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SUB SURFACE
Site Investigation Specialists,
Geotechnical & Environmental Consultants

GROUND INVESTIGATION REPORT

FOR
FOOD ENTERPRISE ZONE,
PLOT 12,
HOLBEACH,
LINCOLNSHIRE,

PREPARED FOR
GLEEDS COST MANAGEMENT SERVICES LIMITED

REPORT NO. NE3989A
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SUB SURFACE NORTH EAST LIMITED
RCM Business Centre
Dewsbury Road
Ossett
West Yorkshire
WF5 9ND
Tel: (01924) 278181 Fax: (01924) 283455
Email: dsimpson@subsurface.co.uk
Website: www.subsurface.co.uk

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Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

GROUND INVESTIGATION FOR FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

CLIENT: GLEEDS COST MANAGEMENT SERVICES LIMITED

ENGINEER: COLLINS HALL GREEN LIMITED

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1. INTRODUCTION

This report has been prepared in accordance with an email instruction, dated 22nd October 2020, from the Client.

The brief was set out in our estimate, ref. E6796B and dated 19th October 2020, with amendments as the investigation proceeded and includes:

- 3 No. cable percussive boreholes
- 6 No. trial pits
- 2 No. soakaway tests
- Insitu testing
- Geotechnical laboratory testing
- Contamination analysis
- Installation of standpipes followed by groundwater and ground gas monitoring
- Provision of an interpretative report on the above.

AECOM have issued a Phase I Geo-environmental and Geotechnical Desk Study Report, Project No. 60550563 dated February 2019 and a Phase II Geo-Environmental and Geotechnical Assessment, Report No. 60550563/HOLB/003 dated September 2019 for all plots of the Food Enterprise Zone, which should be read in conjunction with this report.

1.1 Site Location and Description

The site is located at the Food Enterprise Zone, Plot 12, Holbeach, Lincolnshire, as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is 534718E, 325643N.

As shown on Figures 2 and 3, the irregular shaped site is accessed from a roundabout on the A151 and is bound by new access roads to the east and south, by a ploughed agricultural field to the west currently under construction and by a ploughed agricultural field to the north. At the time of the ground investigation the site comprises of a relatively flat ploughed agricultural field with sparse vegetation and a drainage ditch along parts of the western and southern boundaries. In the south west of the site was a contractor's compound, limiting the investigation in this area.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

1.2 Proposed Development and Purpose of the Ground Investigation

We understand that it is proposed to build a two-storey structure with associated parking facilities, as shown on Figure 3.

The purpose of the investigation was to determine the ground conditions at the positions of the exploratory holes, to assess the likelihood of a general pattern of strata being present below the site and to establish the load bearing characteristics of the strata deriving if possible, an assessment of the suitability of appropriate founding techniques.

Soakaway tests were required to determine the Soil Infiltration Rate and laboratory CBR tests were required to determine the CBR value of the near surface strata for the design and construction of the parking facilities.

In addition, a contamination analysis and assessment was required in order to determine necessary precautions and/or remedial measures required for the proposed development and to ascertain the need for any further sampling and analysis.

Ground gas monitoring and assessment was also required to determine necessary precautions and/or remedial measures.

2. INVESTIGATION

2.1 Investigation Details

Three 150mm diameter boreholes were put down by cable percussive boring techniques at the positions determined by the Clients Engineer and set out by Sub Surface North West Ltd, as shown on Figure 3. The boreholes were put down to depths of between 15.72 and 15.81 metres, samples taken were logged in accordance with BS EN ISO 14688-1: 2018 and the resulting Borehole Records are appended.

Six trial pits were taken out by a mechanical excavator at the positions determined and set out by Sub Surface North East Ltd, as shown on Figure 3. The trial pits were excavated to depths of between 2.00 and 3.20 metres, representative samples were taken and the materials were logged in accordance with BS EN ISO 14688-1: 2018. The resulting Trial Pit Records are appended. On completion the trial pits were backfilled with arisings with nominal compaction by the excavator and it is likely that loose or soft pockets will still remain.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

2.2 Sub Surface Detail

Details of the strata encountered in the ground investigation are given on the appended Borehole and Trial Pit Records. The exploratory holes generally found Topsoil to depths of 0.00m to 0.60m (Made Ground in TP2 to 0.30m), overlying Tidal Flat Deposits of soft very low strength to low strength brown slightly gravelly slightly sandy clayey silt with occasional bands and pockets of sand, overlying loose becoming very dense with depth brown slightly gravelly silty fine to medium sand. The depths of strata found were as follows:

TABLE 1 STRATA

Expl. Hole No.	Depth of Made Ground / Topsoil (m)	Depth of Cohesive Strata (m)	Depth of Granular Strata (m)	Depth of Hole (m)
BH1	0.20	0.20 – 2.00	2.00 - >15.80	15.80
BH2	-	0.00 – 3.00	3.00 - >15.81	15.81
BH3	-	0.00 – 5.50	5.50 - >15.72	15.72
TP1	0.45	0.45 - >2.00	-	2.00
TP2	0.60	0.60 – >2.90	-	2.90
TP3	0.30	0.30 – 1.40	1.40 – >3.20	3.20
TP4	0.30	0.30 – 0.90	0.90 - >2.50	2.50
TP5	0.30	0.30 - >2.40	-	2.40
TP6	0.30	0.30 – 1.70	1.70 - >2.10	2.10

BH = Borehole, TP = Trial Pit,

A general summary of the strata found is as follows:

2.2.1 Made Ground/Topsoil

Made Ground comprising of brown silty clay was recorded in TP2 to a depth of 0.30m. Most of the remaining exploratory holes recorded brown silty clay topsoil to depths of between 0.20m and 0.60m.

2.2.2 Superficial Deposits

Tidal Flat deposits underlay the site generally comprising of soft very low strength to low strength brown slightly gravelly slightly sandy clayey silt with occasional bands and pockets of sand, overlying loose becoming very dense with depth brown slightly gravelly silty fine to medium sand with occasional fragments of shell and in BH2 occasional bands of clayey silt. In addition, a small stratum of firm medium strength brown silty clay was recorded in TP1, TP2, TP3 and TP6 at the near surface.

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2.2.3 Bedrock

The West Walton Formation is anticipated beneath but was not recorded in the investigation. However, the Phase II Geo-Environmental and Geotechnical Assessment by AECOM recorded the West Walton Formation from depths of 15.00m comprising of soft to firm extremely closely fissured grey mottled yellowish brown slightly gravelly slightly sandy clay.

2.2.4 Groundwater

A summary of groundwater entries and levels are tabulated below:

TABLE 1 GROUNDWATER

Expl. Hole No.	Water Entry Depth (m)	Depth Sealed (m)	Depth to Standing Water Level (m)
BH1	5.90	Not Sealed	5.50*
BH2	6.50	Not Sealed	5.00*
BH3	6.30	Not Sealed	5.50*
TP1	1.90		1.60#
TP2	1.70		
TP6	2.00		1.65#

* after 20 minutes,
# on completion at 2.40m and 2.10m depth respectively

No groundwater was encountered in the remainder of the exploratory holes although the strata was damp in TP3, TP4 and TP5 from depths of 2.40m, 1.90m and 1.90m respectively. It should be noted that they were only left open for a short period of time and groundwater levels and rates of inflow and may be subject to seasonal and/ or climatic variations.

Monitoring of standpipes, installed in BH1, BH2 and BH3, between 6th November 2020 and 16th February 2021 found groundwater to be at 1.10m depth.

3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Small disturbed and bulk disturbed samples were obtained for the strata encountered and were subjected to careful examination and hand shear vane tests, where appropriate.

The samples will be retained for a period of one month after the issue of this report, for reference purposes, and then disposed of unless otherwise instructed.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

3.2 Field Testing

Seven hand shear vane tests were undertaken in the trial pits and the results are given on the appended Trial Pit Records.

Thirty-six Standard Penetration Tests (SPTs) were performed in the boreholes, the results of which are recorded on the appended Standard Penetration Test Results Sheet with 'N' values and indicative relative density and shear strength, where appropriate, given on the Borehole Records.

On completion of TP1 and TP6, soakaway tests were undertaken in brown silty clay, becoming clayey silty found in TP1 and brown clayey silt with bands of sand and brown fine sand found in TP6. Water was added to the pits from a bowser and water levels were subsequently monitored over a period of four hours. Water levels were found to have fallen insufficiently to determine the Soil Infiltration Rates and details of the soakaway tests are appended.

3.3 Installations and Monitoring

On completion of BH1, BH2 and BH3, hdpe standpipes were installed to depths of 5.00 metres respectively. The standpipes are slotted from 1.00 metres depth, have an internal diameter of 50mm and have removable quick release gas valves to enable both ground gas and groundwater monitoring and sampling to be undertaken. Details of the installations are given on the Borehole Records.

Monitoring of the standpipes for ground gas and groundwater has been undertaken on six scheduled occasions using portable equipment. A Gas Data GFM 435 was used for monitoring methane, carbon dioxide, oxygen, gas flows and atmospheric pressure. The results of the monitoring is given on the appended Ground Gas and Groundwater Monitoring Results sheet.

3.4 Laboratory Testing

The following laboratory tests were carried out in accordance with BS.1377: 1990, where applicable, and the results are appended.

- Moisture content, plastic limit and liquid limit tests
- Particle size distribution by wet sieve analysis
- California Bearing Ratio tests on samples remoulded at natural moisture content
- Soluble sulphate content and pH value tests (including pyritic ground testing).

Contamination analyses have been performed on seven soil samples to determine: pH and concentrations of sulphate, sulphide, cyanide, arsenic, boron (soluble), cadmium, chromium, hexavalent chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, speciated total petroleum hydrocarbons (TPHs), the speciated polynuclear aromatic hydrocarbons (PAHs) suite, the benzene/ ethylbenzene/ toluene/ xylene (BTEX) suite and phenols. In addition, two soil samples were subjected to an asbestos screen.

Waste Acceptance Criteria (WAC) analysis has also been undertaken on two soil samples.

The results of the above analyses are appended.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

4. APPRAISAL AND RECOMMENDATIONS

4.1 Comments on the Profile

At the outset it should be appreciated that only a small proportion of the area to be developed has been investigated and consequently the recommendations made and opinions expressed in this report can only be applied to such conditions as were encountered in the exploratory holes.

The exploratory holes indicate a nature and degree of similarity to the extent that we consider them likely to be representative of the natural ground conditions. However, whilst the exploratory holes indicate a degree of similarity they should not be interpolated or extrapolated to represent the ground conditions in adjacent areas.

Due to the site having been previously developed, and the nature of Made Ground, localised variations in thickness and composition should be anticipated and hence interpolation or extrapolation from the exploratory holes to adjoining areas should only be undertaken with caution.

Details of the findings of the investigation are given on the appended Borehole and Trial Pit Records and a summary of the ground conditions is given in Section 2.2.

4.2 Foundations

We understand that it is proposed to build a two-storey structure with associated parking facilities, as shown on Figure 3. However, at the time of writing this report no specific details regarding the proposed foundations and design loadings were available and consequently the recommendations given are in general terms only.

The ground investigation generally found Topsoil to depths of 0.00m to 0.60m (Made Ground in TP2 to 0.30m), overlying Tidal Flat Deposits of soft very low strength to low strength brown slightly gravelly slightly sandy clayey silt with occasional bands and pockets of sand, overlying loose becoming very dense with depth brown slightly gravelly silty fine to medium sand.

We would not recommend founding in the Made Ground in its present condition because of its inherent variability in consistency and compaction, and in parts the nature of its constituents.

Taking the results of the field tests, we have determined the safe bearing capacity of the natural strata, as follows:

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

TABLE 1 SAFE BEARING CAPACITY

Expl Hole No.	Depth (m)	SPT 'N' Value	Shear Strength (kN/m^2)	Safe Bearing Pressure (kN/m^2)	
				Strip Footing	Square Pad
BH1	1.35	7	28	50	60
	2.15	7	-	65	65
	3.15	11	-	110**	110**
	4.15	13	-	140**	140**
BH2	1.35	3	12	20	25
	2.15	6	24	45	55
	3.15	9	-	85**	85**
	4.15	12	-	125**	125**
BH3	1.35	7	28	50*	60*
	2.15	6	24	45	55
	3.15	10	40	75	90
	4.15	12	48	90	105

* Consideration must be given to weaker underlying strata which might be overstressed if loading is not reduced.

** For footings on granular strata, the safe bearing capacity given is based upon a footing width of less than 1.50 metres. For wider footings a reduction would be necessary.

In view of the relatively low safe bearing pressures determined above, the high-water levels and major collapses of the excavation sides; shallow foundations in natural ground are not feasible and hence alternative foundations need to be considered. Due to the high-water levels and silt present on site, ground improvement by vibroflotation with shallow reinforced foundations would not be suitable for the site as it may cause liquefaction. Therefore, we would recommend the structure is built using pile foundations.

With regard to the choice of pile type, consideration could be given to driven piles, continuous flight auger (CFA) piles or cast in-situ bored piles with the driven pile option probably being the most economical. However, in considering piles driven to a pre-determined set in the more competent strata at depth, it is essential to ensure that any vibrations set up during the driving process are not transmitted to adjacent/ nearby buildings, structures, services and/or slopes/ retaining walls as they may be detrimentally affected. Consequently, in respect of driven piles, we recommend that any tendering Specialist Piling Contractor confirm that vibrations will not detrimentally affect adjacent/ nearby buildings, structures, services and/or slopes/ retaining walls. If such confirmation cannot be given then we would recommend using either CFA or cast in-situ bored piles. When considering the type of pile to use, it should be noted that due to hydrostatic pressure, the sand strata blew up the casing below depths of 6.50m and chiselling techniques were required to penetrate the very dense sand in BH1, BH2 and BH3 from 15.00m.

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Care must be taken to space the piles in any group to ensure the adequate utilisation of skin friction where this has been assumed in the calculation of the load bearing capacity of an individual pile. Checks must also be undertaken to confirm that the underlying ground supporting the pile group is not overstressed.

