



SHADBOLT
ENVIRONMENTAL



Unit 3 Pilsworth Industrial Estate Bury

Ground Investigation Interpretive Report

Star UK PAS I Propco Ltd

Issue V2

February 2023



SHADBOLT
GROUP

Unit 3 Pilsworth Industrial Estate
Bury
Ground Investigation Interpretive Report
Project Reference: 2931

Client	Star UK PAS I Propco Ltd
Our Reference	2931 – Unit 3 Pilsworth Industrial Estate
Produced by	Rob Plews
Checked by	Mike Taylor
Submitted	Issue V2 – February 2023



CONTENTS

1.0	INTRODUCTION	1
1.1	Aims and Objectives.....	1
1.2	Proposed Development.....	1
1.3	Scope of Works.....	1
1.4	Limitations.....	1
2.0	SITE INFORMATION	2
2.2	Site Description	3
3.0	HISTORICAL LAND USE	4
4.0	PREVIOUS INVESTIGATIONS	5
5.0	SITE INVESTIGATION	7
5.1	Scope of Investigation	7
5.2	In-Situ Testing	7
5.3	Geotechnical Laboratory Testing.....	7
5.4	Chemical Laboratory Testing.....	7
5.5	Groundwater and Gas Monitoring.....	7
5.6	Limitations.....	8
6.0	GROUND CONDITIONS	9
6.1	Made Ground	9
6.2	Topsoil.....	9
6.3	Superficial Deposits	9
6.4	Solid Deposits	9
6.5	Groundwater.....	9
6.6	Ground Obstructions.....	10
6.7	Observed Contamination.....	10
6.8	In-Situ and Laboratory Geotechnical Analysis.....	10
7.0	GROUND CONTAMINATION ASSESSMENT	12
7.1	Legislation	12
7.2	Assessment Methodology	12
7.3	Derivation of Soil SSVs.....	13
7.4	Soil Contamination Assessment.....	15
7.4.1	Soils Statistical Assessment	15
7.5	Leachate Contamination Assessment.....	15
7.6	Groundwater Contamination Assessment.....	15
7.7	Waste Acceptance Criteria.....	15
7.8	Contamination Summary	15
8.0	GAS RISK ASSESSMENT	16
8.1	Gas Monitoring	16
8.2	Gas Risk Assessment	16
8.3	Gas Protection Measures	17

8.4 Discussion	17
9.0 CONCEPTUAL SITE MODEL.....	18
9.1 Contamination Sources	18
9.2 Potential Contaminant Pathways.....	18
9.3 Potential Contamination Receptors.....	18
9.4 Qualitative Risk Assessment.....	19
9.4.1 Current and Future Site Users	22
9.4.2 Ground Excavation / Development Workers.....	22
9.4.3 Future Developments including Buried Structures and Services.....	22
9.4.4 Controlled Waters.....	22
9.4.5 Flora	23
10.0 GROUND ENGINEERING CONSIDERATIONS	24
10.1 Proposed Development – COMMERCIAL.....	24
10.2 Ground Obstructions.....	24
10.3 Mining	24
10.4 Foundations and Earthworks	24
10.5 Chemical Attack on Buried Structures.....	24
10.6 Drainage and Infrastructure	24
11.0 CONCLUSIONS AND RECOMMENDATIONS	26
11.1 Conclusions.....	26
11.2 Recommendations.....	27
13.0 REFERENCES	28

APPENDICES

Appendix A	Report Conditions
Appendix B	Exploratory Hole Logs
	Exploratory Hole Location Plan – 2931-003
Appendix C	Chemical Screening Values
Appendix D	Chemical Laboratory Results
Appendix E	Geotechnical Laboratory Results
Appendix F	Gas Monitoring Results and Risk Assessment Methodology
Appendix G	Outline Development Proposals

1.0 INTRODUCTION

Shadbolt Group (SG) were commissioned by the Client, Star PAS Propco Ltd, to undertake a site investigation in relation to a proposed commercial development located at the site of Unit 3 Pilsworth Industrial Estate, Bury, Greater Manchester.

1.1 Aims and Objectives

The purpose of the investigation was to determine the existing ground conditions and identify possible contamination and potential pollutant linkages related to past uses of the site which may provide constraints to the proposed development and future end users.

To achieve the above stated aims and objectives the following works have been undertaken:

- Intrusive investigations comprising cable percussive boreholes and trial pits.
- In-situ testing (SPT within cable percussive boreholes and Hand shear vanes within trial excavation).
- Chemical laboratory testing.
- Geotechnical Laboratory Testing.
- Gas and water monitoring.
- Contamination risk assessment.

1.2 Proposed Development

At this stage it is understood that the final development will comprise the extension of the existing commercial development which comprises a large portal framed unit.

1.3 Scope of Works

The site investigation was undertaken by Shadbolt Group in November 2022.

The works undertaken by Shadbolt Group to date comprise:

- 3 No. cable percussive boreholes to a maximum depth of 13.54m bgl.
- 10 No. trial excavations to a maximum depth of 2.40m bgl.
- Chemical laboratory testing (including groundwater sampling).
- Geotechnical Laboratory testing.
- Ground gas and groundwater monitoring.
- Contamination risk assessment.

1.4 Limitations

The recommendations and opinions expressed in this report are based on the strata observed in the borings and excavations; together with the results of the site and laboratory tests as detailed within the report. The Shadbolt Group take no responsibility for ground conditions which occur between the exploratory hole positions.

Every effort has been made to interpret the conditions between investigation locations; however, such information is indicative. A detailed review of the extent of limitations of this report is included in the Report Conditions included in Appendix A and the standard terms and conditions of the agreement.

2.0 SITE INFORMATION

The site is located in the Bury area of Greater Manchester within the Pilsworth Industrial Estate, approximately 2.0km south of Bury town centre and 0.6km west of the M66 motorway on a site elevated above the river Roch.

The approximate National Grid Reference (NGR) for the centre of the site is **SD 81487 09020**.

A general site location plan of the site is shown in Figure 1 and an aerial photograph in Figure 2.

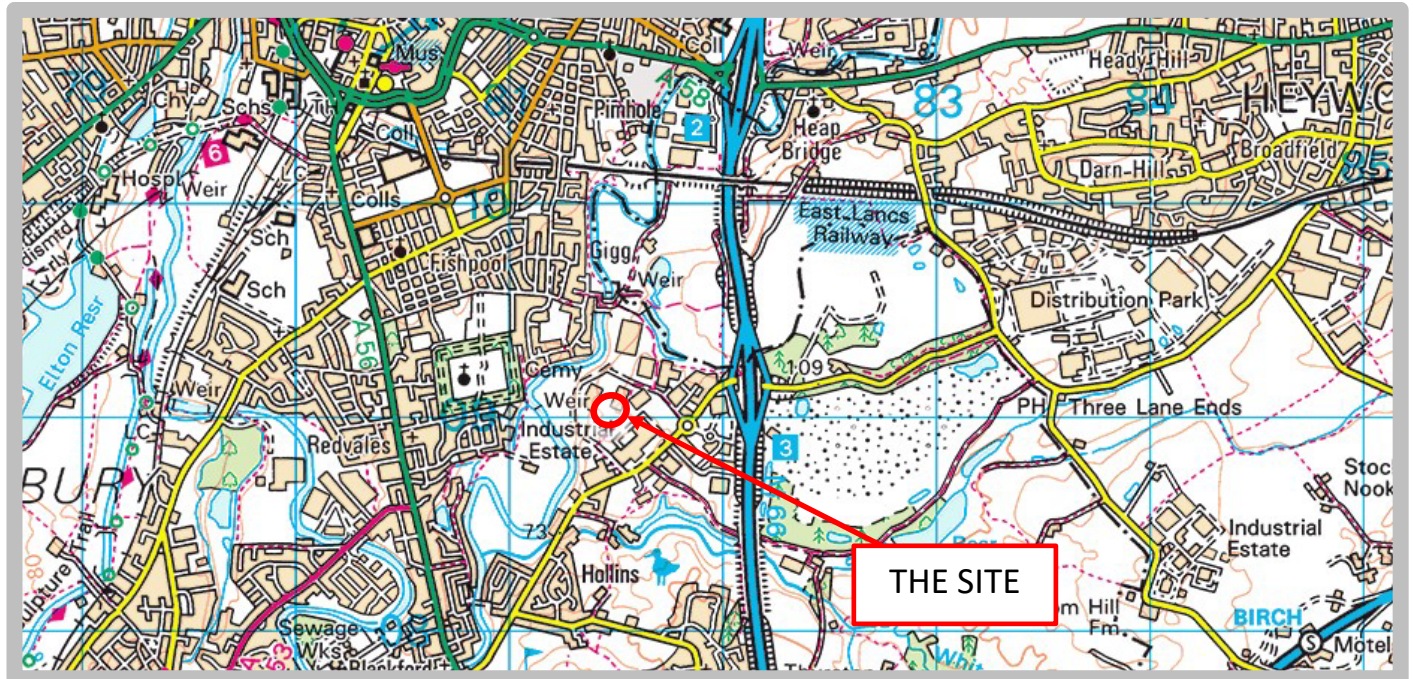


Fig. 1 – General Site Location Plan

2.2 Site Description

A site reconnaissance visit was made in November 2022.

The site is approximately rectangular in shape and comprises rough scrubby grass land with shrubs and small trees. The site was notably wet at the time of site works with pooling water within depressions.

The site is surrounded immediately by similar commercial buildings of the Pilsworth Industrial Estate. The river Roch lies approximately 300m to the west of the site with the Redvales area of Bury beyond this. To the east lies the M66 motorway with the Pilsworth South Landfill beyond this. Beyond the industrial estate land to the north and south is more agricultural in nature.

Access to the site is via Roach Bank Road/Pilsworth way and through the existing hardstanding yard of the wider Unit 3 site with generally good access.



Fig.2 – Aerial Photograph Showing the Development Area in red (approximate).

3.0 HISTORICAL LAND USE

SG have reviewed a Phase 1 Desk Study entitled;

- Phase 1 Environmental Report. Unit 3 Roach Bank Road Bury BL9 8RY. Nova Ambiente for Star UK PAS PROPCO Ltd. November 2020.

The site history (covering the entire unit area) is summarised thus;

'From the earliest available map (dated 1851), the site was developed with Roach Bank Farm buildings (arranged around a central farm yard) in the central eastern part of the site with surrounding fields to the north, south and west. An access track extended from the farm off-site to the east. In a detailed map dated 1893 a second access track was marked from the farm extending off-site to the north. A spring was also marked in the western part of the site (no longer marked after 1910).

The farm building had largely been demolished by the map of 1980. A map dated 1999 shows almost all the former features within the site boundary were no longer present. An aerial photograph dated 1999 shows apparent earthworks across the whole site, with a large mound of material occupying the eastern half of the site. A 2003 aerial photograph shows ongoing earthworks and the mound on the eastern side is no longer present. The site was shown to be developed in its current configuration between the aerial images of 2003 and 2005.'

SG have also reviewed a more recent Phase 1 Desk Study for the site entitled;

- Phase 1 Desk Study for L'Oreal, Unit 3 Pilsworth Industrial Estate, Bury, SL07660-HBPW-DOC-C-GE-DSR Rev A03. HBPW for Star UK PAS I PROPCO Ltd. Issue 03 August 2022.

'Historic land use is summarised thus: The site was occupied by a farm and open land from the earliest map until the 2001 map, the existing warehouse on site was first shown on the 2006 map. The site was surrounded by open land from the earliest map until 1970 where industrial development started to occur east of the site. Based on the observed history there are potential ground obstructions from previous land uses on site, most notably the demolition of the farm buildings. There may be some contamination of near surface soils associated with agricultural and industrial uses.'

Reference should be made to these reports for full details.

4.0 PREVIOUS INVESTIGATIONS

SG have not had sight of any previously commissioned Phase 2 investigations for the Unit 3 site however the Nova Ambiente report (section 3.0) references a ground investigation at the site from 2003;

Proposed Commercial Development at Unit 3 Roach Bank, Bury, Lancashire - Ground Investigation Report. RSA Geotechnics Ltd, November 2003 (Report No: 8951).

SG have been unable to obtain a copy of this report. However, the following text is included in the Nova Ambiente report and describes the findings of the RSA report:

'The report covers the subject site and was undertaken for the current development. The study included a brief summary of the site setting and two previous reports, followed by an intrusive investigation (boreholes and trial pits), ground gas / groundwater monitoring and laboratory testing of soil samples.

The report identified that the site was part of a larger site licensed for the disposal of inert, non-contaminated wastes and fill materials had been imported to raise levels since April 1990. At the time of the investigation RSA Geotechnics report that the filling in the site area had been complete for two to three years. At the time of the investigation, the filling of the wider Roach Bank site was almost complete, with works ongoing to the north of the site. A stockpile of imported material was present in the north western edge of the proposed building footprint. This was awaiting processing and placement off site at the northern end of the Roach Bank site.

The investigation involved the drilling of seven boreholes (BH101-107) to depths between 0.8m and 13.5mbgl and excavation of eight trial pits (TP201-207) to depths between 1.2m and 2.7mbgl. Gas and groundwater monitoring standpipes were installed in each of the boreholes. Made Ground, described as Engineered Fill, comprising sandy clays and sandy gravel, was encountered across the majority of the site, ranging in thickness from 100mm to 3.7m on the western edge of the site. No Made Ground was present on the eastern edge of the site. Glacial Deposits, described as boulder clay was noted from the surface on the eastern edge of the site up to a depth of 1.2m, elsewhere granular glacial deposits were present beneath the Made Ground varying in thickness between 0.4m and 3.1m. Beneath these layers the Glacial Deposits comprised interbedded clays and sands varying in thickness between 4.5m and 11.4m.

The underlying Pennine Lower Coal Measures were encountered at depths between 10.4m and 13.3m, with the depth to rockhead increasing from north to south. The Pennine Lower Coal Measures strata were found to comprise a fine-medium grained weak sandstone. An inflow of oily water was observed at shallow depth in TP201, it was assumed that this related to leaks and spillage from earthworks plant known to have been stored close by.

Groundwater monitoring found groundwater levels between 84.5mAOD and 87.89mAOD (0.9-4.1 mbgl) across the site indicating groundwater flow from north east to south west towards the River Roch. A total of 10 soil samples were analysed for contaminants including TPH, PAH, PCB and asbestos. Four groundwater samples were also analysed. The results of the soil analysis were compared to commercial end use criteria, RSA Geotechnics concluded that none of the results indicated a risk to human health. The presence of elevated concentrations of TPH was concluded not to be significant given the extensive hardstanding forming the proposed development, but it was recommended that any material with hydrocarbon odours encountered during the earthworks be removed from site and disposed of to landfill. Concentrations of TPH were found in all three water samples elevated above the drinking water criteria and concentrations of ammonia in excess of the EQS value were also present in all three samples. RSA Geotechnics concluded that these were not significant as they were likely to be representative of the water quality in the wider area, given the extent of the landfilling in the surrounding area and no specific remedial works would be required.

Three rounds of gas monitoring were undertaken with a maximum concentration of carbon dioxide of 14%v/v and methane of 2.2%v/v recorded. Low flows were recorded in some locations. RSA Geotechnics concluded that the site would be classified as 'gas characteristic situation 4' based on CIRIA R149, and gas protection measures would be required to protect end users of the development.

2 No. Phase 1 Desk Studies have been undertaken at the site as described in the previous section.

Both reports find a maximum risk to current/future site users of 'Moderate' associated with ground gas emissions at the site associated with historic landfill activities.

The HBPW report is accompanied by a Coal Mining Risk Assessment Report entitled

- *Mining Risk Assessment for L'Oreal Unit 3 Pilsworth Industrial Estate, Bury, BL9 8RY. HBPW Project No. SL07660. HBPW LLP for Star UK PAS Propco Limited UK.*

This report considers the overall risk to the site from historic coal mining activities to be low. The Nova Ambiente report references an earlier investigation undertaken by Wardell Armstrong in 1989 to investigate the presence of a coal seam beneath the site. It is noted that no coal seams were encountered in the Wardell Armstrong investigation however the extent of the Wardell Armstrong investigation is not known.

5.0 SITE INVESTIGATION

The physical ground investigation work was carried out by The Shadbolt Group in November 2022.

5.1 Scope of Investigation

The SG ground investigation undertaken comprised the boring of 3 No. cable boreholes to a maximum depth of 13.54m bgl. 3 No. ground gas/groundwater monitoring installations were installed as part of the SG site works to a maximum depth of 13.00m bgl.

10 No. mechanically excavated trial pits were undertaken across the site reaching a maximum depth of 2.40m bgl.

Logs from these exploratory holes are presented, along with an Exploratory Hole Location Plan within Appendix B of this report following the main body of text.

The soils encountered during this investigation have been logged in accordance with BS5930:2015 "Code of Practice for Ground Investigation". Representative samples were taken at regular intervals from the exploratory holes during the investigation to assist in the identification of the soils, and to allow selected geotechnical and chemical testing to be programmed.

5.2 In-Situ Testing

Insitu testing was undertaken during the ground investigation works including hand shear vane tests in cohesive strata within trial excavations (where possible) and SPT testing within cable percussive boreholes.

5.3 Geotechnical Laboratory Testing

Laboratory geotechnical testing was undertaken on samples selected by SG. This included Atterberg limits, particle size distribution, dry density/moisture content relationship and remoulded CBR value testing.

5.4 Chemical Laboratory Testing

A targeted programme of chemical laboratory analysis was scheduled by Shadbolt Group and undertaken by our nominated environmental testing laboratory to determine the concentrations of potential contaminants which may be present within the soils encountered at the site. 15 No. soil samples were tested for a range of determinants including fuels, heavy and phytotoxic metals and metalloids and inorganic and organic contaminants as part of the SG investigation. These samples were also tested for the presence of asbestos.

3 No. water samples were submitted to the laboratory for water leachate testing including TPH leachate screening.

The SG Screening Values, together with the results of the contamination testing are presented in Appendix C and Appendix D respectively.

5.5 Groundwater and Gas Monitoring

3 No. monitoring wells were installed by SG as part of the commissioned works. 6 No. monitoring visits have been undertaken to date – gas and groundwater monitoring is complete. Results are reported within **Appendix F**.

5.6 Limitations

It should be noted that although every effort has been made to ensure the accuracy of the data obtained from the investigation, the possibility exists of variations in ground and groundwater conditions between and around the borehole locations; additionally, groundwater levels and ground gas concentrations will vary seasonally and with changes in weather conditions.

6.0 GROUND CONDITIONS

For a full description of the strata encountered and any identified groundwater strikes, reference should be made to the individual exploratory hole logs presented included in **Appendix B**.

The ground conditions encountered at the site are summarised in the following sections.

6.1 Made Ground

Made Ground was encountered to a maximum depth of 6.00m bgl (BH03) and was widespread across the site being encountered at all exploratory locations. Encountered Made Ground comprised dark grey sandy very gravelly clay/very clayey gravel including frequent demolition type rubble including brick, sandstone, tarmac, concrete fragments, concrete blocks, metallic fragments, wood fragments and plastic including sheeting.

A slight hydrocarbon odour was noted with tarmac and wood fragments.

Made Ground became progressively deeper with progression from east to west across the site ranging from 0.90m thickness (TP09) to 6.00m bgl (BH03).

6.2 Topsoil

Topsoil was identified across the site to a maximum thickness of 0.20m bgl and includes generally grey slightly sandy very clayey Topsoil including angular to subangular sandstone and mudstone.

6.3 Superficial Deposits

Natural superficial deposits were encountered across the site to a maximum depth of 13.54m bgl (the maximum drilled depth). The base of superficial deposits is considered to have been encountered during these works with refusal possibly within bedrock. Generally superficial deposits were encountered within deeper cable percussive boreholes with the exception of TP09 in the far east of the site.

Superficial deposits were generally encountered below Topsoil and Made Ground with predominant deposits of soft/firm grey silty clay/clayey silt noted with rarer lamination noted as well as limited fine subangular to subrounded mudstone gravel. Sand was generally fine within silty/cohesive strata. BH01 encountered shallower deposits of brown and grey fine to medium gravelly sand encountered at (4.00m thickness) including fine gravel including mudstone in thin bands.

Deeper deposits included stiff grey and brown slightly sandy gravelly boulder clay including gravel of fine to medium subangular to subrounded sandstone mudstone and coal.

6.4 Solid Deposits

Solid deposits were considered to have been encountered within 3 No. cable percussive boreholes at the site at depths ranging from 11.20m to 13.54m bgl. Although recovery was limited due to the nature of the drilling technique medium grained red/brown sandstone was noted within SPT refusals.

6.5 Groundwater

Groundwater was encountered at shallow depth during the investigation within several trial excavations including TP09 (sandy strata) and TP01 (perched within Made Ground). Groundwater within borehole installations was encountered between 2.28m and 4.23m bgl upon return visits.

