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SITE INVESTIGATION REPORT

BELFIELD LAWN
BELFIELD MILL LANE
ROCHDALE
LANCASHIRE

Report Reference C12263A

On behalf of:-

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June 2019

MICHAEL BRERETON

SITE INVESTIGATION REPORT

FOR

NEW RESIDENTIAL DEVELOPMENT

AT

BELFIELD LAWN

BELFIELD MILL LANE

ROCHDALE

LANCASHIRE

Report Reference No. C12263A **June 2019**

INTRODUCTION

The client, Mr Michael Brereton, proposes to build six new dwellings, with associated gardens and hardstanding on a plot of land off Belfield Mill Lane, Rochdale in Lancashire.

Ground Engineering Limited was commissioned by the client, to carry out a site investigation to determine the nature and chemical properties of the underlying soils, and provide a contamination assessment report. A desk study report by Ground Engineering Limited (reference C12263) dated November 2010 has previously been issued, which should be consulted for further details on the site. This report summarises the previous desk study, and an updated environmental report has also been incorporated into this text.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The site of the former Belfield Cottage, Belfield Lawn, Rochdale is a cleared site, situated on the southern side of Belfield Lawn and western side of Dobfield Road, some 500m north of Belfield centre. Belfield is approximately 1.5km east of Rochdale in Lancashire. The National Grid Reference for the centre of the site is SD 9176 1395 and its location is shown on a plan following this report text.

The approximately 'L' shaped site is accessed from Belfield Lawn, off Belfield Mill Lane to the north, and Dobfield Road to the east of the site. The site is bordered by houses and gardens to the south and west, with Firgrove Business Park on the eastern side of Dobfield Road. The site is approximately 48m by 26m in size.

At the time of the investigation in May 2019, former buildings had been demolished and a stockpile of brick and concrete rubble was present. Trees and vegetation on the site had also been cut down and a stockpile of branches was present. The ground level in the eastern part of the site had been lowered to match the adjacent Dobfield Road, which was a planning requirement. Made ground, and stockpiles of soil, was present in the western part of the site, which was approximately 1m higher than the eastern part of the site.

No trees remained on the site, however mature trees were present in the adjacent gardens to the west and south.

The site had an elevation of approximately 145mOD and was located about 40m to the west of the Rochdale Canal. The site was on a level area between two south-east to north-west aligned valleys.

The geological map for the area, sheet 76 "Rochdale" (2008) at 1:50,000 scale, shows the site to be covered by superficial Glaciofluvial Deposits (undifferentiated sand and gravel with lenses of clay and stony clay), overlying Till (clay to sandy clay) and underlain at depth by the solid geology of the Pennine Coal Measures Group. Alluvium is shown 75m to the east associated with the River Beal. An area of made ground is shown about 50m to the east and south of the site.

SUMMARY OF HISTORICAL INFORMATION

On the 1848 map extract the site consisted of open land with a building in the northern part of the site, a barn understood to be associated with a mill, with cottages and a coach house attached on its southern side. These buildings were subsequently demolished sometime after 1988. A Refuse Tip/spoil heap was shown 80m south-east of the site in the late 1980's.

SUMMARY OF ENVIRONMENTAL DATA

Appendix 1 contains information derived from Environmental Databases for the site and its immediate vicinity. The information covers datasets held by Groundsure with contributors including the local authority, the Environment Agency (EA), British Geological Survey, Ordnance Survey and the Coal Authority and the results are summarised below.

Database Summary

The report did not identify any areas of concern regarding coal mining.

The site has passed Groundsure's Contaminated Land Liability assessment, however the site is identified in an area with a former industrial land use which may necessitate further assessment. A former barn in the northern part of the site was understood to have been used for storage for the adjacent Fulling (wool) Mill. No landfills or other waste sites are recorded within 250m of the site.

The site has a moderate risk from groundwater flooding; a very low risk from river flooding; and a negligible risk from surface water flooding. The Rochdale Canal is recorded 35m north-west of the site. The property has been rated as 'green' by JBA for flood risk.

No significant concerns were identified as a result of ground stability searches, and the site is rated as a having a 'negligible to very low' risk.