In determining the final pile design, it should be noted that up to 3.00m metre of the piles will be in topsoil/Made Ground, soft very low strength and low strength silt and due regard should be paid to the lack of lateral restraint over this length in cases where significant lateral forces are to be catered for.

To provide assistance for estimating purposes only, we have undertaken a preliminary pile design calculation for a 12.00m long pile taking into consideration the ground conditions at BH2, as follows:

Preliminary Pile Design based on strata in BH2 (water at 1.70m)

Bored Cast In-situ or CFA Pile Factor of Safety: 2.5 (shaft), 3.0 (end)
Dia. = 0.30m, Perimeter = 0.94m, Cross Section Area = 0.07m^2, Length = 12.00m

0.00 to 3.00m	Soft very low to low strength SILT	ignore
3.00 to 12.00m	Loose to dense silty fine to medium SAND	($\bar{N}$ = 19)
	Allowable Shaft Friction	= 14.3 kN/m^2
	Allowable Shaft Friction Load	= 120 kN
12.00m	Dense silty fine to medium SAND	(N = 35)
	Allowable End Bearing	= 764 kN/m^2
	Allowable End Bearing Load	= 53kN

Total Allowable Working Load = 120 + 53 = 173kN

The ground investigation recorded sand to depths of >15.72m and >15.81m, however clay is anticipated directly below the sand as clay was recorded from 15.00m in the Phase II Geo-Environmental and Geotechnical Assessment by AECOM. Sand has a much larger end bearing capacity than clay and checks should be made to ensure that the clay is not within influencing distance (usually around 10D), otherwise a reduction in end bearing would be required.

In order to use the load carrying capacity attributable to both shaft friction and end bearing, the final design figures should be checked to ensure that the ultimate shaft friction is greater than or equal to the allowable working load, otherwise end bearing only should be used.

In order to use the full load carrying capacity attributable to end bearing for bored cast in-situ piles either base ramming should be carried out or settled debris should be removed.

To formulate the most satisfactory and economic scheme we suggest that competitive tenders and designs from Specialist Piling Contractors should be sought using the borehole information obtained.

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Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

4.3 Floor Slab Construction

With regard to the design and construction of floor slabs we would recommend the removal of any topsoil and/or Made Ground and the level brought up as required using a graded granular hardcore placed and compacted in layers of not greater than 150mm followed by the construction of a reinforced concrete ground bearing floor slab.

4.4 Excavations and Groundwater

There should be no particular difficulties in excavating the strata indicated in the exploratory holes utilising an appropriate and suitably sized mechanical excavator.

The trial pit sides were found to have variable stability during the relatively short period that they were left open and unsupported with major collapse recorded in TP2, TP3, TP4 and TP5 below 1.70m, 1.70m, 1.00m and 1.90m, and partial collapse in TP6 below 1.20m.

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level, are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle.

Groundwater inflows and levels are given in Section 2.2.4.

Monitoring of standpipes, installed in BH1, BH2 and BH3, between 6th November 2020 and 16th February 2021 found groundwater to be at 1.10m depth.

Where groundwater is encountered to about 1.60 metres depth and accumulates in open excavations it is considered that it should be able to be removed by pumping from a filtered sump. Below, the water table more sophisticated dewatering measures may be required.

Care will need to be taken when reducing groundwater levels to ensure that adjoining/ nearby buildings, structures and services are not affected.

On completion of TP1 and TP6, soakaway tests were undertaken in brown silty clay, becoming clayey silty found in TP1 and brown clayey silt with bands of sand and brown fine sand found in TP6. Water was added to the pits from a bowser and water levels were subsequently monitored over a period of four hours. Water levels were found to have fallen insufficiently to determine the Soil Infiltration Rates and details of the soakaway tests are appended.

4.5 Buried Concrete

For the design of buried concrete the recommendations given in Building Research Establishment (BRE) Special Digest 1 (February 2017 revision), “Concrete in Aggressive Ground”, should be followed.

4.5.1 Tidal Flat Deposits

The three boreholes terminated in the very dense sand (Tidal Flat Deposits) at depths of 15.72m, 15.80m and 15.81m. Determination of pH on the soil samples from the three boreholes gave values in the range of 8.1 to 8.8 (slightly alkaline).

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RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

Soluble sulphate concentrations were also determined for the soil samples encountered within the three boreholes and the results ranged from <0.01 to 0.02 g/l. In view of the potential for pyritic ground, total sulphate, total sulphur, magnesium, chloride, nitrate and ammonia have been determined for three samples and the results were 0.02-0.03 %, 0.01-0.02 %, <10-10 mg/l, <10-13 mg/l, <10 mg/l and <10 mg/l respectively. Our calculations have determined that pyrite (sulphides), which might weather and produce higher levels of sulphates, are not present in the Tidal Flat Deposits. The results indicate that the Design Sulphate Class for the Tidal Flats Deposits should be DS-1.

Our knowledge of the site and ground conditions indicates that the site is "greenfield" with potentially mobile groundwater. Consequently, in accordance with the Design Sulphate Class for the site together with the site and groundwater conditions an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1 should be used, as detailed on the appended extract to a depth of say 14m.

4.5.2 West Walton Formation

The West Walton formation was not recorded in the three boreholes, however, the Phase II Geo-Environmental and Geotechnical Assessment by AECOM recorded the weathered West Walton Formation from depths of 15.00m. The results indicated that the West Walton Formation should have a Design Sulphate Class of DS-4. The West Walton Formation was recorded as potentially pyritic and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-4. Therefore, in our opinion, if piles are likely to progress deeper than say 14m, these classifications should be used.

4.6 Roads, Hardstandings and Car Parks

Laboratory California Bearing Ratio (CBR) tests have been undertaken on samples of clay and silt recompacted at their natural moisture content and the results of the tests are appended. A summary of the laboratory CBR test results is as follows:

TABLE 2 CBR RESULTS

Expl. Hole No.	Depth (m)	Dry Density (Mg/m^3)	Moisture Content (%)	CBR Value (%)	Sample
TP1	0.45	1.71	18	1.5	Firm medium strength brown silty CLAY.
TP5	0.45	1.63	20	1.4	Brown clayey SILT.
TP6	0.45	1.76	18	2.8	Firm medium strength brown silty CLAY.

It should be noted that the above values are moisture dependent and it is possible that the CBR values would reduce with increased moisture content; this being particularly so for cohesive strata.

Given the above, it would be advisable to design on a CBR value of 1.4% for the parking facilities where they are found at formation level. If there is to be a delay before construction, to prevent water softening, loosening and disturbance, the formation strata should not be exposed.

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RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

We recommend that following earthworks to form the final formation levels for the proposed parking facilities, proof rolling and additional insitu CBRs should be undertaken. A review of the design CBR values should then be undertaken before finalising the pavement design. Due to the low CBR values, consideration may need to be given to providing a geotextile membrane within the formation or cement/lime stabilisation carried out.

4.7 Contamination Considerations

AECOM have issued a Phase I Geo-environmental and Geotechnical Desk Study Report, Project No. 60550563 dated February 2019 and a Phase II Geo-Environmental and Geotechnical Assessment, Report No. 60550563/HOLB/003 dated September 2019 for the full Food Enterprise Zone area. This site-specific Phase II ground investigation has been undertaken to provide a contamination risk assessment in accordance with the Phase I and updated Phase 2 Conceptual Ground Model which categorised the site as very low to low risk. Based upon the findings of the above additional sampling, analysis and assessment may be required.

It should be appreciated that the suite of determinants analysed for consists of a range of contaminants identified in the Conceptual Ground Model. However, the absence of any other specific contaminants cannot be guaranteed.

4.7.1 Assessment (Soil)

In order to provide an assessment of the presence of contamination seven soil samples have been analysed for a suite of determinants and the results are appended.

Levels of the determinants have been compared against the most recently published guideline values. Contaminated Land: Applications in Real Environments (CL:AIRE) published guideline values in December 2009 to supplement previous guideline values. The Department for Environment, Food and Rural Affairs (DEFRA) published in March 2014 Category 4 Screening Levels (C4SLs) for arsenic, cadmium, lead, hexavalent chromium, benzo(a)pyrene and benzene. Land Quality Management Limited (LQM)/ Chartered Institute of Environmental Health (CIEH) then published Suitable for Use Levels (S4ULs) in November 2014, which largely superseded the previous guideline values. Updated S4ULs values for cadmium and phenols were published in July 2015 and for nickel in August 2015. The guideline values (S4ULs and occasionally C4SLs and CL:AIRE) are derived using the Environment Agency's CLEA Model and vary dependent upon the land use; allotment and residential use being the most sensitive and commercial/ industrial use being the least sensitive.

For the purposes of assessment, as the proposed development is commercial building, contamination analyses have been compared with the guideline values for a standard land use of commercial and industrial.

The contamination analysis determined no elevated levels of the determinants analysed for when compared with the guideline values for a standard land use of commercial and industrial. Guideline values for the assessment can be supplied directly to the Regulator, if requested.

An asbestos screen was undertaken on two soil samples and no asbestos was detected.

The results of the Waste Acceptance Criteria (WAC) analysis is also appended.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

In addition to the above, an assessment of risk to personnel who will come into contact with on-site materials throughout the site has been undertaken.

4.7.2 Conclusions and Recommendations

Section 78a(2) of the Environmental Protection Act: 1990 as amended by the Contaminated Land (England) (Amendment) regulations 2012, and Section 86 of the Water Act 2003, defines CONTAMINATED LAND for the purposes of Part IIA as:

"any land which appears to the LOCAL AUTHORITY in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

(a) SIGNIFICANT HARM is being caused or there is a SIGNIFICANT POSSIBILITY of such harm being caused; or
(b) SIGNIFICANT POLLUTION OF CONTROLLED WATERS is being, or is likely to be, caused"

Before a LOCAL AUTHORITY can make the judgement that land appears to be CONTAMINATED LAND on the basis that SIGNIFICANT HARM is being caused, or that there is a SIGNIFICANT POSSIBILITY of such harm being caused, the LOCAL AUTHORITY must identify a SIGNIFICANT POLLUTANT LINKAGE. This means that each of the following has to be identified:

(a) a CONTAMINANT;
(b) a relevant RECEPTOR (defined as living organisms, ecological systems, controlled waters or property); and
(c) a PATHWAY by means of which either:
  (i) the CONTAMINANT is causing SIGNIFICANT HARM to that RECEPTOR, or
  (ii) there is a SIGNIFICANT POSSIBILITY of such harm being caused by that CONTAMINANT to that RECEPTOR

It should be noted that the words in capitals have a legal definition within the legislation.

Without a clear identification of all three elements of the pollutant linkage, land cannot be identified as contaminated under the regime.

The National Planning Policy Framework states that, "after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990". Therefore, the general principles detailed above apply to this assessment.

Our assessment, based on seven soil samples, indicates that there are no contaminants requiring remediation and/or precautions to be taken for the proposed development.

If waste materials are to be removed from the site, classification of the waste should be undertaken to determine the most appropriate tip to use and the associated costs. It should be noted that significant cost savings can sometimes be made on waste disposal by correct classification of the waste, a service that we can provide.

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RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

S4ULs, C4SLs and CL:AIRE assume long term contact with contamination and assess chronic health risk. The risk of short term acute exposure to site personnel is dealt with in the remit of the Health and Safety Executive under the Health and Safety at Work Act: 1974 and Regulations made under the Act, including the Control of Substances Hazardous to Health (COSHH) Regulations. The levels of contamination and risk to site personnel should be considered under the Construction Design and Management (CDM) Regulations at the planning stage and in the development of the designers and contractors Health and Safety Plans and Method Statements. The risk of contact with on-site soils should be minimised and the following precautions should be taken as a minimum requirement.

As good practice, site personnel involved in earthworks and excavations should wear gloves, overalls, and boots and smoking should be prohibited.

4.8 Ground Gas Considerations

Ground gas monitoring has been undertaken on six scheduled occasions and the results of the monitoring visits are appended.

Ground gases: methane, carbon dioxide and oxygen and flow rate have been monitored and the ranges of ground gases and flow rate during the monitoring period are as follows:

TABLE 3 GROUND GAS CONCENTRATIONS AND FLOW RATE

Methane (% vol. In air)	Carbon Dioxide (% vol. in air)	Oxygen (% vol. in air)	Gas Flow Rate (litres/ hour)
0.0	0.2 – 6.4*	20.8 – 7.5**	<0.1 – 1.3

* Phase II Geo-Environmental and Geotechnical Assessment by AECOM recorded carbon dioxide up to 18.2% on site (BH1)

** Phase II Geo-Environmental and Geotechnical Assessment by AECOM recorded oxygen levels as low as 1.1% on site (BH1)

It can be seen from the monitoring that no elevated levels of methane have been detected. However, elevated levels of carbon dioxide, depleted levels of associated oxygen and gas flows have been detected in BH1, BH2 and BH3 on occasions, and in BH1 of the Phase II Geo-Environmental and Geotechnical Assessment by AECOM.

Methane gas when present between 5% volume in air (Lower Explosive Limit - L.E.L.) and 15% volume in air (Upper Explosive Limit - U.E.L.) is potentially explosive and inflammable whilst carbon dioxide in conjunction with depleted oxygen is an asphyxiant. Both methane and carbon dioxide are a by-product of the anaerobic and aerobic decomposition of biodegradable materials.

The levels of gas have been assessed in accordance with British Standard 8485, “Code of practice for the design of protective measures for methane and carbon dioxide gasses for new buildings”, published in June 2015 and updated in January 2019 (BS.8485:2015+A1:2019).

The characteristic hazardous gas flow rate (Q_{hgs}) is calculated by dividing the maximum gas (methane or carbon dioxide) concentration by 100 and multiplying by the maximum flow rate in litres per hour (minimum 0.1 l/hr for Sub Surface monitoring equipment). For this site Q_{hgs} = [18.2 / 100] x 1.3 = 0.237 l/hr.

Based on the monitoring to date, BS.8485:2015+A1:2019, Table 2, indicates that the site falls into Characteristic Situation 2 (CS2). BS.8485:2015+A1:2019, Table 4, indicates that for a CS2 and the type of development proposed (Type C), a score of 2.5 gives the level of protection and remedial measures required.