6.6 Ground Obstructions

Ground obstructions were not generally encountered during site works beyond larger boulders of concrete etc within Made Ground.

The presence of further similar obstructions cannot be ruled out along with naturally occurring cobbles and boulders within natural superficial deposits.

6.7 Observed Contamination

A slight hydrocarbon odour was noted with tarmac and wood fragments at the site. Notable quantities of demolition rubble were encountered within Made Ground at the site.

6.8 In-Situ and Laboratory Geotechnical Analysis

The following in-situ and laboratory geotechnical testing has been undertaken at the site during the SG works;

Method	Strata	Parameter	Comments
Standard Penetration Test	MADE GROUND (Stoney cohesive strata) 0.20-6.00m bgl	Average 'N' Value N = 18 'N' Value Range 10 - 36	SPT testing indicates natural cohesive strata to be stiff to very stiff, generally stiff. High to very high strength generally high strength.
	Natural Cohesive Strata (Silty clay/clayey silt) 5.00 – 13.00m bgl	Average 'N' Value N = 8 'N' Value Range 1 – 34	SPT testing indicates natural cohesive strata to be very soft to stiff, generally firm (although widely soft in shallower strata). Very low to high strength generally medium strength (low at shallow depth).
	Natural Granular Strata (Clayey sand) 2.50 – 6.50m bgl	Average 'N' Value N = 8 'N' Value Range 4 – 11	SPT testing indicates natural sand strata to be very loose to medium dense, generally loose. Low to medium strength generally low strength.
	Natural Cohesive Strata (Boulder Clay) 10.50 – 13.54m bgl	Average 'N' Value N = >50 'N' Value Range 50+	SPT values indicate very high strength clays – possible bedrock encountered within SPTs.

Particle Size Distribution	Natural Cohesive Strata 1.50m bgl	Cobbles: 0 % Gravel: 0% Sand: 19% Silt/Clay: 81%	Strata is confirmed as a 2C/2D material (SHW600). Sandy Silty Clay.
	Made Ground 1.20to 1.30m bgl	Cobbles: 0-10 % Gravel: 10-51% Sand: 15-35% Silt/Clay: 18-55%	Strata is confirmed as a 2C material (SHW600). Sandy Gravelly Clay.
Atterberg Limits	Natural Cohesive Strata 1.50 to 11.00m bgl	LL = 39 to 45% PI _(mod) = 18 to 23%	Cohesive deposits of intermediate plasticity. Medium Volume Change Potential.
Compaction (Dry Density - Moisture Content Relationship) Made Ground	0.80m to 1.30m bgl	Moisture Content as received was 15-22% Optimum Moisture Content was 10-15%	Materials are likely to be detrimentally affected by elevated moisture. Cohesive material generally 3-6% wet of optimum. Some drying of material will likely be required.
Undrained Shear Strength Triaxial Compression	Cohesive Superficial Strata (12.20-12.65m bgl) (only 1 No. sample retrieved).	Shear Strength (Cu) 17 kPa	Undrained triaxial test confirm cohesive deposits to be Very Soft (very low strength).

Table 6.8.1 – Summary of In-Situ and Laboratory Geotechnical Testing undertaken.

7.0 GROUND CONTAMINATION ASSESSMENT

7.1 Legislation

Part IIA of the Environmental Protection Act 1990 provides for the control of specific threats to health or the environment from existing land contamination. In accordance with the Act, the statutory guidance document and The Contaminated Land (Scotland) Regulations 2005, the definition of contaminated land is intended to embody the concept of risk assessment. Therefore, land is only “contaminated land” where it appears to the regulatory authority, by reason of substances within, on, or under the land that:

Significant harm is being caused, or there is significant possibility of such harm being caused; or

Pollution of controlled waters is being, or is likely to be, caused.

The guidance defines “risk” as the combination of:

- Probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- Magnitude (including the seriousness) of the consequences.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all the following elements must be present:

- Source, i.e. a substance that can cause pollution or harm;
- Receptor (or target), i.e. something which could be adversely affected by the contaminant; and
- Pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is missing (source, pathway or receptor) there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

7.2 Assessment Methodology

To assess the environmental risk posed by potential contaminants within the underlying soils and groundwater Shadbolt Environmental undertook an initial screen of the laboratory results using Atkins ATRISK Screening Values (SSVs). This screening was undertaken using SSVs derived for a Commercial end use as this represents the end use that is likely to be developed in the area in the future (i.e. Infrastructure and commercial buildings).

Contaminant concentrations below the SSVs are considered not to warrant further risk assessment. Concentrations of potential contaminants above the SSVs require further consideration of the potential pollutant linkages.

It should be noted that exceedance of the SSVs does not necessarily require that the site be remediated.

7.3 Derivation of Soil SSVs

On-going research by the Environment Agency (EA) is being undertaken to produce toxicology reports (TOX series) for each of the contaminants identified within the LCRM framework and then to produce published Soil Guideline Values (SGVs) using the Contaminated Land Exposure Assessment (CLEA) Model. Parallel to the work being undertaken by the EA is research being undertaken by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH) to produce similar General Assessment Criteria (GAC) using the CLEA Model. To date, SGVs and GACs have been published for over 80 No. contaminants with SGVs / GACs derived for each contaminant for three different land use scenarios namely:

- Residential
- Allotment
- Commercial
- Playing Fields and Open Spaces

Shadbolt Environmental SSV's are based upon Atkins ATRISK values which are in turn based on the SGVs and GACs which are scientifically based generic assessment criteria that can be used to simplify the assessment of human health risks arising from long-term and on-site exposure to chemical contamination in soil.

SGVs and GACs are a screening tool for the generic quantitative risk assessment of land contamination (Defra and Environment Agency, 2004). They are not (unless clearly stated otherwise) relevant for assessing risks to human health from short-term exposure to chemicals in soil including injury arising from direct bodily contact and do not take account of other types of risks to humans such as explosion or suffocation risks (associated with the build-up of gases such as methane and carbon dioxide) or aesthetic issues such as odour or colour. SGVs and GACs do not take account of other non-soil-based sources of contamination such as contamination in groundwater, surface waters or drinking waters. They cannot be used to evaluate risks to non-human receptors such as controlled waters, ecosystems, buildings and services, domestic pets or garden plants. Where, for example, phytotoxic effects are an important consideration in the current or future intended land use further investigation should be undertaken.

SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health. They represent "trigger values" – indicators to a risk assessor that soil concentrations above this level may pose a possibility of *significant harm* to human health (Defra, 2008b). *Significance* is linked to:

- Margin of exceedance;
- Duration and frequency of exposure;
- Other site-specific factors that the enforcing authority may wish to consider.

SGVs do not of themselves represent the threshold at which there is a *significant possibility of significant harm* (SPOSH). Nor do they automatically represent an unacceptable intake in the context of Part 2A of the Environmental Protection Act 1990. However, they can be a useful starting point for such an assessment.

In order to assess the soil analyses results with regard to potential human health risks, Shadbolt Environmental's chosen SSVs have been derived in accordance with the UK framework set out in the most recent LCRM guidance documents (EA 2020) and LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment 2nd Edition 2015 and are "in line" with industry standards.

Assessment Framework

The CLEA model states that, 'the contamination is assumed to be at or within 1m of the surface'. It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

Statistical Analysis

The CLEA guidelines also state that for each contaminant, the upper 95th percentile of the mean measured concentration (95%UCL) should be calculated and this value should be compared to the SSV.

The objective of maximum value tests is to decide whether the maximum concentration observed should be treated as an outlier or whether it can reasonably be considered to come from the same underlying population as the other samples.

It is known that contaminant concentrations often demonstrate lognormal or other distribution forms. Therefore, to calculate what are considered to be more representative 95%UCL values, the contaminant concentrations have first been assessed to determine if each contaminant distribution is closer to a normal or lognormal distribution.

If a dataset was found to be log normally distributed, the geometric mean was used to calculate the 95%UCL, for those that were found to be normally distributed; the arithmetic mean was used to calculate the 95%UCL. Constituent non-detects were assigned a value equal to the reported analytical laboratory limit of detection, considered reasonably conservative. Any identified outliers are excluded from the datasets used in calculation of the 95%UCL value.

7.4 Soil Contamination Assessment

In total 15 No. soil samples retrieved during initial site works were tested for a suite of common contaminants. All of these samples were also tested for the presence of asbestos (asbestos screen).

The laboratory testing reported no chemical contaminants to be exceeding the SG screening values for a COMMERCIAL end use.

1 No. samples reported asbestos – TP10 0.60m bgl. Quantification reported the percentage asbestos to be less than the laboratory detection limit of 0.001%.

7.4.1 Soils Statistical Assessment

Statistical analysis was not required owing to generally low concentrations of contaminants reported.

7.5 Leachate Contamination Assessment

2 No. soil samples were tested for leachability. Results reported all PAH concentrations to be below laboratory screening values ($<0.001\mu\text{g/l}$). Metallic contaminants were below SG water screening values (UK drinking water standards).

2 No. water samples sampled post works from groundwater monitoring installations were tested for leachability of contaminants. Again results reported all PAH concentrations to be below laboratory screening values ($<0.001\mu\text{g/l}$) and metallic contaminants were below SG water screening values (UK drinking water standards).

7.6 Groundwater Contamination Assessment

Groundwater was encountered at shallow depth during the investigation within several trial excavations including TP09 (sandy strata) and TP01 (perched within Made Ground). Groundwater within borehole installations was encountered between 2.28m and 4.23m bgl upon return visits. Leachate testing (as above) reported low contaminant concentrations.

7.7 Waste Acceptance Criteria

No WAC testing was undertaken as part of the commissioned works. Any excess materials to be removed from site should be placed in a skip or wagon and removed by a suitably licensed waste carrier to a suitably licensed receiving facility.

Based on the reported results, it is anticipated that much of clay materials on site would be classed as inert, for disposal purposes. However, it is considered unlikely that these materials will require offsite disposal.

7.8 Contamination Summary

The findings of the environmental testing indicate that the soils encountered at the site are unlikely to pose a significant risk to human health or the environment with respect to the proposed commercial development.

Based on the chemical analysis data it is considered that the site presents a **LOW** risk to the proposed development.

Considering the results of groundwater testing the risk of contaminant migration to off-site receptors is considered to be **LOW** – leachate concentration results from both on site Made Ground and water samples retrieved from natural strata have reported low concentrations of contaminants.

8.0 GAS RISK ASSESSMENT

8.1 Gas Monitoring

Ground gas and water monitoring wells have been monitored in accordance with CIRIA C665 and BS8576:2013.

8.2 Gas Risk Assessment

CIRIA have developed a characterisation system for all buildings except for low-rise housing developments with a clear ventilated sub-floor void. Low-rise housing developments are generally covered by the NHBC's "Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present".

The CIRIA system as detailed in CIRIA Report C665, is a risk-based system which compares gas emission rates to generic Characteristic Situations (CS) derived and expanded on from CIRIA 149. The NHBC guidance uses a concept of 'Traffic Lights' developed by Boyle and Witherington for the assessment of gas emission rates for a residential development.

Each methodology utilises 'Typical Maximum Concentrations' for initial screening purposes and the development of risk-based Gas Screening Values (GSVs) for consideration when the Typical Maximum Concentrations are exceeded. The GSVs are calculated by multiplying the borehole flow rate by the concentration in the air stream of the particular gas being considered.

The Traffic Light and Characteristic Situation systems have been designed for both methane and carbon dioxide, with the worst-case value adopted for assessment. The relevant assessment tables from each methodology referenced below are presented in Appendix F for clarity.

Ground Gas Monitoring Data

6 No. of the scheduled 6 No. monitoring visits have been undertaken; monitoring is complete. The gas monitoring results are presented in Appendix F.

The Methane and Carbon Dioxide emissions, which are considered representative of the Typical Maximum Concentrations, were as follows:

Methane:	36.2% v/v
Carbon Dioxide:	3.2% v/v

The maximum recorded positive flow rate in the boreholes was 0.1 l/hr.

The calculated GSVs for Methane and Carbon Dioxide are as follows:

Methane:	$(36.2/100) \times 0.1 = 0.036$ l/hr
Carbon Dioxide:	$(3.2/100) \times 0.1 = 0.0032$ l/hr

When monitoring data to date is compared to the values in Table 8.5 in CIRIA Report C665, the site is classified as **Characteristic Situation 2**.

Gas monitoring results are presented within Appendix F.

8.3 Gas Protection Measures

BS8485:2015, "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings" sets out a methodology for determining an appropriate level of protection against ground gases in respect of the Characteristic Situation classification and the proposed building type.

The construction details of any proposed development are not confirmed at this stage; however, it is likely that a ground bearing floor slab will be preferred.

For any non-residential properties the methodology in BS8485 should be followed through Tables 3 to 7 inclusive which are presented in Appendix F for reference. In working through the tables, the development is categorised by Building Type; a Minimum Gas Protection Score is determined by Characteristic Situation of the site under C659 and Building Type; and Gas Protection Scores are calculated based on proposed/required structural barrier, ventilation details and gas resistant membrane.

For a Type C building (Commercial Building with small to large rooms – medium risk) on a CS2 site the Minimum Gas Protection Score is 2.5. Therefore, specific ground gas protection should be likely to be required when the development is assessed using BS8485:2015 with respect to Methane and Carbon Dioxide potentially involving a well reinforced suspended floor slab with minimal penetrations (score 1.5) and a suitable impermeable gas membrane (score 2.0) meeting the required 2.5 points.

Clarification should be sought from building control/planning authority.

8.4 Discussion

Using calculated GSVs for Methane and Carbon Dioxide, both of the assessment methods classify the site in the low risk classification (BS8485 CS2).

Ground gas protection measures are likely to be required for commercial development at the site considering BS8485:2015 methods.

The Nova Ambiente Phase 1 report notes that a gas membrane was installed as part of the floor slab construction across the existing building on site along with a positive pressure air blanket system installed into a granular layer beneath the floor slab. This feature being installed and maintained by Prestige Air Ltd. The rationale behind this is understood to be a gas regime classification of 'Characteristic Situation 4' under CIRIA R149 guidance – this has now been superseded. Elevated concentrations of methane have been noted within all borehole installations (including those within natural ground) suggesting methane may be naturally occurring at the site as well as being associated with Made Ground. CIRIA 665 guidance notes that a CS2 source would be considered to be Natural soil, high peat/ organic content and or "Typical" Made Ground which would be considered appropriate for the ground conditions encountered.

9.0 CONCEPTUAL SITE MODEL

All available data has been collated and evaluated to establish an initial conceptual model of the site in its current condition and post development identifying sources, pathways and receptors and pollutant linkages. The site conceptual model has been developed in accordance with BS10175: 2017.

A Tier 1 risk assessment has been undertaken using guidelines for a Commercial End Use with plant uptake as an initial screening level as this best represents the end use for this area of the site.

9.1 Contamination Sources

In total 15 No. soil samples retrieved during initial site works were tested for a suite of common contaminants. All of these samples were also tested for the presence of asbestos (asbestos screen).

The laboratory testing reported no analysed chemical contaminants to be exceeding the SG screening values for a COMMERCIAL end use.

1 No. sample reported chrysotile asbestos – TP10 0.60m bgl. Quantification reported this sample to be below laboratory detection limits.

It is considered that some materials encountered are likely to be suitable for reuse at the site and will not require off-site disposal.

9.2 Potential Contaminant Pathways

The following potential contaminant pathways are possible considering the proposed infrastructure development and potential future commercial land use and accounting for pathways which may be realised during the construction phase.

- Inhalation / ingestion of dust, gases and vapour;
- Ground gas / vapour migration;
- Dermal contact;
- Ingestion of soils and / or groundwater;
- Leaching of contaminants from made ground soils to groundwater;
- Groundwater flow;
- Soil gas migration through Made Ground, granular soils, fissures and mine entries
- Migration and leakage through service conduits;

9.3 Potential Contamination Receptors

The potential receptors listed below are proposed considering the current status of the site and surrounding area, and the proposed Commercial end use.

Human Health

Current site users.
Future site occupiers.
Site development workers.
Maintenance workers.

Environmental

Future establishment of flora and fauna.
Buildings and underground services.
Controlled waters and aquifers.

9.4 Qualitative Risk Assessment

By considering the sources, pathways and receptors, an assessment of the environmental risks is made with reference to the significance and degree of the risk to the development for current and future site users.

The qualitative risk assessment has been undertaken in accordance with BS10175:2017 and CIRIA Document C552: Contaminated Land Risk assessment, A Guide to Good Practice.

The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential severity of the hazard and the sensitivity of the target, based on the categories given in Table 9.4.1 below.

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings / property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species

Table 9.4.1 – Definition of Risk Severity

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given in Table 9.4.2 below.

Category	Definition
High Likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low Likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

Table 9.4.2 – Definition of Risk Probability

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix to give a level of risk for each potential hazard, given in Table 9.4.3 below.

		Potential Severity			
		Severe	Medium	Mild	Minor
Probability of Risk	High Likelihood	Very high	High	Moderate	Low/Moderate
	Likely	High	Moderate	Low/Moderate	Low
	Low likelihood	Moderate	Low/Moderate	Low	Very low
	Unlikely	Low/Moderate	Low	Very low	Very low

Table 9.4.3 – Risk Matrix of Potential Hazard

The risk assessment for the site is presented in Table 9.4.4. Further discussion of the more significant pollutant linkages is provided in a discussion below for each receptor in turn.

Hazard / Pollutant	Source	Pathway	Receptor	Potential severity	Probability of risk	Level of risk
The site has been historically associated with industrial uses including an airfield and more recent commercial land use. Contaminants may be present in the soils in and around the subject area from previous site history. However, no SG SSVs exceedance have been reported when assessed for a Commercial end use. No asbestos has been identified during asbestos screening. Potential for isolated contaminants within historic/redundant services.	Potential Made Ground, former and current off-site and on-site sources.	Inhalation, Dermal contact and Ingestion	Future site users, future buildings and structures.	Medium	Unlikely	Low
		Inhalation, Dermal contact and Ingestion	Development workers.	Medium	Unlikely	Low
		Root Uptake	Plants	Minor	Low likelihood	Very Low
		Contaminated Groundwater Migration	Superficial Aquifer (Secondary A)	Medium	Unlikely	Low
			Bedrock Aquifer (Secondary A)	Medium	Unlikely	Low
			Water Courses	Medium	Unlikely	Low
		Leaching of Soil Contamination	Superficial Aquifer (Secondary A)	Medium	Unlikely	Low
			Bedrock Aquifer (Secondary A)	Medium	Unlikely	Low
			Water Courses	Medium	Unlikely	Low
		Migration through service conduits, foundations, drainage solutions.	Superficial Aquifer (Secondary A)	Medium	Unlikely	Low
			Bedrock Aquifer (Secondary A)	Medium	Unlikely	Low
			Water Courses	Medium	Unlikely	Low
		Surface Run-off	Superficial Aquifer (Secondary A)	Medium	Unlikely	Low
			Bedrock Aquifer (Secondary A)	Medium	Unlikely	Low
			Water Courses	Medium	Unlikely	Low
		Volatilisation (vapour phase migration and partitioning into sorbed / dissolved phase).	Superficial Aquifer (Secondary A)	Medium	Unlikely	Low
			Principle Aquifer (Secondary A)	Medium	Unlikely	Low
			Water Courses	Medium	Unlikely	Low
Migration from Made Ground possibly natural soils. Site preliminarily assessed as CS2 (Low Risk). Potential for depleted oxygen conditions.	Migration from possible Made Ground and buried organic soils.	Inhalation, Explosion	Future site users, Structures	Medium	Low Likelihood	Low/Moderate
			Site development workers	Medium	Low Likelihood	Low/Moderate

Table 9.4.4 – Risk Assessment

9.4.1 Current and Future Site Users

Potential pathways considered significant to current and future site uses are dermal contact, ingestion of contaminated soil / groundwater and inhalation of fibres, gases, vapours or dusts.

Based on the chemical analysis data it is considered that the site presents a LOW risk to current site users from the soils located at the site.

Should the site be developed in the future the risk to site users would be LOW from the soils located at the site.

The potential exists for depleted oxygen concentrations to pose a risk to future site users. The proposed development is at this stage understood to be commercial with associated infrastructure. Workers should be made aware of the risk posed by confined spaces - in these environments they should follow procedures regarding safe working regulations within such spaces to ensure a safe system of work.

9.4.2 Ground Excavation / Development Workers

Minor earthworks may be required as part of the proposed development. It is considered that the risk to construction and/or maintenance workers during redevelopment works and post-development maintenance works is LOW.

However, site development workers should remain vigilant for the evidence of unidentified contamination.