The site is not in a radon affected area and no radon protection measures are required for new dwellings on the site.

Energy transmission lines and pylons have been identified by the searches, however these are at least 366m from the site and are not considered as a concern. An active railway is indicated, which is approximately 70m north-west of the site on the other side of the Rochdale Canal. Mobile phone masts are identified 63m and 84m south-west of the site, and 89m north-east of the site.

Belfield Bridge, 39m west of the site is a listed structure.

Immediately east of the site is the Liverpool, Manchester and West Yorkshire Greenbelt. The Rochdale Canal is recorded as a Site of Special Scientific Interest.

PRELIMINARY RISK ASSESSMENT

Potential sources of contamination present on or beneath the site would relate primarily to; the historical use of the site; the presence of contaminated soil; and the potential presence of hazardous or ground gas beneath the site.

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that;

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused.*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source – pathway – target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets.

Contaminants or ***potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed overleaf in Table 1.

Table 1: Identified Potential Contaminant Sources

Contaminant Source	*Comments*
Drainage	Effluent from leaking drains would provide a contaminant source.
Former Buildings	Former buildings may have contained asbestos containing materials (ACMs).
Soil Beneath Site	Contamination may be present within made ground materials on the site.
Soil Gas	Potential soil gas generated from made ground or natural organic soils.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites, such as the nearby works to the east.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

Human Receptor-Mechanism	*Typical Exposure Pathway*
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -produce grown on contaminated soil Ingesting dust or soil on vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

Receptor-Water Environment	*Typical Exposure Pathway*
Groundwater The Superficial Till is indicated to be a 'Secondary (A) Aquifer'. The underlying solid geology Coal Measures is also indicated to be a 'Secondary (A) Aquifer'.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water/Watercourses The nearest surface water features are the Rochdale Canal 37m west and the River Beal 55m east of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life.

Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model is presented below in Table 4.

Table 4: Preliminary Conceptual Model Relative to Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Drainage	**Former Buildings**	**Soil Beneath Site**	**Soil Gas**	**Ground Contamination Outside Site Boundary**
Human Health – ground or construction workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Human Health – end users	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Unlikely	N/A	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or surrounding groundwater	Low likelihood	N/A	Low likelihood	Unlikely	Unlikely
Flora	Vegetation on site growing on contaminated soil	Low likelihood	N/A	Low likelihood	Low likelihood	Unlikely
Building Materials	Contact with contaminated soil	Low likelihood	N/A	Low likelihood	Low likelihood	Low likelihood

Key to Table 4 **Estimated Potential for Linkage with Contaminant Source**	**Definition**
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.
N/A	Not Applicable.

SITE WORK

The site work conducted on 16th and 24th May 2019 comprised two window sampled boreholes (WS1 and WS2), three hand excavated trial pits (TP1, TP2 and TP3), two machine excavated trial pits (TPA and TPB), and four samples from stockpiles (SP1, SP2, SP3 and SP4). The positions are shown on the exploratory hole location plan following this report text.

Public utility service and client provided drawings were consulted prior to determining the exploratory hole positions. Prior to excavation, a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests and the groundwater conditions observed during and on completion of excavation, and subsequent monitoring.

Window Sample Boreholes

The window sample boreholes were sunk to depths of 5.00m below ground level by a small track mounted window sampling and super heavy dynamic probing rig. The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrels were initially of 87mm internal diameter. Upon extraction, a continuous profile of the soil was obtained within the plastic liners.

Representative small disturbed samples of soil were taken within appropriate containers, pending possible contamination testing, from the starter pits at regular intervals throughout their depth.

A standard penetration test (SPT) was undertaken at 2.00m depth within borehole WS2 in order to give an indication of the in-situ relative density of the material. The test was made by driving a solid cone (C) attachment into the soil at the base of the borehole by means of

an automatic trip hammer weighing 63.50kg falling freely through 750mm. The penetration resistance ('N' value) is determined as the number of blows required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The SPT test is fully described in BS EN22476:3:2005 and the results of these tests are presented on the borehole record.