BS.8485:2015+A1:2019 Tables 5, 6 and 7 indicate that a combination of the following protection and remedial measures should be considered to achieve the required score:

Table 5.1 precast suspended segmental sub-floor slab (block and beam).
(Score 0.0)

Table 5.2 cast in-situ ground bearing floor slab (nominal mesh reinforcement).
(Score 0.5)

Table 5.3 reinforced cast in-situ monolithic ground bearing floor slab with minimal penetrations.
(Score 1.0)

Table 5.4 additionally reinforced cast in-situ monolithic ground bearing floor slab with minimal penetrations – slab of minimum 150mm thickness with reinforcement at the bottom and the top
(Score 1.5)

……

Table 6.1 pressure relief pathway (low fines gravel blanket/ thin geocomposite blanket/ strips terminating in gravel trench external to the building)
(Score 0.5)

Table 6.2 passive sub floor ventilation/ dispersal layer (clear void/ polystyrene void former/ geocomposite void former/ no fines gravel layer with gas drains/ no fines gravel layer) of very good performance.
(Score 2.5)

Table 6.3 passive sub floor ventilation/ dispersal layer (clear void/ polystyrene void former/ geocomposite void former/ no fines gravel layer with gas drains/ no fines gravel layer) of good performance.
(Score 1.5)

……

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Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

Table 7 gas resistant membrane meeting the following criteria:

- sufficiently impervious to gases with a methane gas transmission rate of <40.0 ml/day/m^2/atm (average) for sheets and joints (tested in accordance with BS.ISO.15105-1 manometric method).
- sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions.
- sufficiently strong to withstand in-service stresses due to say settlement if placed below a floor slab.
- sufficiently strong to withstand the installation process and following trades (penetration from steel fibres in fibre reinforced concrete/ penetration from reinforcement ties/ tearing due to working above it or dropped tools) until covered.
- after installation being capable of providing a complete barrier to the entry of the relevant gas.
- verified in accordance with CIRIA C735 [N1].
  (Score 2.0)

…….....

An example of gas protection measures to achieve a score of 2.5 would be a cast insitu ground bearing floor slab (Score 0.5) and a gas resistant membrane (Score 2.0).

In road, hardstanding and car park areas over-site concrete and/or bituminous macadam surfaces will prevent ground gas escaping naturally to the atmosphere. It would be advisable to provide vent pipes through which ground gases are able to escape. These vent pipes might be placed in adjoining landscaped areas or incorporated in lamp posts or other similar furniture.

All excavations of greater than 1.20 metres depth should be routinely checked for air quality prior to man entry and appropriate precautions taken.

Any manholes, inspection chambers or other void spaces formed beneath the sites ground surface are potential ground gas traps. Precautions, as per the excavations above, should be taken.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

4.9 General

We recommend that consultation should be undertaken with and written approval obtained from the Local Authority Environmental Health Officer and the Local Authority Building Control Officer prior to commencing development.

Following completion of the Phase II ground investigation and monitoring a Phase III remediation statement should be compiled and submitted to the Regulator for approval prior to commencing development.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Mr David Simpson at our Ossett office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. NE3989A
FEBRUARY 2021

D. C. Marsden M.Eng.(Hons.).
Senior Geotechnical Engineer
For and on behalf of
Sub Surface Consultants Limited

C. A. Marsden B.Sc.(Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

Sub Surface North East Limited
RCM Business Centre, Dewsbury Road, Ossett, West Yorkshire, WF5 9ND
Tel: 01924 278181 Fax: 01924 283455 Email: dsimpson@subsurface.co.uk

INSITU TEST RESULTS

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Standard Penetration Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.20	1.35	1.65	SPT	1	1	1	2	2	2	N=7	
BH1	2.00	2.15	2.45	SPT	1	1	1	2	2	2	N=7	
BH1	3.00	3.15	3.45	SPT	2	2	2	3	3	3	N=11	
BH1	4.00	4.15	4.45	SPT	2	3	3	3	3	4	N=13	
BH1	5.00	5.15	5.45	SPT	2	3	3	4	4	5	N=16	
BH1	6.50	6.65	6.95	SPT	2	2	4	5	5	7	N=21	
BH1	8.00	8.15	8.45	SPT	2	4	5	2	2	9	N=18	
BH1	9.50	9.65	9.95	SPT	4	5	7	8	9	9	N=33	
BH1	11.00	11.15	11.45	SPT	4	7	8	9	11	12	N=40	
BH1	12.50	12.65	12.95	SPT	5	8	9	10	10	12	N=41	
BH1	14.00	14.15	14.39	SPT	5	9	10	14	17	9	50/243mm	
BH1	15.40	15.55	15.78	SPT	5	8	10	15	19	6	50/233mm	
BH2	1.20	1.35	1.65	SPT	1	0	1	0	1	1	N=3	
BH2	2.00	2.15	2.45	SPT	1	1	1	2	1	2	N=6	
BH2	3.00	3.15	3.45	SPT	1	2	2	2	2	3	N=9	
BH2	4.00	4.15	4.45	SPT	2	2	2	3	3	4	N=12	
BH2	5.50	5.65	5.95	SPT	2	3	3	4	3	4	N=14	
BH2	7.00	7.15	7.45	SPT	3	3	4	4	5	6	N=19	
BH2	8.50	8.65	8.95	SPT	3	4	5	5	5	7	N=22	
BH2	10.00	10.15	10.45	SPT	3	4	5	7	8	8	N=28	
BH2	11.50	11.65	11.95	SPT	4	5	7	9	9	10	N=35	
BH2	13.00	13.15	13.45	SPT	4	7	8	11	12	12	N=43	
BH2	14.50	14.65	14.90	SPT	4	5	11	12	15	12	50/245mm	
BH2	15.40	15.55	15.81	SPT	5	9	10	14	15	10	49/260mm	
BH3	1.20	1.35	1.65	SPT	1	1	1	2	2	2	N=7	
BH3	2.00	2.15	2.45	SPT	1	1	1	1	2	2	N=6	
BH3	3.00	3.15	3.45	SPT	1	2	2	2	3	3	N=10	
BH3	4.00	4.15	4.45	SPT	1	2	2	3	3	4	N=12	
BH3	5.50	5.65	5.95	SPT	2	2	4	4	5	7	N=20	
BH3	7.00	7.15	7.45	SPT	4	4	5	3	8	8	N=24	
BH3	8.50	8.65	8.95	SPT	5	3	7	9	10	11	N=37	
BH3	10.00	10.15	10.45	SPT	4	5	7	8	8	9	N=32	
BH3	11.50	11.65	11.95	SPT	5	2	6	7	10	12	N=35	
BH3	13.00	13.15	13.45	SPT	5	7	8	10	12	12	N=42	
BH3	14.50	14.65	14.93	SPT	5	8	10	12	14	14	50/280mm	
BH3	15.30	15.45	15.72	SPT	7	9	10	10	18	12	50/267mm	

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SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client: GLEEDS COST MANAGEMENT SERVICES LIMITED

Engineer: COLLINS HALL GREEN LIMITED

Job Number: NE3989A

Sheet: 1 / 1

Ground Gas and Groundwater Monitoring Results Sheet

Date	Hole No.	Methane (% Volume)	Carbon Dioxide (% Volume)	Oxygen (% Volume)	Gas Flow Rate (l/hr)	Atmospheric Pressure (m bars)	Depth to Groundwater (m)
06/11/2020	BH1	0.0	0.2	20.8	<0.1	1031	1.67
	BH2	0.0	0.7	20.2	<0.1	1031	1.70
	BH3	0.0	0.3	20.5	<0.1	1031	1.67
17/11/2020	BH1	0.0	0.1	20.7	<0.1	1010	1.60
	BH2	0.0	***3.8***	***7.5***	<0.1	1010	3.10
	BH3	0.0	***1.6***	***14.7***	<0.1	1010	2.10
07/12/2020	BH1	0.0	0.1	20.1	<0.1	998	1.60
	BH2	0.0	***3.2***	***12.3***	1.3	998	3.10
	BH3	0.0	***1.5***	***17.5***	1.3	998	2.10
11/01/2021	BH1	0.0	1.3	***11.4***	1.2	1014	1.20
	BH2	0.0	***2.3***	***15.2***	1.2	1014	1.20
	BH3	0.0	0.9	19.9	1.2	1014	1.20
21/01/2021	BH1	0.0	***2.5***	19.5	0.1	981	1.10
	BH2	0.0	1.2	18.7	0.1	981	1.10
	BH3	0.0	0.9	19.7	0.0	981	1.10
16/02/2021	BH1	0.0	1.1	19.7	0.4	1004	1.10
	BH2	0.0	***6.4***	***11.7***	0.6	1004	1.10
	BH3	0.0	0.9	20.0	0.1	1004	1.10

Remarks: Elevated levels of methane and carbon dioxide and depleted levels of oxygen are shown in ***bold/italics.***

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SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, SPALDING, LINCOLNSHIRE

Client: GLEEDS COST MANAGEMENT SERVICES LTD

Engineer: COLLINS HALL GREEN LTD

Job Number: NE3989

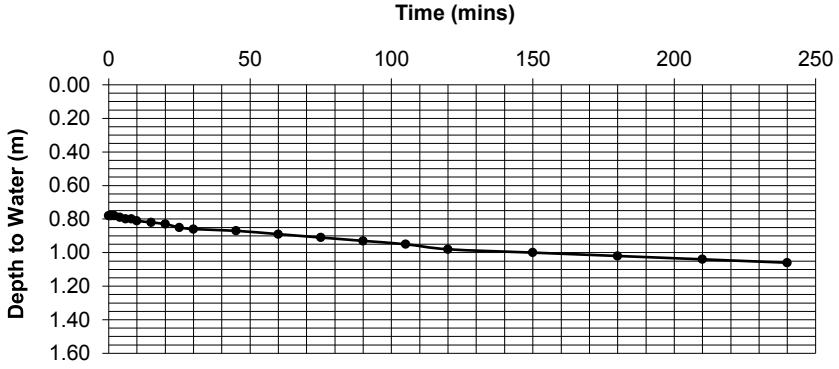
Sheet: 1 / 2

SOAKAWAY TEST

Position: TP1

Test Number: 1

Date: 03/11/20



Time (min)	Depth (m)
0	0.78
1	0.78
1	0.78
2	0.78
4	0.79
6	0.80
8	0.80
10	0.81
15	0.82
20	0.83
25	0.85
30	0.86
45	0.87
60	0.89
75	0.91
90	0.93
105	0.95
120	0.98
150	1.00
180	1.02
210	1.04
240	1.06

Length of pit:	L =	1.80	m	
Width of pit:	W =	0.60	m	
Depth of pit	D =	1.60	m	*
Base area of pit:	A =	1.08	m^2	
100% effective depth	D100 =	0.78	m	
75% effective depth	D75 =	0.99	m	
50% effective depth	D50 =	1.19	m	
25% effective depth	D25 =	1.40	m	
time to D75	T75 =	8100	sec	
time to D25	T25 =	-	sec	
time from D75 to D25 (T25 - T75)	t_{p75-25} =	-	sec	
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.44	m^3	
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	3.05	m^2	

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = - m/sec **

Test Strata:

See TP1 Log

Remarks:

* Groundwater level at the start of the test was 1.60. Test depth reduced from 2.00m to 1.60m.

** Unable to calculation Soil Infiltration Rate due to strata being of low permeability.

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SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Insitu Test Results

Site: FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, SPALDING, LINCOLNSHIRE

Client: GLEEDS COST MANAGEMENT SERVICES LTD

Engineer: COLLINS HALL GREEN LTD

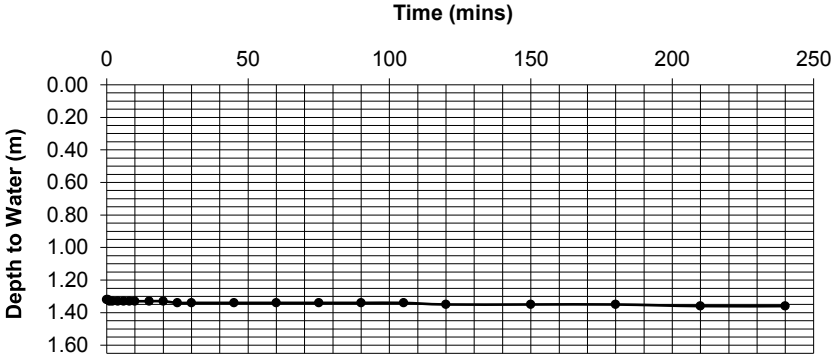
Job Number: NE3989

Sheet: 2 / 2

SOAKAWAY TEST

Position: TP6

Test Number: 1
Date: 03/11/20



Time (min)	Depth (m)
0	1.32
1	1.32
1	1.33
2	1.33
4	1.33
6	1.33
8	1.33
10	1.33
15	1.33
20	1.33
25	1.34
30	1.34
45	1.34
60	1.34
75	1.34
90	1.34
105	1.34
120	1.35
150	1.35
180	1.35
210	1.36
240	1.36

Length of pit:	L =	1.90	m	
Width of pit:	W =	0.60	m	
Depth of pit	D =	1.65	m	*
Base area of pit:	A =	1.14	m^2	
100% effective depth	D100 =	1.32	m	
75% effective depth	D75 =	1.40	m	
50% effective depth	D50 =	1.49	m	
25% effective depth	D25 =	1.57	m	
time to D75	T75 =	-	sec	
time to D25	T25 =	-	sec	
time from D75 to D25 (T25 - T75)	t_{p75-25} =	-	sec	
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.19	m^3	
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	1.97	m^2	

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = - m/sec **

Test Strata:
See TP6 Log

Remarks:
* Groundwater level at the start of the test was 1.65. Test depth reduced from 2.10m to 1.60m.
** Unable to calculation Soil Infiltration Rate due to strata being of low permeability.