Should any materials, including suspected Asbestos Containing Materials, suspected of being contaminated be observed during site works these works should cease and specialist environmental advice sought.

The potential exists for depleted oxygen concentrations to pose a risk to future site users. The proposed development is at this stage understood to be commercial with associated infrastructure. Workers should be made aware of the risk posed by confined spaces - in these environments they should follow procedures regarding safe working regulations within such spaces to ensure a safe system of work.

9.4.3 Future Developments including Buried Structures and Services

The risk to buried structures and services (i.e. possible migration of contamination within service corridors) is considered to be low post development subject to the suitable removal/placement of contaminated material and the installation of 'clean corridors' for services.

9.4.4 Controlled Waters

It is considered localised perched groundwater was encountered during site works within Made Ground. Deeper groundwater within natural ground and was generally below 2.00m bgl during return monitoring visits.

Leachate concentrations have been reported to be low from tested Made Ground and water samples retrieved from natural ground at the site.

9.4.5 Flora

It is considered soils encountered at the site would generally pose a low risk to any planting at the site.

10.0 GROUND ENGINEERING CONSIDERATIONS

10.1 Proposed Development – COMMERCIAL

The area covered by this report is currently expected to be developed for a commercial end use with the extension of an existing industrial building.

10.2 Ground Obstructions

Significant ground obstructions were not encountered during site works with obstructions within Made Ground limited to concrete cobbles and boulders.

The presence of further similar obstructions cannot be ruled out along with naturally occurring cobbles and boulders within natural superficial deposits.

10.3 Mining

Based on the Phase 1 Preliminary Assessment of the site (see section 4.0) the risks to the site from historic coal mining are considered to be low.

10.4 Foundations and Earthworks

Made Ground encountered at the site is considered unlikely to provide a suitable founding medium for buildings due to potential issues relating to differential settlement.

Shallow soils beneath Made Ground (predominantly alluvial sands, clays and silts) are considered to have a low shear strength widely in the order of 15-40kN/m². Based on this it is considered that a piled foundation solution will be required extending to/into bedrock from c. 13.50m bgl. A vibropiled solution is unlikely to be considered suitable due to potential liquefaction issues however a piling specialist may be able to provide more a more detailed assessment.

Made Ground at the site has been classified as a type 2C material (SHW series 600) and have been reported to be 3-6% wet for optimum compaction to be achieved. Should earthworks be required drying of material is likely to be required.

Groundwater was encountered at shallow depth during the investigation within several trial excavations including TP09 (sandy strata) and TP01 (perched within Made Ground). Groundwater within borehole installations was encountered between 2.01m and 4.30m bgl upon return visits.

10.5 Chemical Attack on Buried Structures

The water-soluble sulphate test results generally recorded concentrations between 13 mg/l and 260mg/l. The soil pH was between 7. and 10.1 indicating neutral to alkali conditions.

The results have been assessed in accordance with the guidance given in BRE Special Digest 1:2005. Based on natural soil with mobile groundwater the Design Sulphate Class for the site is DS-1, ACEC Class AC-1s.

10.6 Drainage and Infrastructure

Made Ground at the site is considered unsuitable for soakaway drainage. Superficial deposits were not widely encountered at shallow depth.

Based on these findings it is considered that shallow soakaway drainage is unlikely to be feasible across the majority of the site.

Excavations became unstable within Made Ground and natural strata where groundwater was present.

The design CBR value for highways is considered to be in the order of 3% where Made Ground is appropriately reengineered.

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

Shadbolt Group (SG) were commissioned by the Client, Star PAS Propco Ltd, to undertake a site investigation in relation to a proposed commercial development located at the site of Unit 3 Pilsworth Industrial Estate, Bury, Greater Manchester.

The SG ground investigation undertaken comprised the boring of 3 No. cable boreholes to a maximum depth of 13.54m bgl along with the installation of 3 No. ground gas/groundwater monitoring installations to a maximum depth of 13.00m bgl. 10 No. mechanically excavated trial pits were undertaken across the site reaching a maximum depth of 2.40m bgl.

Made Ground was encountered to a maximum depth of 6.00m bgl and was widespread across the site being encountered at all exploratory locations. Encountered Made Ground generally comprised dark grey sandy very gravelly clay/very clayey gravel including frequent demolition type rubble including brick, sandstone, tarmac, concrete fragments, concrete blocks, metallic fragments, wood fragments and plastic including sheeting. Made Ground became progressively deeper from east to west across the site ranging from 0.90m thickness to 6.00m bgl

Topsoil was identified across the site to a maximum thickness of 0.20m bgl and includes generally grey slightly sandy very clayey Topsoil including angular to subangular sandstone and mudstone.

Natural superficial deposits were encountered across the site to a maximum depth of 13.54m bgl (the maximum drilled depth). The base of superficial deposits is considered to have been encountered during these works with refusal possibly within bedrock. Encountered deposits included soft/firm grey silty clay/clayey silt noted with rarer lamination noted as well as limited fine subangular to subrounded mudstone gravel. Sand was generally fine within silty/cohesive strata. More locally shallower deposits of brown and grey fine to medium gravelly sand encountered at BH01 including fine gravel including mudstone in thin bands. Deeper deposits included stiff grey and brown slightly sandy gravelly boulder clay including gravel of fine to medium subangular to subrounded sandstone mudstone and coal.

Solid deposits were considered to have been encountered within 3 No. cable percussive boreholes at the site at depths ranging from 11.20m to 13.54m bgl. Although recovery was limited due to the nature of the drilling technique medium grained red/brown sandstone was noted within SPT refusals.

Should the site be developed in the future the risk to site users would, overall, be considered LOW from the soils located at the site including Made Ground encountered. Low contaminant concentrations have generally been reported.

Chemical laboratory results have been assessed in accordance with the guidance given in BRE Special Digest 1:2005. Based on natural soil with mobile groundwater the Design Sulphate Class for the site is DS-2, ACEC Class AC-2.

Made Ground encountered at the site is considered unlikely to provide a suitable founding medium for buildings due to potential issues relating to differential settlement. Shallow soils beneath Made Ground (predominantly alluvial sands, clays and silts) are considered to have a low shear strength and it is considered that a piled foundation solution will be required extending to/into bedrock from c. 13.50m bgl.

Made Ground at the site has been classified as a type 2C material (SHW series 600) and have been reported

to be 3-6% wet for optimum compaction to be achieved. Should earthworks be required drying of material is likely to be required.

Groundwater was encountered at shallow depth during the investigation within several trial excavations including TP09 (sandy strata) and TP01 (perched within Made Ground). Groundwater within borehole installations was encountered between 2.01m and 4.30m bgl upon return visits.

Ground gas protection measures are likely to be required for commercial developments at the site considering both the NHBC and BS8485:2015 methods with the site classified as CS2. Clarification should be sought from building control.

11.2 Recommendations

A detailed remediation strategy should be produced for the site including consultation with a piling specialist regarding the most effective foundation solution for the proposed development.

The Shadbolt Group

13.0 REFERENCES

- Site walkover survey.
- Historical and Recent Ordnance Survey maps and plans.
- Geological Survey Sheets.
- The Environment Agency.
- Groundsure Report.
- British Geological Survey.
- Coal Authority Mining Report.
- BRE Report BR211; Radon: Protective measures for new buildings.
- NRPB-W26 'Radon Atlas of England and Wales,' NRPB, 2002.
- CIRIA 132 'A guide for safe working on contaminated sites,' CIRIA, 1996.
- CIRIA C552 'Contaminated Land Risk assessment. A guide to good practice,' CIRIA, 2001.
- BS10175 'Investigation of potentially contaminated sites – code of practice,' BS, 2011.
- LCRM 'How to assess and manage the risks from land contamination' October 2020, Environment Agency
- Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance April 2012.
- Ciria C733 Asbestos in soil and made ground: a guide to understanding and managing risks, March 2014.
- BRE Special Digest 1, 2005 (Third Edition). Concrete in aggressive ground. Construction Research Communications Ltd, Watford.
- BS 5930: 1999. Code of practice for site investigations. BSI, UK.
- BS 10175: 2011. Investigation of potentially contaminated sites – Code of Practice. BSI, UK.
- CIRIA C665: 2006. Assessing risks posed by hazardous ground gases to buildings. London UK.
- DD ENV, 1997. Eurocode 7: Geotechnical Design. Parts 1 to 3. BSI, UK.
- Environment Agency, 2008 - onwards, Science Reports SC050021 (SGVs)
- TOMLINSON, M.J., 2001 Foundation design and construction. Prentice Hall, London.
- The LQM/CIEH S4ULs for Human Health Risk Assessment (S4UL3251), November 2014
- The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations, September 2015.
- Keynetix Holebase SI (including connected data sources)
- RocScience Slide and Settle 3D Software.
- Introduction to Light Weight Deflectometer. International Journal of Engineering Research & Technology (IJERT) IJERT/IJERT ISSN: 2278-0181.Vol 3 Issue 4, April 2014
- CIRIA C574: 2002. Engineering in Chalk. London UK.

APPENDIX A

REPORT CONDITIONS

REPORT CONDITIONS

GEO-ENVIRONMENTAL GROUND INVESTIGATION

This report is produced for the benefit of **Star UK PAS I Propco Ltd** in accordance with the terms of the appointment.

This report has been prepared in accordance with the terms and conditions of the appointment and relates to the condition of the site at the time of ground investigations. No warranty is provided as to the possibility of future changes in the condition of the site.

Shadbolt Environmental takes no responsibility for conditions which occur between the individual exploratory holes. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative.

Whilst the contamination assessment detailed within this report reflects our view, because there are no exact UK definitions of these matters, being subject to risk analysis, Shadbolt Environmental are unable to give categoric assurances that they will be accepted by authorities or funds without question. This report is prepared and written for the purposed uses stated in the report and should not be used in a different context without reference to Shadbolt Environmental. In time, improved practices or amended legislation may necessitate a re-assessment.

The report is limited to the geotechnical and environmental aspects detailed within the report and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents.

APPENDIX B

EXPLORATORY HOLE LOGS

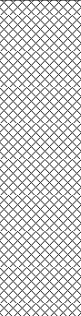
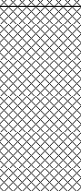
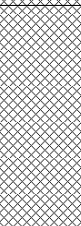
DRAWING NO. 2931-003 EXPLORATORY HOLE LOCATION PLAN



Trial Pit Log

Trial Pit No
TP10
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381527.13 - 409015.91 Level: 89.06	Date 03/11/2022
Location: Bury, Lancashire	Dimensions (m): 2.00 0.45 		Scale 1:20
Client: Star UK PAS I Propco Ltd	Depth 2.10		Logged RP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.15	88.91		Dark grey gravelly clayey TOPSOIL. Gravel includes angular to subangular sandstone and mudstone.	
	0.60	ES					MADE GROUND. Dark grey sandy very clayey GRAVEL. Gravel includes angular brick tarmac fragments and sandstone fragments. Concrete blocks, wood and plastic fragments and reinforcement bar noted.	
	1.20	B		1.00	88.06		MADE GROUND. Firm brown and grey sandy gravelly CLAY. Gravel includes angular brick fragments.	1
				1.50	87.56		MADE GROUND. Dark grey sandy very gravelly clay. Gravel includes angular brick tarmac fragments and sandstone fragments. Concrete blocks, wood and plastic fragments noted.	
	2.00	ES		2.10	86.96		End of Pit at 2.10m	2
								3
								4

Remarks: No groundwater encountered.	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP09
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381533.15 - 408995.63 Level: 88.87	Date 03/11/2022
Location: Bury, Lancashire	Dimensions (m): Depth 2.40		Scale 1:20 Logged JF
Client: Star UK PAS I Propco Ltd			

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.15	88.72		Dark grey clayey TOPSOIL.	
	0.50	ES					MADEGROUND. Firm dark grey very sandy, slightly gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick and occasional concrete.	
				0.90	87.97		Firm very sandy light brown and grey mottled CLAY.	1
	1.50	B					Brown, slightly clayey slightly gravelly SAND. Sand is fine to coarse, with bands of grey coarse sand and fine mudstone gravel.	2
	2.20	ES					End of Pit at 2.40m	
	2.40	W		2.40	86.47			3
								4

Remarks: Water and collapsing in sand at 2.40m bgl.

Stability: Collapse in wet sand.

Plant: 3.5 Tonne Tracked





Trial Pit Log

Trial Pit No
TP08
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381496.42 - 408996.92 Level: 88.65	Date 03/11/2022
--	------------------	--	--------------------

Location: Bury, Lancashire	Dimensions (m): 2.00 0.45	Scale 1:20
Client: Star UK PAS I Propco Ltd	Depth 2.00	Logged JF

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15	88.50		Dark grey clayey TOPSOIL.
	0.50	ES					MADEGROUND. Firm dark grey very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes, brick, wood, mudstone, cobbles and boulders of concrete. Tiles noted. Pipe found at 0.50m.
	1.20	B		1.60	87.05		MADEGROUND. Firm dark grey and brown mottled very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick, wood, mudstone, cobbles and boulders of concrete.
				2.00	86.65		End of Pit at 2.00m

Remarks: Pipe found at 0.50m	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP07
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381505.75 - 409011.46 Level: 89.03	Date 03/11/2022
--	------------------	--	--------------------

Location: Bury, Lancashire	Dimensions (m): 2.00 0.45	Scale 1:20
Client: Star UK PAS I Propco Ltd	Depth 2.00	Logged JF

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15	88.88		Dark grey clayey TOPSOIL.
	0.50	ES					MADEGROUND. Firm dark grey very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick, wood, mudstone, cobbles and boulders of concrete.
	1.60	B		1.50	87.52		MADEGROUND. Firm dark grey and brown mottled very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick, wood, mudstone, cobbles and boulders of concrete.
				2.00	87.02		End of Pit at 2.00m

Remarks: Groundwater at the base.	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP06
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381515.65 - 409026.43 Level: 89.11	Date 02/11/2022
Location: Bury, Lancashire		Dimensions (m): 2.00 Depth 1.70	Scale 1:20
Client: Star UK PAS I Propco Ltd			Logged JF

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.15	88.96		Dark grey clayey TOPSOIL.	
	0.70	ES					MADEGROUND. Firm dark grey very sandy gravelly Clay. Gravel is fine to coarse, angular to sub-angular and includes brick, tarmac and concrete.	1
	1.60	B		1.40	87.70		Firm brown very sandy slightly gravelly CLAY. Gravel is fine to medium, angular to sub-angular and includes sandstone and mudstone.	
				1.70	87.40		End of Pit at 1.70m	2
								3
								4

Remarks: Steady inflow of water from 1.40m	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

TrialPit No
TP05
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381466.98 - 409013.34 Level: 88.57	Date 02/11/2022
Location: Bury, Lancashire		Dimensions (m): 2.00 Depth 1.80	Scale 1:20
Client: Star UK PAS I Propco Ltd			Logged JF

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.15	88.42		Dark brown clayey TOPSOIL.	
	0.50	ES					MADEGROUND. Firm dark grey very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick tarmac, wood, cobbles and boulders of concrete.	1
	0.80	B		1.20	87.37		MADEGROUND. Firm dark brown and grey mottled gravelly clay. Gavel is fine to coarse, angular to sub-angular and includes brick, tarmac, concrete cobbles and groundwater.	
	1.50	ES		1.80	86.77		End of Pit at 1.80m	2
								3
								4

Remarks: Steady inflow	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP04
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381477.62 - 409038.34 Level: 89.00	Date 02/11/2022
Location: Bury, Lancashire		Dimensions (m): 2.00 Depth 1.30	Scale 1:20 Logged JF
Client: Star UK PAS I Propco Ltd			

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15	88.85		Dark grey clayey gravelly TOPSOIL. Moss over grass. TOPSOIL
	0.60	ES					MADEGROUND. Firm dark grey very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes bricks, concrete and tarmac.
	1.20	B		1.00	88.00		MADEGROUND. Firm dark grey and light grey mottled very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes bricks, concrete, tarmac and sandstone.
				1.30	87.70		End of Pit at 1.30m

Remarks: No groundwater encountered.	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP03
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381456.82 - 409030.13 Level: 88.66	Date 02/11/2022
Location: Bury, Lancashire		Dimensions (m): 2.00 Depth 1.40	Scale 1:20
Client: Star UK PAS I Propco Ltd			Logged JF

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15	88.50		Dark grey clayey gravelly TOPSOIL.
				0.40	88.26		MADEGROUND. Firm dark brown, very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick, tarmac, cobbles and boulders of concrete.
	0.50	ES					MADEGROUND. Firm dark grey very sandy gravelly clay. Gravel is fine to coarse, angular to sub-angular and includes brick, tarmac, wood, cobbles and boulders of concrete, sandstone.
	1.30	B		1.40	87.26		End of Pit at 1.40m

Remarks: No groundwater encountered.	
Stability: Stable	
Plant: 3.5 Tonne Tracked	



Trial Pit Log

Trial Pit No
TP02
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381444.39 - 409043.40 Level: 88.71	Date 02/11/2022
Location: Bury, Lancashire		Dimensions (m): 2.00 Depth 1.30	Scale 1:20
Client: Star UK PAS I Propco Ltd			Logged RP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20	88.51		Dark grey gravelly clayey TOPSOIL. Gravel includes sandstone and mudstone.	
	0.40	ES		0.55	88.16		MADE GROUND. Brown sandy gravelly CLAY. Gravel includes sandstone and brick fragments (angular).	
	1.00	ES		1.30	87.41		Dark grey sandy very gravelly clay. Gravel includes angular brick tarmac fragments and sandstone fragments. Concrete blocks, wood and plastic fragments noted.	1
							End of Pit at 1.30m	2
								3
								4

Remarks: Slight seep of groundwater around boulders.	
Stability: Stable Plant: 3.5 Tonne Tracked	



Trial Pit Log

TrialPit No
TP01
Sheet 1 of 1

Project Name: Unit 3 Pilsworth Industrial Estate	Project No. 2931	Co-ords: 381430.15 - 409028.55 Level: 88.65	Date 02/11/2022
--	------------------	--	-----------------

Location: Bury, Lancashire	Dimensions (m): 2.00 Depth 2.00	Scale 1:20 Logged RP
----------------------------	------------------------------------	-------------------------

Client: Star UK PAS I Propco Ltd

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15	88.50		Dark grey clayey TOPSOIL. Grass and moss over. TOPSOIL
	0.50	ES					Dark grey sandy very gravelly clay. Gravel includes angular brick tarmac fragments and sandstone fragments. Concrete blocks, wood and plastic fragments noted.
	1.30	B					
	1.50	W					
				2.00	86.65		End of Pit at 2.00m

Remarks: Wet from 1.30m (steady inflow).

Stability: Wet from 1.30m
Plant: 3.5 Tonne Tracked





Borehole Log

Borehole No.

BH03

Sheet 1 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381448E - 409021N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.59

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 31/10/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	D		0.22	88.37		Grey sandy very clayey organic TOPSOIL.	1
		0.10 - 0.40	D					MADE GROUND. Dark grey very sandy very gravelly cobbly CLAY. Sand is fine to coarse. Gravel is fine to coarse and includes angular sandstone concrete tarmac fragments, brick and metal shards.	
		1.00	D						
		1.20 - 1.65	D						
		1.20	SPT	N=32 (2,3/4,4,9,15)					
		2.00	D		6.00	82.59			2
		2.20 - 2.65	D						
		2.20	SPT	N=36 (2,9/9,9,10,8)					
		3.00	D						
		3.20 - 3.65	D						
		3.20	SPT	N=18 (2,2/2,4,6,6)					
		4.00	D						3
		4.20 - 4.65	D						
		4.20	SPT	N=17 (3,4/4,5,4,4)					
		5.00	D						
		5.20 - 5.65	D						
		5.20	SPT	N=18 (2,4/4,4,6,4)					
		6.00	D		6.00	82.59			4
		6.00 - 6.20	B						
		6.20 - 6.65	B						
		6.20	SPT	N=1 (1,0/0,1,0,0)					
		7.00	D						
		7.20 - 7.65	D		6.00	82.59			5
		7.20	SPT	N=3 (0,1/0,1,1,1)					
		8.00	D						
		8.20 - 8.65	D						
		8.20	SPT	N=5 (0,1/1,1,1,2)					
		9.00	D		6.00	82.59			6
		9.20 - 9.65	D						
		9.20	SPT	N=9 (1,1/2,3,2,2)					
		10.00	D						

Continued on Next Sheet

Remarks





Borehole Log

Borehole No.