On completion of boreholes WS1 and WS2, gas and groundwater monitoring standpipes were installed to 4.00m depth in each hole. The pipes were perforated to within 1.00m of ground level and the annulus backfilled with pea gravel. A bentonite seal was placed from ground surface to 1.00m depth and a gas tap fitted. A protective stopcock cover was concreted in place at ground level above each installation.

Soakaway Trial Pits/Hand Excavated Trial Pits/Stockpile Samples

Trial pits TPA and TPB were excavated by machine to depths of 2.00m below ground level, in order to undertake soakaway testing in proposed rear garden areas. The exposed strata were logged and sampled by a Geoenvironmental Engineer.

Representative small disturbed samples of soil were taken from the trial pits at regular intervals throughout their depth.

Soakaway tests were carried out within the trial pits, in broad accordance with BRE Digest 365 (2016) in order to allow the assessment of the soil infiltration rate. The general method of the test was to excavate the trial pits with vertical sides trimmed square to the base. The dimensions were accurately measured and recorded, and the pits were then filled with clean water. The rate of water dissipation from the pits was measured by recording the depth of water relative to a datum at frequent time intervals. The test in TPA was initially monitored for 70 minutes, and then the water in the pit was topped up and the test monitored for a further 120 minutes. The test in TPB was monitored for a period of 240 minutes. The results are presented and follow the respective trial pit records.

Trial pits TP1, TP2 and TP3 were excavated using hand digging tools in the proposed garden areas. The exposed strata were logged and sampled by an Engineer, and samples collected for subsequent laboratory testing.

Representative disturbed soil samples were taken at regular intervals throughout the depth of the pits.

On completion, the trial pits were backfilled with arisings and the surfaces reinstated.

Samples were also taken from stockpiles SP1, SP2, SP3 and SP4 at the request of the client, pending possible chemical testing.

Gas and Groundwater Monitoring

Three return gas monitoring visits were undertaken on 24th and 31st May, and 13th June 2019 in order to monitor methane, carbon dioxide and oxygen gas levels in the borehole standpipes. The ambient pressure and flow rate was also recorded together with the depth to groundwater. The gas/groundwater results are tabulated following the exploratory hole records.

LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil descriptions have been made in accordance with BS5930:2015. The chemical test results are presented following the exploratory hole records.

Chemical analysis of five soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'. In addition, the samples were tested for total petroleum hydrocarbons (TPH) and screened for the presence of asbestos. Where the laboratory identified the presence of asbestos, the type of asbestos was determined.

GROUND CONDITIONS

The ground conditions generally comprised a 0.50m to 1.40m thick surface layer of made ground, and was in turn underlain by superficial Till which was proved to at least the base of the exploratory holes at a maximum depth of 5.00m. Groundwater was recorded as shallow as 1.46m below ground level.

Made Ground

A 0.50m to 1.40m thick surface layer of made ground, which comprised soft, brown, dark brown and grey, slightly gravelly, sandy clay fill, varying to clayey/silty, sandy gravel fill, was encountered at most positions. No made ground was present in TPA as this part of the site had been lowered following the site clearance. The gravel fraction comprised angular to rounded quartzite, mudstone, sandstone, slate, igneous rock, clinker, coal, ash, glass, mortar, wood and brick fragments.

Till

In the southern part of the site, from surface in TPA, and beneath the made ground in WS2 at 1.30m depth, superficial Till comprising loose, orange brown and brown, silty sand and gravel was encountered to 1.80m depth in TPA, and 2.60m depth in WS2. Beneath the sand and gravel, firm or stiff, fissured, brown and grey, slightly gravelly, silty clay was encountered to at least the base of the exploratory holes at 2.00m depth (TPA) and 5.00m depth (WS2). The gravel fraction comprised angular to rounded quartzite, sandstone, igneous rock and slate.

In the northern part of the site, at 0.50m depth in TPB, and 1.40m in WS1, a superficial Till comprising a soft or firm, grey, brown and orange brown, slightly gravelly, sandy (TPB), silty clay, was encountered to 1.60m depth in TPB, and to 4.45m depth in WS1. The gravel fraction comprised angular to-rounded quartzite, igneous rock and sandstone. A layer of dark orange brown and brown, slightly clayey, silty sand and gravel was encountered in TPB at 1.60m to 1.80m depth, and brown, slightly gravelly, silty sand was encountered in WS1 below

4.45m depth to at least the base of the borehole at 5.00m below ground level. These soils were also considered to represent superficial deposits of glacial Till.