LABORATORY TEST RESULTS

SUB SURFACE
SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

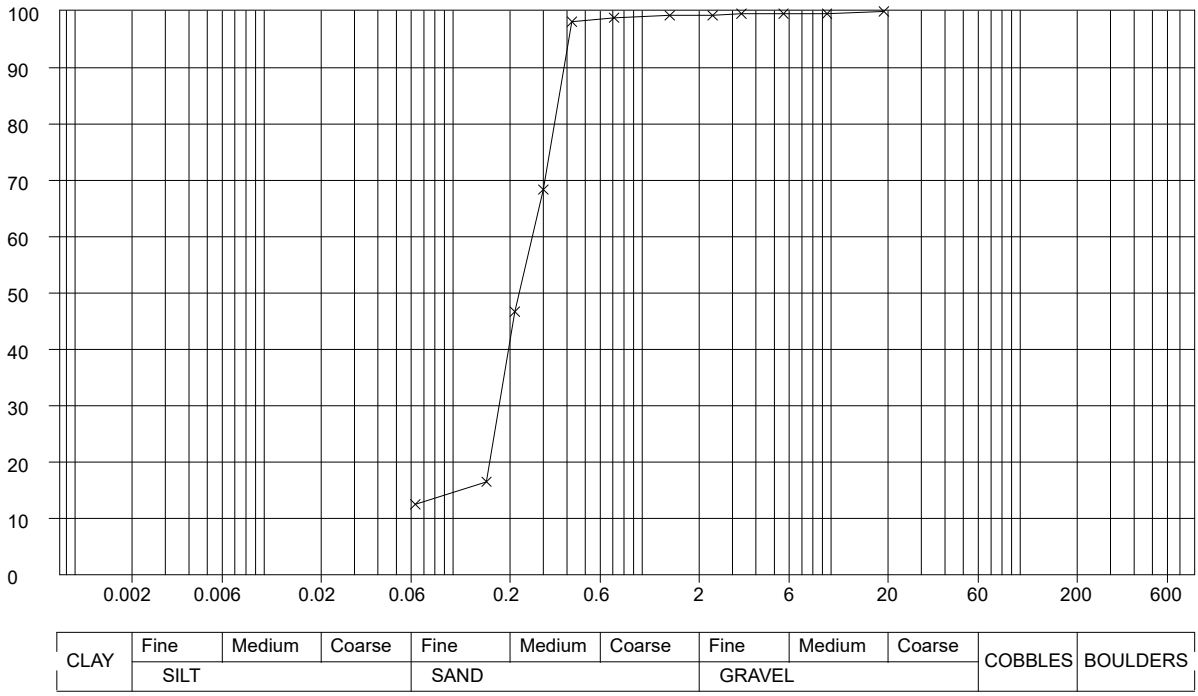
Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 1/5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH1	2.00	B	Brown slightly silty fine to medium SAND with occasional lenses of silty clay.



Sieve / Particle Size	% Passing
19 mm	100.0
9.5 mm	99.6
5.6 mm	99.6
3.35 mm	99.6
2.36 mm	99.3
1.4 mm	99.3
710 µm	98.9
425 µm	98.2
300 µm	68.4
212 µm	46.7
150 µm	16.5
63 µm	12.5

Grading Analysis	
D85	369.6 µm
D60	265.9 µm
D10	<63.0 µm
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	-
Gravel	0.7%
Sand	86.8%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

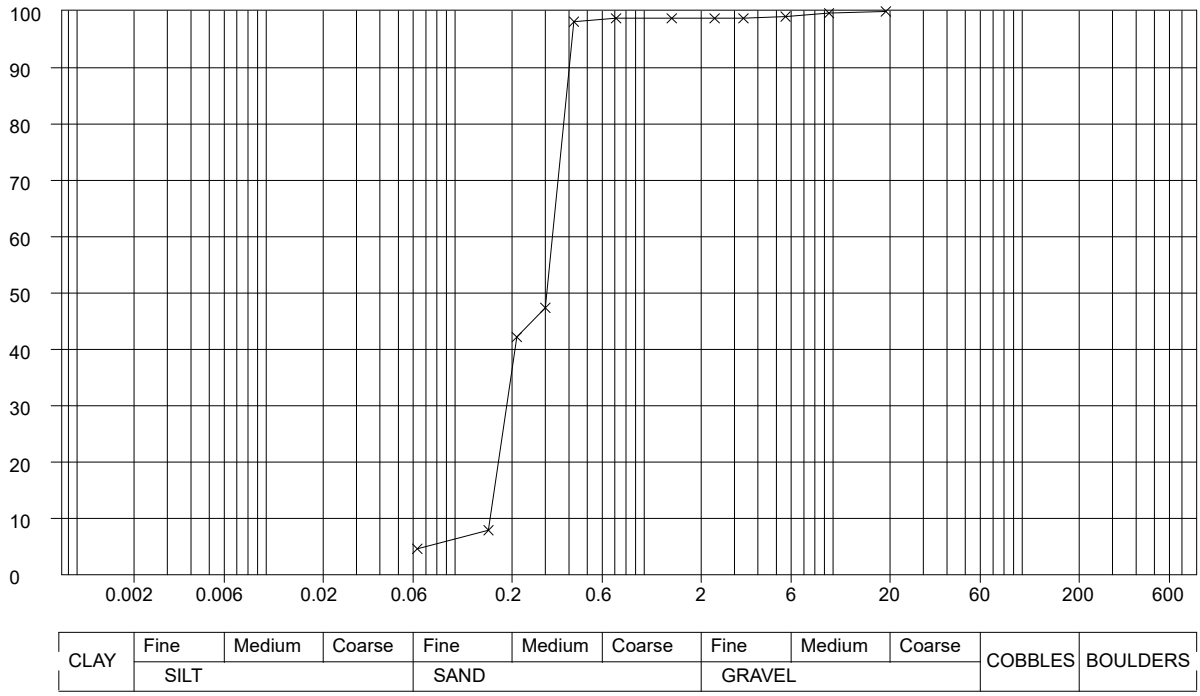
Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 2/5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH1	4.00 - 4.50	B	Brown slightly silty fine to medium SAND with occasional fragments of shell.



Sieve / Particle Size	% Passing
19 mm	100.0
9.5 mm	99.7
5.6 mm	99.1
3.35 mm	98.8
2.36 mm	98.8
1.4 mm	98.8
710 µm	98.8
425 µm	98.2
300 µm	47.4
212 µm	42.2
150 µm	7.9
63 µm	4.6

Grading Analysis	
D85	392.5 µm
D60	331.0 µm
D10	153.8 µm
Uniformity Coefficient	2.2

Particle Proportions	
Cobbles + Boulders	-
Gravel	1.2%
Sand	94.2%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

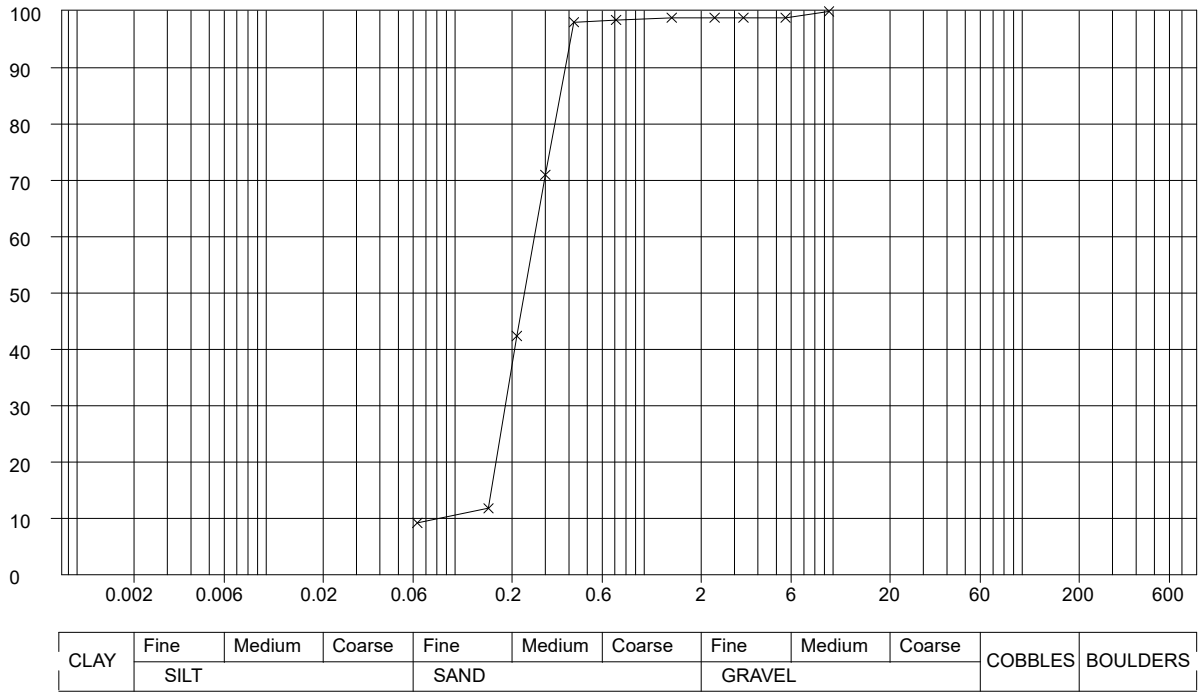
Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 3/5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH1	6.50	B	Brown slightly gravelly silty fine to medium SAND. Gravel is subrounded medium sandstone and quartz.



Sieve / Particle Size	% Passing
9.5 mm	100.0
5.6 mm	98.9
3.35 mm	98.9
2.36 mm	98.9
1.4 mm	98.9
710 µm	98.5
425 µm	98.1
300 µm	71.0
212 µm	42.4
150 µm	11.8
63 µm	9.2

Grading Analysis	
D85	364.6 µm
D60	266.2 µm
D10	89.8 µm
Uniformity Coefficient	3.0

Particle Proportions	
Cobbles + Boulders	-
Gravel	1.1%
Sand	89.7%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

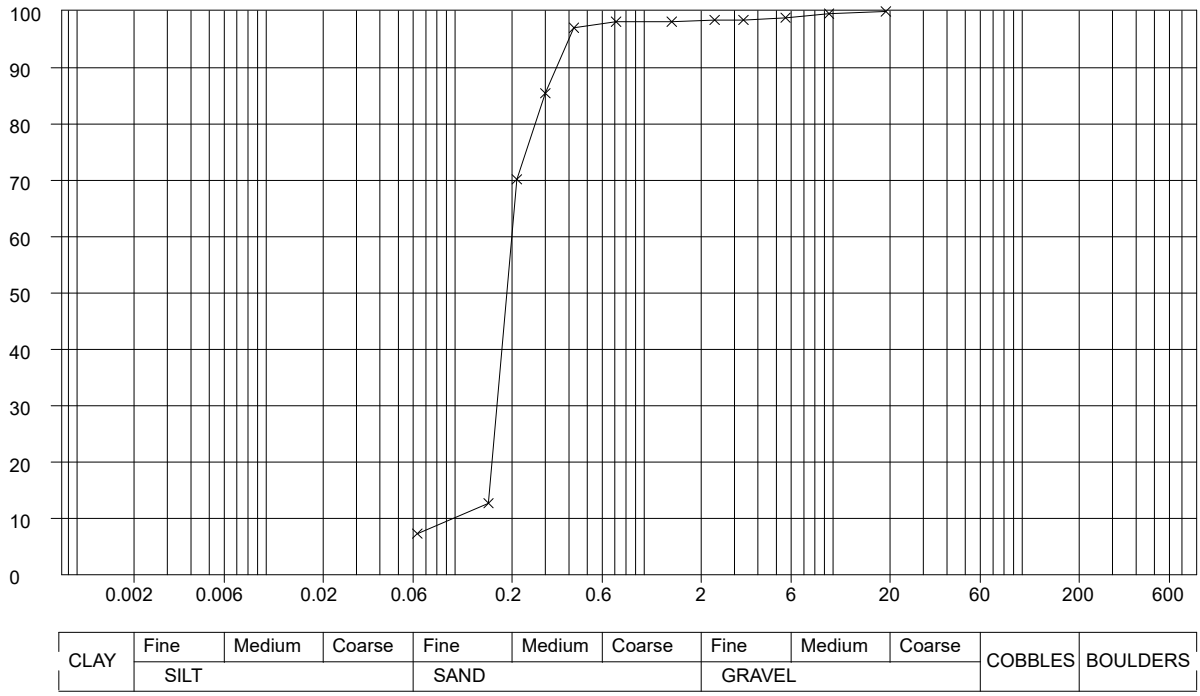
Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 4/5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH1	11.00 - 11.50	B	Brown slightly gravelly silty fine to medium SAND with occasional fragments of shell. Gravel is subangular to subrounded fine to medium sandstone, siltstone and quartz.