BH03

Sheet 2 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381448E - 409021N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.59

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 31/10/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.20 - 10.65 10.20	D SPT	N=20 (2,4/5,5,5,5)				Soft to firm brown becoming grey sandy silty CLAY/ clayey SILT. Sand is fine. Occasionally slightly gravelly (fine to medium subangular to subrounded mudstone).	
		11.00	D						11
		11.20 - 11.65 11.20	D SPT	N=20 (4,5/5,5,5,5)					
		11.60	D						
		11.70 - 12.00	B						12
		12.20 - 12.65	UT						
		13.00 - 13.10	D		13.00	75.59			13
		13.20 - 13.54 13.20	D SPT	50 (10,14/50 for 150mm)	13.54	75.05		Stiff grey and brown sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to medium and includes sandstone and mudstone. Thinly bedded fine grained red sandstone in SPT end (possible bedrock). End of Borehole at 13.54m	
									14
									15
									16
									17
									18
									19
									20

Remarks





Borehole Log

Borehole No.

BH02

Sheet 1 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381485E - 409010N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.83

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 02/11/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 0.10 - 0.40	D B		0.20	88.63		Grey slightly sandy peaty TOPSOIL.	
		1.20 - 1.65 1.20	D SPT	N=10 (2,2/2,2,3,3)				MADE GROUND. Dark grey very sandy very gravelly cobbly CLAY. Sand is fine to coarse. Gravel is fine to coarse and includes angular sandstone concrete and brick.	1
		2.00 2.20 - 2.65 2.20	D D SPT	N=25 (5,5/9,6,5,5)					2
		3.00 3.20 - 3.65 3.20	D D SPT	N=11 (2,3/3,3,2,3)					3
		4.00 4.20 - 4.65 4.20	D D SPT	N=10 (1,3/4,2,2,2)					4
		5.00 5.00 - 5.20 5.20 - 5.65 5.20	D B D SPT	N=4 (1,1/1,1,1,1)	5.00	83.83		Soft to firm grey sandy silty CLAY/clayey SILT. Sand is fine. Occasionally slightly gravelly (fine to medium subangular to subrounded mudstone).	5
		6.00 6.20 - 6.65 6.20	D D SPT	N=7 (1,1/1,2,2,2)					6
		7.00 7.20 - 7.65 7.20	D B SPT	N=4 (1,1/1,1,1,1)					7
		8.00 8.20 - 8.65 8.20	D D SPT	N=7 (1,1/2,1,2,2)					8
		9.00 9.20 - 9.65 9.20	D D SPT	N=11 (1,2/2,3,3,3)					9
		10.00	D					Continued on Next Sheet	10

Remarks





Borehole Log

Borehole No.

BH02

Sheet 2 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381485E - 409010N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.83

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 02/11/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.20 - 10.65 10.20	D SPT	N=10 (2,1/3,2,2,3)	10.80 11.34	78.03 77.49		Soft to firm grey sandy silty CLAY/clayey SILT. Sand is fine. Occasionally slightly gravelly (fine to medium subangular to subrounded mudstone).	11
		10.80 - 11.00 11.00 11.00	D D SPT	50 (5,14/50 for 225mm)				Stiff grey and brown sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to medium and includes sandstone and mudstone. Cobble fragments noted (possible bedrock). End of Borehole at 11.34m	
									12
									13
									14
									15
									16
									17
									18
									19
									20

Remarks





Borehole Log

Borehole No.

BH01

Sheet 1 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381514E - 408999N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.95

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 02/11/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	D		0.20	88.75		Grey sandy very clayey organic TOPSOIL.	
		0.10 - 0.40	B					MADE GROUND. Dark grey very sandy very gravelly cobbly CLAY. Sand is fine to coarse. Gravel is fine to coarse and includes angular sandstone concrete and brick.	
		1.00	D						1
		1.20 - 1.65	D						
		1.20	SPT	N=11 (1,2/2,3,3,3)					
		2.00	D						
		2.20 - 2.65	D		2.50	86.45			2
		2.20	SPT	N=18 (4,5/5,5,3,5)					
		2.70	D						
		2.70 - 3.00	B					Grey and brown fine to medium grained SAND. Slightly clayey in upper with fine gravel is mudstone/ coal noted.	
		3.20 - 3.65	D						3
		3.20	SPT	N=10 (2,2/2,2,3,3)					
		4.00	D						4
		4.20 - 4.65	D						
		4.20	SPT	N=7 (1,1/1,2,2,2)					
		4.60	D						5
		4.60 - 4.90	B						
		5.20 - 5.65	D						
		5.20	SPT	N=11 (1,2/3,2,3,3)					
		5.70	D						6
		6.20 - 6.65	D					From 5.70m bgl very gravelly (fine to coarse subangular to subrounded mudstone).	
		6.20	SPT	N=4 (1,1/1,1,1,1)	6.50	82.45			
		6.70	D					Soft grey slightly sandy silty CLAY/clayey SILT. Sand is fine.	
		7.20 - 7.65	D						7
		7.20	SPT	N=1 (1,0/0,1,0,0)					
		7.60	D						
		7.60 - 7.90	B						8
		8.20 - 8.65	D						
		8.20	SPT	N=3 (0,0/0,1,1,1)					
		8.60	D						
		9.20 - 9.65	D						9
		9.20	SPT	N=3 (1,1/1,0,1,1)					
		9.70	D						10

Continued on Next Sheet

Remarks





Borehole Log

Borehole No.

BH01

Sheet 2 of 2

Project Name: Unit 3 Pilsworth Industrial Estate

Project No.
2931

Co-ords: 381514E - 408999N

Hole Type
CP

Location: Bury, Lancashire

Level: 88.95

Scale
1:50

Client: Star UK PAS I Propco Ltd

Dates: 02/11/2022

Logged By
RP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.20 - 10.65 10.20	D SPT	N=34 (3,6/6,8,10,10)	10.50	78.45		Soft grey slightly sandy silty CLAY/clayey SILT. Sand is fine. <i>From 10.00m bgl becoming firm to stiff.</i>	11
		10.80 - 11.00 11.00 11.00	D D SPT	50 (18,7/50 for 115mm)	11.20	77.75		Stiff grey/red very sandy CLAY. Sand is fine to medium. Yellow sandstone noted possible bedrock.	
								End of Borehole at 11.20m	
									12
									13
									14
									15
									16
									17
									18
									19
									20

Remarks



Project Id: 2931
Project Title: Unit 3 Pilsworth Industrial Estate
Location: Bury, Lancashire
Client: Star UK PAS I Propco Ltd

Title: Site Plan
Scale: 1:500
Engineer: RP



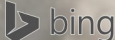
Legend Key

 Locations By Type - CP

 Locations By Type - TP

 Bounds - Project Bounds




Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

20 Metres

80 Feet

APPENDIX C

CHEMICAL SCREENING VALUES

PLEASE NOTE: These values are provided exclusively for the use of subscribers to www.atrisksoil.co.uk. In accordance with the terms and conditions of the atrisksoil website the information is for the sole use of the user and by receiving or obtaining any information contained herein the user agrees that at all times they will keep secret and confidential and shall procure and safeguard that their directors and employees keep secret and confidential all business and trade secrets and any information of a confidential nature relating to the processes, affairs, methods and data belonging to Atkins Limited which they may have received or obtained in the performance of or otherwise as a direct or indirect result of entering into any agreement with Atkins Limited.

Any information contained herein is protected by copyright and other intellectual property laws. Any unauthorised copying, distribution, public display, public performance [and preparation of derivative works] form any information contained herein are prohibited by copyright law. By using the atrisksoil service the user represents and warrants that they will not use the services in any manner that would violate any copyright, intellectual property, or any other rights.

Before using Atkins ATRISK SSVs users should read the accompanying Notes for Use.

Commercial				
Contaminant	1% SOM Sand		6 % SOM Sandy Loam	
	SSV (mg/kg)	Saturation Limit (mg/kg)	SSV (mg/kg)	Saturation Limit (mg/kg)
Metals & Metalloids				
Antimony	4650		4650	
Arsenic (C4SL)	635		635	
Barium	22000		22000	
Beryllium	14		14	
Cadmium (C4SL)	410		410	
Chromium III	208000		208000	
Chromium VI (C4SL)	49.1		49.1	
Chromium VI (MRL)	19.7		19.7	
Copper	106000		106000	
Lead (C4SL)	2310		2310	
Mercury, elemental	-		-	
Mercury, inorganic	-		-	
Mercury, methyl	-		-	
Molybdenum	17600		17600	
Nickel	1770		1770	
Selenium	13000		13000	
Vanadium	7490		7490	
Zinc	1100000		1100000	
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	83600	156.80 (sol)	106000	
Anthracene	535000		544000	
Fluoranthene	72200		72600	
Fluorene	66500		72000	
Naphthalene	90.1	75.0 (sol)	1050	432 (sol)
Pyrene	54100		54400	
Benzo[a]pyrene (C4SL)	76.3		76.3	
Benzo[a]pyrene (MRL)	26.1		26.2	
Total Petroleum Hydrocarbons				
TPH aromatic C5-C7 (Benzene)	12.5		98	
TPH aromatic C7-C8 (Toluene)	27900	834 (vap)	183000	4360 (vap)
TPH aromatic C8-C10	2210	613 (sol)	20800	3600 (sol)
TPH aromatic C10-C12	12300	369 (sol)	53800	2190 (sol)
TPH aromatic C12-C16	41300	155 (vap)	65400	
TPH aromatic C16-C21	28400		28400	
TPH aromatic C21-C35	28400		28400	
TPH aliphatic C5-C6	4490	327 (vap)	29400	1100 (vap)
TPH aliphatic C6-C8	10400	157 (vap)	98200	769 (vap)
TPH aliphatic C8-C10	1370	82.4 (sol)	14800	476 (sol)
TPH aliphatic C10-C12	7900	49.9 (sol)	69500	297 (sol)
TPH aliphatic C12-C16	34000	20.9 (vap)	139000	126 (vap)
TPH aliphatic C16-C35	3620000		3620000	
BTEX				
Benzene (C4SL)	12.5		98	
Toluene	27900	834 (vap)	183000	4360 (vap)
Ethylbenzene	7660	507 (vap)	63100	2840 (vap)
Xylene, o-	3030	467 (sol)	32700	2620 (sol)
Xylene, m-	2830	612 (vap)	30900	3460 (vap)
Xylene, p-	2720	564 (sol)	29700	3170 (sol)
Methyl tert-butyl ether	3140		22400	

Notes

1. The benzo(a)pyrene C4SL has been published in lieu of other genotoxic PAH constituents based on the adoption of the surrogate marker approach. Users should confirm that their PAH profile falls within the upper and lower ratio's as published by the Defra C4SL Project Methodology.
2. Where the combined indoor and outdoor vapour pathway exceeds 10% of the total exposure, the respective saturation limit has been reported and annotated as '(sol)' if limited by solubility or '(vap)' if limited vapour saturation. Users should confirm that free product if not observed where measured concentrations exceed this value.
3. To account for conservatism in the partitioning of hydrocarbons from soil into vapour phase, a soil to indoor air correction factor of 10 has been applied to TPH aromatic >C5-C16 aromatic and >C5-C16 aliphatic fractions, benzene, ethylbenzene, toluene, and xylenes.
4. The sum of all xylene isomers in soil should be compared against the lower xylene SSV or the relevant isomer for the xylene source as per the SGV documentation.

PLEASE NOTE: These values are provided exclusively for the use of subscribers to www.atrisksoil.co.uk. In accordance with the terms and conditions of the atrisksoil website the information is for the sole use of the user and by receiving or obtaining any information contained herein the user agrees that at all times they will keep secret and confidential and shall procure and safeguard that their directors and employees keep secret and confidential all business and trade secrets and any information of a confidential nature relating to the processes, affairs, methods and data belonging to Atkins Limited which they may have received or obtained in the performance of or otherwise as a direct or indirect result of entering into any agreement with Atkins Limited.

Any information contained herein is protected by copyright and other intellectual property laws. Any unauthorised copying, distribution, public display, public performance [and preparation of derivative works] form any information contained herein are prohibited by copyright law. By using the atrisksoil service the user represents and warrants that they will not use the services in any manner that would violate any copyright, intellectual property, or any other rights.

Before using Atkins ATRISK SSVs users should read the accompanying Notes for Use.

Commercial				
Contaminant	1% SOM Sand		6 % SOM Sandy Loam	
	SSV (mg/kg)	Saturation Limit (mg/kg)	SSV (mg/kg)	Saturation Limit (mg/kg)
VOCs				
Chlorobenzene (mono)	502		5460	
Chloroform	45.2		357	
1,1,2-Trichloroethane	40.1		382	
1,1-Dichloroethane	115		803	
1,1-Dichloroethene	11.9		86.6	
1,2-Dichloropropane	1.34		11.1	
2,4-Dimethylphenol	11800	1327 (vap)	29800	7184 (vap)
2,4-Dinitrotoluene	3730		3760	
2,6-Dinitrotoluene	1840		1880	
2-Chloronaphthalene	176	112 (vap)	2090	667 (vap)
2-Methylphenol	155000	14166 (sol)	182000	
4-Methylphenol	156000	25771 (sol)	182000	
3-Methylphenol	166000	25259 (sol)	184000	
Bromobenzene	42.1		485	
Bromoform	327		2970	
Butyl benzyl phthalate	940000		945000	
Chloroethane	436		1970	
Chloromethane	0.452		1.49	
Cis 1,2 Dichloroethene	6		44.4	
Dichloromethane	109		526	
Bromodichloromethane	0.854		7.12	
Diethyl Phthalate	108000	12.8 (vap)	280000	65 (vap)
Di-n-butyl phthalate	70800		15400	
Di-n-octyl phthalate	89000		89000	
Hexachloroethane	9.41	8.13 (vap)	110	48.0 (vap)
Trans 1,2 Dichloroethene	9.51		76.1	
Bis (2-ethylhexyl) phthalate	85100		86000	
Trichloroethene	0.149		1.49	
Vinyl chloride	0.0309		0.117	
1,1,1,2-Tetrachloroethane	204		1930	
1,1,2,2-Tetrachloroethanes	426		3910	
Tetrachloroethene	71.4		777	
1,1,1-trichloroethane	306		2950	
1,2-dichloroethane	0.854		5.09	
Carbon tetrachloride	14.8		152	
Carbon disulphide	10.9		94.5	
Trichloromethylbenzene	0.025		0.247	
Formaldehyde	436		1350	
2,6-bis(1,1-dimethyl)-4-(1-methylpropyl)-phenol	2160		2240	
Iso-propylbenzene	5760	387 (sol)	53500	2254 (sol)
Propylbenzene	16200	399 (sol)	103000	2332 (sol)
Styrene	9670	607(sol)	20400	3347 (sol)
Biphenyl	42400	34.1 (vap)	67900	
1,2,4-Trimethylbenzene	165		1030	
2,4-Dichloro-o-cresol	54700		58600	
Dibromochloromethane	9.27		92.1	
Phenol	685		3170	

Notes

- For phenol the SSV presented is protective of localised dermal contact in sensitised individuals as per the methodology set out in the Environment Agency SGV for phenol.
- For methylphenols (cresols) the sum of 2-, 3- and 4-methylphenol isomers in soil should be compared against the lower of 2-, 3-, and 4-methylphenol SSVs as per the CL:AIRE-EIC GAC documentation.
- To account for conservatism in the partitioning of hydrocarbons from soil into vapour phase, a soil to indoor air correction factor of 10 has been applied to isopropylbenzene, propylbenzene, styrene, biphenyl, and 1,2,4-trimethylbenzene.

PLEASE NOTE: These values are provided exclusively for the use of subscribers to www.atrisksoil.co.uk. In accordance with the terms and conditions of the atrisksoil website the information is for the sole use of the user and by receiving or obtaining any information contained herein the user agrees that at all times they will keep secret and confidential and shall procure and safeguard that their directors and employees keep secret and confidential all business and trade secrets and any information of a confidential nature relating to the processes, affairs, methods and data belonging to Atkins Limited which they may have received or obtained in the performance of or otherwise as a direct or indirect result of entering into any agreement with Atkins Limited.

Any information contained herein is protected by copyright and other intellectual property laws. Any unauthorised copying, distribution, public display, public performance [and preparation of derivative works] form any information contained herein are prohibited by copyright law. By using the atrisksoil service the user represents and warrants that they will not use the services in any manner that would violate any copyright, intellectual property, or any other rights.

Before using Atkins ATRISK SSVs users should read the accompanying Notes for Use.				
Commercial				
	1% SOM Sand		6 % SOM Sandy Loam	
Contaminant	SSV (mg/kg)	Saturation Limit (mg/kg)	SSV (mg/kg)	Saturation Limit (mg/kg)
Pesticides				
Dinoseb	7.1		68.7	
Prochloraz	12400		12500	
DDD	983		988	
PCBs				
Total PCDDs, PCDFs and dioxin-like PCBs	0.184		0.184	
Other Contaminants				
Nicotine	855		860	
Tributyl tin oxide	119		199	
Free Cyanide	373		373	
Notes				
8. The SSV for Total PCDDs, PCDFs and dioxin-like PCBs is based on the distribution of these congeners from the UK Soil Heritage Survey (SHS) data as set out in the Environment Agency SGV methodology. Users should not use this value where their specific source of PCBs could differ from that of the UK SHS.				
9. The SSV for free cyanide is based on a predicted acute exposure scenario involving a 16-65 year old adult who may ingest a bolus of contaminated soil.				

APPENDIX D

CHEMICAL LABORATORY RESULTS



Certificate of Analysis

Certificate Number 22-23054

Issued: 21-Nov-22

Client Shadbolt Group
18 Bewick Road
Gateshead
NE8 4DP

Our Reference 22-23054

Client Reference 2931

Order No PO2359

Contract Title Pilsworth Bury

Description 15 Soil samples, 1 Water sample.

Date Received 11-Nov-22

Date Started 11-Nov-22

Date Completed 21-Nov-22

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083788	2083789	2083790	2083791	2083792	2083793
Sample ID	TP01	TP02	TP02	TP10	TP10	TP03
Depth	0.50	0.10	0.40	0.10	0.60	0.50
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Stones >20mm	DETSC 1003*	1	% m/m	2.0	< 1.0	10	< 1.0	8.0	< 1.0
Moisture Content	DETSC 1004	0.1	%	9.7	27	11	34	14	11
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	7.0	18	5.8	17	7.2	9.8
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.7	0.3	< 0.2	0.2	1.0	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	1.5	0.2	21	1.2	0.5
Chromium	DETSC 2301#	0.15	mg/kg	13	22	15	230	14	21
Copper	DETSC 2301#	0.2	mg/kg	36	89	35	130	34	49
Lead	DETSC 2301#	0.3	mg/kg	63	190	35	140	47	77
Mercury	DETSC 2325#	0.05	mg/kg	0.10	0.52	0.06	2.8	0.33	0.14
Nickel	DETSC 2301#	1	mg/kg	16	22	19	27	19	19
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	1.6	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	60	160	64	160	60	72
Inorganics									
pH	DETSC 2008#		pH	10.1	8.0	8.2	9.8	9.2	8.5
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.2	< 0.1	0.2	< 0.1	0.3
Organic matter	DETSC 2002#	0.1	%	3.9	4.2	1.5	7.0	4.5	3.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	130	22	15	40	260	94
Petroleum Hydrocarbons									
EPH (C10-C40)	DETSC 3311#	10	mg/kg	910	46	150	< 10	670	500
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.26	< 0.03	0.05	< 0.03	< 0.03	0.05
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.49	0.06	0.05	< 0.03	< 0.03	0.29
Fluorene	DETSC 3303	0.03	mg/kg	0.34	0.03	< 0.03	< 0.03	< 0.03	0.22
Phenanthrene	DETSC 3303#	0.03	mg/kg	2.4	0.36	0.29	0.09	0.18	1.2
Anthracene	DETSC 3303	0.03	mg/kg	0.51	0.06	0.05	< 0.03	0.04	0.27
Fluoranthene	DETSC 3303#	0.03	mg/kg	3.9	0.46	0.40	0.16	0.31	1.4
Pyrene	DETSC 3303#	0.03	mg/kg	3.6	0.44	0.39	0.15	0.37	1.4
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	1.2	0.14	0.13	0.06	0.10	0.35
Chrysene	DETSC 3303	0.03	mg/kg	1.6	0.21	0.20	0.07	0.18	0.43
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.3	0.15	0.17	0.07	0.15	0.33
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.40	0.05	0.04	< 0.03	0.05	0.09
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	1.1	0.11	0.10	0.03	0.09	0.27
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.50	0.05	0.07	< 0.03	0.06	0.12
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.13	< 0.03	< 0.03	< 0.03	< 0.03	0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.55	0.06	0.08	< 0.03	0.07	0.12
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	18	2.1	2.0	0.59	1.6	6.6
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 52	DETSC 3401#	0.01	mg/kg			< 0.01			

