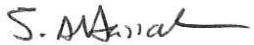


**GEO-ENVIRONMENTAL ASSESSMENT  
LAND WEST OF WESTFIELD AVENUE  
EARL SHILTON, LEICESTERSHIRE  
AVANT HOMES  
GEA-22416G-23-393  
NOVEMBER 2024**

**IDOM**

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EARL SHILTON  
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NOVEMBER 2024

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## EXECUTIVE SUMMARY

A Geo-Environmental Assessment was requested by Avant Homes. The purpose of the assessment was to identify contaminative or geotechnical issues associated with former land use at *Land West of Westfield Avenue, Earl Shilton, Leicestershire* which might impact on the site's redevelopment.

SITE DETAILS	
Approximate site area	0.58 ha
Current use / historic use	The site is currently undeveloped but sits within the wider Westfield Farm residential development.
Proposed use	The site is proposed to be developed for residential purposes with 18 houses planned.

### PHASE 1 NON-INTRUSIVE INVESTIGATION

Expected geology	The southern area of the site is expected to have superficial deposits of Wigston Member with no superficial deposits on the northern area. The bedrock expected is Gunthorpe Member Mudstone.
Groundwater	The superficial deposits are classed as a Secondary A aquifer while the bedrock is Secondary B aquifer status. The site is not in a SPZ and there are no abstractions within 1 km.
Surface water	There are no surface water receptors in vicinity. There are no surface water abstractions within 1 km and the flooding risk on site is low.

### PHASE 2 EXPLORATORY INVESTIGATION

Ground Conditions	Thin recent made ground and locally recently placed sand fill at the surface. Very loose to medium dense and soft to firm superficial deposits identified under most of site to as deep as 4.50 m. Bedrock encountered as firm becoming stiff red silty clay before transition to very stiff/hard clay or very weak mudstone.
Contamination	No elevated levels of contamination detected.
Geotechnical issues	Loose and soft wet strata persist to depths of 2-3 m, locally in excess of 4 m. Potential for shallow water ingress and resulting instability in open excavations.

### RECOMMENDATIONS

Geotechnical	Shallow strip footings not considered suitable on unimproved ground. Piled foundations or ground improvement recommended.
Remediation	No specific soil remedial actions identified. Protected water pipes may be required. Insufficient topsoil present on site – importation required for gardens and landscaped areas.
Waste classification	Non-hazardous. Natural soils considered suitable for disposal as inert waste.

**SECTION 1 INTRODUCTION**

1.1 Avant Homes proposes to develop an area of land located to the west of Westfield Avenue, Earl Shilton for residential development purposes. The proposed development comprises:

- i.* 18 dwellings comprising detached and semi-detached properties with gardens; and
- ii.* Areas of public open space.

1.2 The wider Westfield Farm development area site has been the subject of a previous phase of intrusive investigation by MEC Ltd and reported in January 2018. IDOM Merebrook Limited (IDOM) has been commissioned by Avant Homes to undertake further and updated site investigation works within the redline area shown in Appendix 1 in order to advise on the geo-environmental implications of the development of the site for the proposed end use.

1.3 The objectives of the investigation are to:

- i.* Assess surface and sub-surface ground conditions present at the site;
- ii.* Identify hazards associated with ground contamination which may place constraints on the site and the proposed development;
- iii.* Evaluate the risks associated with any identified hazards;
- iv.* Provide preliminary recommendations for the mitigation of any significant risks identified; and
- v.* Provide preliminary geotechnical recommendations.

1.4 A Phase 1 (Non-intrusive Investigation) has been prepared separately as report reference DS-22416g-23-384 which should be read in conjunction with this report.

1.5 This report presents the findings of the geo-environmental investigation and provides an interpretation of the geo-environmental conditions that exist at the site. The contaminative status of the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment. This report uses a Tier 1 risk assessment to ascribe a conservative qualitative appraisal of the hazards associated with the site.

1.6 This report has been prepared for Avant Homes for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Avant Homes and IDOM as to the extent to which the findings may be appropriate for their use.

**SECTION 2 INTRUSIVE SITE INVESTIGATION****2.1 INTRODUCTION**

- 2.1.1 A site investigation rationale has been devised in accordance with the findings of the Phase 1 investigation and the resultant preliminary conceptual site model and risk assessment.
- 2.1.2 Intrusive sampling locations were chosen on the basis of providing broad spatial coverage of the site as well as targeting proposed development footprints for geotechnical purposes. No obvious features suggesting sources of pollution were identified for targeted contamination testing.

**2.2 SITE INVESTIGATION METHODS**

- 2.2.1 An intrusive investigation was carried out by IDOM on 28 September 2023 and comprised the following scope of work:
  - i. Six windowless sample probe holes (MWS01 to MWS06) to depths of 3.00-4.50 m bgl
- 2.2.2 Exploratory hole locations are indicated on drawing 304-001 in Appendix 1. Logging of exploratory holes was undertaken by an IDOM Officer. Exploratory hole logs are presented as Appendix 2.
- 2.2.3 A tracked windowless sampling rig was used to advance MWS01-MWS06. This comprised a rig-mounted drop hammer to drive a hollow steel barrel into the ground. The barrel is recovered along with a removable plastic sleeve, which lines the barrel and holds a core of soil which is retracted for logging and sampling. SPTs were performed at approximate 1 m intervals in all windowless sample holes. The tests involved driving a steel cone tipped series of rods into the ground over a distance of 450 mm using the repeated blows of a 63.5 kg weight allowed to free fall over a distance of 760 mm. The total number of blows required for the final 300 mm penetration (the 'N' value) is recorded on the window sample logs.
- 2.2.4 Holes were backfilled with arisings on completion.
- 2.2.5 Representative soil samples were taken from various depths and strata to assess the contaminative status of the site. Soil samples were submitted to an MCERTS/UKAS accredited laboratory for chemical analysis of a broad suite of potential contaminants. The results are provided in Appendix 3.
- 2.2.6 A programme of geotechnical laboratory testing was performed on disturbed soil samples for assessment of plasticity and shrinkage potential. Chemical testing was also undertaken to assess the aggressiveness of the ground with respect to buried concrete. The results are provided in Appendix 4.

**SECTION 3 GROUND CONDITIONS****3.1 SURFACE GROUND CONDITIONS**

3.1.1 Recent made ground of clay with mixed gravel and brick fragments colonised by weeds. Recently raised area of sand in the north and various piles of spoil and rubble.

**3.2 SUB-SURFACE GROUND CONDITIONS**

3.2.1 The ground investigation has identified a sequence of very loose and medium dense red sands with occasional wood fragments and soft sandy clay superficial deposits of the Wigston Formation in all boreholes. This was underlain by the Gunthorpe Member (mudstone) recovered as a highly to completely weathered clay. This is contrast with the published geology which only shows the superficial Wigston Formation sands and gravels to be present in the far south of the site. All boreholes terminated upon meeting penetration test refusals, suggesting weathered mudstone strata at the base of the boreholes.

3.2.2 A summary of the ground conditions encountered is presented in Table 1, whilst a more detailed assessment of the strata is contained in the following sections of the report.

Table 1: Summary of Sub-surface Ground Conditions

Strata	Depth to Top of Range (m bgl)	Thickness Range (m)
Made Ground/Topsoil	0.0	0.40-0.90
Red clayey SAND/very sandy CLAY (Possible Wigston Fm)	0.40-0.90	1.70-4.05
Gunthorpe Member	1.70-4.50	>1.0

## 3.2.3 Made Ground

3.2.3.1 Surface made ground was typically present as a pale grey-brown sandy gravelly clay and locally a sand and gravel with Type 1 roadstone gravel, brick and various lithologies. This is likely to be recently placed or disturbed fill associated with use of the site for storage of stockpiles and building materials. Locally remaining topsoil of brown clay loam was identified.

3.2.3.2 No evidence of contamination was observed within this stratum.

## 3.2.4 Superficial Deposits (Possible Wigston Formation)

3.2.4.1 Present below made ground as a red, coloured wet fine to medium sand or a very soft and firm red sandy clay with occasional grey angular gravel and occasional decayed wood fragments. The thickest deposits were identified in the south-west (MWS05).

3.2.4.2 SPT N values ranged from 1 -16 indicated very loose/very soft conditions through to medium dense conditions. The majority of results were in the 6-10 range indicating overall loose soils. An increase to medium dense conditions in MWS05 was found from 3.5 m.

3.2.4.3 Locally poor recovery was reported which was likely due to a combination of low density and high water content of the sand.

3.2.4.4 One sample of gravelly clay at 3.70-4.0 in MWS04 was analysed for determination Atterberg Limits. A Liquid limit of 35 % was identified, indicative of low plasticity soils and a plasticity index of 15%, indicating a low shrinkage potential soil.

3.2.5 Gunthorpe Member

3.2.5.1 Typically recovered as a firm becoming stiff red silt/clay with grey dolomitic siltstone/sandstone inclusions recovered at the base of the sequence, consistent with a highly and completely weathered mudstone. Locally softening of the upper portion was evident.

3.2.5.2 N values at the top of the stratum ranged from 9-21 with N values of 48 and 50 recorded by 3.0-4.5 m. Blow counts of 50 did not achieve the full depth of the test and boreholes were terminated at this point.

3.2.5.3 Atterberg Limits testing from four samples between 2.40 and 3.0 m determined liquid limits in the range 33-35 % indicative of low plasticity soils and plasticity indices in the range 15 to 17%, indicating a low shrinkage potential soil.

## **SECTION 4 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS**

### **4.1 FOUNDATIONS**

4.1.1 The proposed development is indicated to comprise low-rise housing in detached, and semi-detached plots and short terraces of three and four plots.

4.1.2 Ground investigation has identified a variable sequence of very loose, loose and medium dense sands, visually with a high water content and soft through to firm clays persisting to between 2 and 3 m, locally as deep as 4.5 m bgl.