Sieve / Particle Size	% Passing
19 mm	100.0
9.5 mm	99.6
5.6 mm	98.9
3.35 mm	98.5
2.36 mm	98.5
1.4 mm	98.2
710 µm	98.2
425 µm	97.1
300 µm	85.5
212 µm	70.2
150 µm	12.7
63 µm	7.3

Grading Analysis	
D85	297.1 µm
D60	201.0 µm
D10	106.5 µm
Uniformity Coefficient	1.9

Particle Proportions	
Cobbles + Boulders	-
Gravel	1.6%
Sand	91.1%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

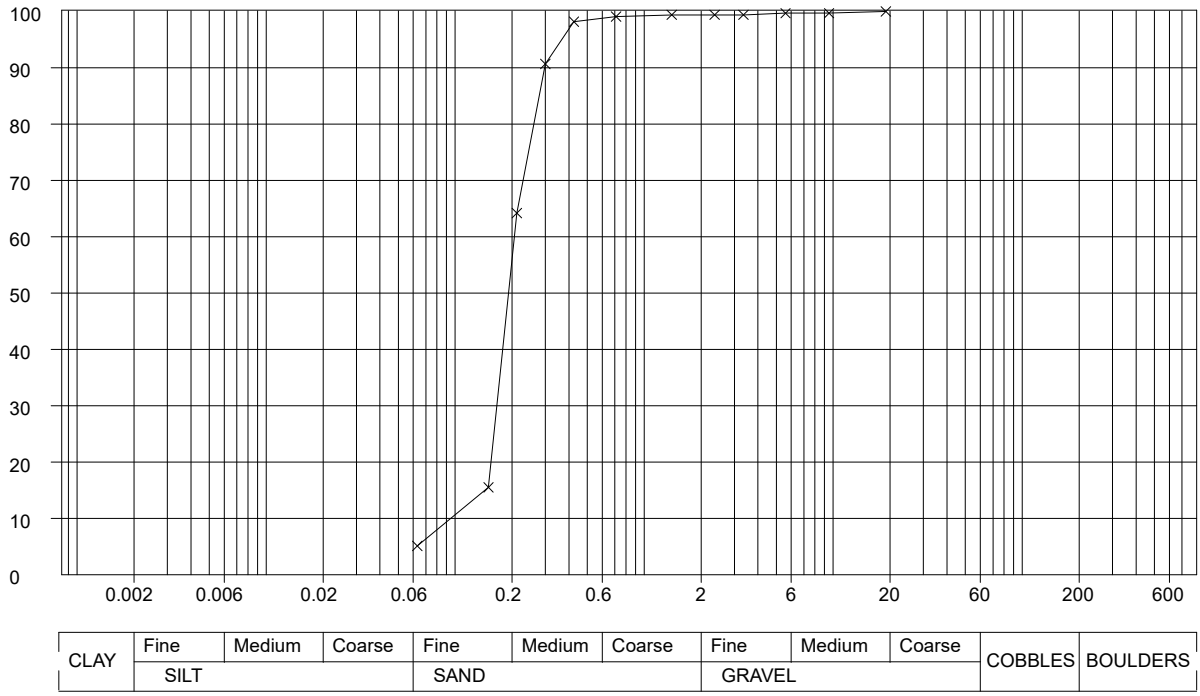
Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 5/5

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Laboratory Description
BH1	14.00 - 14.50	B	Brown slightly gravelly silty fine to medium SAND with occasional fragments of shell. Gravel is subangular to subrounded fine to medium sandstone, siltstone and quartz.



Sieve / Particle Size	% Passing
19 mm	100.0
9.5 mm	99.7
5.6 mm	99.7
3.35 mm	99.4
2.36 mm	99.4
1.4 mm	99.4
710 µm	99.1
425 µm	98.2
300 µm	90.7
212 µm	64.2
150 µm	15.5
63 µm	5.1

Grading Analysis	
D85	281.1 µm
D60	206.7 µm
D10	104.0 µm
Uniformity Coefficient	2.0

Particle Proportions	
Cobbles + Boulders	-
Gravel	0.6%
Sand	94.3%
Silt	-
Clay	-

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 1990:7.4.5 Particle size tests

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Laboratory Test Results

Site: FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client: GLEEDS COST MANAGEMENT SERVICES LIMITED

Engineer: COLLINS HALL GREEN LIMITED

Job Number: NE3989

Sheet: 1/3

CALIFORNIA BEARING RATIO

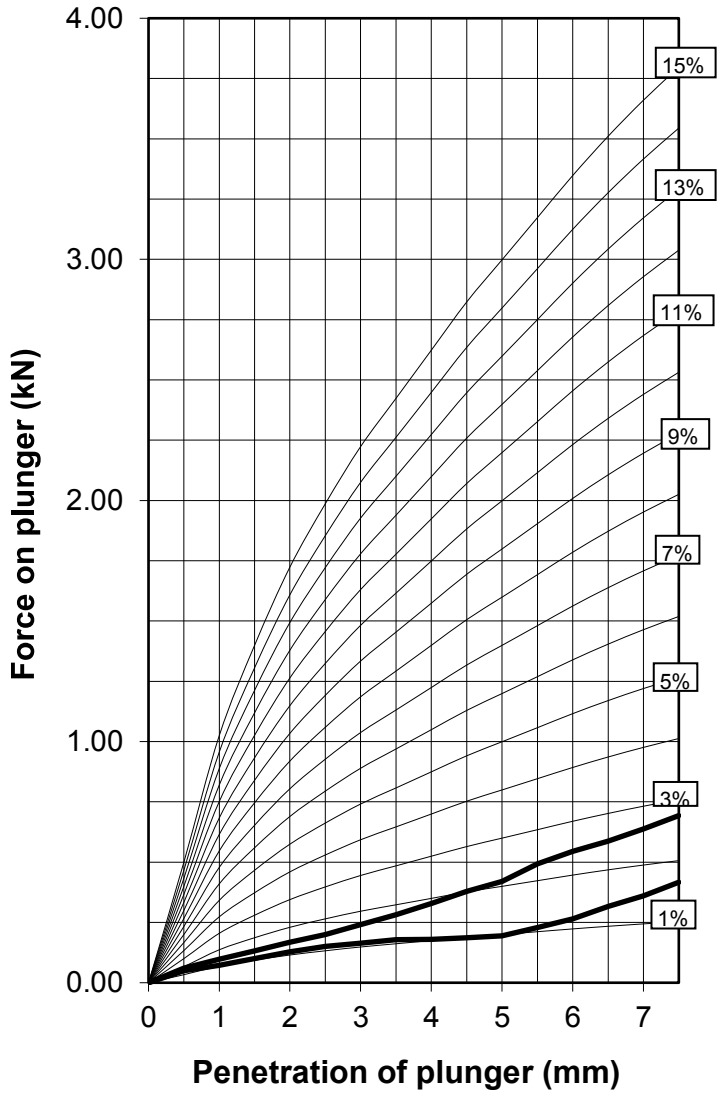
Position: TP1 Sample No: 66 Depth: 0.45 m

Description:

Firm medium strength brown silty CLAY

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	15.0	0.06	12.5	0.05
1.0	24.5	0.10	18.0	0.07
1.5	33.0	0.13	25.0	0.10
2.0	42.0	0.17	32.0	0.13
2.5	50.0	0.20	37.5	0.15
3.0	60.0	0.24	41.0	0.16
3.5	70.5	0.28	44.5	0.18
4.0	82.0	0.33	45.0	0.18
4.5	94.5	0.38	46.5	0.19
5.0	105.0	0.42	48.5	0.19
5.5	123.0	0.49	57.0	0.23
6.0	136.0	0.54	66.0	0.26
6.5	146.5	0.59	79.0	0.32
7.0	159.0	0.64	90.0	0.36
7.5	173.0	0.69	104.0	0.42



	CBR % Value at:	
	2.5mm	5.0mm
Top	**1.5%**	**2.1%**
Bottom	**1.1%**	**1.0%**

Passing 20mm Sieve = **99.8 %**

Moisture Content = **18 %**

Bulk Density = **2.02 Mg/m^3**

Dry Density = **1.71 Mg/m^3**

Comments:

Operator	Checked	Approved
GDR & WAC	CAM	CAM

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Laboratory Test Results

Site: FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client: GLEEDS COST MANAGEMENT SERVICES LIMITED

Engineer: COLLINS HALL GREEN LIMITED

Job Number: NE3989

Sheet: 2/3

CALIFORNIA BEARING RATIO

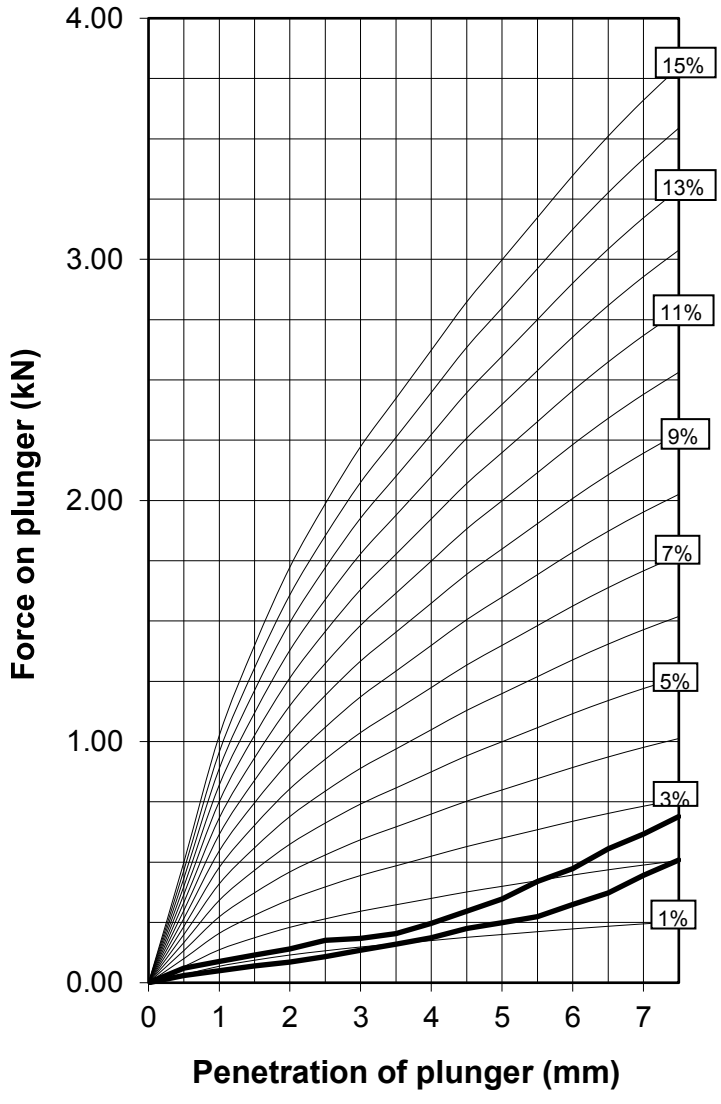
Position: TP5 Sample No: 97 Depth: 0.45 m

Description:

Brown clayey SILT

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	15.0	0.06	7.5	0.03
1.0	22.0	0.09	12.5	0.05
1.5	28.5	0.11	17.5	0.07
2.0	35.0	0.14	21.5	0.09
2.5	44.0	0.18	27.0	0.11
3.0	46.0	0.18	33.5	0.13
3.5	51.0	0.20	40.0	0.16
4.0	61.5	0.25	46.5	0.19
4.5	74.0	0.30	56.0	0.22
5.0	86.5	0.35	62.0	0.25
5.5	105.0	0.42	68.5	0.27
6.0	118.0	0.47	81.0	0.32
6.5	138.5	0.55	93.0	0.37
7.0	154.0	0.62	111.0	0.44
7.5	172.0	0.69	127.0	0.51



	CBR % Value at:	
	2.5mm	5.0mm
Top	**1.3%**	**1.7%**
Bottom	**0.8%**	**1.2%**

Passing 20mm Sieve = **100 %**

Moisture Content = **20 %**

Bulk Density = **1.94 Mg/m^3**

Dry Density = **1.63 Mg/m^3**

Comments:

Operator	Checked	Approved
GDR & WAC	CAM	CAM

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Site:	FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	Job Number NE3989
Client:	GLEEDS COST MANAGEMENT SERVICES LIMITED	Sheet: 3/3
Engineer:	COLLINS HALL GREEN LIMITED	

CALIFORNIA BEARING RATIO

Position: TP6 Sample No: 71 Depth: 0.45 m

Description:

Firm medium strength brown silty CLAY

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	6.5	0.12	3.5	0.07
1.0	9.0	0.17	6.0	0.11
1.5	12.0	0.23	8.0	0.15
2.0	14.5	0.27	9.5	0.18
2.5	18.0	0.34	11.5	0.22
3.0	21.0	0.39	14.0	0.26
3.5	24.0	0.45	16.0	0.30
4.0	27.5	0.52	19.0	0.36
4.5	32.0	0.60	22.0	0.41
5.0	35.5	0.67	24.0	0.45
5.5	38.5	0.72	26.5	0.50
6.0	43.0	0.81	30.5	0.57
6.5	47.0	0.88	33.0	0.62
7.0	51.5	0.97	36.5	0.69
7.5	54.5	1.02	39.5	0.74

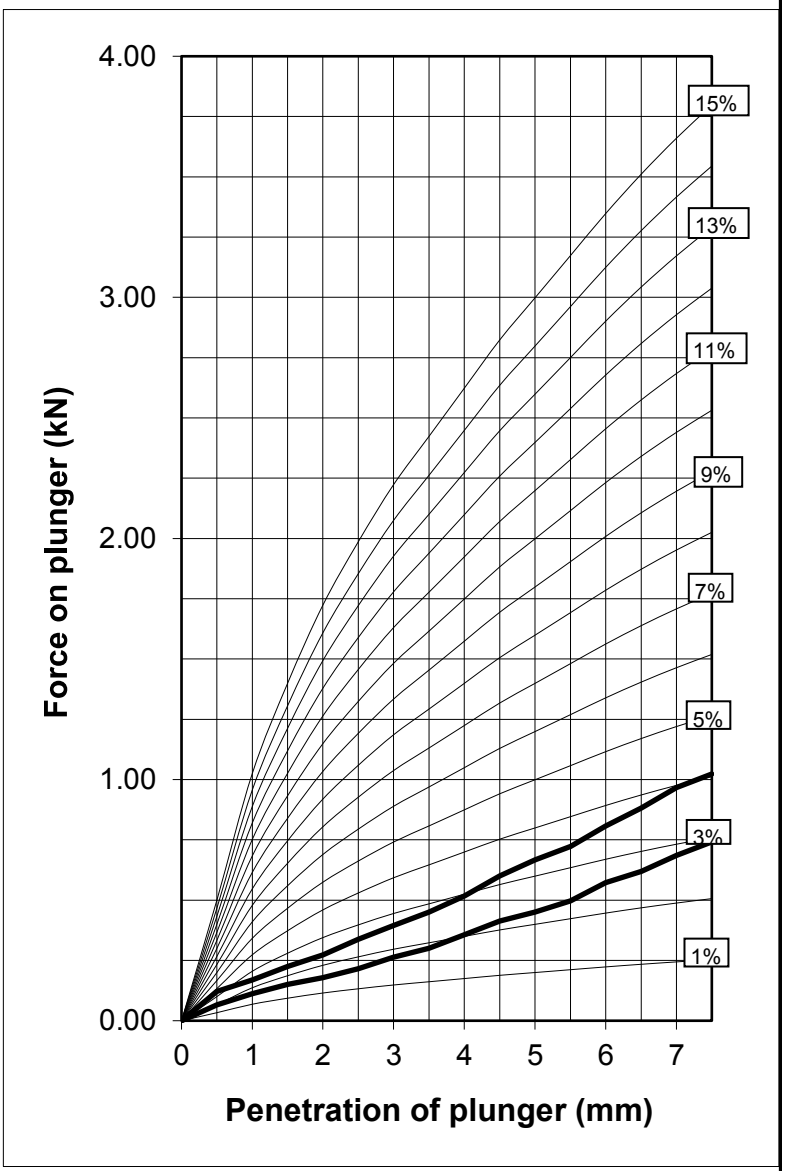
	CBR % Value at:	
	2.5mm	5.0mm
Top	**2.6%**	**3.3%**
Bottom	**1.6%**	**2.3%**