Summary of Chemical Analysis Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083788	2083789	2083790	2083791	2083792	2083793
Sample ID	TP01	TP02	TP02	TP10	TP10	TP03
Depth	0.50	0.10	0.40	0.10	0.60	0.50
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
PCB 101	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 118	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 153	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 138	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 180	DETSC 3401#	0.01	mg/kg			< 0.01			
PCB 7 Total	DETSC 3401#	0.01	mg/kg			< 0.01			

Summary of Chemical Analysis

Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083794	2083795	2083796	2083797	2083798	2083799
Sample ID	TP04	TP05	TP05	TP06	TP07	TP08
Depth	0.60	0.10	1.50	0.70	0.50	0.50
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Stones >20mm	DETSC 1003*	1	% m/m	< 1.0	2.0	5.0	8.0	4.0	4.0
Moisture Content	DETSC 1004	0.1	%	11	25	12	14	11	11
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	9.3	10	7.2	9.7	7.8	10
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.7	0.4	0.4	0.5	0.7	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.4	1.4	0.2	0.2	0.5	0.9
Chromium	DETSC 2301#	0.15	mg/kg	17	18	17	15	16	14
Copper	DETSC 2301#	0.2	mg/kg	40	53	33	32	31	33
Lead	DETSC 2301#	0.3	mg/kg	65	80	55	39	42	60
Mercury	DETSC 2325#	0.05	mg/kg	0.14	0.33	0.06	0.10	0.10	0.21
Nickel	DETSC 2301#	1	mg/kg	20	19	27	17	17	15
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	76	87	75	61	73	82
Inorganics									
pH	DETSC 2008#		pH	8.4	8.2	8.5	8.0	8.3	9.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1	0.2	0.8
Organic matter	DETSC 2002#	0.1	%	3.3	4.2	1.4	2.0	1.9	1.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	89	24	42	73	70	84
Petroleum Hydrocarbons									
EPH (C10-C40)	DETSC 3311#	10	mg/kg	880	53	27	28	230	910
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	0.15	< 0.03	0.04	< 0.03	0.08	0.21
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.70	0.03	0.04	0.05	0.13	0.23
Fluorene	DETSC 3303	0.03	mg/kg	0.66	< 0.03	< 0.03	0.03	0.10	0.15
Phenanthrene	DETSC 3303#	0.03	mg/kg	5.2	0.16	0.21	0.25	0.42	0.82
Anthracene	DETSC 3303	0.03	mg/kg	1.5	0.03	0.04	0.05	0.09	0.14
Fluoranthene	DETSC 3303#	0.03	mg/kg	6.0	0.21	0.16	0.32	0.34	0.77
Pyrene	DETSC 3303#	0.03	mg/kg	5.6	0.20	0.15	0.30	0.30	0.66
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	1.8	0.07	0.05	0.09	0.09	0.20
Chrysene	DETSC 3303	0.03	mg/kg	2.3	0.08	0.07	0.15	0.14	0.32
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	1.9	0.07	0.05	0.13	0.10	0.26
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.65	< 0.03	< 0.03	0.03	0.04	0.09
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	1.8	0.04	< 0.03	0.09	0.07	0.19
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.75	< 0.03	< 0.03	0.06	0.03	0.11
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	0.21	< 0.03	< 0.03	< 0.03	< 0.03	0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.83	< 0.03	< 0.03	0.06	0.04	0.12
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	30	0.79	0.81	1.6	2.0	4.3
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 52	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	

Summary of Chemical Analysis Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083794	2083795	2083796	2083797	2083798	2083799
Sample ID	TP04	TP05	TP05	TP06	TP07	TP08
Depth	0.60	0.10	1.50	0.70	0.50	0.50
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
PCB 101	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 118	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 153	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 138	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 180	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	
PCB 7 Total	DETSC 3401#	0.01	mg/kg			< 0.01		< 0.01	

Summary of Chemical Analysis

Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083800	2083801	2083803
Sample ID	TP09	TP09	TP09
Depth	0.50	2.20	2.40
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Preparation						
Stones >20mm	DETSC 1003*	1	% m/m	40	< 1.0	< 1.0
Moisture Content	DETSC 1004	0.1	%	8.9	18	20
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	5.1	3.0	4.8
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	0.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.7	0.1	0.4
Chromium	DETSC 2301#	0.15	mg/kg	12	7.2	9.5
Copper	DETSC 2301#	0.2	mg/kg	34	16	19
Lead	DETSC 2301#	0.3	mg/kg	28	9.4	8.9
Mercury	DETSC 2325#	0.05	mg/kg	0.13	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	12	7.4	10
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	64	30	38
Inorganics						
pH	DETSC 2008#		pH	8.0	7.5	7.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	2.0	4.4	0.7
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	13	13	17
Petroleum Hydrocarbons						
EPH (C10-C40)	DETSC 3311#	10	mg/kg	64	< 10	< 10
PAHs						
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.23	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.04	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.33	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.31	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.10	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.16	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.13	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.6	< 0.10	< 0.10
PCBs						
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg			
PCB 52	DETSC 3401#	0.01	mg/kg			

Summary of Chemical Analysis Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083800	2083801	2083803
Sample ID	TP09	TP09	TP09
Depth	0.50	2.20	2.40
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	04/11/2022	04/11/2022	04/11/2022
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
PCB 101	DETSC 3401#	0.01	mg/kg			
PCB 118	DETSC 3401#	0.01	mg/kg			
PCB 153	DETSC 3401#	0.01	mg/kg			
PCB 138	DETSC 3401#	0.01	mg/kg			
PCB 180	DETSC 3401#	0.01	mg/kg			
PCB 7 Total	DETSC 3401#	0.01	mg/kg			

Summary of Chemical Analysis

Water Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	2083802
Sample ID	TP01
Depth	1.50
Other ID	
Sample Type	WATER
Sampling Date	04/11/2022
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	23
Boron, Dissolved	DETSC 2306*	12	ug/l	260
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.07
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.68
Copper, Dissolved	DETSC 2306	0.4	ug/l	9.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	5.0
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.12
Nickel, Dissolved	DETSC 2306	0.5	ug/l	7.7
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.4
Zinc, Dissolved	DETSC 2306	1.3	ug/l	20
Inorganics				
pH	DETSC 2008		pH	I/S
Cyanide, Total	DETSC 2130	40	ug/l	I/S
Ammoniacal Nitrogen as NH3	DETSC 2207	0.015	mg/l	I/S
Sulphate as SO4	DETSC 2055	0.1	mg/l	I/S
Sulphur as S, Total	DETSC 2320*	10	mg/l	I/S
Petroleum Hydrocarbons				
EPH (C10-C40)	DETSC 3311	10	ug/l	I/S
PAHs				
Naphthalene	DETSC 3304	0.05	ug/l	I/S
Acenaphthylene	DETSC 3304	0.01	ug/l	I/S
Acenaphthene	DETSC 3304	0.01	ug/l	I/S
Fluorene	DETSC 3304	0.01	ug/l	I/S
Phenanthrene	DETSC 3304	0.01	ug/l	I/S
Anthracene	DETSC 3304	0.01	ug/l	I/S
Fluoranthene	DETSC 3304	0.01	ug/l	I/S
Pyrene	DETSC 3304	0.01	ug/l	I/S
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	I/S
Chrysene	DETSC 3304	0.01	ug/l	I/S
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	I/S
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	I/S
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	I/S
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	I/S
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	I/S
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	I/S
PAH Total	DETSC 3304	0.2	ug/l	I/S

Summary of Asbestos Analysis Soil Samples

Our Ref 22-23054

Client Ref 2931

Contract Title Pilsworth Bury

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2083788	TP01 0.50	SOIL	NAD	none	Pierce Booth
2083789	TP02 0.10	SOIL	NAD	none	Pierce Booth
2083790	TP02 0.40	SOIL	NAD	none	Pierce Booth
2083791	TP10 0.10	SOIL	NAD	none	Pierce Booth
2083792	TP10 0.60	SOIL	Chrysotile	Chrysotile present as fibre bundles	Pierce Booth
2083793	TP03 0.50	SOIL	NAD	none	Pierce Booth
2083794	TP04 0.60	SOIL	NAD	none	Pierce Booth
2083795	TP05 0.10	SOIL	NAD	none	Pierce Booth
2083796	TP05 1.50	SOIL	NAD	none	Pierce Booth
2083797	TP06 0.70	SOIL	NAD	none	Pierce Booth
2083798	TP07 0.50	SOIL	NAD	none	Pierce Booth
2083799	TP08 0.50	SOIL	NAD	none	Pierce Booth
2083800	TP09 0.50	SOIL	NAD	none	Pierce Booth
2083801	TP09 2.20	SOIL	NAD	none	Pierce Booth
2083803	TP09 2.40	SOIL	NAD	none	Pierce Booth

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 22-23054
Client Ref 2931
Contract Pilsworth Bury

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2083788	TP01 0.50 SOIL	04/11/22	GJ 250ml, PT 1L		
2083789	TP02 0.10 SOIL	04/11/22	GJ 250ml, PT 1L		
2083790	TP02 0.40 SOIL	04/11/22	GJ 250ml, PT 1L		
2083791	TP10 0.10 SOIL	04/11/22	GJ 250ml		
2083792	TP10 0.60 SOIL	04/11/22	GJ 250ml, PT 1L		
2083793	TP03 0.50 SOIL	04/11/22	GJ 250ml		
2083794	TP04 0.60 SOIL	04/11/22	GJ 250ml, PT 1L		
2083795	TP05 0.10 SOIL	04/11/22	GJ 250ml		
2083796	TP05 1.50 SOIL	04/11/22	GJ 250ml, PT 1L		
2083797	TP06 0.70 SOIL	04/11/22	GJ 250ml, PT 1L		
2083798	TP07 0.50 SOIL	04/11/22	GJ 250ml, PT 1L		
2083799	TP08 0.50 SOIL	04/11/22	GJ 250ml, PT 1L		
2083800	TP09 0.50 SOIL	04/11/22	GJ 250ml, PT 1L		
2083801	TP09 2.20 SOIL	04/11/22	GJ 250ml, PT 1L		
2083802	TP01 1.50 WATER	04/11/22	GJ 250ml	Kone (4 days), pH/Cond/TDS (1 days), PAH MS (4 days), EPH (4 days)	
2083803	TP09 2.40 SOIL	04/11/22	GJ 250ml		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



4041

Rob Plews

The Shadbolt Group
18 Bewick Road
Gateshead
NE8 4DP

e: robp@shadboltgroup.net



i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 22-99094

Project / Site name:	Unit 3 Pilsworth Industrial Estate	Samples received on:	25/11/2022
Your job number:	2931 BURY	Samples instructed on/ Analysis started on:	25/11/2022
Your order number:		Analysis completed by:	02/12/2022
Report Issue Number:	1	Report issued on:	02/12/2022
Samples Analysed:	2 water samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.



4041



Analytical Report Number: 22-99094

Project / Site name: Unit 3 Pilsworth Industrial Estate

Lab Sample Number				2513092	2513093
Sample Reference				CP01	CP02
Sample Number				None Supplied	None Supplied
Depth (m)				4.50	5.50
Date Sampled				24/11/2022	24/11/2022
Time Taken				1200	1200
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH	pH Units	N/A	ISO 17025	7.6	7.2
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10
Sulphate as SO ₄	µg/l	45	ISO 17025	23000	84600
Total Sulphur	µg/l	15	NONE	7700	28000
Ammoniacal Nitrogen as NH ₃	µg/l	15	ISO 17025	22	94

Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16
-------------------	------	------	-----------	--------	--------

Heavy Metals / Metalloids

Boron (dissolved)	µg/l	10	ISO 17025	16	56
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.59	2.38
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.3	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	7.2	3.5
Lead (dissolved)	µg/l	0.2	ISO 17025	0.4	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	15	4.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4	2.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	13	14

Petroleum Hydrocarbons

TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10
---------------------------------	------	----	-----------	------	------

U/S = Unsuitable Sample I/S = Insufficient Sample



4041

**Analytical Report Number : 22-99094****Project / Site name: Unit 3 Pilsworth Industrial Estate****Water matrix abbreviations:****Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Ammonia as NH3 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).**For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).****For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.****Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture****correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.****Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.**

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Analytical Report Number : 22-99094

Project / Site name: Unit 3 Pilsworth Industrial Estate

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
CP01	None Supplied	W	2513092	bc	Ammonia as NH3 in water	L082-PL	c
CP01	None Supplied	W	2513092	bc	Ammoniacal Nitrogen as N in water	L082-PL	c
CP01	None Supplied	W	2513092	bc	Speciated EPA-16 PAHs in water	L102B-PL	b
CP01	None Supplied	W	2513092	bc	TPH1 (Waters)	L070-PL	b
CP01	None Supplied	W	2513092	bc	pH at 20oC in water (automated)	L099-PL	c
CP02	None Supplied	W	2513093	bc	Ammonia as NH3 in water	L082-PL	c
CP02	None Supplied	W	2513093	bc	Ammoniacal Nitrogen as N in water	L082-PL	c
CP02	None Supplied	W	2513093	bc	Speciated EPA-16 PAHs in water	L102B-PL	b
CP02	None Supplied	W	2513093	bc	TPH1 (Waters)	L070-PL	b
CP02	None Supplied	W	2513093	bc	pH at 20oC in water (automated)	L099-PL	c

APPENDIX E

GEOTECHNICAL LABORATORY RESULTS



LABORATORY REPORT



4043

Contract Number: PSL22/7362

Report Date: 09 December 2022

Client's Reference: 2931

Client Name: The Shadbolt Group
18 Bewick Road
Gateshead
Ttyne & Wear
NE8 4DP

For the attention of: Rob Plews

Contract Title: Pilsworth Bury

Date Received: 16/11/2022

Date Commenced: 16/11/2022

Date Completed: 9/12/2022

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP09		B	1.50		Brown sandy CLAY.
BH03		B	11.00		Brown sandy CLAY.
BH02		B	7.20	7.65	Brown slightly gravelly sandy CLAY.
BH01		J	8.20		Brown slightly gravelly sandy CLAY.
BH02		J	6.00		Brown slightly gravelly sandy CLAY.
BH01		B	6.20	6.55	Brown slightly gravelly sandy CLAY.
TP01		B	1.30		MADE GROUND grey very sandy very clayey GRAVEL with cobbles.
TP05		D	0.80		MADE GROUND grey gravelly sandy CLAY.
TP03		B	1.30		MADE GROUND brown gravelly very sandy clay.
TP04		B	1.20		MADE GROUND brown gravelly very sandy clay.
TP10		B	1.20		MADE GROUND brown gravelly very sandy clay.
TP07		B	1.60		MADE GROUND brown slightly gravelly very sandy clay.
TP08		B	1.20		Brown gravelly very sandy CLAY.
BH03		U	12.20	12.65	Very soft brown slightly gravelly sandy CLAY.



4043

PSL

Professional Soils Laboratory

Pilsworth Bury

Contract No:

PSL22/7362

Client Ref:

2931

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL

Professional Soils Laboratory

Pilsworth Bury

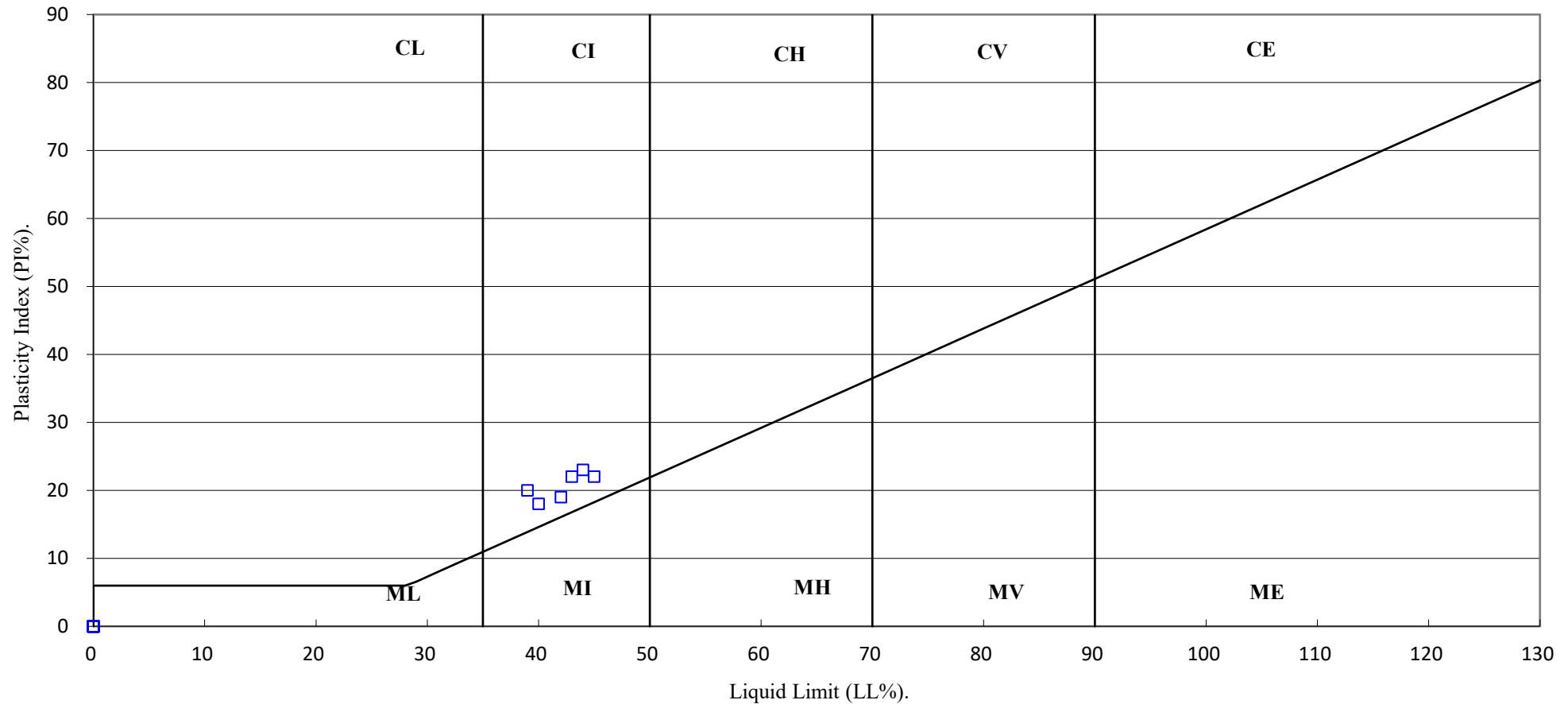
Contract No:

PSL22/7362

Client Ref:

2931

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL

Professional Soils Laboratory

Pilsworth Bury

Contract No:

PSL22/7362

Client Ref:

2931

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

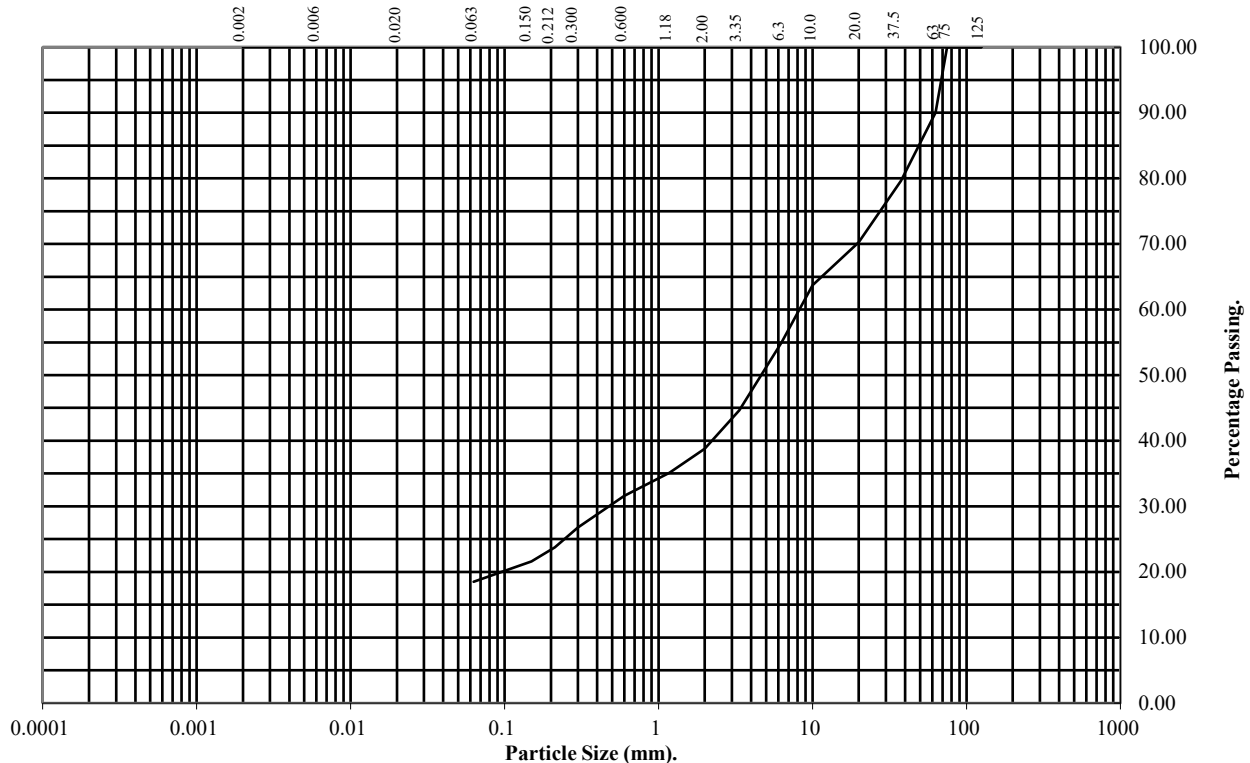
Hole Number: TP01

Top Depth (m): 1.30

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	90
37.5	80
20	70
10	64
6.3	55
3.35	45
2	39
1.18	35
0.6	32
0.3	27
0.212	24
0.15	22
0.063	18