4.1.3 N values at normal foundation depths of around 1 m indicate that safe bearing pressure of no more than 50 kN/m<sup>2</sup> would be available in clay soils for a 1 m wide footing whilst limiting settlement to acceptable levels. In sand soils, variable conditions are indicated. Shallow medium dense soils give way to loose soil, particular further south. In MWS05 the N values reduced with depth to as low as 1, indicating very loose conditions and possibly reflecting saturated conditions. This would indicate safe bearing pressures varying from 50-100 kN/m<sup>2</sup> at 1 m depth reducing to less than 25 and only up to 40 kN/m<sup>2</sup> with depth.

4.1.4 Consistently competent strata are therefore indicated to be absent in the upper 2.5 m to as much 4.5 m, relative to existing ground levels. Where very stiff clay/highly

weathered mudstone is encountered a safe bearing pressure of 200 kN/m<sup>2</sup> should be available.

- 4.1.5 Due to the low N values and variability in strength and changes from cohesive and granular soils, it is considered that traditional strip footings will not be suitable and that an alternative, such as piled foundations will be required. It is likely that either driven or augered piles, extending into very stiff clay/weak mudstone would be feasible.
- 4.1.6 Alternatively, ground improvement using vibro-replacement techniques (stone columns) could be considered to allow use of strip footings. However, in view of the locally very loose and wet conditions, it is recommended that a specialist ground improvement contractor be consulted to advise what bearing capacities could be realistically achieved.
- 4.1.7 In either case, it is recommended that further borehole investigation is undertaken for pile design purposes to confirm ground conditions to at least 5 m below the base of piles or stone columns. Indicatively 10-12 m deep boreholes would be advised.

#### **4.2 EXCAVATIONS AND GROUNDWATER**

- 4.2.1 Wet sandy soils would indicate that instability could occur in the short-term in service trenches and foundation excavations.
- 4.2.2 Any excavation required to remain open for extended periods or where man-entry is proposed should be supported or battered back to a safe angle.
- 4.2.3 Wet sandy soils were encountered in the exploratory holes and it is recommended that provisions for dewatering are made during groundworks.

#### **4.3 FLOOR SLABS**

- 4.3.1 In view of the presence of made ground in excess locally of 0.6 m and weak superficial deposits, it is recommended that suspended floors be adopted for new dwellings.

#### **4.4 BURIED CONCRETE**

- 4.4.1 Recommendations given in BRE Special Digest 1:2005 "*Concrete in aggressive ground*" have been followed in order to give recommendations with respect to buried concrete.
- 4.4.2 Water soluble sulphate analysis was carried out on ten soil samples (six made ground samples and four from underlying natural soils) obtained from depths of between 0.2 and 1.0 m bgl with soil pH determination also carried out on these samples. Water soluble sulphate contents ranged between 0.0346 and 0.645 g.l<sup>-1</sup>. In accordance with BRE guidelines the characteristic value is calculated for each of the made ground data and the natural soil data, using the highest value for each. In this case the characteristic value is 0.645 g.l<sup>-1</sup> for made ground and 0.0704 g.l<sup>-1</sup> for

the natural soil. On this basis the Design Sulphate Class is DS-1 for the shallow natural strata and DS-2 for made ground.

4.4.3 The pH values in the soil samples varied between 6.5 and 11.4. The mean of the lowest 20 % of values is 6.8 which represents the characteristic value. Mobile groundwater conditions have been assumed and, on this basis, the Aggressive Chemical Environment for Concrete (ACEC) class for the site is AC-1 for natural soil and AC-2 for concrete in contact with made ground.

#### 4.5 ROADS AND PAVED AREAS

4.5.1 No in situ testing of California Bearing Ratio (CBR) has been carried out as part of this investigation. From the soft clay present in the upper 1 m of soil, it is recommended that a maximum value of 2% is adopted for design purposes.

### SECTION 5 ENVIRONMENTAL ASSESSMENT

#### 5.1 SOIL QUALITY

5.1.1 A total of six soil samples were submitted to the laboratory for chemical analysis, all of which were from the surface deposits of sandy gravelly clay made ground or remnant topsoil (MWS02). The laboratory chemical analysis certificates are contained in Appendix 3. The results of the analysis are summarised in Table 2.

5.1.2 An initial screening exercise has been undertaken whereby contaminant concentrations recorded in soils have been assessed against *Suitable for Use Levels* (S4ULs) published in 2015 by LQM/CIEH<sup>1</sup>. These precautionary screening levels are designed to be representative of minimal risk to human health in a number of land use scenarios. In this report S4ULs have been selected for a residential land use where the possibility of consumption of homegrown produce exists and assuming a soil organic matter of 1 %. For lead the DEFRA Category 4 Screening Level<sup>2</sup> has been used as this is based on updated toxicological data and a low risk to human health.

5.1.3 An additional set of phytotoxin screening levels have been adopted from 'The Code of Agricultural Practice for the Protection of Soil' Ministry of Agriculture, Fisheries and Food (MAFF), 1993, which are protective of healthy plant growth.

Table 1: Summary of Soils Chemical Analysis Results

Contaminant	Units	Max	Mean	No of Tests	Screening Level (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
pH	-	6.5-11.4	8.52	10	5 – 9	3
Arsenic	mg.kg <sup>-1</sup>	22	9.367	6	37	0

<sup>1</sup> Nathanail, C. P., McCaffrey, C., Gillett, A. G., Ogden, R. C. and Nathanail, J. F. 2015. *The LQM/CIEH S4ULs for Human Health Risk Assessment*. Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3100. All rights reserved. Including August 2015 nickel update.

<sup>2</sup> SP1010 *Development of Category 4 Screening Levels Main Report* (Dec 2013) and SP1010 *Policy Companion Document* (Mar 2014).

Contaminant	Units	Max	Mean	No of Tests	Screening Level (SL)	No > SL*
<b>HUMAN HEALTH RISK ASSESSMENT</b>						
Cadmium	mg.kg <sup>-1</sup>	0.7	0.383	6	11	0
Chromium (total)	mg.kg <sup>-1</sup>	25	18.83	6	910	0
Hexavalent Chromium	mg.kg <sup>-1</sup>	<1.8	<1.8	6	6	0
Lead	mg.kg <sup>-1</sup>	61	36.7	6	200	0
Mercury	mg.kg <sup>-1</sup>	<0.3	<0.3	6	40	0
Nickel	mg.kg <sup>-1</sup>	27	17.23	6	130	0
Selenium	mg.kg <sup>-1</sup>	<1	<1	6	250	0
TPH Aliphatic >EC <sub>5</sub> - EC <sub>6</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	42	0
TPH Aliphatic >EC <sub>6</sub> - EC <sub>8</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	100	0
TPH Aliphatic >EC <sub>8</sub> - EC <sub>10</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	27	0
TPH Aliphatic >EC <sub>10</sub> - EC <sub>12</sub>	mg.kg <sup>-1</sup>	<1	<1	6	130	0
TPH Aliphatic >EC <sub>12</sub> - EC <sub>16</sub>	mg.kg <sup>-1</sup>	12	6.5	6	1100	0
TPH Aliphatic >EC <sub>16</sub> - EC <sub>21</sub>	mg.kg <sup>-1</sup>	110	25	6	65000	0
TPH Aliphatic >EC <sub>21</sub> - EC <sub>35</sub>	mg.kg <sup>-1</sup>	530	98.33	6	65000	0
TPH Aromatic >EC <sub>5</sub> - EC <sub>7</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	70	0
TPH Aromatic >EC <sub>7</sub> - EC <sub>8</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	130	0
TPH Aromatic >EC <sub>8</sub> - EC <sub>10</sub>	mg.kg <sup>-1</sup>	<0.1	<0.1	6	34	0
TPH Aromatic >EC <sub>10</sub> - EC <sub>12</sub>	mg.kg <sup>-1</sup>	<1	<1	6	74	0
TPH Aromatic >EC <sub>12</sub> - EC <sub>16</sub>	mg.kg <sup>-1</sup>	4.7	2.9	6	140	0
TPH Aromatic >EC <sub>16</sub> - EC <sub>21</sub>	mg.kg <sup>-1</sup>	28	23	6	260	0
TPH Aromatic >EC <sub>21</sub> - EC <sub>35</sub>	mg.kg <sup>-1</sup>	140	35.167	6	1100	0
Benzene	mg.kg <sup>-1</sup>	<0.005	<0.005	6	0.087	0
Toluene	mg.kg <sup>-1</sup>	<0.005	<0.005	6	130	0
Ethylbenzene	mg.kg <sup>-1</sup>	<0.005	<0.005	6	47	0
Xylene	mg.kg <sup>-1</sup>	<0.005	<0.005	6	56	0
Acenaphthene	mg.kg <sup>-1</sup>	<0.05	<0.05	6	210	0
Acenaphthylene	mg.kg <sup>-1</sup>	<0.05	<0.05	6	170	0
Anthracene	mg.kg <sup>-1</sup>	0.1	0.06	6	2400	0
Benz(a)anthracene	mg.kg <sup>-1</sup>	0.46	0.163	6	7.2	0
Benzo(a)pyrene	mg.kg <sup>-1</sup>	0.69	0.21	6	2.2	0
Benzo(b)fluoranthene	mg.kg <sup>-1</sup>	0.85	0.253	6	2.6	0
Benzo(ghi)perylene	mg.kg <sup>-1</sup>	0.51	0.155	6	320	0
Benzo(k)fluoranthene	mg.kg <sup>-1</sup>	0.44	0.142	6	77	0
Chrysene	mg.kg <sup>-1</sup>	0.47	0.17	6	15	0
Dibenz(ah)anthracene	mg.kg <sup>-1</sup>	<0.05	<0.05	6	0.24	0
Fluoranthene	mg.kg <sup>-1</sup>	0.88	0.3	6	280	0
Fluorene	mg.kg <sup>-1</sup>	<0.05	<0.05	6	170	0
Indeno(123-cd)pyrene	mg.kg <sup>-1</sup>	0.42	0.136	6	27	0
Naphthalene	mg.kg <sup>-1</sup>	<0.05	<0.05	6	2.3	0
Phenanthrene	mg.kg <sup>-1</sup>	0.21	0.125	6	95	0
Pyrene	mg.kg <sup>-1</sup>	1	0.31	6	620	0