Groundwater

A groundwater seepage was recorded at 2.00m in WS1, within Till, and water was recorded at 4.80m depth on completion of the borehole. Water was recorded standing at between 1.97m and 1.46m depth during monitoring of the standpipe installed in WS1 in May and June. The water level in WS1 was rising during the monitoring period, which also during a period of rain. The standpipe in WS2 was initially dry during the monitoring, and groundwater was recorded at 3.98m depth on the final visit in June. The shallow holes were dry during excavation and on completion.

Observations

Live roots were observed in most of the holes, and to a maximum 2.50m depth in WS2 on the higher ground in the south-west of the site in an area cleared of trees.

Evidence of Contamination

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. The made ground contained fragments of clinker, coal, ash, glass, mortar, wood and brick. Asbestos containing materials were noted in the soils on the higher western part of the site during this investigation, which was identified by microscopy in the chemical laboratory as chrysotile.

Drainage

The soakaway tests (TP1 and TP2) gave soil infiltration rates (f) of between 1.87×10^{-5}m/s and 2.59×10^{-5}m/s, for the sand and gravel Till, and 2.78×10^{-6}m/s for sandy clay Till. These results rate the Till as having a 'good' to marginal 'poor' drainage potential according to BS8004:1986, and reflects the variable drainage properties of the Till.

Groundwater was locally met as a seepage at 2.00m depth in WS1, within the clay Till, and was recorded in the standpipe in WS1 rising to 1.46m depth during the monitoring period. Soakaway drainage on this site may deteriorate over time as the chambers become blocked with silt. Provision should be made for regular cleaning. There would be no advantage in excavating soakaway chambers below the groundwater level, which reduces the effective volume of the soakaway.

COMMENTS ON THE SOIL CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.04 and 1.06 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 5 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 5: Comparison of Chemical Test Results with SSVs for Made Ground Soils

Determinand	Number of Samples	Min Value mg/kg	Max Value mg/kg	Number of Samples Exceeding SSV for			Assessment Method	Soil Screening Criteria 2.5% SOM		
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial		Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial mg/kg
Organic Matter	5	4.5%	17%	-	-	-	-	-	-	-
Arsenic	5	11	26	0	0	0	S4UL	37	40	640
Cadmium	5	0.17	0.48	0	0	0	S4UL	11	85	190
Chromium (III)*	5	18	27	0	0	0	S4UL	910	910	8600
Chromium (VI)	5	<0.50	<0.50	0	0	0	S4UL	6	6	33
Lead	5	80	600	2	1	0	C4SL	200	310	2330
Mercury	5	<0.10	0.33	0	0	0	S4UL	11	15	320
Selenium	5	<0.20	0.54	0	0	0	S4UL	250	430	12,000
Nickel	5	22	37	0	0	0	S4UL	130	180	980
Phenols	5	<0.30	<0.30	0	0	0	S4UL	200	690	690
Benzo[a]pyrene	5	<0.10	3.0	4	4	0	S4UL	0.98	1.2	15
Copper	5	27	74	0	0	0	S4UL	2400	7100	68,000
Zinc	5	83	170	0	0	0	S4UL	3700	40,000	730,000
Free Cyanide	5	<0.50	<0.50	0	0	0	ATRISK	34	34	34

Notes

*The concentration of Trivalent Chromium is assumed to be equivalent to the Total Chromium concentration. This is because most naturally occurring chromium is in the trivalent (chromic) state.

S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.

LQM/CIEH S4ULs 'Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reserved'.

ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

Discussion of Soil Results

The results of the laboratory analysis indicate that the made ground contains elevated concentrations of benzo[a]pyrene and lead, which exceeded the soil screening criteria for residential with home grown produce end use; and for residential without home grown produce end use. The highest concentrations did not exceed the associated soil screening criteria for a commercial/industrial end use.

Levels of all remaining elements and compounds in the samples tested were within the associated soil screening values for both residential end uses and for a commercial/industrial end use.