Passing 20mm Sieve = **100 %**

Moisture Content = **18 %**

Bulk Density = **2.07 Mg/m^3**

Dry Density = **1.76 Mg/m^3**



Comments:	Operator	Checked	Approved
	GDR & WAC	CAM	CAM

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3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Laboratory Test Results

Site : FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE

Client : GLEEDS COST MANAGEMENT SERVICES LIMITED

Engineer : COLLINS HALL GREEN LIMITED

Job Number NE3989

Sheet 1 / 1

DETERMINATION OF pH, SULPHATE CONTENT AND TOTAL SULPHUR OF SOIL AND GROUNDWATER AND MAGNESIUM, CHLORIDE, AMMONIA AND NITRATE CONTENT

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Sulphate			Total Sulphur %	Magnesium mg/l	Ammonium NH4 mg/l	Water Soluble Chloride mg/l	Water Soluble Nitrate mg/l	pH	Design Class	Laboratory Description
			Soil		Ground Water g /l								
			Total S03 %	S04 in 2:1 water:soil g /l									
BH1	2.00	B	0.02	<0.01		0.02	<10	< 10	<10	<10	8.8	DS-1	Brown slightly silty fine to medium SAND with occasional lenses of silty clay.
BH1	4.00	B	0.02	0.01		0.01	<10	< 10	<10	<10	8.7	DS-1	Brown slightly silty fine to medium SAND with occasional fragments of shell.
BH2	1.20	B		<0.01							8.4	DS-1	Brown slightly gravelly slightly sandy clayey SILT with occasional rootlets. Gravel is angular to subrounded sandstone,siltstone, quartz and coal.
BH2	8.50	B		0.02							8.7	DS-1	Brown silty fine to medium SAND with occasional fragments of shell and occaisonal bands of clayey silt.
BH3	2.00	D	0.03	<0.01		0.02	10	< 10	13	<10	8.1	DS-1	Brown slightly gravelly slightly sandy clayey SILT with occasional rootlets. Gravel is subangular to subrounded fine to medium sandstone, siltstone and coal.

Method of Preparation : BS 1377:PART 1:1990:7.5 Preparation of soil for chemical tests BS 1377:PART 3:1990:5.2, 5.3, 5.4 & 9.4

Method of Test : Lab in-house methods based on BS1377: Part 3 for contents of water sol sulphate, pH, chloride and magnesium. Lab in-house method based on MEWAM (EA, 2006) for total sulphur

Remarks : Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)

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AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) SITE CLASSIFICATION

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations[a]

Sulfate				Groundwater		
Design Sulfate Class for Location	2:1 water/soil extract[b]	Groundwater	Total potential sulfate[c]	Static water	Mobile water	ACEC Class for location
1	2 (SO_4 mg/l)	3 (SO_4 mg/l)	4 (SO_4 %)	5 (pH)	6 (pH)	7
DS-1	<500	<400	<0.24	≥2.5		AC-1s
					>5.5d	AC-1[d]
					2.5 - 5.5	AC-2z
DS-2	500 - 1500	400 - 1400	0.24 - 0.6	>3.5		AC-1s
					>5.5	AC-2
				2.5-3.5		AC-2s
					2.5 - 5.5	AC-3z
DS-3	1600-3000	1500-3000	0.7 - 1.2	>3.5		AC-2s
					>5.5	AC-3
				2.5 - 3.5		AC-3s
					2.5 - 5.5	AC-4
DS-4	3100 - 6000	3100 - 6000	1.3 - 2.4	>3.5		AC-3s
					>5.5	AC-4
				2.5 - 3.5		AC-4s
					2.5 - 5.5	AC-5
DS-5	>6000	>6000	>2.4	>3.5		AC-4s
				2.5 - 3.5	≥2.5	AC-5

Notes

a Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie not brownfield - Table C2) or clean fill derived from such ground

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions (SO_4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

d For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations[a]

Sulfate						Groundwater		
Design Sulfate Class for Location	2:1 water/soil extract[b]		Groundwater		Total potential sulfate[c]	Static water	Mobile water	ACEC Class for location
1	2 (SO_4 mg/l)	3 (Mg mg/l)	4 (SO_4 mg/l)	5 (Mg mg/l)	6 (SO_4 %)	7 (pH)[d]	8 (pH)[d]	9
DS-1	<500		<400		<0.24	≥2.5		AC-1s
							>6.5[d]	AC-1
							5.5 - 6.5	AC-2z
							4.5 - 5.5	AC-3z
							2.5 - 4.5	AC-4z
DS-2	500 - 1500		400 - 1400		0.24 - 0.6	>5.5		AC-1s
							>6.5	AC-2
						2.5 - 5.5		AC-2s
							5.5 - 6.5	AC-3z
							4.5 - 5.5	AC-4z
							2.5 - 5.5	AC-5z
DS-3	1600 - 3000		1500 - 3000		0.7 - 1.2	>5.5		AC-2s
							>6.5	AC-3
						2.5 - 5.5		AC-3s
							5.5 - 6.5	AC-4
							2.5 - 5.5	AC-5
DS-4	3100 - 6000	≤1200	3100 - 6000	≤1000	1.3 - 2.4	>5.5		AC-3s
							>6.5	AC-4
						2.5 - 5.5		AC-4s
							2.5 - 6.5	AC-5
DS-4m	3100 - 6000	>1200[e]	3100 - 6000	>1000[e]	1.3 - 2.4	>5.5		AC-3s
							>6.5	AC-4m
						2.5 - 5.5		AC-4ms
							2.5 - 6.5	AC-5m
DS-5	>6000	≤1200	>6000	≤1000	>2.4	>5.5		AC-4s
						2.5 - 5.5	≥2.5	AC-5
DS-5m	>6000	>1200[e]	>6000	>1000[e]	>2.4	>5.5		AC-4ms
						2.5 - 5.5	≥2.5	AC-5m

Notes

a Brownfield sites are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions (SO_4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).

e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17000 mg/l). This allows 'm' to be omitted from the relevant ACEC Classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.
- Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

CONTAMINATION ANALYSIS RESULTS

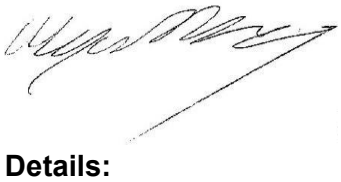
eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-30938-1
Initial Date of Issue:	19-Nov-2020
Client	Sub Surface
Client Address:	3 Peel Street Preston Lancashire PR2 2QS
Contact(s):	Simon Gabbatt
Project	NE3989 Fez, Plot 12, Holbeach

Quotation No.:		**Date Received:**	13-Nov-2020
Order No.:		**Date Instructed:**	13-Nov-2020
No. of Samples:	13		
Turnaround (Wkdays):	5	**Results Due:**	19-Nov-2020
Date Approved:	19-Nov-2020		

Approved By:



Details: Glynn Harvey, Technical Manager

Results - Soil

Project: NE3989 Fez, Plot 12, Holbeach

Client: Sub Surface				**Chemtest Job No.:**	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938
Quotation No.:				**Chemtest Sample ID.:**	1096414	1096415	1096416	1096417	1096418	1096419	1096420	1096421	1096422
				Client Sample ID.:	65	76	85	90	97	70	439	442	447
				Sample Location:	TP1	TP2	TP3	TP4	TP5	TP6	BH1	BH1	BH1
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.10	0.20	0.80	0.20	0.45	0.15	0.40	2.00	4.00
				Bottom Depth (m):							1.00	2.45	4.50
				Date Sampled:	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020
				Asbestos Lab:	LIVERPOOL	LIVERPOOL							
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-							
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected							
ACM Detection Stage	U	2192		N/A	-	-							
Moisture	N	2030	%	0.020	16	15	19	19	16	19	18	16	18
pH	M	2010		4.0	8.3	8.6	8.5	8.3	8.6	8.4	8.5	8.8	8.7
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40	0.55	< 0.40	0.57	< 0.40	0.74	< 0.40		
Magnesium (Water Soluble)	N	2120	g/l	0.010								< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010								< 0.010	0.010
Total Sulphur	M	2175	%	0.010								0.016	0.014
Chloride (Water Soluble)	M	2220	g/l	0.010								< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010								< 0.010	< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	1.9	2.1	< 0.50	0.72	1.4	1.2	1.3		
Ammonium (Water Soluble)	M	2120	g/l	0.01								< 0.01	< 0.01
Sulphate (Total)	M	2430	%	0.010	0.045	0.045	0.022	0.048	0.020	0.052	0.038		
Sulphate (Acid Soluble)	M	2430	%	0.010								0.018	0.016
Arsenic	M	2450	mg/kg	1.0	11	12	8.5	13	7.9	15	13		
Cadmium	M	2450	mg/kg	0.10	0.27	0.10	< 0.10	0.15	< 0.10	0.15	0.10		
Chromium	M	2450	mg/kg	1.0	18	19	14	20	14	25	23		
Molybdenum	M	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		
Copper	M	2450	mg/kg	0.50	13	12	5.5	19	5.6	22	13		
Mercury	M	2450	mg/kg	0.10	0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10		
Nickel	M	2450	mg/kg	0.50	17	19	14	18	14	22	21		
Lead	M	2450	mg/kg	0.50	19	15	7.9	19	8.9	23	15		
Selenium	M	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20		
Zinc	M	2450	mg/kg	0.50	70	44	31	47	31	56	48		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
TPH >C6-C10	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
TPH >C10-C21	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
TPH >C21-C40	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total TPH >C6-C40	M	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10		
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		

Results - Soil

Project: NE3989 Fez, Plot 12, Holbeach

Client: Sub Surface		**Chemtest Job No.:**			20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938	20-30938
Quotation No.:		**Chemtest Sample ID.:**			1096414	1096415	1096416	1096417	1096418	1096419	1096420	1096421	1096422
		Client Sample ID.:			65	76	85	90	97	70	439	442	447
		Sample Location:			TP1	TP2	TP3	TP4	TP5	TP6	BH1	BH1	BH1
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.10	0.20	0.80	0.20	0.45	0.15	0.40	2.00	4.00
		Bottom Depth (m):									1.00	2.45	4.50
		Date Sampled:			05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020	05-Nov-2020
		Asbestos Lab:			LIVERPOOL	LIVERPOOL							
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.26	< 0.10	< 0.10		
Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.26	< 0.10	< 0.10		
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Chrysene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Toluene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
o-Xylene	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30		

Results - Soil

Project: NE3989 Fez, Plot 12, Holbeach

Client: Sub Surface		**Chemtest Job No.:**			20-30938	20-30938	20-30938
Quotation No.:		**Chemtest Sample ID.:**			1096423	1096424	1096426
		Client Sample ID.:			387	401	416
		Sample Location:			BH2	BH2	BH3
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			1.20	8.50	2.00
		Bottom Depth (m):			1.70		
		Date Sampled:			05-Nov-2020	05-Nov-2020	05-Nov-2020
		Asbestos Lab:					
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A			
Asbestos Identification	U	2192		N/A			
ACM Detection Stage	U	2192		N/A			
Moisture	N	2030	%	0.020	17	20	24
pH	M	2010		4.0	8.4	8.7	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			
Magnesium (Water Soluble)	N	2120	g/l	0.010			0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	0.015	< 0.010
Total Sulphur	M	2175	%	0.010			0.021
Chloride (Water Soluble)	M	2220	g/l	0.010			0.013
Nitrate (Water Soluble)	N	2220	g/l	0.010			< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50			
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50			
Ammonium (Water Soluble)	M	2120	g/l	0.01			< 0.01
Sulphate (Total)	M	2430	%	0.010			
Sulphate (Acid Soluble)	M	2430	%	0.010			0.027
Arsenic	M	2450	mg/kg	1.0			
Cadmium	M	2450	mg/kg	0.10			
Chromium	M	2450	mg/kg	1.0			
Molybdenum	M	2450	mg/kg	2.0			
Copper	M	2450	mg/kg	0.50			
Mercury	M	2450	mg/kg	0.10			
Nickel	M	2450	mg/kg	0.50			
Lead	M	2450	mg/kg	0.50			
Selenium	M	2450	mg/kg	0.20			
Zinc	M	2450	mg/kg	0.50			
Chromium (Hexavalent)	N	2490	mg/kg	0.50			
TPH >C6-C10	N	2670	mg/kg	1.0			
TPH >C10-C21	N	2670	mg/kg	1.0			
TPH >C21-C40	N	2670	mg/kg	1.0			
Total TPH >C6-C40	M	2670	mg/kg	10			
Naphthalene	M	2700	mg/kg	0.10			
Acenaphthylene	M	2700	mg/kg	0.10			
Acenaphthene	M	2700	mg/kg	0.10			
Fluorene	M	2700	mg/kg	0.10			
Phenanthrene	M	2700	mg/kg	0.10			