Contaminant	Units	Max	Mean	No of Tests	Screening Level (SL)	No > SL*
<b>HUMAN HEALTH RISK ASSESSMENT</b>						
Phenol	mg.kg <sup>-1</sup>	<1	<1	6	120	0
<b>PHYTOTOXICITY RISK ASSESSMENT</b>						
	Units	Max	Mean	No of Test	Screening Level (SL)	No > SL
Copper	mg.kg <sup>-1</sup>	66	19.16	6	200	0
Nickel	mg.kg <sup>-1</sup>	27	17.23	6	110	0
Zinc	mg.kg <sup>-1</sup>	130	89.5	6	300	0

Notes: \* Number of samples exceeding screening level

nd = not detected

- 5.1.4 Zootoxic Metals (harmful to human health)
  - 5.1.4.1 None of the determinands was found to exceed their respective screening levels.
- 5.1.5 Phytotoxic Metals (harmful to plant health)
  - 5.1.5.1 None of the determinands was found to exceed their respective screening levels.
- 5.1.6 Organic Contaminants
  - 5.1.6.1 None of the determinands was found to exceed their respective screening levels.
- 5.1.7 Inorganic Contaminants
  - 5.1.7.1 None of the potential chemical contaminants was found to exceed their respective screening levels.
  - 5.1.7.2 Elevated (alkaline pH) was present in made ground samples which is likely to reflect the presence of fragments of building materials.

## 5.2 WASTE CLASSIFICATION, OFF-SITE DISPOSAL OR RE-USE

- 5.2.1 Waste Considerations
  - 5.2.1.1 Using *Guidance on the classification and assessment of waste (1st Edition v1.2.GB)* *Technical Guidance WM3* 1.2GB, the solid chemical contamination levels are indicated to be below hazardous thresholds for materials which are to be disposed of off-site.
  - 5.2.1.2 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statutes including the *Environmental Protection Act 1990* (as amended), *The Controlled Waste Regulations 2012* (as amended), *The Waste (England and Wales) Regulations 2011* (as amended), *The Hazardous Waste (England and Wales) Regulations 2005* as amended, *The Waste Management (England and Wales) Regulations 2006*, and *The Environmental Permitting (England and Wales) Regulations 2016* (as amended).

5.2.1.3 It is a requirement of these regulations that waste sent to landfill should have been subject to measures to reduce the amount of waste, reduce harmful or hazardous properties and facilitate recycling. These requirements may be satisfied by measures such as segregation and screening of wastes to recover suitable fill and material for crushing, segregation of inert materials and putrescible wastes.

5.2.2 Re-use Considerations

5.2.2.1 As a sustainable alternative to off-site disposal, it may be possible to re-use site-won soils provided the following criteria are met:

- i. Use of the material will not create an unacceptable risk of pollution to the environment or harm to human health;
- ii. The material must be chemically and geotechnically suitable without further treatment;
- iii. There must be certainty of use within the scheme;
- iv. Material should only be used in the quantity necessary for that use.

5.2.2.2 Provided these criteria are met, the re-use of site-won materials is unlikely to be deemed a waste activity. Production of a *Materials Management Plan* under the industry *CL:AIRE Code of Practice on the Definition of Waste* represents a robust method of demonstrating that the proposed re-use of material meets the criteria and is not liable for landfill tax.

5.2.2.3 During the course of excavation and re-use of "*uncontaminated soil and other naturally occurring material*", an exclusion to waste legislation can apply under the Waste Framework Directive. To qualify for the exclusion, soils must be:

- i. Uncontaminated;
- ii. Excavated during the construction activities; and
- iii. Certain to be used in its natural state for construction purposes on the same site.

5.2.2.4 Under this exclusion, the definition of uncontaminated soil and other naturally occurring material is as follows:

*virgin soil or soil that is equivalent to virgin soil. Other naturally occurring material means soil, stones, gravel, rock, etc.*

## SECTION 6 RISK ASSESSMENT

6.1 The potential sources of contamination at the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment.

6.2 The investigations demonstrate that the former uses of the site have resulted in locally alkaline conditions. Chemical contamination of the site, where compared to soil screening levels appropriate to the proposed land use, was not detected. The site is underlain by gravelly sand, sandy gravelly clay and weathered mudstone strata with only relatively shallow surface made ground deposits. Total organic carbon levels within the natural soils which would underlie foundations do not indicate a significant potential of generation of hazardous ground gases.

6.3 The potential impacts of the soil chemical conditions have been considered with respect to the following receptors:

- i. Residents of future development,
- ii. Groundwater,
- iii. Surface water,
- iv. Construction workers,
- v. Adjacent land, and
- vi. Infrastructure.

6.4 In each case the existence of a pollutant linkage requires a pathway by which the receptor could be exposed to the source. A qualitative assessment of risk is thus considered in the first instance with respect to the site in its current condition and is

6.5 **Residents of future development**

6.5.1.1 No risks identified.

6.5.1.2 Strongly alkaline made ground may indicate a risk to health from dermal contact. However, the elevated pH levels can reflect the grinding preparation of the sample and guidance on assessment of elevated pH in soil wastes suggest elevated pH from concrete content of soils is often weakly buffered. It is unlikely that the levels measured indicate a significant risk of harm via skin contact.

6.5.2 Hazardous Soil Gas/Vapours (including hydrocarbon vapours/radon)

6.5.2.1 Ground gas monitoring was previously undertaken by MEC for the wider development and significant ground gas levels were not detected in the southern part of the site. Whilst gas monitoring has not been undertaken as part of this investigation, the potential for gas generation can also be considered by an alternative approach on sites which can be identified as low risk due to their former land use (such as greenfield), the composition of the strata beneath the site (natural sands and clays) and the content of organic carbon in soil which has been determined as <1%.

6.5.2.2 On this basis the potential for ground gas generation is low and unlikely to pose a risk via ingress into new dwellings.

**6.6 Controlled waters**

6.6.1 No risk identified. Shallow water receptor present but no significant source of contamination identified.

**6.7 Construction workers**

6.7.1 Potentially, construction workers are initially at the greatest risk from exposure to hazardous contamination due to excavation works and during the handling of materials including imported soils. Providing that dust levels are kept within statutory limits and appropriate health and safety procedures are adhered to during the construction phase, the levels of chemical contamination recorded to date are not considered to present an acute risk to human health.

**6.8 Adjacent land**

6.8.1 No risk identified.

**6.9 Infrastructure**

6.9.1 Phytotoxic contamination with the potential to inhibit healthy plant growth have not been identified.

6.9.2 Two samples of made ground from MWS04 and MWS06 were found to contain hydrocarbons in the C<sub>10</sub>-C<sub>16</sub> range which marginally exceed the UK Water Industry Research threshold for use of PE pipes. Hydrocarbons have the potential to permeate polymeric services. Generally, the risk is likely to be very low where made ground is thin and remains above the level at which pipes are typically laid. However, this should be reviewed when finished site levels and pipe depths are confirmed.

6.9.3 It is recommended that the utility provider is consulted with respect to their requirements for water supply pipes.

6.9.4 Utility companies apply strict guideline levels on use of polymeric pipes and may consider all made ground unsuitable for typical plastic pipe materials to be used.

**SECTION 7 UPDATED CONCEPTUAL MODEL**

7.1 Following completion of phases 1 and 2 of the investigation and a qualitative risk assessment, the conceptual model for the site, with relation to pollutant linkages, has been updated. The revised model is presented in Table 3 below.

