth to water from ground level |      |
|-------|-------------|----------------------------------|------|
|       | (min)       | (m)                              | (mm) |
| 12:49 | 0           | 0.58                             | 580  |
| 12:50 | 1           | 0.59                             | 590  |
| 12:51 | 2           | 0.60                             | 600  |
| 12:52 | 3           | 0.60                             | 600  |
| 12:53 | 4           | 0.60                             | 600  |
| 12:54 | 5           | 0.61                             | 610  |
| 12:58 | 9           | 0.62                             | 620  |
| 13:02 | 13          | 0.63                             | 630  |
| 13:19 | 30          | 0.67                             | 670  |
| 13:52 | 63          | 0.70                             | 700  |
| 14:33 | 104         | 0.71                             | 710  |
| 14:52 | 123         | 0.71                             | 710  |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |
|       |             |                                  |      |

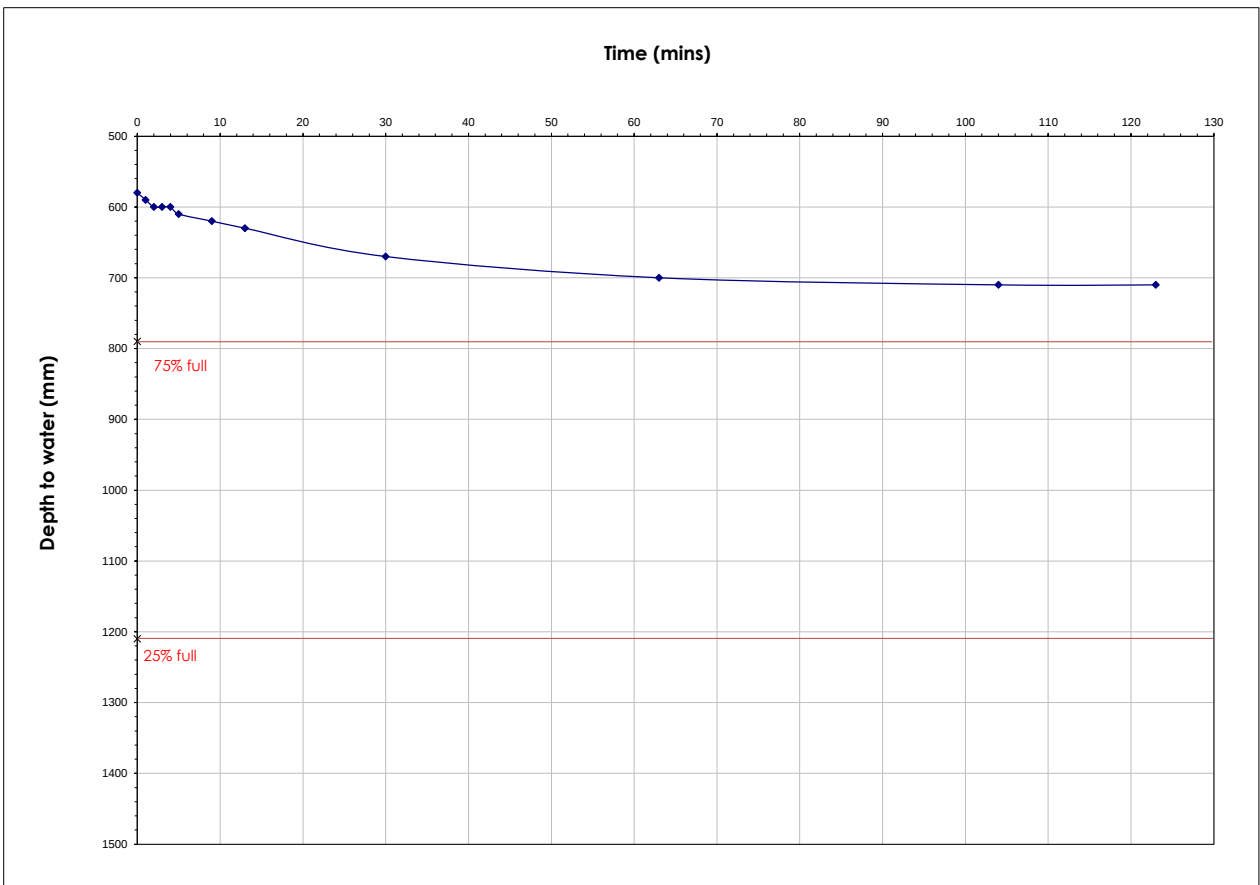
| SOAKAWAY TRIAL PIT |   |      |      |
|--------------------|---|------|------|
| Dimensions         |   | (m)  | (mm) |
| Length             | = | 1.83 | 1830 |
| Width              | = | 0.68 | 680  |
| Depth              | = | 1.42 | 1420 |

| Effective Depth (% full) |   | (mm) | (m)  |
|--------------------------|---|------|------|
| 0.25                     | = | 1210 | 1.21 |
| 0.50                     | = | 1000 | 1.00 |
| 0.75                     | = | 790  | 0.79 |

|                             |   |     |
|-----------------------------|---|-----|
| Depth at start of test (mm) | = | 580 |
| Depth at end of test (mm)   | = | 710 |

|                                                 |   |          |
|-------------------------------------------------|---|----------|
| Base area of pit                                | = | 1.2444   |
| $a_{p50}$ - 50% internal surface area inc. base | = | 3.3528   |
| $V_{p75-25}$ - Volume 75 - 25%                  | = | 0.522648 |

| Read from the graph: |   |  |
|----------------------|---|--|
| $t_{p75}$ (min)      | = |  |
| $t_{p25}$ (min)      | = |  |



Test did not attain 25% Effective depth. Unable to calculate soil infiltration rate