Soil Fraction	Total Percentage
Cobbles	10
Gravel	51
Sand	21
Silt/Clay	18

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:

PSL22/7362

Client Ref:

2931

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

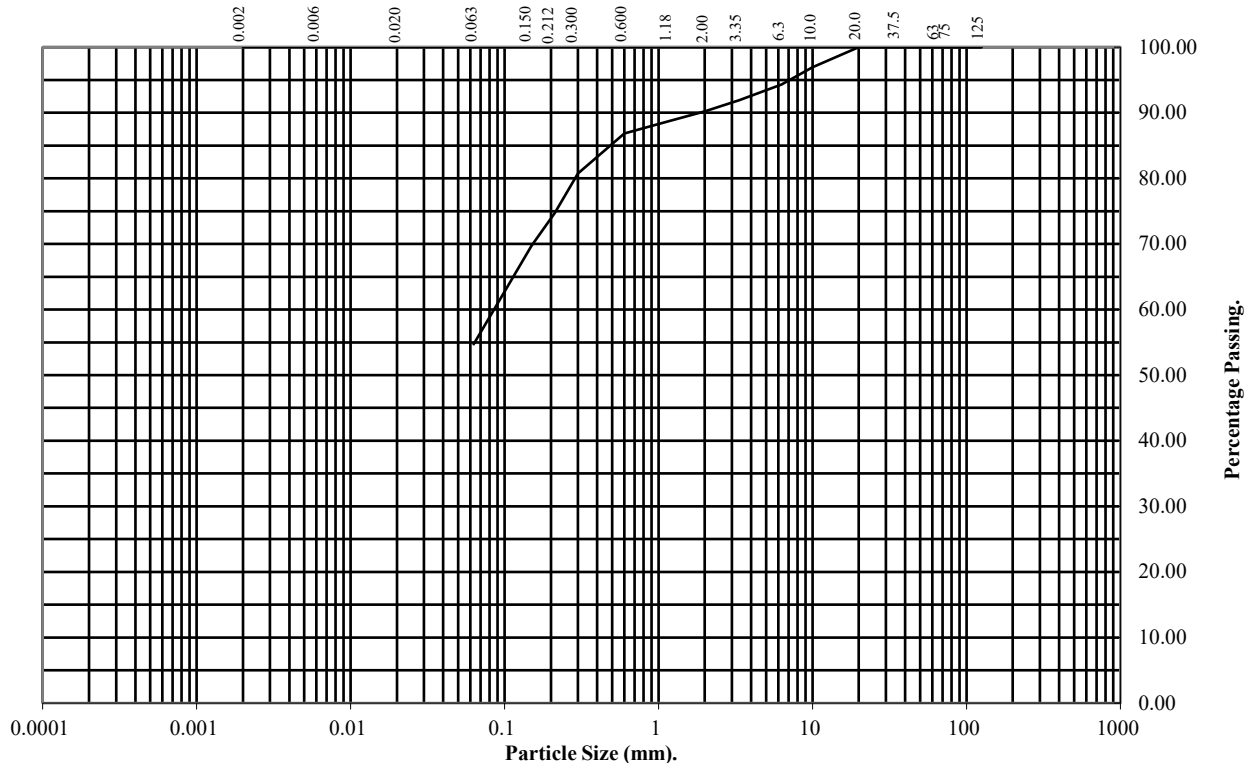
Hole Number: TP04

Top Depth (m): 1.20

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	94
3.35	92
2	90
1.18	89
0.6	87
0.3	81
0.212	75
0.15	70
0.063	55

Soil Fraction	Total Percentage
Cobbles	0
Gravel	10
Sand	35
Silt/Clay	55

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number:

TP09

Top Depth (m):

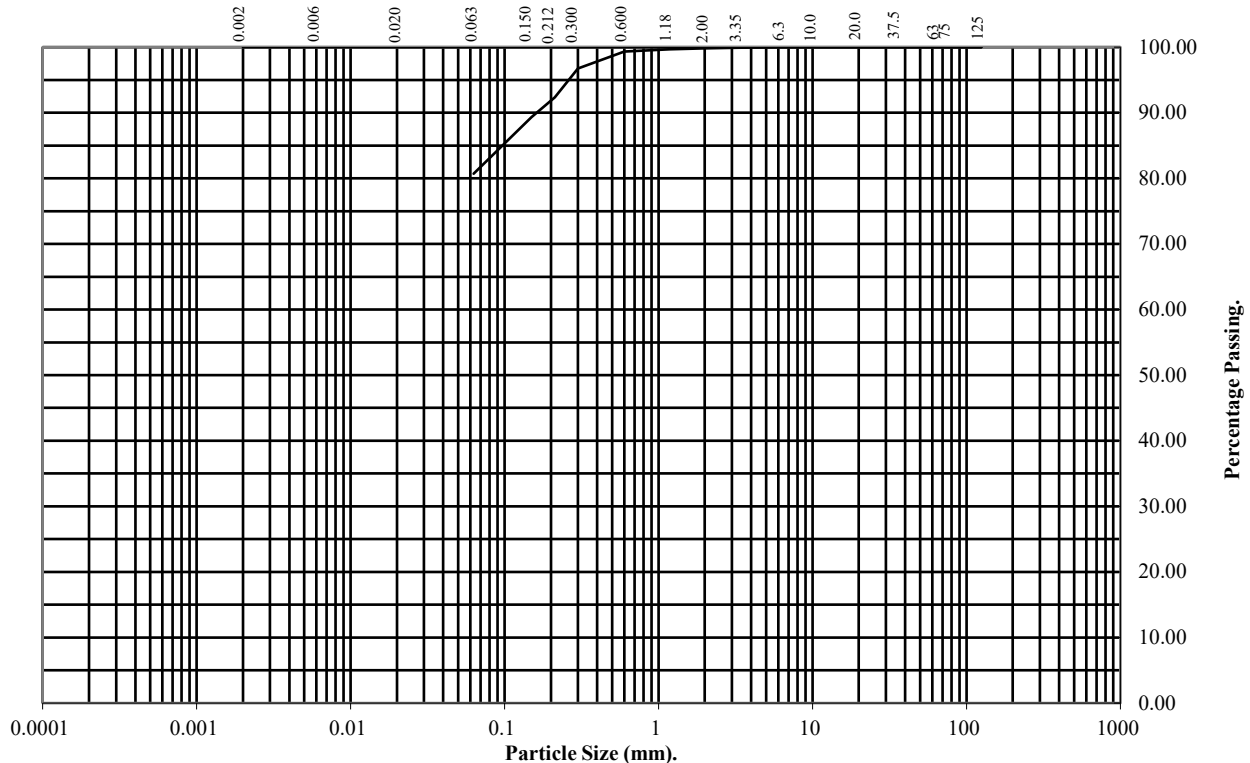
1.50

Sample Number:

Base Depth(m):

Sample Type:

B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	97
0.212	92
0.15	89
0.063	81

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	19
Silt/Clay	81

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.6 : 1990

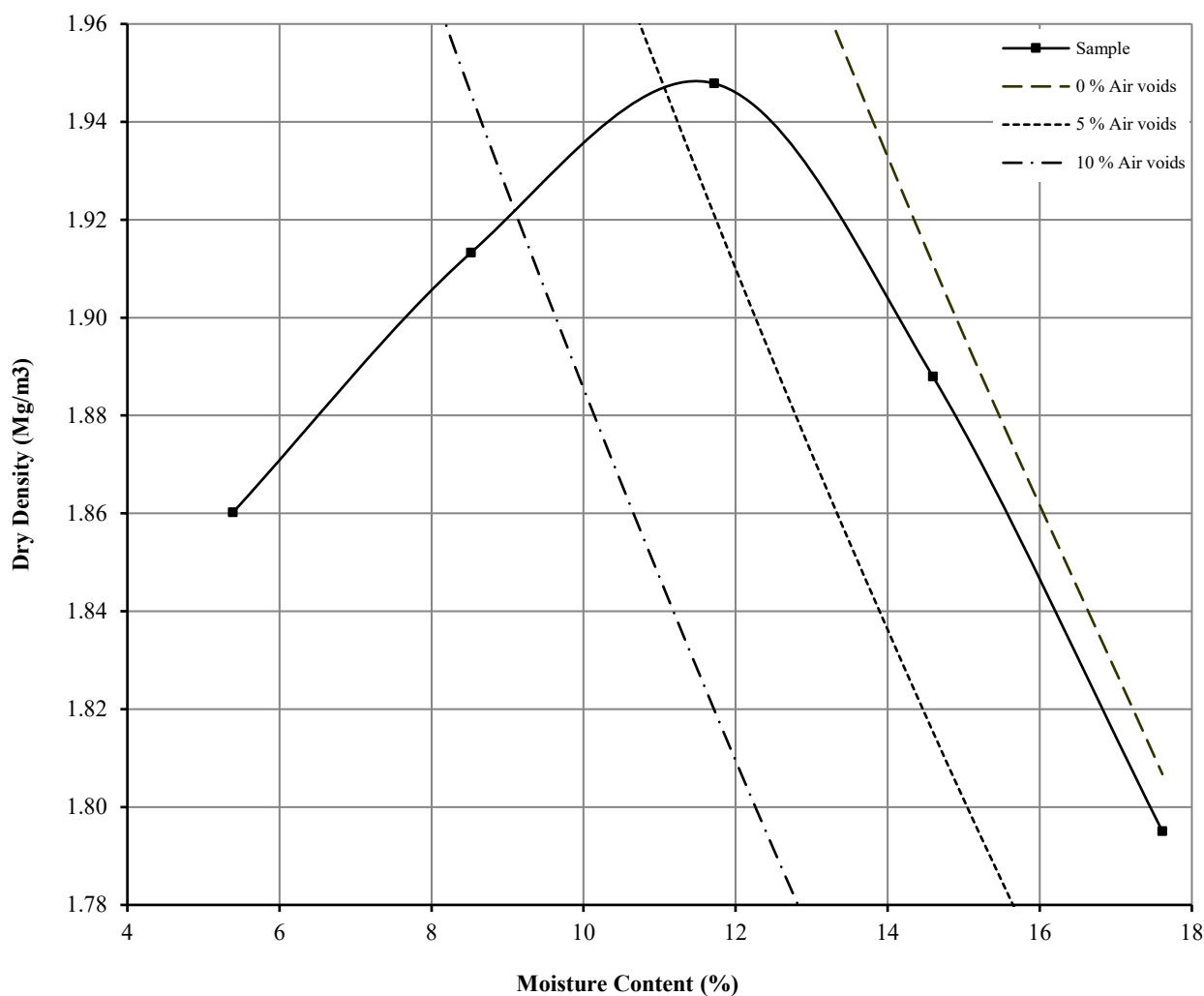
Hole Number: TP01

Top Depth (m) : 1.30

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	18	Method of Compaction:	4.5kg	Separate Samples
Particle Density (Mg/m ³):	2.65	Assumed	Material Retained on 37.5 mm Test Sieve (%):	20
Maximum Dry Density (Mg/m ³):	1.95		Material Retained on 20.0 mm Test Sieve (%):	10
Optimum Moisture Content (%):	12			
Remarks See summary of soil descriptions				



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract
PSL22/7362
Client Ref
2931

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.6 : 1990

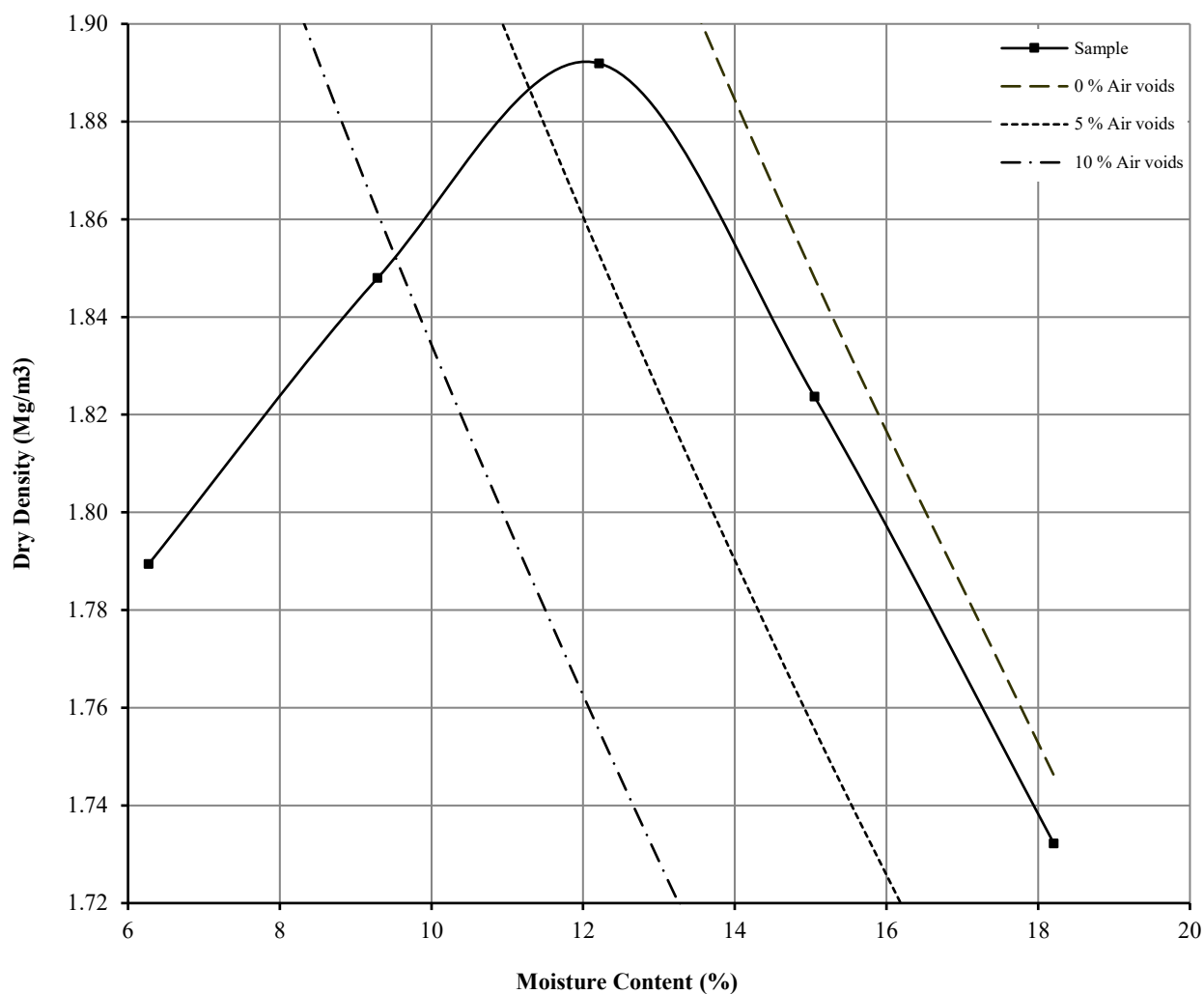
Hole Number: TP03

Top Depth (m) : 1.30

Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	15	Method of Compaction:	4.5kg	Separate Samples
Particle Density (Mg/m ³):	2.56	Assumed	Material Retained on 37.5 mm Test Sieve (%):	7
Maximum Dry Density (Mg/m ³):	1.89		Material Retained on 20.0 mm Test Sieve (%):	4
Optimum Moisture Content (%):	12			
Remarks See summary of soil descriptions				



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract
PSL22/7362
Client Ref
2931

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.5 : 1990

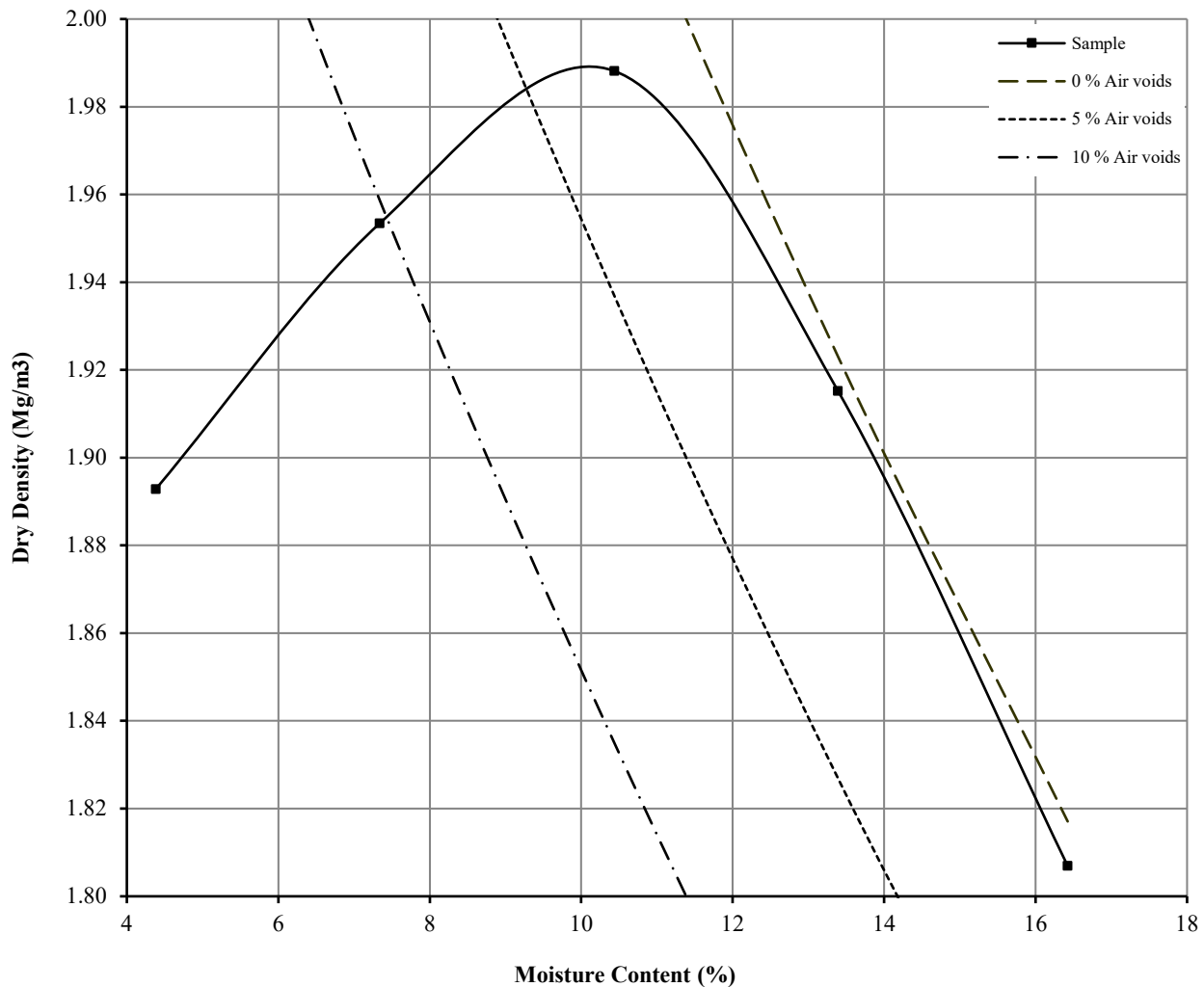
Hole Number: TP04

Top Depth (m) : 1.20

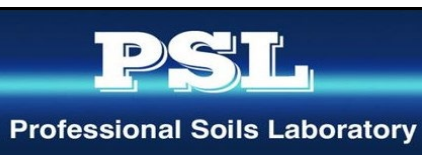
Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	16	Method of Compaction:	4.5kg	Separate Samples
Particle Density (Mg/m ³):	2.59	Assumed	Material Retained on 37.5 mm Test Sieve (%):	0
Maximum Dry Density (Mg/m ³):	1.99		Material Retained on 20.0 mm Test Sieve (%):	0
Optimum Moisture Content (%):	10			
Remarks See summary of soil descriptions				