Table 2: Revised Conceptual Model

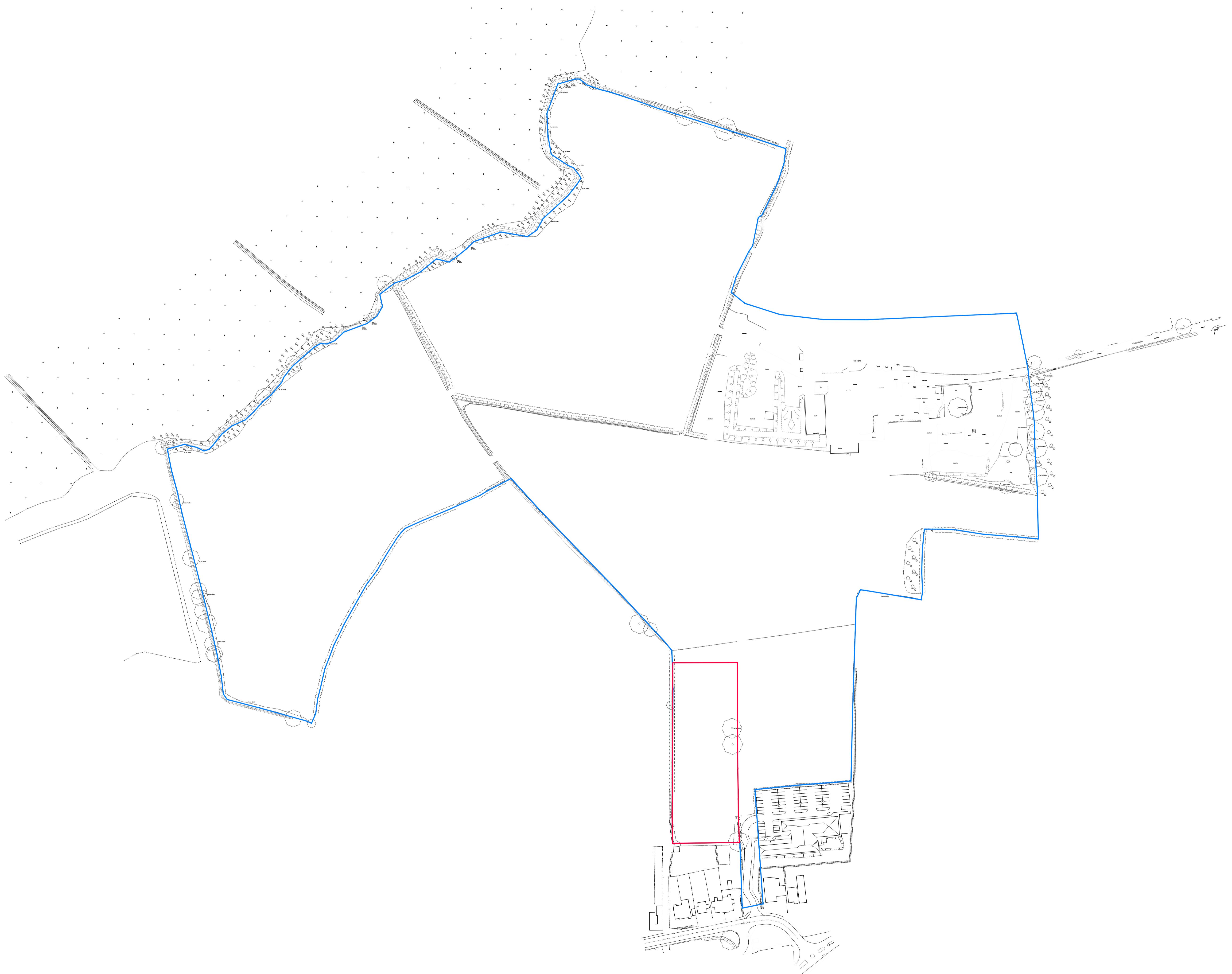
POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	PATHWAYS	RECEPTORS	
Heavy metals and hydrocarbons (made ground)	Contact with contaminated soil	Human health (future residents and construction workers)	<b>No risk identified</b> Potential for made ground which can contain elevated metals and hydrocarbons.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	<b>No risk identified</b> Shallow water indicated but no significant sources of contamination identified
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	<b>No risk identified</b> No surface waters in the vicinity
Hydrocarbons	Direct contact	Plastic water pipes	<b>Moderate risk identified</b> Locally marginal exceedances of PE pipe threshold but in shallow soils.
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (future residents and construction workers)	<b>Very low risk identified</b> Ground conditions consistent with the lowest Characteristic Situation gas risk level
Adjacent Land	Fugitive dusts, groundwater migration	Adjacent land quality and site users	<b>No risk identified</b> Very low contamination levels. Low contamination potential also on adjacent sites

## SECTION 8 CONCLUSIONS AND RECOMMENDATIONS

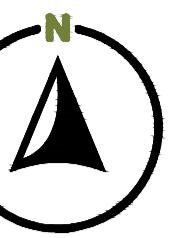
- 8.1 The identified risks at the site can be mitigated by removal of either the source, pathway or receptor. With reference to the conceptual model for the site a remediation strategy, based on source or pathway removal, has been designed.
- 8.2 No significant contamination has been detected by the current investigation and specific soil remediation is not considered to be necessary to protect human health.
- 8.3 Surface soils comprise gravelly clay made ground and sand with very little topsoil identified. Placement of suitable topsoil for gardens and landscaped areas is likely to be required. Material imported for the formation of domestic gardens and landscaped areas should be obtained from a validated source. The validation should incorporate an assessment of the provenance of the material and chemical analysis.
- 8.4 Made ground with sporadic hydrocarbons in excess of water industry thresholds for use of PE pipes may require the adoption of protected potable water pipes. A worse case could be assumed at this stage due to the stringent guidance. However, further risk assessment and chemical testing of soils at the depths and routes of pipelines may permit use of PE pipes if clean service corridors can be demonstrated.

- 8.5 Whilst significant risks to construction workers have not been identified, as with all sites the adoption of appropriate Health and Safety procedures is recommended to ensure that operatives' exposure to soils, made ground and unknown hazardous materials at the site, are minimised. Operatives should not be allowed to eat, drink or smoke on site except in designated areas and should be required to wash all exposed skin at the end of each shift. Operatives should be informed of the potential hazards at the site and should be required to report any observations of suspect material.
- 8.6 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statutes including the *Environmental Protection Act 1990* (as amended), *The Controlled Waste Regulations 2012* (as amended), *The Waste (England and Wales) Regulations 2011* (as amended), *The Hazardous Waste (England and Wales) Regulations 2005* as amended, *The Waste Management (England and Wales) Regulations 2006*, and *The Environmental Permitting (England and Wales) Regulations 2016* (as amended).
- 8.7 It is recommended that this report is submitted to the regulators (Local Authority EHO and Planners, Environment Agency Planning Liaison and NHBC) for approval prior to commencement of the works.
- 8.8 Any observations of ground conditions atypical of those already described should be reported to IDOM immediately so that an assessment of appropriate action can be made.

**APPENDIX 1** ▪ Drawings



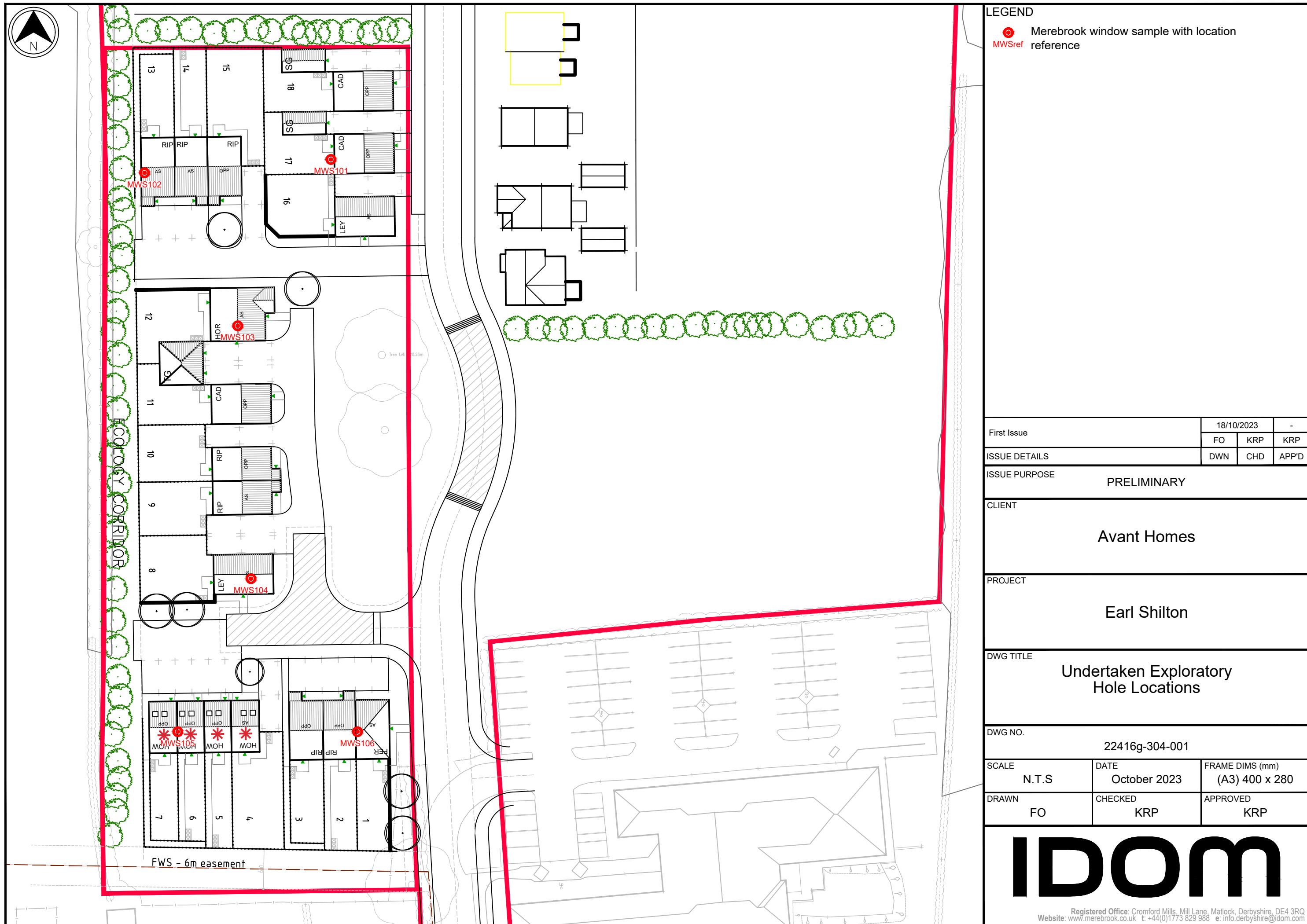
Notes  
 © Radford Architectural Services Ltd. Do not scale from this drawing.  
 Refer to figure dimensions only. Contractors must check all dimensions on site.



Revision \_\_\_\_\_ Date \_\_\_\_\_ Amendment \_\_\_\_\_ Initials \_\_\_\_\_

Radford Architectural Services Ltd. T 01902 762854 M 07977 253860  
 W www.radford-architectural.co.uk E radfordarchitecturalservices@gmail.com

Client \_\_\_\_\_  
**AVANT homes**  
 Project \_\_\_\_\_  
 WESTFIELD AVENUE,  
 EARL SHILTON  
 Title \_\_\_\_\_  
**LOCATION PLAN**  
 Due No \_\_\_\_\_  
**WES-05-LP**  
 Revision \_\_\_\_\_ Scale @A1 \_\_\_\_\_  
 Drawn \_\_\_\_\_ Date \_\_\_\_\_  
 DS JUN 2023



## LEGEND

## Merebrook window sample with location reference

First Issue		18/10/2023		-
		FO	KRP	KRP
ISSUE DETAILS		DWN	CHD	APP'D
ISSUE PURPOSE		PRELIMINARY		
CLIENT				
Avant Homes				
PROJECT				
Earl Shilton				
DWG TITLE				
Undertaken Exploratory Hole Locations				
DWG NO.				
22416g-304-001				
SCALE N.T.S	DATE October 2023	FRAME DIMS (mm) (A3) 400 x 280		
DRAWN FO	CHECKED KRP	APPROVED KRP		

**IDOM**

Registered Office: Cromford Mills, Mill Lane, Matlock, Derbyshire, DE4 3RQ  
Website: [www.merebrook.co.uk](http://www.merebrook.co.uk) t: +44(0)1773 829 988 e: [info.derbyshire@idom.com](mailto:info.derbyshire@idom.com)

**APPENDIX 2** ▪ Exploratory Hole Logs

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 446011E - 297863N		Scale 1:25
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN		
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP		
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.40	D,J,V					MADE GROUND: Orange-brown sandy gravelly CLAY fill material. Gravel is fine to medium angular to rounded. Sand is coarse.	
		1.00	D SPT()	N=6 (1,1/1,1,2,2)					
		1.00							
		2.00	SPT()	N=6 (1,0/1,2,1,2)					
		2.70 - 3.00	D						
		3.00	SPT()	N=11 (2,2/2,2,3,4)					
		3.70	SPT()	N=48 (10,13/10,12,13,13)					
D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample					SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)		Remarks Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.		