There was no visual or olfactory evidence of hydrocarbon contamination, and the total petroleum hydrocarbon concentrations were between less than 10mg/kg (below laboratory detection limit) and 550mg/kg, which are not considered significant.

Samples of the near surface made ground soils from WS2, TP1 and TP3, were identified in the laboratory by microscopy as containing fibres/clumps of chrysotile asbestos.

The results indicate that the made ground on this site would be considered unsuitable for retention in gardens and landscaping areas of the proposed residential development.

SOIL GAS MONITORING

The monitoring of soil gasses (methane, carbon dioxide and oxygen) within the standpipes installed within WS1 and WS2 was undertaken on 24th and 31st May, and 13th June 2019. The results of the monitoring are summarised in Table 6 below.

Table 6: Summary of Gas Monitoring Data

Hole Location	No. Visits	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Flow (l/hr)	Water Level (mbgl)	Atmospheric Pressure (mb)
WS1	3	<0.1	3.5-5.5	10.5-13.5	<0.1	1.46-1.97	995-1005
WS2	3	<0.1	4.5-5.5	15.6-16.4	<0.4	3.98-dry	995-1005

The results of the soil gas monitoring of the installation indicated less than 0.1% by volume methane and a maximum 5.5% by volume carbon dioxide, recorded during the monitoring visits. The in-situ measurements recorded gas emission rates of less than 0.1l/hr.

Using a flow rate of 0.1l/hr, the detection limit of the equipment used, these in-situ measurements indicate a Gas Screening Value (GSV) of 0.0055l/hr for carbon dioxide and 0.0001l/hr for methane. These results fall into Characteristic Situation 2 due to the carbon dioxide concentrations, as defined by BS8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'. These results indicate a low likelihood of risk, and that gas protection measures are necessary for the new dwellings. Further guidance on gas protection measures are set out in BS8485:2015.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model relative to the existing site and future residential use of the site is presented in Table 7 below.

Table 7: General Conceptual Model Relative to Future Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Drainage	Former Buildings	Soil	Soil Gas	Off-Site Sources
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low	High	High	Moderate	Very Low
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	N/A	High	Very Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	Low	N/A	Very Low	Very Low	Very Low
Flora	Vegetation on site growing on contaminated soil	Very Low	N/A	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	Very Low	N/A	Very Low	Very Low	Very Low

Key to Table 7 Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

Anticipated exposure scenarios relating to the existing plot, the site history and a proposed residential end use of the site, in the context of the conceptual model, are discussed as follows.

The proposed development is understood to comprise building six new dwellings, with associated gardens and hardstanding.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site work reveals materials that may appear to be contaminated.

Contaminated Soil

On the basis of the ground investigation, the site is underlain by between 0.50m and 1.40m of made ground resting on naturally deposited Till.

The results of the chemical analysis undertaken would indicate that the near surface soils should be considered unsuitable for retention or re-use at the surface in any new gardens or landscaped areas in the residential setting.

The underlying naturally deposited soils encountered beneath the site would be considered suitable for re-use within the development.

Any soil imported to site must be certified as "suitable for use".

Drainage

Redundant foul or surface water drain runs, if present, should be removed where encountered from beneath the site and precautions should ensure that any remaining effluent or sediment is directly disposed off-site. The integrity of the existing drains should be checked, and where they are to be retained, any damaged sections should be replaced prior to development.

Soil Gas

There are no landfills within 250m of the site. The site is underlain by a layer of made ground, covering superficial, silty clay or sand and gravel soils. The results of the soil gas monitoring of the installation indicated less than 0.1% by volume methane and a maximum 5.5% by volume carbon dioxide, recorded during the monitoring visits.

There is a moderate risk that hazardous gases would affect groundworkers during the construction phase and a very low risk of hazardous gas affecting future users of the site.

The site lies within an area where less than 1% of homes are above the BRE action level for radon and that no radon protection measures are required.

Human Health - Construction Workers

Based on the chemical test results, no special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Consideration should be given to gas monitoring within deep or confined spaces, particularly where thick made ground is present, to ensure safety of personnel entering them, since carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

e) Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos containing material, during the construction phase.