Pilsworth Bury

Contract
PSL22/7362
Client Ref
2931

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.6 : 1990

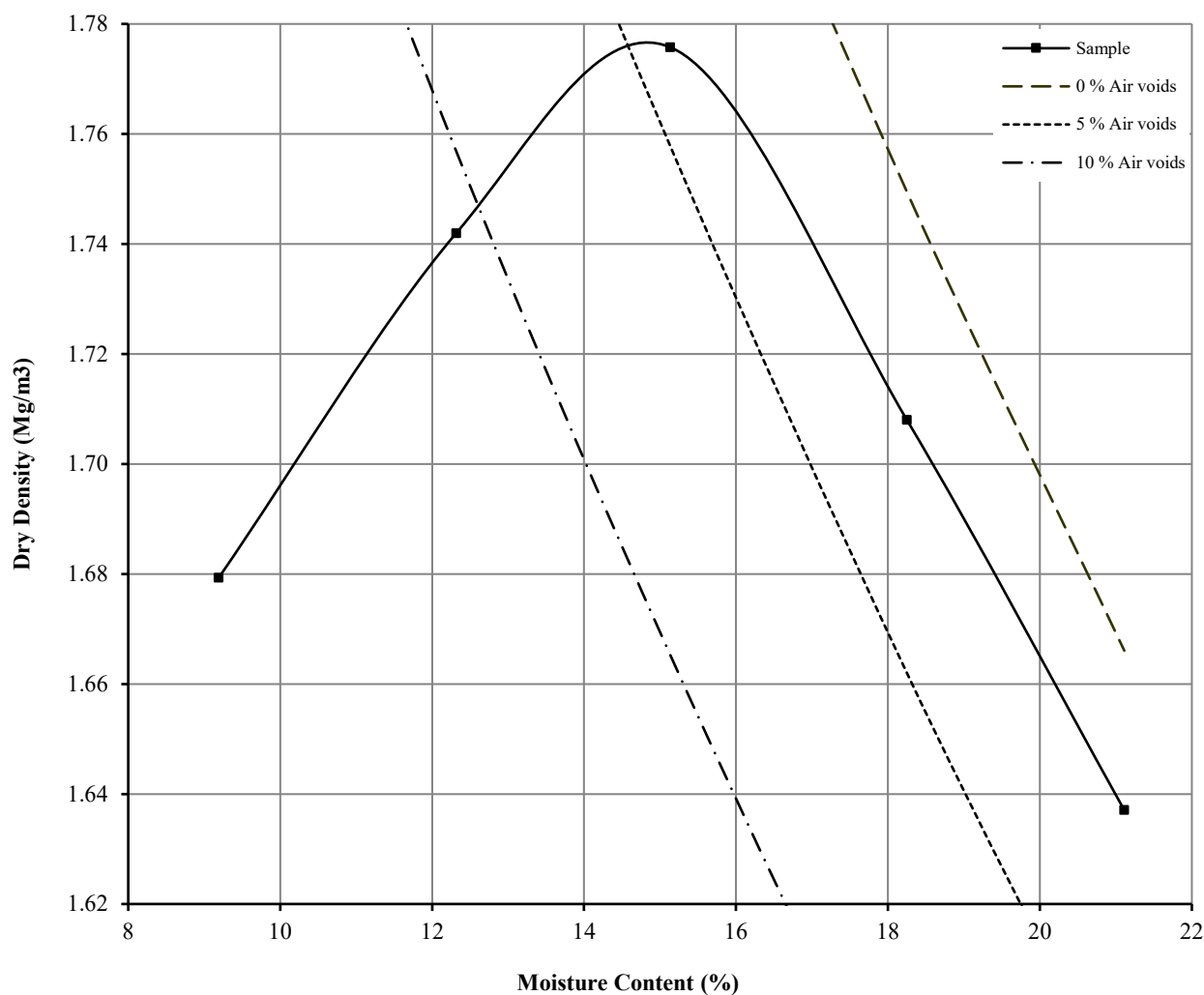
Hole Number: TP05

Top Depth (m) : 0.80

Sample Number:

Base Depth (m) :

Sample Type: D



Initial Moisture Content:	21	Method of Compaction:	4.5kg	Separate Samples
Particle Density (Mg/m ³):	2.57	Assumed	Material Retained on 37.5 mm Test Sieve (%):	1
Maximum Dry Density (Mg/m ³):	1.78		Material Retained on 20.0 mm Test Sieve (%):	6
Optimum Moisture Content (%):	15			
Remarks See summary of soil descriptions				



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract
PSL22/7362
Client Ref
2931

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : Clause 3.6 : 1990

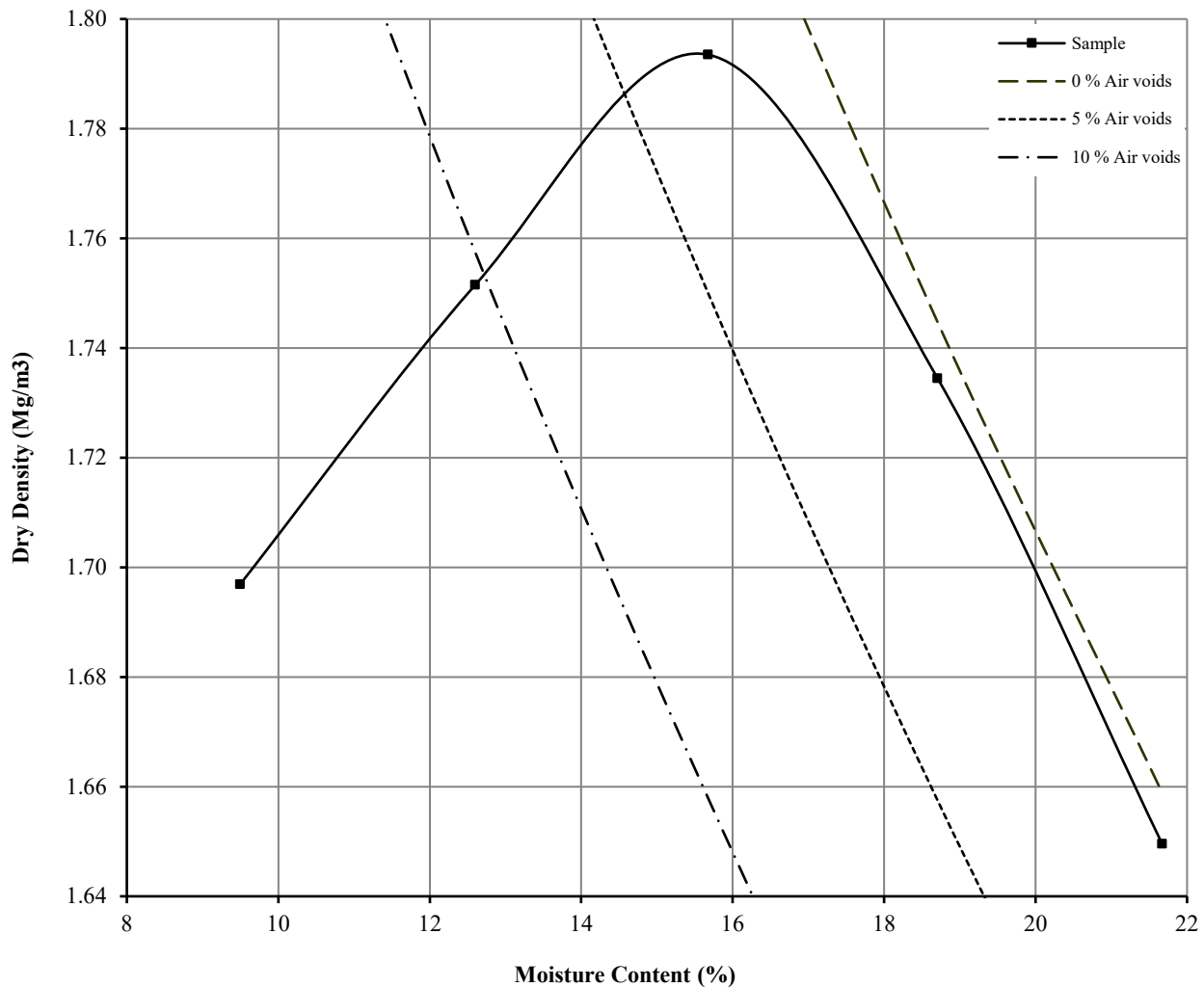
Hole Number: TP10

Top Depth (m) : 1.20

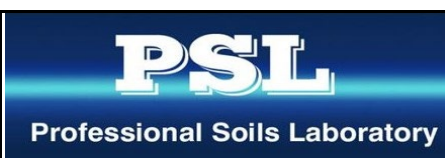
Sample Number:

Base Depth (m) :

Sample Type: B



Initial Moisture Content:	22	Method of Compaction:	4.5kg	Separate Samples
Particle Density (Mg/m ³):	2.59	Assumed	Material Retained on 37.5 mm Test Sieve (%):	2
Maximum Dry Density (Mg/m ³):	1.79		Material Retained on 20.0 mm Test Sieve (%):	4
Optimum Moisture Content (%):	16			
Remarks See summary of soil descriptions				



Pilsworth Bury

Contract
PSL22/7362
Client Ref
2931

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

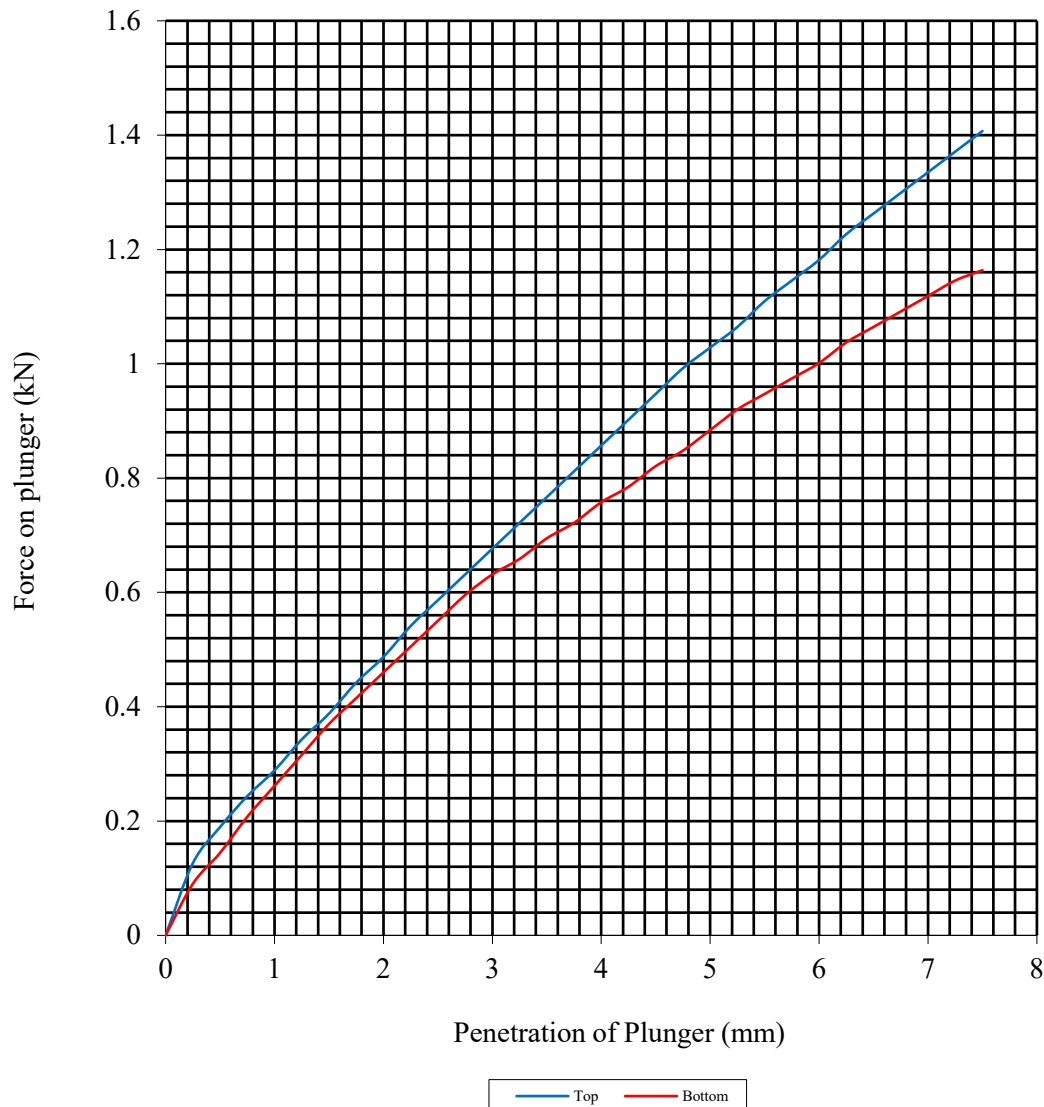
Hole Number: TP05

Top Depth (m): 0.80

Sample Number:

Base Depth (m):

Sample Type: D



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	21	Surcharge Kg:	4.00	Sample Top	21	Sample Top	5.1
Bulk Density Mg/m3:	1.99	Soaking Time hrs	0	Sample Bottom	21	Sample Bottom	4.4
Dry Density Mg/m3:	1.64	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:		7					
Compaction Conditions		2.5kg					



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

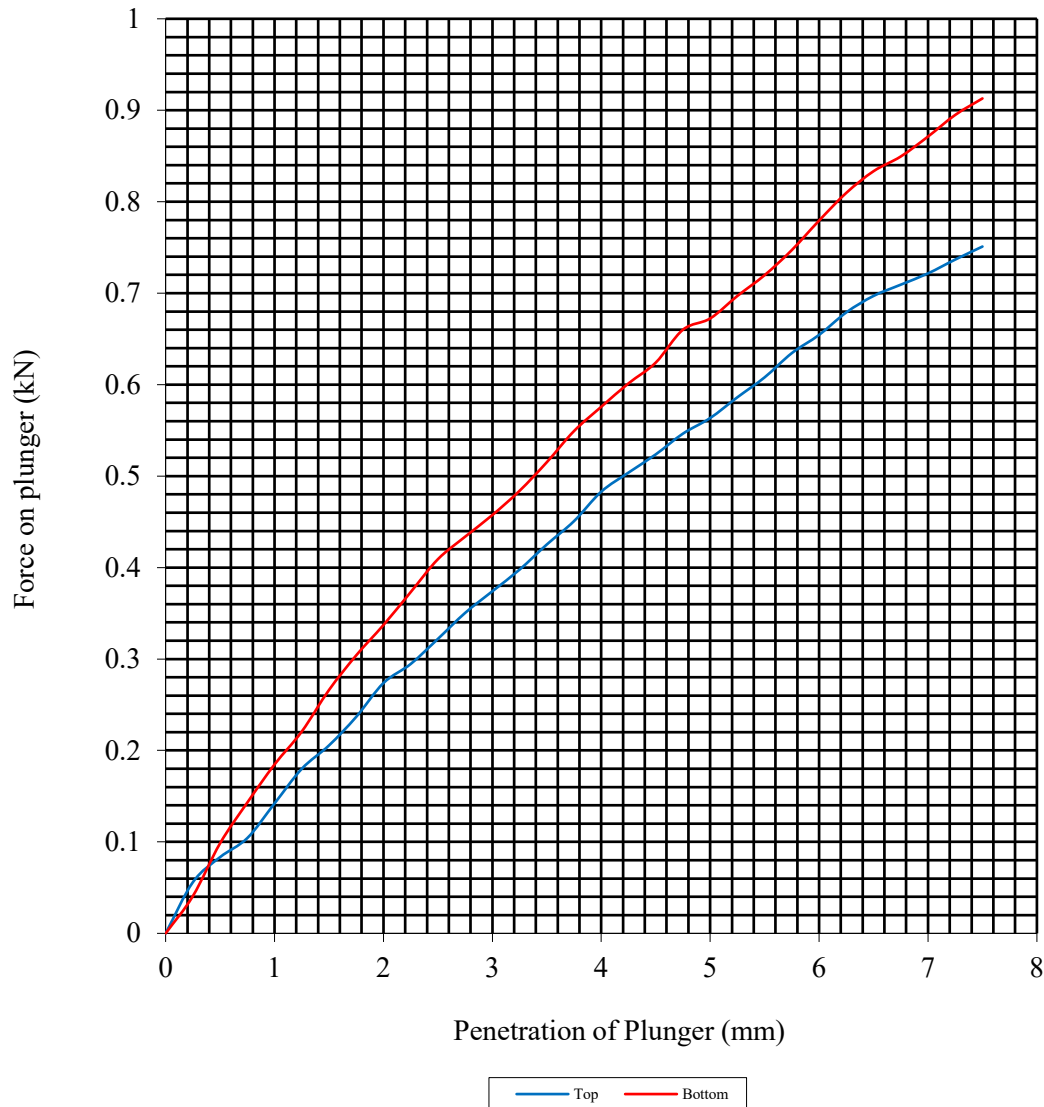
Hole Number: TP07

Top Depth (m): 1.60

Sample Number:

Base Depth (m):

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	18	Surcharge Kg:	4.00	Sample Top	18	Sample Top	2.8
Bulk Density Mg/m ³ :	2.06	Soaking Time hrs	0	Sample Bottom	18	Sample Bottom	3.4
Dry Density Mg/m ³ :	1.74	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

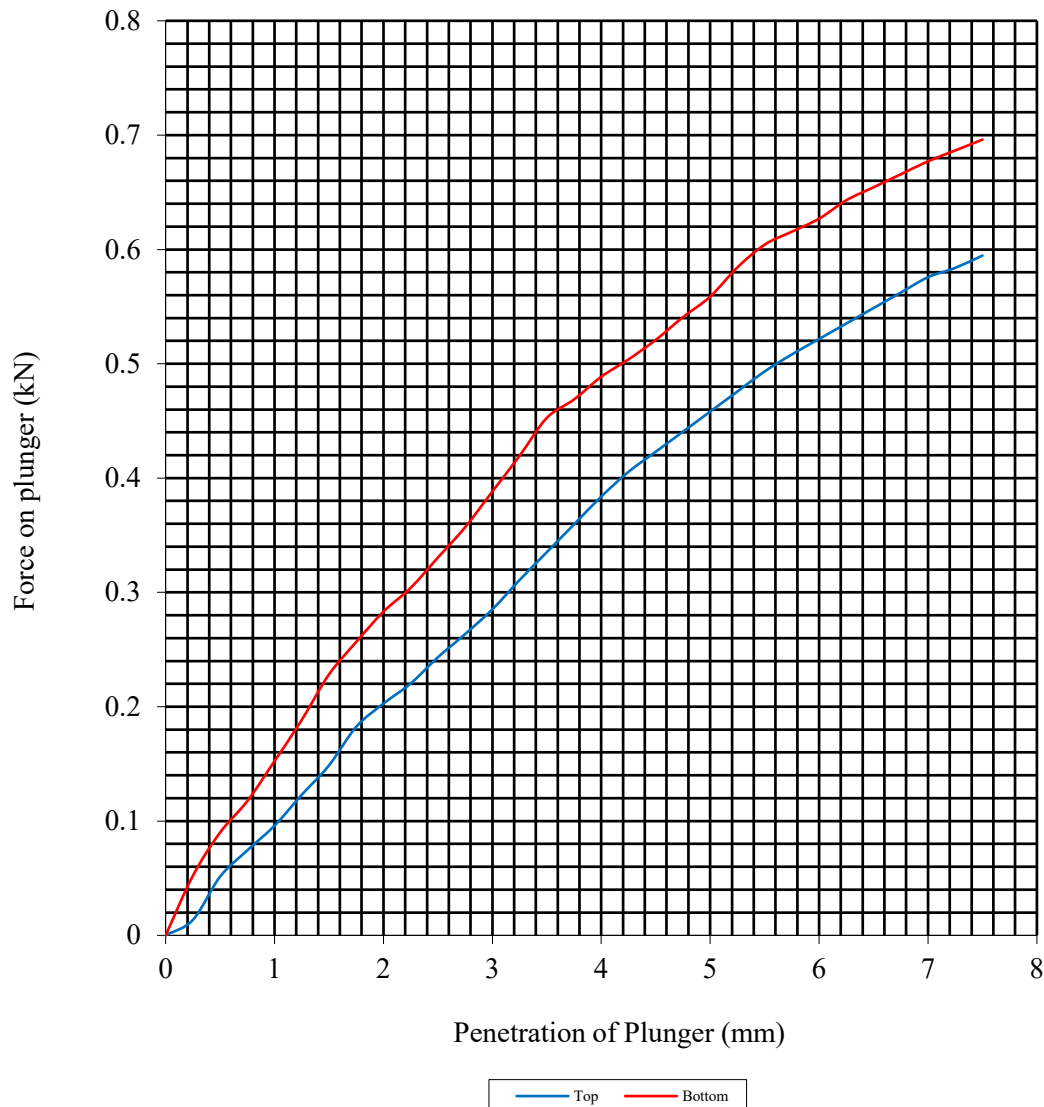
Hole Number: TP08

Top Depth (m): 1.20

Sample Number:

Base Depth (m):

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	17	Surcharge Kg:	4.00	Sample Top	17	Sample Top	2.3
Bulk Density Mg/m3:	2.08	Soaking Time hrs	0	Sample Bottom	17	Sample Bottom	2.8
Dry Density Mg/m3:	1.77	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:		8					
Compaction Conditions		2.5kg					



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

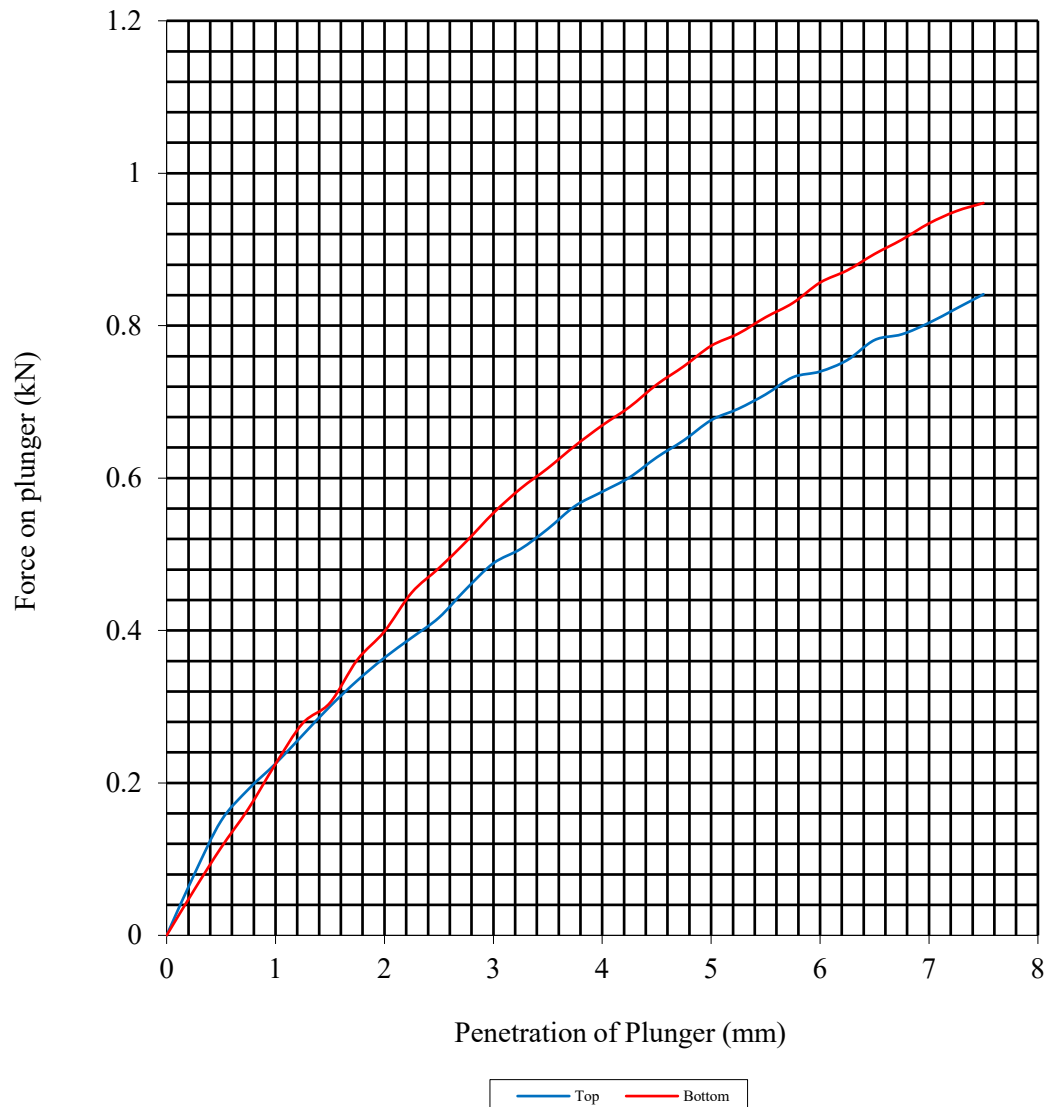
Hole Number: TP09

Top Depth (m): 1.50

Sample Number:

Base Depth (m):

Sample Type: B



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	25	Surcharge Kg:	4.00	Sample Top	25	Sample Top	3.4
Bulk Density Mg/m3:	1.98	Soaking Time hrs	0	Sample Bottom	25	Sample Bottom	3.9
Dry Density Mg/m3:	1.59	Swelling mm:	0	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:		0					
Compaction Conditions		2.5kg					



PSL
Professional Soils Laboratory

Pilsworth Bury

Contract No:
PSL22/7362
Client Ref:
2931

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

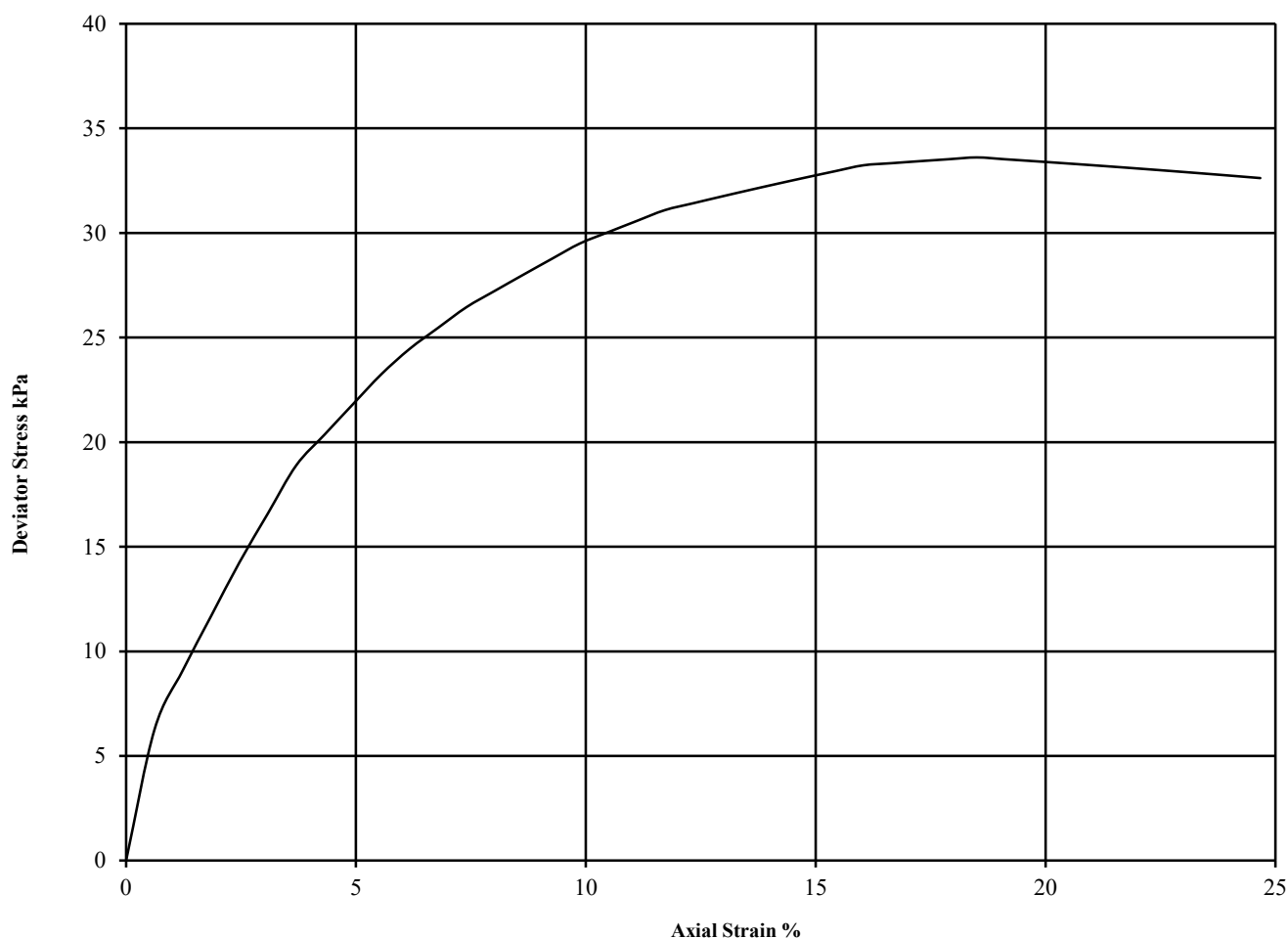
Hole Number: BH03

Top Depth (m): 12.20

Sample Number:

Base Depth (m): 12.65

Sample Type U



Diameter (mm):		103	Height (mm):		167	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	28	2.01	1.57	244	34	17	18.5	Plastic	



4043

PSL

Professional Soils Laboratory

Pilsworth Bury

Contract No:

PSL22/7362

Client Ref:

2931

APPENDIX F

GAS AND GROUNDWATER MONITORING RESULTS

GAS RISK ASSESSMENT TABLES (NHBC, CIRIA C665)

GAS PROTECTION MEASURES TABLES (BS8485:2015)

CIRIA C665

Characteristic Situation

Characteristic Situation (CIRIA 149)	Comparable Classification In DETER <i>et al</i> (1999)	Risk Classification	Gas Screening Value (GSV) (CH ₄ or CO ₂) (l/hr) ¹	Additional Factors	Typical source of generation
1	A	Very Low Risk	<0.07	Typically, methane 1 % and/or carbon dioxide 5 %. Otherwise consider increase to Situation 2.	Natural soils with low organic content. "Typical" made ground
2	B	Low. Risk	<0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/ organic content "Typical" made ground
3	C	Moderate Risk	<3.5		Old landfill, inert waste, mineworkings flooded
4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mineworkings – susceptible to flooding, completed landfill (WMP 26B criteria)
5	E	High risk	<70		Mineworkings Unflooded inactive with shallow workings near surface
6	F	Very high risk	>70		Recent landfill site

Notes:

Gas screening value: (Litres of gas/hour) is calculated by multiplying the maximum gas concentration (%) by the maximum measured borehole flow rate (l.hr) – See Glossary.

Site Characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum period defined in Table 5.5, CIRIA 659.

Source of gas and generation potential/performance should be identified.

Soil gas investigation should be in accordance with guidance provided in Chapters 4 to 6.

If there is no detectable flow, use the limit of detection of the instrument.

The boundaries between the Partners in Technology classifications do not fit exactly with the boundaries for the CIRIA classification.

Gas Risk Assessment – Characteristic Situations with Typical Maximum concentrations and Gas Screening Values (Reproduced from Table 8.5, CIRIA Report C659 – Assessing risk posed by hazardous ground gases to buildings).

NHBC Guidance

Traffic Light Classification System – Table 14.1

Traffic light Classification	Methane ¹		Carbon Dioxide ²	
	Typical Maximum Concentration ³ (% v/v)	Gas Screening Value ^{2,4} (l/hr)	Typical Maximum Concentration ³ (% v/v)	Gas Screening Value ^{2,4} (l/hr)
Green	1	0.13	5	0.78
Amber 1	5	0.63	10	1.60
Amber 2	20	1.60	30	3.10
Red				

Notes:

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic light is allocated;
2. Borehole Gas Volume Flow Rates, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

*Gas Risk Assessment - Traffic Lights with Typical Maximum Concentrations and Gas Screening Values
Reproduced from NHBC Guidance*

NHBC Guidance

Gas Protection Measures Required for Traffic Light Classification – Table 14.2

Traffic Light Classification	Ground Gas Protection Measures Required
Green	Ground gas protection measures are not required.
Amber 1	Low-level ground gas protection measures are required, using a membrane and ventilated sub-floor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours.
Amber 2	High-level ground gas protection measures are required, creating a permeability contrast to prevent ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Membranes used should always be fitted by a specialist contractor and should be fully certified (see Appendix E). As with Amber 1, ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours.
Red	Standard residential housing is not normally acceptable without further Ground Gas Risk Assessment and/or possible remedial mitigation measures to reduce/remove the source of the ground gases. In certain circumstances, active protection methods could be applied, but only when there is a legal agreement assuring the management and maintenance of the system for the life of the property.

Table 14.2 - Reproduced from NHBC Guidance

BS8485:2015

Code of Practice for the Design of Gas Protective Measures for Methane and Carbon Dioxide for New Buildings

Table 3

BRITISH STANDARD

BS 8485:2015

Table 3 Building types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/public, possible multiple	Commercial/public	Commercial/industrial
Control (change of use, structural alterations, ventilation)	None	Some but not all	Full	Full
Room sizes	Small	Small/medium	Small to large	Large industrial/retail park style

- **Type A building:** private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.
- **Type B building:** private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small to medium size rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.
- **Type C building:** commercial building with central building management control of any alterations to the building or its uses and central building management control of the maintenance of the building, including the gas protection measures. Single occupancy of ground floor and basement areas. Small to large size rooms with active ventilation or good passive ventilation of all rooms and other internal spaces throughout ground floor and basement areas. Probably civil engineering construction. Examples include offices, some retail premises, and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).
- **Type D building:** industrial style building having large volume internal space(s) that are well ventilated. Corporate ownership with building management controls on alterations to the ground floor and basement areas of the building and on maintenance of ground gas protective measures. Probably civil engineering construction. Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

NOTE 2 Type A buildings are those where the risk of failure of the gas protection measures is likely to be most significant to the safety of the occupants and Type D buildings are those where this same risk is likely to be least significant.

From the design CS and the type of building (A, B, C or D) the minimum level of gas protection (score) in the range 0 to 7.5 should be determined in accordance with Table 4.

BS8485:2015

Code of Practice for the Design of Gas Protective Measures for Methane and Carbon Dioxide for New Buildings

Table 4

BS 8485:2015

BRITISH STANDARD

Table 4 Gas protection score by CS and type of building

CS	Minimum gas protection score (points)			
	High risk	Medium risk		Low risk
	Type A building	Type B building	Type C building	Type D building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5 ^{A)}	5.5 ^{A)}	4.5	3.5
5	— ^{B)}	6.5 ^{A)}	5.5	4.5
6	— ^{B)}	— ^{B)}	7.5	6.5

^{A)} Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.

^{B)} The gas hazard is too high for this empirical method to be used to define the gas protection measures.

NOTE 3 The NHBC has published guidance [8] for use on residential developments, which utilizes an alternative classification ("traffic light") system. This guidance typically applies to Type A buildings utilizing beam and block floor constructions with clear void ventilation. The design choice variables are limited to decisions relating to the membrane specification and verification recommendations (see Table 7). Designers utilizing this system would therefore need to refer to the NHBC [8] to assess compliance for specific recommendations.

When the minimum gas protection score has been determined for the building as a whole, or for each part of the building, then a combination of two or more of the following three types of protection measures should be used to achieve that score:

- the structural barrier of the floor slab, or of the basement slab and walls if a basement is present;
- ventilation measures; and
- gas resistant membrane.

NOTE 4 The method of selecting the combination of these types of protection measures for a particular building is given in 7.2.

Once the types of protection measures have been decided, the detailed design and specification of the measures should be undertaken (see 7.3).

NOTE 5 In some cases, the designer might be of the opinion at this stage that the extent of the protection measures is potentially more than is needed, because of limitations in the scope of the site investigation [these limitations having led to a more conservative GSV and CS than is likely from the conceptual site model (see 6.3.7.2 and 6.3.7.3)]. In this case, further site investigation could be carried out to check the GSV. Only if there is sufficient time to carry out additional site investigation and gas monitoring would this step be useful.

The detailed design and specification of the protection measures should be recorded in a design report (see 8.3).

BS8485:2015

Code of Practice for the Design of Gas Protective Measures for Methane and Carbon Dioxide for New Buildings

Table 5

Table 5 Gas protection scores for the structural barrier	
Floor and substructure design (see Annex A)	Score ^{A)}
Precast suspended segmental subfloor (i.e. beam and block)	0
Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations	1 or 1.5 ^{B)}
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing ^{C)}	2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing ^{C)}	2.5
^{A)} The scores are conditional on breaches of floor slabs, etc., being effectively sealed. ^{B)} To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2). ^{C)} The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).	

BS8485:2015

Code of Practice for the Design of Gas Protective Measures for Methane and Carbon Dioxide for New Buildings

Table 6

BRITISH STANDARD		BS 8485:2015
Table 6 Gas protection scores for ventilation protection measures		
Protection element/system	Score	Comments
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)	0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Very good performance: Good performance: Media used to provide the dispersal layer are: • Clear void • Polystyrene void former blanket • Geocomposite void former blanket • No-fines gravel layer with gas drains • No-fines gravel layer	2.5 1.5	Performance criteria for methane and carbon dioxide are shown in Figure B.6 and Figure B.7, respectively. The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B. Passive ventilation should be designed to meet at least "good performance", see Annex B.
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a subfloor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers	1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance", as described in Annex B.
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to <i>Buildings Regulations 2000, Approved Document F</i> [9].

BS8485:2015

Code of Practice for the Design of Gas Protective Measures for Methane and Carbon Dioxide for New Buildings

Table 7

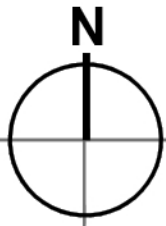
BRITISH STANDARD		BS 8485:2015
Table 7 Gas protection score for the gas resistant membrane		
Protection element/system	Score	Comments
Gas resistant membrane meeting all of the following criteria: - sufficiently impervious to the gases with a methane gas transmission rate $<40.0 \text{ ml/day/m}^2/\text{atm}$ (average) for sheet 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 (e.g. settlement if placed below a floor slab); - sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc); - capable, after installation, of providing a complete barrier to the entry of the relevant gas; and - verified in accordance with CIRIA C735 [N1]	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.4 mm thickness (equivalent to 370 g/m^2 for polyethelene) reinforced membrane (virgin polymer) meets the performance criteria in Table 7 (see C.3). If a membrane is installed that does not meet all the criteria in column 1 then the score is zero.

APPENDIX G

OUTLINE DEVELOPMENT PROPOSALS



Proposed Site Layout Scale 1:500



- Dimensions are in millimeters, unless stated otherwise.
- Scaling of this drawing is not recommended.
- It is the recipient's responsibility to print this document to the correct scale.
- All relevant drawings and specifications should be read in conjunction with this drawing.

SCHEDULE OF ACCOMMODATION

Unit 3	
Existing GIA	
Warehouse	74,932 sq ft / 6,961 sq m
Office	12,712 sq ft / 1,180 sq m
Existing GEA	
Warehouse	76,608 sq ft / 7,117 sq m
Office	13,864 sq ft / 1,286 sq m

NOTE:
All areas have been measured from survey information provided by others

Proposed GIA	
Warehouse	33,000 sq ft / 3,065 sq m
Proposed GEA	
Warehouse	33,985 sq ft / 3,157 sq m

Overall Area GIA	
120,644 sq ft / 11,206 sq m	
Overall Area GEA	
124,457 sq ft / 11,560 sq m	

Loading Docks	-	10
Level Access	-	2
Car Parking	-	90
Cycle Parking	-	14
(12 No. Long Stay - 2 No. Short Stay Spaces)		
Site Area	-	5.97 Acres (2.41 Hectares)

rev	amendments	by	ckd	date
-----	------------	----	-----	------

Unit 3 - Pilsworth Ind Est

Proposed Site Plan

LOD 3	LOI 3
-------	-------

Star UK PAS I Propco
Limited (UK)



Newark Beacon, Cafferata Way, Newark, Nottinghamshire NG24 2TN
t: +44 (0)1636 653027 e: info@umcarchitects.com

RIBA PoW Stage:	3 - Spatial Coordination
Document Suitability:	S2
Drawn / Checked:	LF / DEB
Date:	29.07.2022
Scale:	1:500 A1
UMC Project Number:	22410
Document Reference:	Drawing no: Revision:
22410 - UMC - 0100 - SI - D - A	0601 E



SHADBOLT GROUP

DESIGN | MANAGE | CONSTRUCT