Results - Soil

Project: NE3989 Fez, Plot 12, Holbeach

Client: Sub Surface		**Chemtest Job No.:**			20-30938	20-30938	20-30938
Quotation No.:		**Chemtest Sample ID.:**			1096423	1096424	1096426
		Client Sample ID.:			387	401	416
		Sample Location:			BH2	BH2	BH3
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			1.20	8.50	2.00
		Bottom Depth (m):			1.70		
		Date Sampled:			05-Nov-2020	05-Nov-2020	05-Nov-2020
		Asbestos Lab:					
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Anthracene	M	2700	mg/kg	0.10			
Fluoranthene	M	2700	mg/kg	0.10			
Pyrene	M	2700	mg/kg	0.10			
Benzo[a]anthracene	M	2700	mg/kg	0.10			
Chrysene	M	2700	mg/kg	0.10			
Benzo[b]fluoranthene	M	2700	mg/kg	0.10			
Benzo[k]fluoranthene	M	2700	mg/kg	0.10			
Benzo[a]pyrene	M	2700	mg/kg	0.10			
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10			
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10			
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10			
Total Of 16 PAH's	M	2700	mg/kg	2.0			
Benzene	M	2760	µg/kg	1.0			
Toluene	M	2760	µg/kg	1.0			
Ethylbenzene	M	2760	µg/kg	1.0			
m & p-Xylene	M	2760	µg/kg	1.0			
o-Xylene	M	2760	µg/kg	1.0			
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			
Total Phenols	M	2920	mg/kg	0.30			

Results - Single Stage WAC

Project: NE3989 Fez, Plot 12, Holbeach

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-30938						
Chemtest Sample ID:	1096415						
Sample Ref:							
Sample ID:	76				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP2						
Top Depth(m):	0.20						
Bottom Depth(m):							
Sampling Date:	05-Nov-2020						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	M	%	0.53	3	5	6
Loss On Ignition	2610	M	%	2.5	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.042	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0028	< 0.050	0.5	2	25
Barium	1450	U	0.011	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0030	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0020	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.3	23	800	15000	25000
Fluoride	1220	U	1.1	11	10	150	500
Sulphate	1220	U	8.4	84	1000	20000	50000
Total Dissolved Solids	1020	N	98	970	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	36	360	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	15

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: NE3989 Fez, Plot 12, Holbeach

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	20-30938						
Chemtest Sample ID:	1096425						
Sample Ref:							
Sample ID:	413						
Sample Location:	BH3						
Top Depth(m):	0.20						
Bottom Depth(m):							
Sampling Date:	05-Nov-2020						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	0.51	3	5	6
Loss On Ignition	2610	M	%	2.7	--	--	10
Total BTEX	2760	M	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	M		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0060	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0047	< 0.050	0.5	2	25
Barium	1450	U	0.011	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0029	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0015	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.87	8.7	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	91	910	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	64	640	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	18

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

BOREHOLE RECORD SHEETS

SUB SURFACE

SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.30m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	05/11/2020	COLLINS HALL GREEN LIMITED	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.20) 0.20	TOPSOIL (driller's description).			
0.20 0.40-1.00	D B						Soft low strength dark brown slightly gravelly slightly sandy clayey SILT with occasional pockets of fine sand and rootlets. Gravel is subangular to subrounded fine to medium sandstone and coal.			
						(1.80)				
1.20-1.65 1.20-1.65 1.20-1.70	SPT N=7 D B			1,1/1,2,2,2						
						2.00	Loose brown slightly silty fine to medium SAND with occasional lenses of silty clay.			
2.00-2.45 2.00-2.45 2.00-2.50	SPT N=7 D B			1,1/1,2,2,2						
						(1.00)				
						3.00	Medium dense brown slightly silty fine to medium SAND with occasional fragments of shell.			
3.00-3.45 3.00-3.45	SPT N=11 D			2,2/2,3,3,3						
4.00-4.45 4.00 4.00-4.45 4.00-4.50	SPT N=13 D D B			2,3/3,3,3,4						
						(3.50)				
5.00-5.45 5.00-5.45	SPT N=16 D			2,3/3,4,4,5						
5.50	D								▼1	
				Water Inflow(1) at 5.90m, rose to 5.50m in 20 mins, not sealed.					▽1	
6.50-6.95 6.50-6.95 6.50-6.95	SPT N=21 B D			2,2/4,5,5,7		6.50	Medium dense brown slightly gravelly slightly silty fine to medium SAND. Gravel is subrounded medium sandstone and quartz.			
						(2.50)				
8.00-8.45 8.00-8.45	SPT N=18 D			2,4/5,2,2,9						
9.00	D					9.00	Dense becoming very dense brown slightly gravelly silty fine to medium SAND with occasional fragments of shell. Gravel is subangular to subrounded fine to medium sandstone, siltstone and quartz.			
9.50-9.95 9.50-9.95 9.50-10.00	SPT N=33 D B			4,5/7,8,9,9						

Remarks
Hand dug inspection pit from GL to 1.20m to check for services - 1hr
Chiselling from 15.00m to 15.30m - 45mins
Water added to aid drilling from 1.50m to 15.00m, possibly masking water inflows.
From 11.00m sand blowing up to casing, water kept topped up.
On completion backfilled with arisings and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH1

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SUB SURFACE

SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.30m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	05/11/2020	COLLINS HALL GREEN LIMITED	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
11.00-11.45	SPT N=40			4,7/8,9,11,12			Dense becoming very dense brown slightly gravelly silty fine to medium SAND with occasional fragments of shell. Gravel is subangular to subrounded fine to medium sandstone, siltstone and quartz.			
11.00-11.45	D									
11.00-11.50	B									
						(6.80)				
12.50-12.95	SPT N=41			5,8/9,10,10,12						
12.50-12.95	D									
13.50	D									
14.00-14.39	SPT 50/243			5,9/10,14,17,9			.... below 14.15m : very dense			
14.00-14.39	D									
14.00-14.50	B									
15.00	D									
15.40-15.78	SPT 50/233			5,8/10,15,19,6						
15.40-15.79	D									
15.80	D			05/11/2020:		15.80	Complete at 15.80m			

Remarks

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH1

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SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.40m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location AS PLAN	**Dates** 03/11/2020	**Engineer** COLLINS HALL GREEN LIMITED	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	D						Soft, locally firm, very low becoming low strength brown slightly gravelly slightly sandy clayey SILT with occasional rootlets. Gravel is angular to subrounded sandstone, siltstone, quartz and coal.			
0.20-1.00	B									
1.20-1.65	SPT N=3			1,0/1,0,1,1						
1.20-1.65	B					(3.00)				
1.20-1.65	D									
2.00-2.45	SPT N=6			1,1/1,2,1,2			.... below 2.15m : low strength			
2.00-2.45	D									
2.00-2.50	B									
3.00-3.45	SPT N=9			1,2/2,2,2,3		3.00	Loose becoming medium dense, then dense, then very dense brown silty fine to medium SAND with occasional fragments of shell and occasional bands of clayey silt.			
3.00	D									
3.00-3.45	D									
3.00-3.50	B									
4.00-4.45	SPT N=12			2,2/2,3,3,4			.... below 4.15m : medium dense			
4.00-4.45	D									
5.00	D						.... at 5.00m : slightly clayey		▼1	
5.50-5.95	SPT N=14			2,3/3,4,3,4						
5.50-5.95	D									
5.50-6.00	B									
				Water Inflow(1) at 6.50m, rose to 5.00m in 20 mins, not sealed.					▽1	
7.00-7.45	SPT N=19			3,3/4,4,5,6						
7.00-7.45	D									
7.00-7.50	B									
8.50-8.95	SPT N=22			3,4/5,5,5,7						
8.50-8.95	D									
8.50-9.00	B					(12.81)				
10.00-10.45	SPT N=28			3,4/5,7,8,8						

Remarks
Hand dug inspection pit from GL to 1.20m to check for services - 1hr
Sand blown up casing at 6.50m up to 5.00m - 1hr redrill. Water kept topped up.
Chiselling from 15.00m to 15.45m - 1hr
Water added to aid drilling from 3.00m to 15.00m, possibly masking water inflows.
On completion backfilled with arisings and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH2

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3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907

Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.40m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00	D						Medium dense, then dense, then very dense brown silty fine to medium SAND with occasional shell fragments of shell and occasional bands of clayey silt.			
10.00-10.45	D									
10.00-10.50	B									
11.50-11.95	SPT N=35			4,5/7,9,9,10						
11.50-11.95	D						.... below 11.65m : dense			
11.50-12.00	B									
12.00	D									
13.00-13.45	SPT N=43			4,7/8,11,12,12						
13.00-13.45	D									
13.00-13.50	B									
14.50-14.90	SPT 50/245			4,5/11,12,15,12						
14.50-14.90	D						.... below 14.65m : very dense			
14.50-15.00	B									
15.40-15.81	SPT 49/260			5,9/10,14,15,10						
15.40-15.81	D									
				03/11/2020:		15.81	Complete at 15.81m			

Remarks

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH2

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Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.20m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	04/11/2020	COLLINS HALL GREEN LIMITED	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	Soft, locally firm brown slightly gravelly slightly sandy clayey SILT with occasional rootlets. Gravel is subrounded quartz.			
0.20	B					0.30				
0.30-1.00	B						Firm becoming soft low strength brown slightly sandy clayey SILT with some rootlets.			
						(1.60)				
1.20-1.65	SPT N=7			1,1/1,2,2,2			.... below 1.20m : soft low strength			
1.20-1.65	D									
1.20-1.70	B									
						1.90	Soft low strength brown slightly gravelly slightly sandy clayey SILT with occasional rootlets. Gravel is subangular to subrounded fine to medium sandstone, siltstone and coal.			
2.00-2.45	SPT N=6			1,1/1,1,2,2						
2.00-2.45	D									
2.00-2.50	B									
						(1.60)				
3.00-3.45	SPT N=10			1,2/2,2,3,3						
3.00-3.45	D									
						3.50	Soft medium strength brown and grey slightly sandy clayey SILT.			
3.50	B									
4.00-4.45	SPT N=12			1,2/2,3,3,4						
4.00-4.45	D									
4.00-4.50	B									
						(2.00)				
						5.50	Medium dense becoming dense brown and grey silty fine SAND.		▼1	
5.50-5.95	SPT N=20			2,2/4,4,5,7						
5.50-5.95	D									
5.50-6.00	B								▽1	
				Water inflow(1) at 6.30m, rose to 5.50m in 20 mins, not sealed.						
7.00-7.45	SPT N=24			4,4/5,3,8,8						
7.00	D									
7.00-7.45	D									
7.00-7.50	B									
						(4.50)				
8.50-8.95	SPT N=37			5,3/7,9,10,11			.... below 8.65m : dense			
8.50-8.95	D									
8.50-9.00	B									
10.00-10.45	SPT N=32			4,5/7,8,8,9						

Remarks
Hand dug inspection pit from GL to 1.20m to check for services - 1hr
Chiselling from 15.00m to 15.30m - 45mins
Water added to aid drilling from 1.10mm to 15.30m, possibly masking water inflows.
On completion backfilled with arisings and installed a 50mm dia slotted standpipe with a gas valve and a gravel surround to 5.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH3

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Site	Borehole Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 15.20m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	04/11/2020	COLLINS HALL GREEN LIMITED	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45 10.00-10.50	D B					10.00	Dense becoming very dense brown and grey slightly silty fine to medium SAND with occasional fragments of shell.			
11.50-11.95 11.50-11.95 11.50-12.00	SPT N=35 D B			5,2/6,7,10,12		(5.72)				
13.00-13.45 13.00-13.50 13.00-13.50	SPT N=42 B D			5,7/8,10,12,12						
14.50-14.93 14.50-14.93 14.50-15.00	SPT 50/280 D B			5,8/10,12,14,14			.... below 14.65m : very dense			
15.30-15.72 15.30-15.72	SPT 50/267 D			7,9/10,10,18,12		15.72	Complete at 15.72m			
				04/11/2020:						

Remarks

Scale (approx)	Logged By
1:50	BSP/SJ

Figure No. NE3989.BH3

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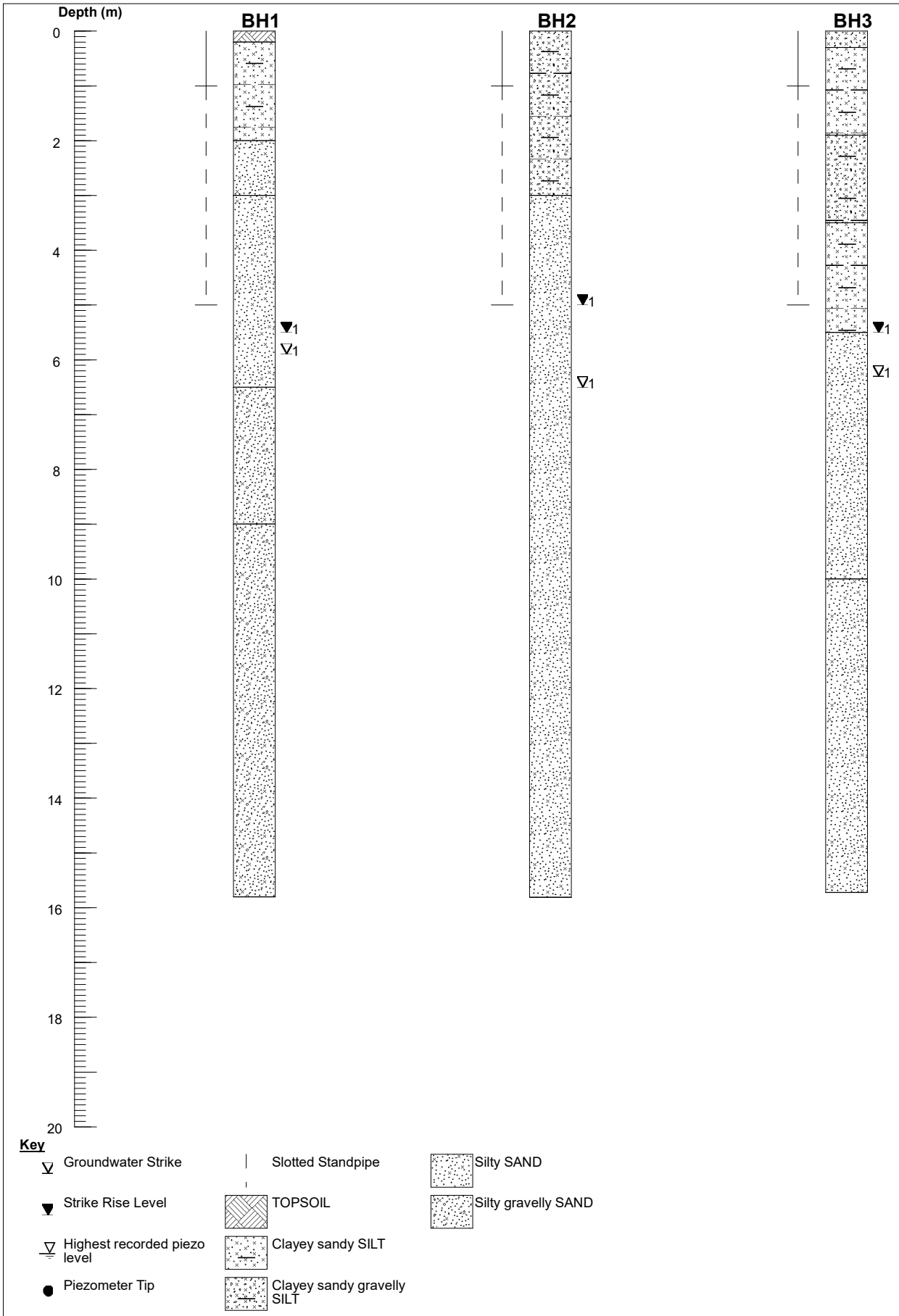