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 445983E - 297861N		Scale 1:25
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN		
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP		
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		D SPT()	N=6 (1,2/1,2,1,2)	0.20 - 0.40	0.40	1.80	TOPSOIL: Grass over brown sandy CLAY with rootlets.	1 2 3 4 5	
							Soft going to very soft grey brown mottled very sandy CLAY. <i>Sample not recovered</i>		
							Brown-grey mottled sandy gravelly CLAY.		
							Very soft red-brown sandy CLAY.		
							Stiff red-grey mottled sandy, slightly gravelly CLAY. Gravel is fine to medium, angular. [Weathered Mudstone- Gunthorpe Member]		
							Very stiff grey mottled brown silty sandy CLAY. [Weathered Mudstone- Gunthorpe Member]. End of Borehole at 3.00m		
D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample					SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)				
<b>Remarks</b> Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.									

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 445997E - 297838N		Scale 1:25
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN		
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP		
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.30	D,J,V		0.40			MADE GROUND: Grey sandy gravelly CLAY. Gravel is angular including brick fragments.	
		1.00	D SPT()	N=15 (3.4/4,4,4,3)	0.80			MADE GROUND: Firm red sandy gravelly CLAY. Gravel is fine to medium angular. Black wood fragments.	
		1.00			1.00			Medium blue-grey slightly silty, sandy, gravelly CLAY. Gravel is fine to medium rounded.	
		2.00	SPT()	N=13 (1,2/2,3,4,4)	1.40			Blue-grey clayey silty SAND. [Wigston Member]	
		2.40 - 2.60	D		2.10			Soft red clayey SAND. [Wigston Member]	
		3.00	SPT()	N=50 (3,3/50 for 295mm)	3.00			Stiff red-blue mottled sandy, silty CLAY. Blue mudstone fragments are silty. [Weathered Mudstone-Gunthorpe Member]	
								End of Borehole at 3.00m	
D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample			SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)			Remarks Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.			

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 445999E - 297800N		Scale 1:25					
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN							
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP							
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.30 - 0.40	D,J,V					MADE GROUND: Moss over brown sandy, very gravelly CLAY. Gravel is fine to medium angular.						
		1.00	SPT()	N=8 (2,2/2,2,2,2)				0.40	0.50	0.80	MADE GROUND: Grey sandy clayey GRAVEL. Gravel is fine to medium rounded and angular.	MADE GROUND: Firm grey sandy gravelly CLAY. Gravel is angular including brick fragments.		
		2.00	SPT()	N=7 (1,1/2,2,2,1)							Very soft, going to medium around 0.8 orange-brown slightly clayey SAND with inclusions of black wood fragments. [Wigston Member]			
		3.00	SPT()	N=22 (2,3/3,5,7,7)				3.00			Very soft red sandy CLAY. [Wigston Member]			
		3.70 - 4.00	D						3.70		Medium red-grey mottled sandy silty, slightly gravelly, CLAY. Gravel is fine and rounded. [Wigston Member]			
		4.00	SPT()	N=21 (3,3/3,4,5,9)							Sample not recovered			
		4.50	SPT()	50 (25 for 90mm/50 for 225mm)				4.50			End of Borehole at 4.50m			
														5
		D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample		SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)				Remarks Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.						

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 445985E - 297777N		Scale 1:25			
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN					
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP					
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description				
		Depth (m)	Type	Results								
		0.00 - 0.30	D,J,V					MADE GROUND: Brown sandy slightly clayey GRAVEL. Gravel is fine to medium sub-angular to angular with inclusions of brick, plastic and mixed lithologies.				
		1.00	D SPT()	N=15 (3.5/4,4,4,3)				Medium grey blue/cream mottled silty SAND with inclusions of wood fragments. [Wigston Member]				
		1.00						1				
		2.00						Loose red medium grained wet SAND. [Wigston Member]				
		2.00						2				
		2.20						Grey blue/cream mottled medium silty SAND. [Wigston Member]				
		3.00						Loose wet red medium grained SAND with black banding. [Wigston Member]				
		3.50						3				
		4.00						Not recovered as sand too wet and hole collapsing in				
		4.50						4				
								End of Borehole at 4.50m				
D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample					SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)		<b>Remarks</b> Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.					

Project Name: Earl Shilton					Project No. 22416g		Co-ords: 446015E - 297777N		Scale 1:25
Location: Westfield Avenue, Leicestershire					Level (m):		Logged By SN		
Equipment: Dart 130 Rig					Dates: 28/09/2023		Checked By KRP		
Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.35 - 0.60	D,J,V		0.40			MADE GROUND: Grey/brown sandy GRAVEL. Gravel is fine to medium of mixed lithologies including brick and concrete that is angular and rounded.	
								MADE GROUND: Firm grey/cream mottled sandy, slightly gravelly CLAY. Gravel is fine. <i>Fabric matting layer</i>	
		1.00	SPT()	N=13 (2,3/3,3,4,3)	0.90			Loose wet blue-grey/ brown mottled medium grain SAND. Inclusions of black woody fragments. [Wigston Member]	
		2.00	SPT()	N=9 (1,0/1,2,2,4)					
		2.80 - 3.00	D		2.80			Firm red-blue mottled sandy, silty gravelly CLAY. Gravel is fine, sub-angular to sub-rounded mudstone fragments. [Weathered Mudstone - Gunthorpe Member]	
		3.00	SPT()					<i>Sample not recovered</i>	
		3.50	SPT()	N=25 (3,4/5,7,7,6)	4.50				
		4.00	SPT()	N=33 (7,6/7,8,9,9)					
		4.50	SPT()	N=50 (10,10/50 for 290mm)				End of Borehole at 4.50m	
D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample					SPT(C) = Standard Penetration Test (Cone) SPT(S) = Standard Penetration Test (Split Spoon) HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm <sup>2</sup> ) PID = photoionisation detector (ppm)		<b>Remarks</b> Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.		

**APPENDIX 3**

- Soil Chemistry
- Laboratory Analysis Certificates

**Keith Paramor**

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Derbyshire  
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Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01923 225404  
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## Analytical Report Number : 23-59676

<b>Project / Site name:</b>	Earl Shilton	<b>Samples received on:</b>	29/09/2023
<b>Your job number:</b>	22416G	<b>Samples instructed on/ Analysis started on:</b>	29/09/2023
<b>Your order number:</b>	23 2 FDO LABS	<b>Analysis completed by:</b>	09/10/2023
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	09/10/2023
<b>Samples Analysed:</b>		<u>10 soil samples</u>	

Signed:

Dominika Liana  
Junior 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: 23-59676

Project / Site name: Earl Shilton

Your Order No: 23 2 FDO LABS

Lab Sample Number	2830158	2830159	2830160	2830161	2830162
Sample Reference	MWS01	MWS01	MWS02	MWS02	MWS03
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.20-0.40	1.00	0.20-0.40	1.00	0.10-0.30
Date Sampled	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	17
Total mass of sample received	kg	0.001	NONE	1.2	0.8
				0.7	0.8
					1.2

**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	9.5	7.1	7.7	8	6.5
Total Sulphate as SO4	%	0.005	MCERTS	-	0.024	-	0.025	-
Water Soluble SO4 1:1000 extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.118	0.0704	0.0627	0.0675	0.265
Water Soluble SO4 1:1000 extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	70.4	-	67.5	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	4.8	-	1.8	-
Total Sulphur	%	0.005	MCERTS	-	0.012	-	0.015	-
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	-	< 0.5	-	< 0.5	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.05	-	< 0.05	-
Organic Matter (automated)	%	0.1	MCERTS	0.7	-	3.9	-	1.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.4	-	2.3	-	1
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	-	< 2.0	-

**Total Phenols**

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
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**Speciated PAHs**

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.06	-	0.08	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.06	-	0.06	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	-	< 0.05	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	-	< 0.05	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	-	< 0.80	-	< 0.80
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4041



Analytical Report Number: 23-59676

Project / Site name: Earl Shilton

Your Order No: 23 2 FDO LABS

Lab Sample Number	2830158	2830159	2830160	2830161	2830162
Sample Reference	MWS01	MWS01	MWS02	MWS02	MWS03
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.20-0.40	1.00	0.20-0.40	1.00	0.10-0.30
Date Sampled	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

**Heavy Metals / Metalloids**

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.5	-	22	-	2.5
Barium (aqua regia extractable)	mg/kg	1	MCERTS	1000	-	290	-	48
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	-	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	< 1.8	-	< 1.8
Chromium (III)	mg/kg	1	NONE	22	-	25	-	9
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	-	25	-	10
Copper (aqua regia extractable)	mg/kg	1	MCERTS	60	-	25	-	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	53	-	49	-	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	-	18	-	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	24	-	41	-	11
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	-	93	-	31

Magnesium (water soluble)	mg/kg	5	NONE	-	9.9	-	17	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	5	-	8.3	-