Human Health - Users of Completed Development

The risk of the made ground affecting the site users in a residential setting, would be considered to be high due to the elevated concentrations of lead and benzo[a]pyrene, and the presence of asbestos fibres.

The results of the chemical analysis undertaken indicate that the made ground should be considered unsuitable for re-use at the surface in any garden, landscaped or planted areas.

Due to the presence of asbestos in the made ground, these soils should also be considered unsuitable for re-use beneath proposed buildings and permanent hardstanding.

Any soil imported to site must be certified as "suitable for use".

Water Environment

The site is underlain by superficial Till, indicated by the EA to be a 'Secondary (A) Aquifer', which covers the solid geology Coal Measures, also indicated by the EA to be a 'Secondary (A) Aquifer'. The nearest surface water feature is the Rochdale Canal 37m west of the site.

Groundwater seepages were recorded below 2.00m depth, and water was recorded at 1.46m depth during the final monitoring visit in June 2019.

The risk to the water environment is considered very low as it is unlikely that the proposed development would impact the quality of the water environment.

Effects on Buried Services

The local water supply company should be consulted if new buried plastic water pipes are proposed within the made ground soils on this site.

Off-Site Disposal of Soil Arisings

The results of chemical analysis are provided following the exploratory hole records and can be used within the information necessary for basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM3 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code which is determined by the waste type.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer, whilst compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer, as the approach relies on the information from basic characterisation. Asbestos containing materials would be considered hazardous and should be appropriately disposed of.

It is expected that arisings of natural soils from the excavations across this site would fall into the inert category under the European Waste Catalogue description 'Soil and Stones', EWC code 17 05 04 with restrictions excluding topsoil and peat.

CONTAMINATION ASSESSMENT CONCLUSIONS

The proposed development is for construction of four detached dwellings and a semi-detached pair of dwellings for residential end-use.

Remediation Statement

The results of the chemical analysis would indicate that the made ground should be considered to be unsuitable for re-use at the surface within any new landscaped, garden or patio areas, due to the elevated concentrations of benzo[a]pyrene and lead, and presence of asbestos.

For rear garden areas it is recommended that the made ground should be either completely removed or to a minimum depth of 1.00m below finished ground level. In landscaped and patio areas the made ground should either be completely removed, or removed to a minimum depth of 0.60m below finished ground level, and replaced with an equivalent thickness of clean inert topsoil or clean granular fill.

The made ground should also be considered unsuitable for re-use beneath proposed buildings and permanent hardstanding, due to the presence of benzo[a]pyrene, lead and asbestos fibres, and these soils could affect buried services.

Topsoil

Any imported topsoil should have appropriate certificates confirming its suitability prior to placement.

REMEDIATION METHOD STATEMENT

The following points will constitute a plan for remedial works considered necessary in order to ensure that soils retained within the development are fit for use.

- The groundworks contractor should undertake a watching brief during works to check for polluted soil and the presence of asbestos containing materials.
- Where private residential garden areas are proposed it is recommended that the made ground should either be completely removed, or removed and replaced with up to 1.00m of clean inert topsoil or clean granular fill. In landscaped and patio areas the made ground should be removed and replaced with up to 0.60m of clean inert topsoil or clean granular fill. Due to the presence of asbestos fibres, the made ground should not be considered for re-use beneath proposed buildings and permanent hardstanding.
- If soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought. Any such soils will either be immediately removed off site to a licensed disposal or treatment facility or placed within a designated quarantine zone on a membrane or holding tank for future classification, treatment and/or removal.
- A photographic record of such remediation should be undertaken by the contractor.
- Any imported 'clean' inert topsoil and granular fill should be supported by verification certificates to provide proof of its suitability. Documentation relating to the source of clean inert topsoil should be presented to the Local Planning Authority for approval prior to infilling. Samples of the imported clean topsoil placed in the garden and landscaped areas should be tested to verify that the soil is suitable for use.
- The Local Authority should also be informed regarding each stage of the works and photographic evidence together with copied waste transfer receipts for any arisings should be gathered, as they are essential to demonstrate the works.

- The local water supply company should be consulted if new buried plastic water pipes within the made ground soils on this site are proposed.
- Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos containing material, during the construction phase.