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Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	22/12/2020		1/1	NE3989
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
GLEEDS COST MANAGEMENT SERVICES LIMITED			1:100[V]	NE3989.1

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TRIAL PIT RECORD SHEETS

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.45)	TOPSOIL: dark brown silty clay.		
0.45	B				0.45	Firm medium strength brown silty CLAY becoming clayey SILT.		
0.90	D		HV@1.00m, c=42kPa		(1.55)			
1.45	D		Damp(1) at 1.60m.					▽1
1.90	D		Seepage(2) at 1.90m.					▽2
			03/11/2020:1.60m		2.00	Complete at 2.00m		

Plan

Remarks

Pit sides remained vertical and stable.
Groundwater seepage at 1.90m
HV = Hand Shear Vane test
Soakaway test carried out with standing water level of 1.60m prior to testing.
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP1

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.30)	MADE GROUND: brown silty clay.	
0.20	B				0.30		
0.40	D				(0.30)	Clayey TOPSOIL/SUBSOIL.	
					0.60		
0.70	B				(0.60)	Firm brown silty CLAY.	
			HV@1.20m, c=20kPa		1.20		
1.30	D					Soft low strength brown clayey SILT becoming fine SAND with bands of silt.	
1.70	B		Seepage(1) at 1.70m.				
					(1.70)		
2.30	D						
2.90	D		03/11/2020:		2.90	Complete at 2.90m	

Water Strike ▽1

Plan

Remarks

Major collapse of pit sides below 1.70m
Groundwater seepage at 1.70m
HV = Hand Shear Vane test
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP2

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.30)	Clayey TOPSOIL.	
0.10	B				0.30		
0.40	D		HV@0.50m, c=40kPa		(0.40)	Firm medium strength brown silty CLAY.	
					0.70		
0.80	B		HV@1.00m, c=14kPa		(0.75)	Soft very low strength brown clayey SILT with bands of clay.	
1.20	D				1.45		
1.70	B				(0.85)	Brown fine to medium SAND with bands of silty clay.	
					2.30		
2.40	D		Damp(1) at 2.40m.		(0.90)	Brown medium SAND.	
3.00	D				3.20		
			03/11/2020:			Complete at 3.20m	

Water Strike ▽1

Plan

Remarks

Major collapse of pit sides below 1.70m.
HV = Hand Shear Vane test
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP3

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP4

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Clayey TOPSOIL.		
0.20	B				0.30			
0.45	B				(0.60)	Very soft very low strength brown clayey SILT.		
			HV@0.80m, c=12kPa		0.90			
1.00	D					Brown fine to medium SAND with bands of silty clay.		
1.60	B				(1.60)			
1.90	D		Damp(1) at 1.90m.					▽1
2.40	D				2.50			
			03/11/2020:			Complete at 2.50m		

Plan

Remarks

Major collapse of pit sides below 1.00m
HV = Hand Shear Vane test
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP4

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	Clayey TOPSOIL.		
0.45	B				0.30	Brown clayey SILT becoming fine SAND with silt bands.		
1.00	D							
1.40	D				(2.10)			
1.90	B		Damp(1) at 1.90m.					▽1
2.30	D		03/11/2020:		2.40	Complete at 2.40m		

Plan

Remarks

Major collapse of pit sides below 1.90m.
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP5

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Site	Trial Pit Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	TP6

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.60m x 1.80m		GLEEDS COST MANAGEMENT SERVICES LIMITED	NE3989
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/11/2020	COLLINS HALL GREEN LIMITED	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.15	B				(0.30)	Clayey TOPSOIL	
					0.30		
0.45	B		HV@0.50m, c=40kPa		(0.30)	Firm medium strength brown silty CLAY.	
0.70	D				0.60	Very soft very low strength brown clayey SILT / silty clay in places with bands of fine sand.	
1.10	D		HV@1.20m, c=22kPa		(1.10)		
1.60	D				1.70	Brown fine SAND.	
1.90	D		Seepage(1) at 2.00m.		(0.40)		
			03/11/2020:1.65m		2.10	Complete at 2.10m	

Water ▽1

Plan

Remarks

Partial collapse of pit sides below 1.20m.
Groundwater seepage at 2.00m
HV = Hand Shear Vane
Soakaway test carried out with standing water level of 1.65m prior to testing.
On completion backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:25	DS/SJ	NE3989.TP6

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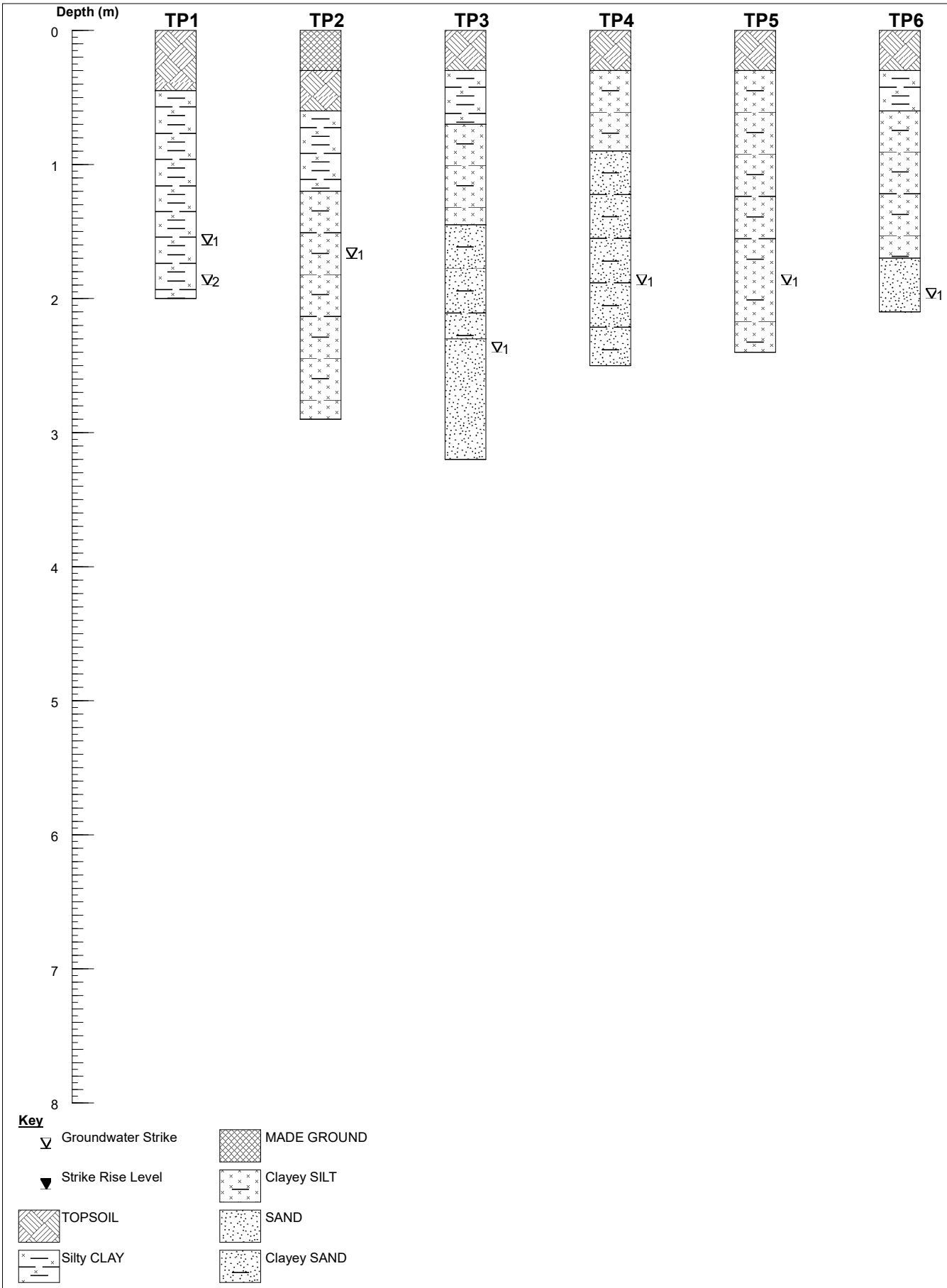

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Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, LINCOLNSHIRE	22/12/2020		1/1	NE3989
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
GLEEDS COST MANAGEMENT SERVICES LIMITED			1:40[V]	NE3989.1

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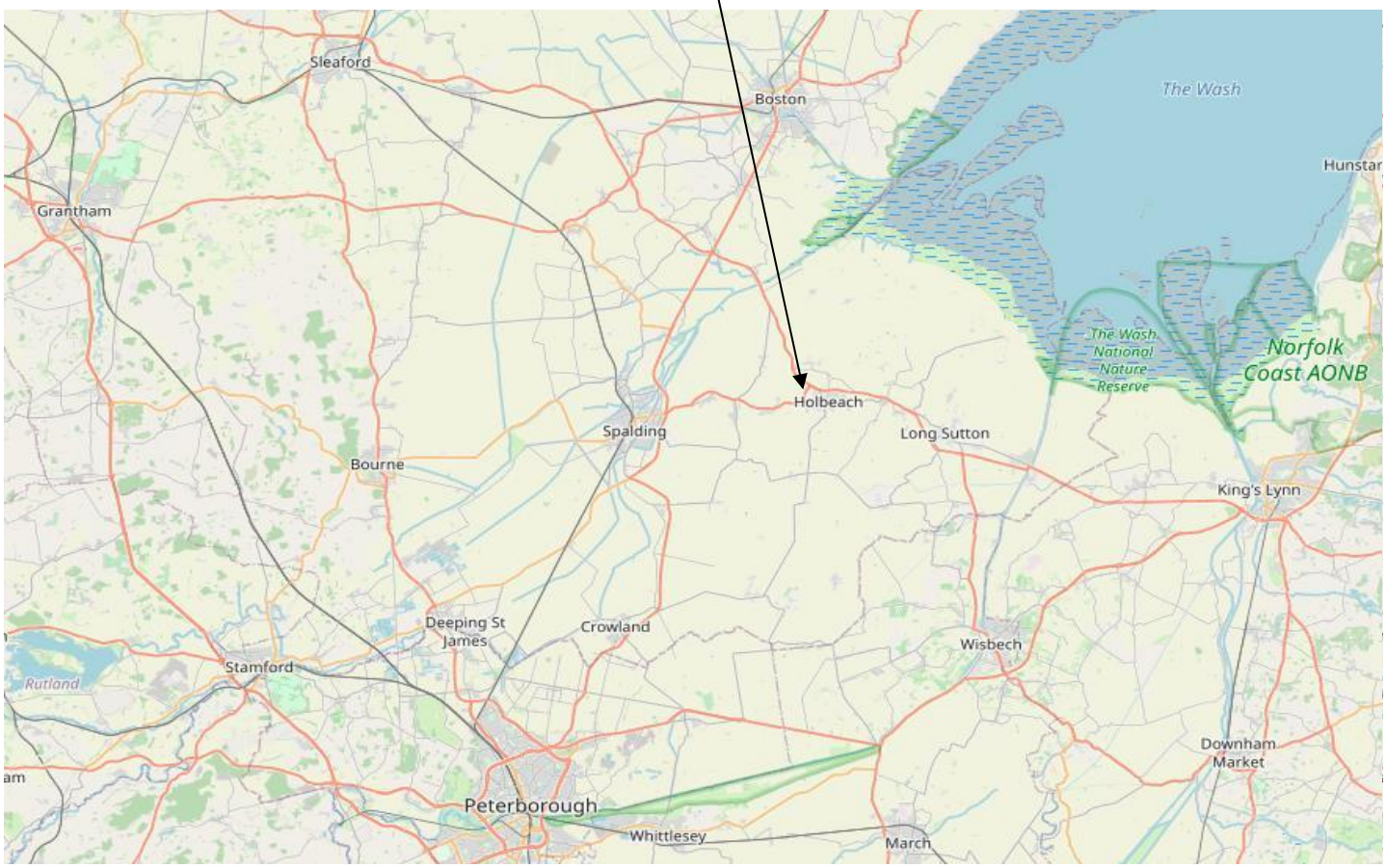
FIGURES



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General Site Location

Site	Date Drawn	Date Checked	Orientation	Job No.
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, SPALDING, LINCOLNSHIRE	17-Dec-20	-	N	NE3989
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
GLEEDS COST MANAGEMENT SERVICES LTD	DM	-	_	1

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Site Location Plan

Site	Date Drawn	Date Checked	Orientation	Job No.
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, SPALDING, LINCOLNSHIRE	17-Dec-20	-	N	NE3989
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
GLEEDS COST MANAGEMENT SERVICES LTD	DM	-	_	2

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Proposed Development and Exploratory Hole Location Plan

Site	Date Drawn	Date Checked	Orientation	Job No.
FOOD ENTERPRISE ZONE, PLOT 12, HOLBEACH, SPALDING, LINCOLNSHIRE	17-Dec-20	-	N	NE3989
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
GLEEDS COST MANAGEMENT SERVICES LTD	DM	-	_	3