**Monoaromatics & Oxygenates**

Benzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	-	< 5.0	-	< 5.0

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 EH CU_1D_AL	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH CU_1D_AL	mg/kg	2	MCERTS	8	-	2.4	-	3.2
TPH-CWG - Aliphatic >EC16 - EC21 EH CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH CU_1D_AL	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC35 - EC40 EH CU_1D_AL	mg/kg	10	NONE	< 10	-	< 10	-	< 10
TPH-CWG - Aliphatic (EC5 - EC35) EH CU+HS_1D_AL	mg/kg	10	NONE	10	-	< 10	-	< 10

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.1	NONE	< 0.10	-	< 0.10	-	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 EH CU_1D_AR	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH CU_1D_AR	mg/kg	2	MCERTS	4.7	-	< 2.0	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH CU_1D_AR	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPH-CWG - Aromatic >EC21 - EC35 EH CU_1D_AR	mg/kg	10	MCERTS	< 10	-	< 10	-	< 10
TPH-CWG - Aromatic >EC35 - EC40 EH CU_1D_AR	mg/kg	10	NONE	< 10	-	< 10	-	< 10
TPH-CWG - Aromatic (EC5 - EC35) EH CU+HS_1D_AR	mg/kg	10	NONE	< 10	-	< 10	-	< 10
TPH Total C5 - C40 EH CU+HS_1D_TOTAL	mg/kg	10	NONE	19	-	< 10	-	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



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Analytical Report Number: 23-59676

Project / Site name: Earl Shilton

Your Order No: 23 2 FDO LABS

Lab Sample Number	2830163	2830164	2830165	2830166	2830167
Sample Reference	MWS03	MWS04	MWS05	MWS05	MWS06
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.00	0.30-0.40	0.00-0.30	1.00	0.35-0.60
Date Sampled	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	9.9
Total mass of sample received	kg	0.001	NONE	0.9	1.1
				36	< 0.1
				10	14
				1.3	0.8
					1.1

**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	8.2	10.7	11.4	7.9	8.2
Total Sulphate as SO4	%	0.005	MCERTS	0.019	-	0.853	-	-
Water Soluble SO4 1:1000 extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0428	0.645	0.426	0.0346	0.22
Water Soluble SO4 1:1000 extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	42.8	-	426	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.8	-	28	-	-
Total Sulphur	%	0.005	MCERTS	0.008	-	0.365	-	-
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	-	< 0.5	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	-	< 0.05	-	-
Organic Matter (automated)	%	0.1	MCERTS	-	1.7	-	0.4	3.3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1	-	0.2	1.9
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-	< 2.0	-	-

**Total Phenols**

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
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**Speciated PAHs**

Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	0.21	-	< 0.05	0.34
Anthracene	mg/kg	0.05	MCERTS	-	0.07	-	< 0.05	0.1
Fluoranthene	mg/kg	0.05	MCERTS	-	0.88	-	< 0.05	0.67
Pyrene	mg/kg	0.05	MCERTS	-	1	-	< 0.05	0.65
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.46	-	< 0.05	0.32
Chrysene	mg/kg	0.05	MCERTS	-	0.47	-	< 0.05	0.35
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	0.85	-	< 0.05	0.47
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	0.44	-	< 0.05	0.23
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.69	-	< 0.05	0.37
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.42	-	< 0.05	0.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.51	-	< 0.05	0.22

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	6.01	-	< 0.80	3.92
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Analytical Report Number: 23-59676

Project / Site name: Earl Shilton

Your Order No: 23 2 FDO LABS

Lab Sample Number	2830163	2830164	2830165	2830166	2830167
Sample Reference	MWS03	MWS04	MWS05	MWS05	MWS06
Sample Number	None Supplied				
Depth (m)	1.00	0.30-0.40	0.00-0.30	1.00	0.35-0.60
Date Sampled	28/09/2023	28/09/2023	28/09/2023	28/09/2023	28/09/2023
Time Taken	None Supplied				

Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Heavy Metals / Metalloids							

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	11	-	1.2	12
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	230	-	47	200
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	0.5	-	< 0.2	0.5
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8	-	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	-	25	-	12	20
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	25	-	13	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	66	-	14	50
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	35	-	6.2	61
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	27	-	9.4	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	45	-	12	29
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	120	-	33	130

Magnesium (water soluble)	mg/kg	5	NONE	17	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	8.3	-	< 2.5	-	-

## Monoaromatics &amp; Oxygenates

Benzene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	-	< 5.0	< 5.0

## Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-	12	-	4.6	8.8
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-	110	-	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-	530	-	< 8.0	37
TPH-CWG - Aliphatic >EC35 - EC40 EH_CU_1D_AL	mg/kg	10	NONE	-	81	-	< 10	19
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	650	-	< 10	54

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.1	NONE	-	< 0.10	-	< 0.10	< 0.10
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-	< 2.0	-	3.5	3.2
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-	28	-	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-	140	-	< 10	31
TPH-CWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	-	50	-	< 10	18
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	170	-	11	40
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	950	-	17	130

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

**Analytical Report Number : 23-59676****Project / Site name: Earl Shilton**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2830158	MWS01	None Supplied	0.20-0.40	Brown clay and loam with gravel and vegetation.
2830159	MWS01	None Supplied	1	Brown clay and sand with gravel.
2830160	MWS02	None Supplied	0.20-0.40	Brown loam and sand with gravel and vegetation.
2830161	MWS02	None Supplied	1	Brown clay and sand.
2830162	MWS03	None Supplied	0.10-0.30	Brown sandy clay with vegetation.
2830163	MWS03	None Supplied	1	Brown sandy clay.
2830164	MWS04	None Supplied	0.30-0.40	Brown clay and sand with gravel.
2830165	MWS05	None Supplied	0.00-0.30	Brown sand with gravel and stones.
2830166	MWS05	None Supplied	1	Grey sandy clay.
2830167	MWS06	None Supplied	0.35-0.60	Brown clay and loam with gravel and vegetation.



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**Analytical Report Number : 23-59676****Project / Site name: Earl Shilton****Water matrix abbreviations:****Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)**

<b>Analytical Test Name</b>	<b>Analytical Method Description</b>	<b>Analytical Method Reference</b>	<b>Method number</b>	<b>Wet / Dry Analysis</b>	<b>Accreditation Status</b>
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS



Analytical Report Number : 23-59676

Project / Site name: Earl Shilton

**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
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

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 - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

# Sample Deviation Report



**Analytical Report Number : 23-59676**

**Project / Site name: Earl Shilton**

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.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
MWS05	None Supplied	S	2830166	b	BTEx and MTBE in soil (Monoaromatics)	L073B-PL	b
MWS05	None Supplied	S	2830166	b	Monohydric phenols in soil	L080-PL	b
MWS05	None Supplied	S	2830166	b	Speciated EPA-16 PAHs in soil	L064-PL	b
MWS05	None Supplied	S	2830166	b	TPH in (Soil)	L076-PL	b
MWS05	None Supplied	S	2830166	b	TPHCWG (Soil)	L088/76-PL	b

**APPENDIX 4** ▪ Geotechnical Laboratory Certificates



# TEST CERTIFICATE

## DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,  
cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,  
cl 5.2 and 6

4041

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Client: Merebrook

Client Address: Cromford Mills, Mill Lane,  
Cromford, Derbyshire,  
DE4 3RQ

Contact: Keith Paramor

Site Address: Earl Shilton

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test Results:

Laboratory Reference: 2829066

Depth Top [m]: 2.70

Hole No.: MWS01

Depth Base [m]: 3.00

Sample Reference: Not Given

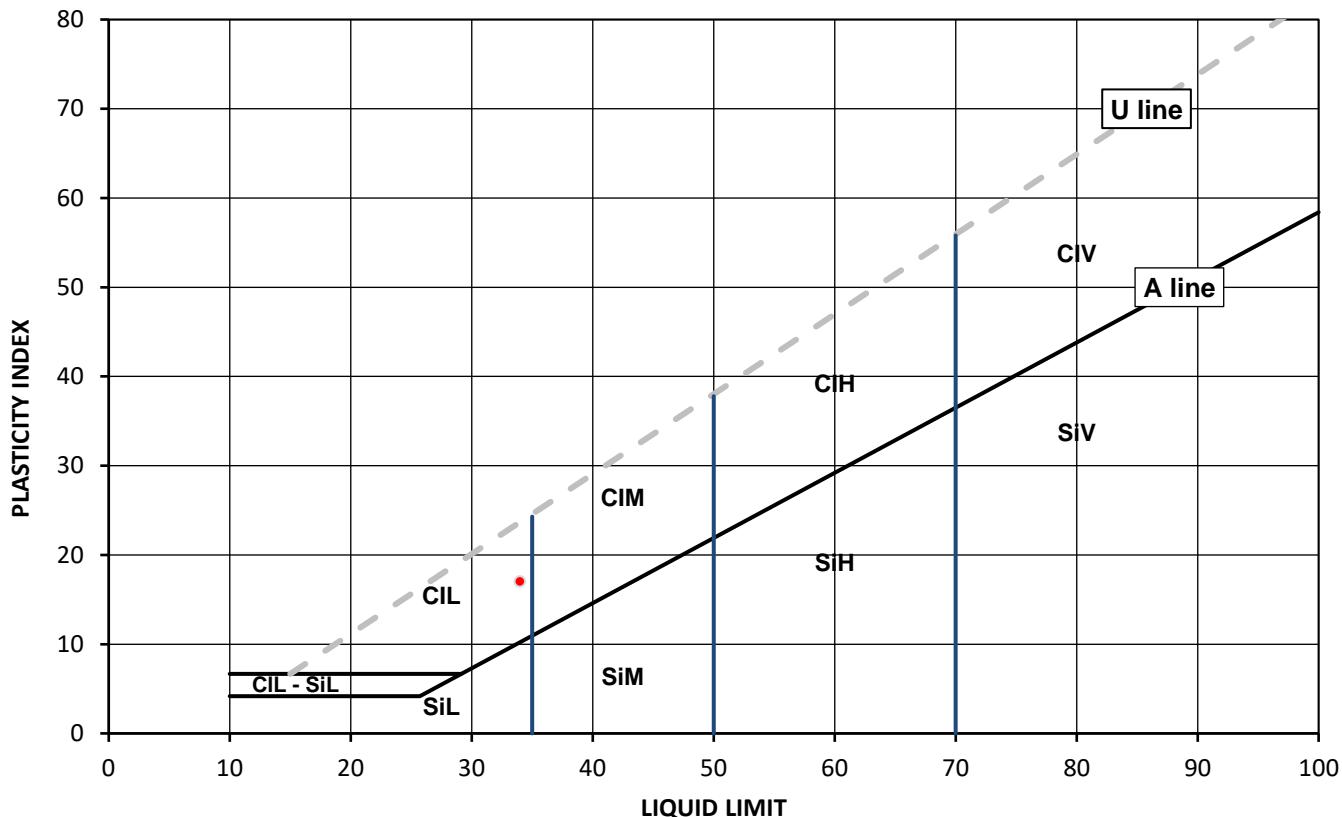
Sample Type: D

Sample Description: Brown slightly gravelly very sandy CLAY

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
18.3	34	17	17	N/A	N/A	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:

Monika Janoszek

PL Environmental & Geotechnical Lab Production Specialist  
for and on behalf of i2 Analytical Ltd

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Date Reported: 25/10/2023

GF 337.13



# TEST CERTIFICATE

## DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,  
cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,  
cl 5.2 and 6

4041

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Client: Merebrook

Client Address: Cromford Mills, Mill Lane,  
Cromford, Derbyshire,  
DE4 3RQ

Contact: Keith Paramor

Site Address: Earl Shilton

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test Results:

Laboratory Reference: 2829067

Depth Top [m]: 2.90

Hole No.: MWS02

Depth Base [m]: 3.00

Sample Reference: Not Given

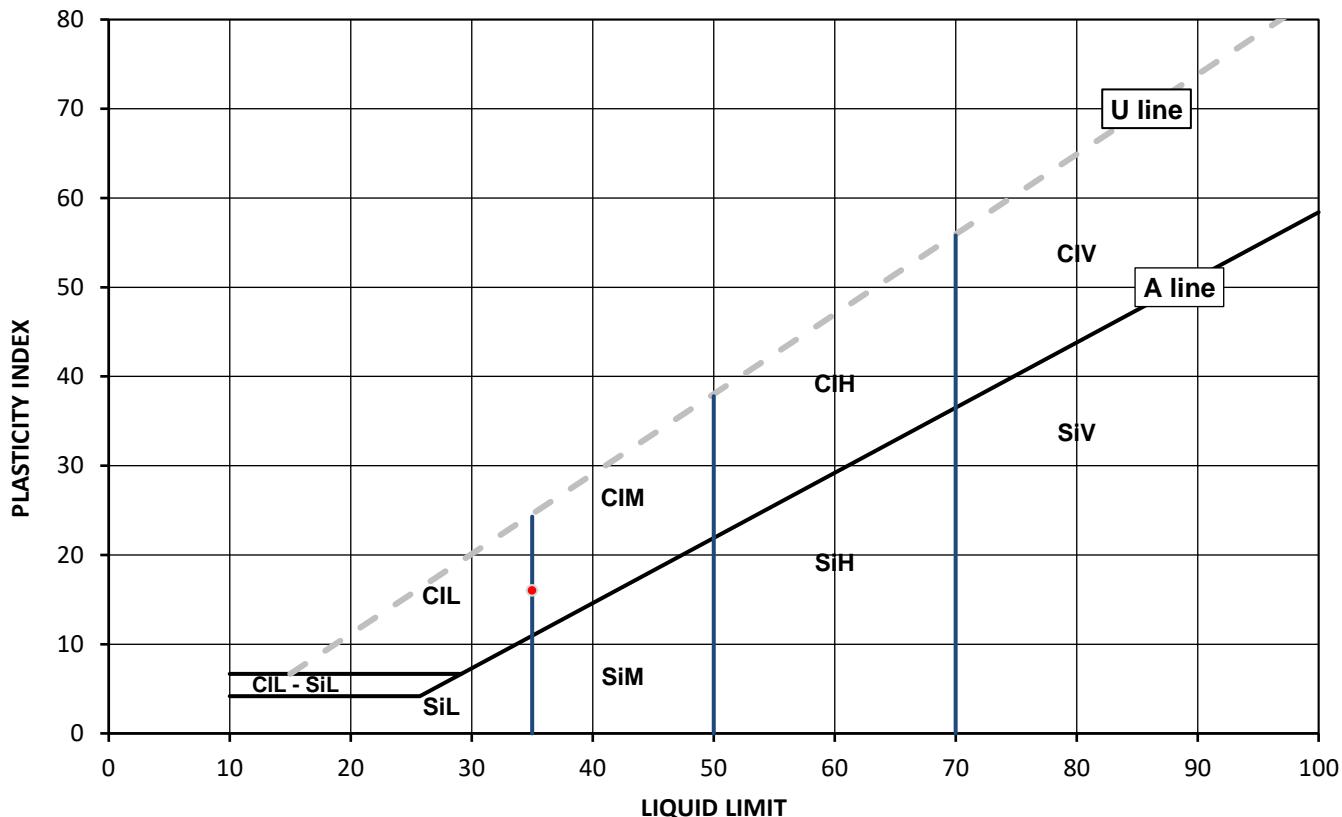
Sample Type: D

Sample Description: Brownish grey gravelly sandy CLAY

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
12.0	35	19	16	N/A	N/A	59



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

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cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,  
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Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test Results:

Laboratory Reference: 2829068

Depth Top [m]: 2.40

Hole No.: MWS03

Depth Base [m]: 2.60

Sample Reference: Not Given

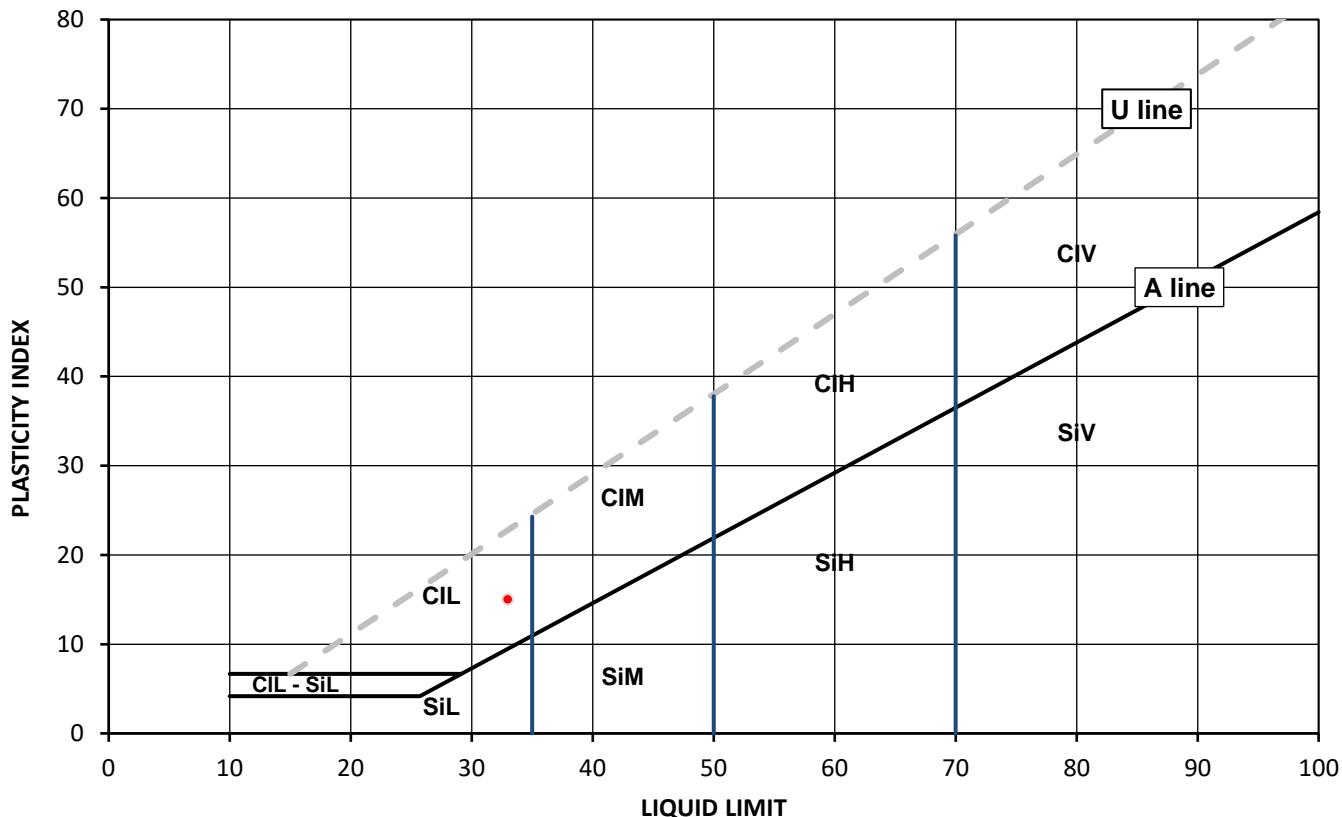
Sample Type: D

Sample Description: Brown very sandy CLAY

Sample Preparation: Tested in natural condition; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
18.4	33	18	15	N/A	N/A	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:

Monika Janoszek

PL Environmental & Geotechnical Lab Production Specialist  
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# TEST CERTIFICATE

## DETERMINATION OF LIQUID AND PLASTIC LIMITS

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cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,  
cl 5.2 and 6

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Site Address: Earl Shilton

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Śląska, Poland

Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test Results:

Laboratory Reference: 2829069

Depth Top [m]: 3.70

Hole No.: MWS04

Depth Base [m]: 4.00

Sample Reference: Not Given

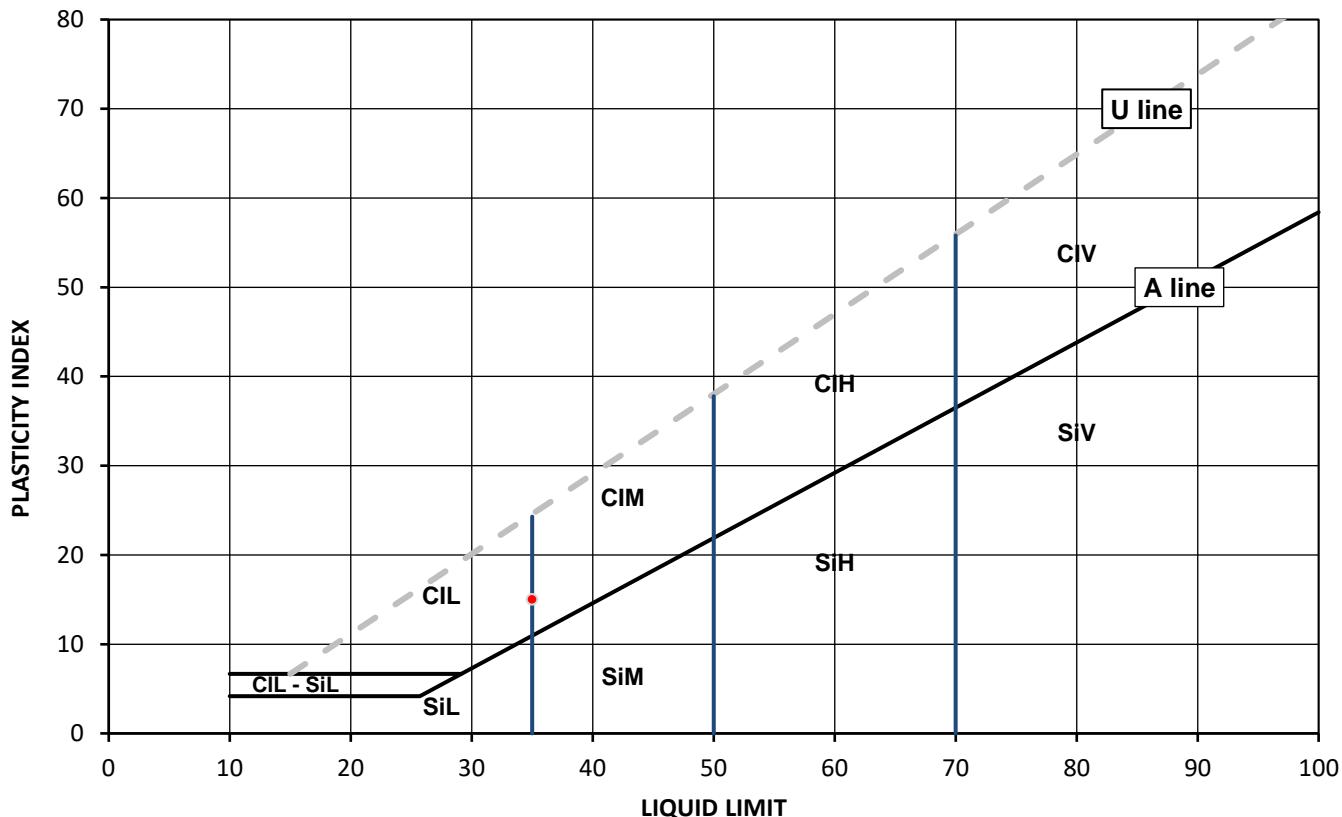
Sample Type: D

Sample Description: Brown sandy CLAY

Sample Preparation: Tested in natural condition; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
18.6	35	20	15	N/A	N/A	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:

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# TEST CERTIFICATE

## DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022,  
cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022,  
cl 5.2 and 6

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DE4 3RQ

Contact: Keith Paramor

Site Address: Earl Shilton

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test Results:

Laboratory Reference: 2829070

Depth Top [m]: 2.80

Hole No.: MWS06

Depth Base [m]: 3.00

Sample Reference: Not Given

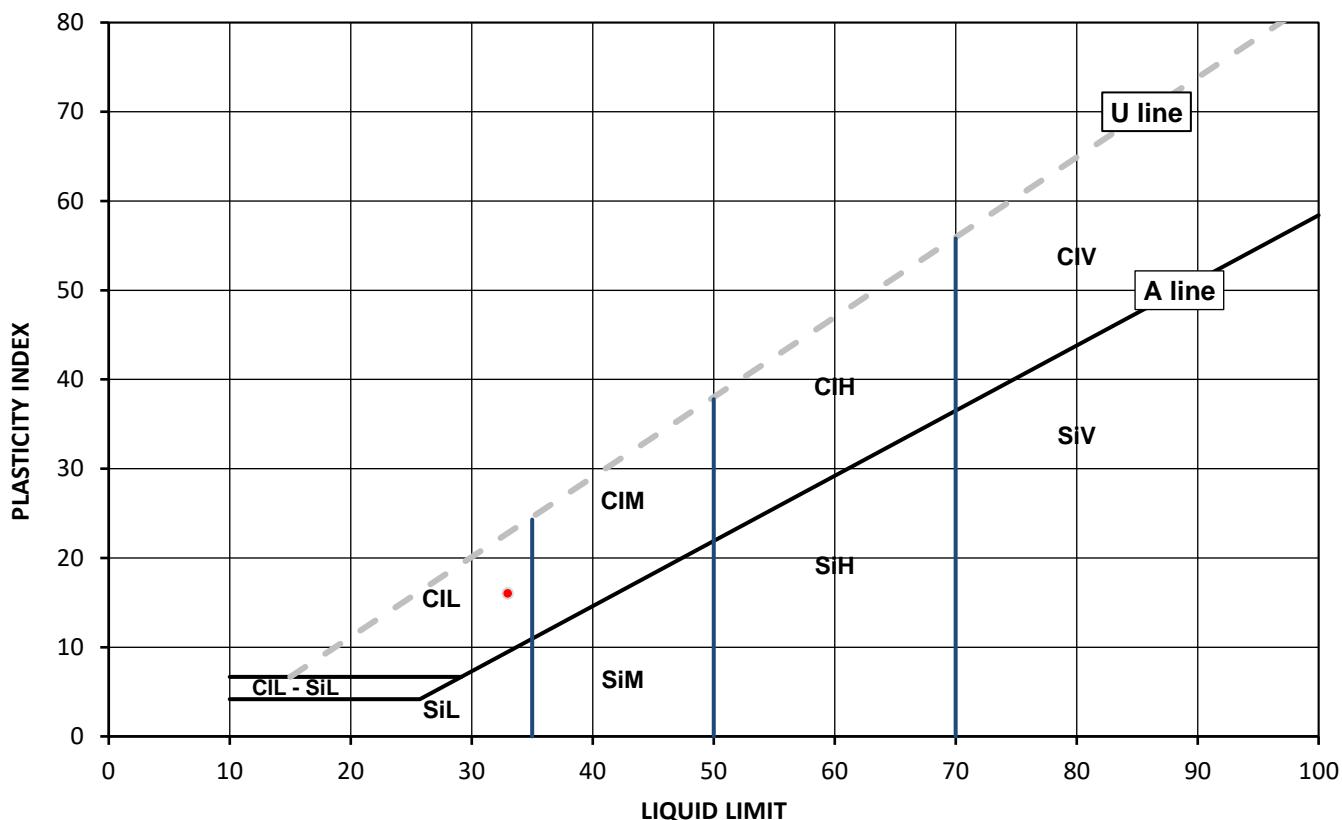
Sample Type: D

Sample Description: Brown slightly gravelly very sandy CLAY

Sample Preparation: Tested after >0.425mm removed by hand; The water content in the sample was increased

Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
19.9	33	17	16	N/A	N/A	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity	Liquid Limit
Cl	Clay	L Low	below 35
Si	Silt	M Medium	35 to 50
		H High	50 to 70
		V Very high	exceeding 70
		O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Signed:

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PL Environmental & Geotechnical Lab Production Specialist  
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# SUMMARY REPORT

## SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test,  
BS 1377-2:2022, cl 5.2 and 6

4041

Client: Merebrook

Client Address: Cromford Mills, Mill Lane,  
Cromford, Derbyshire,  
DE4 3RQ

Contact: Keith Paramor

Site Address: Earl Shilton

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

W by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes  
A.W (1978)

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Client Reference: 22416G

Job Number: 23-59471-1

Date Sampled: 28/09/2023

Date Received: 29/09/2023

Date Tested: 05/10/2023

Sampled By: Client - Sophie Newitt

### Test results

Laboratory Reference	Hole No.	Sample			Description	Remarks	W %	Liquid & Plastic Limit						Density			
		Reference	Depth Top m	Depth Base m	Type			% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
2829066	MWS01	Not Given	2.70	3.00	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	18.3	99	34	-	17	17	80g/30 deg	R / I		
2829067	MWS02	Not Given	2.90	3.00	D	Brownish grey gravelly sandy CLAY	Atterberg 4 Point	12.0	59	35	-	19	16	80g/30 deg	W / I		
2829068	MWS03	Not Given	2.40	2.60	D	Brown very sandy CLAY	Atterberg 4 Point	18.4	100	33	-	18	15	80g/30 deg	N / I		
2829069	MWS04	Not Given	3.70	4.00	D	Brown sandy CLAY	Atterberg 4 Point	18.6	100	35	-	20	15	80g/30 deg	N / I		
2829070	MWS06	Not Given	2.80	3.00	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	19.9	96	33	-	17	16	80g/30 deg	R / I		

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased , D - The water content in the sample was decreased; \* - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

### Comments:

Signed:

Monika Janoszek  
PL Environmental & Geotechnical Lab Production Specialist  
for and on behalf of i2 Analytical Ltd

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