VALIDATION

As the scheme includes private gardens and/or landscaped areas, remediation will be required within the site. Implementation of the remediation strategy should be checked during construction and on completion, and appropriate records kept so that a Validation Report can be compiled and subsequently submitted to the local authority.

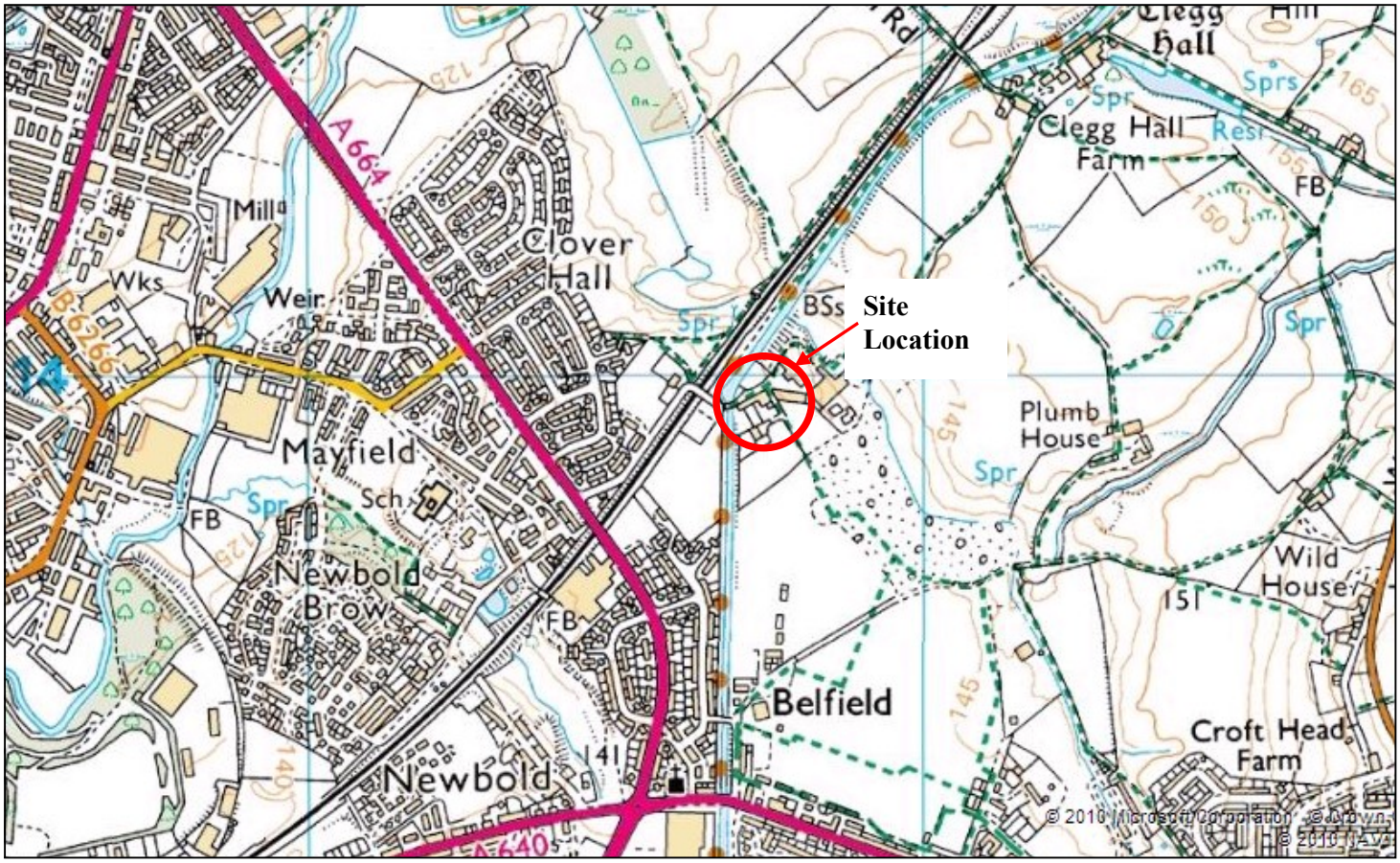
GROUND ENGINEERING LIMITED

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Site Location Plan

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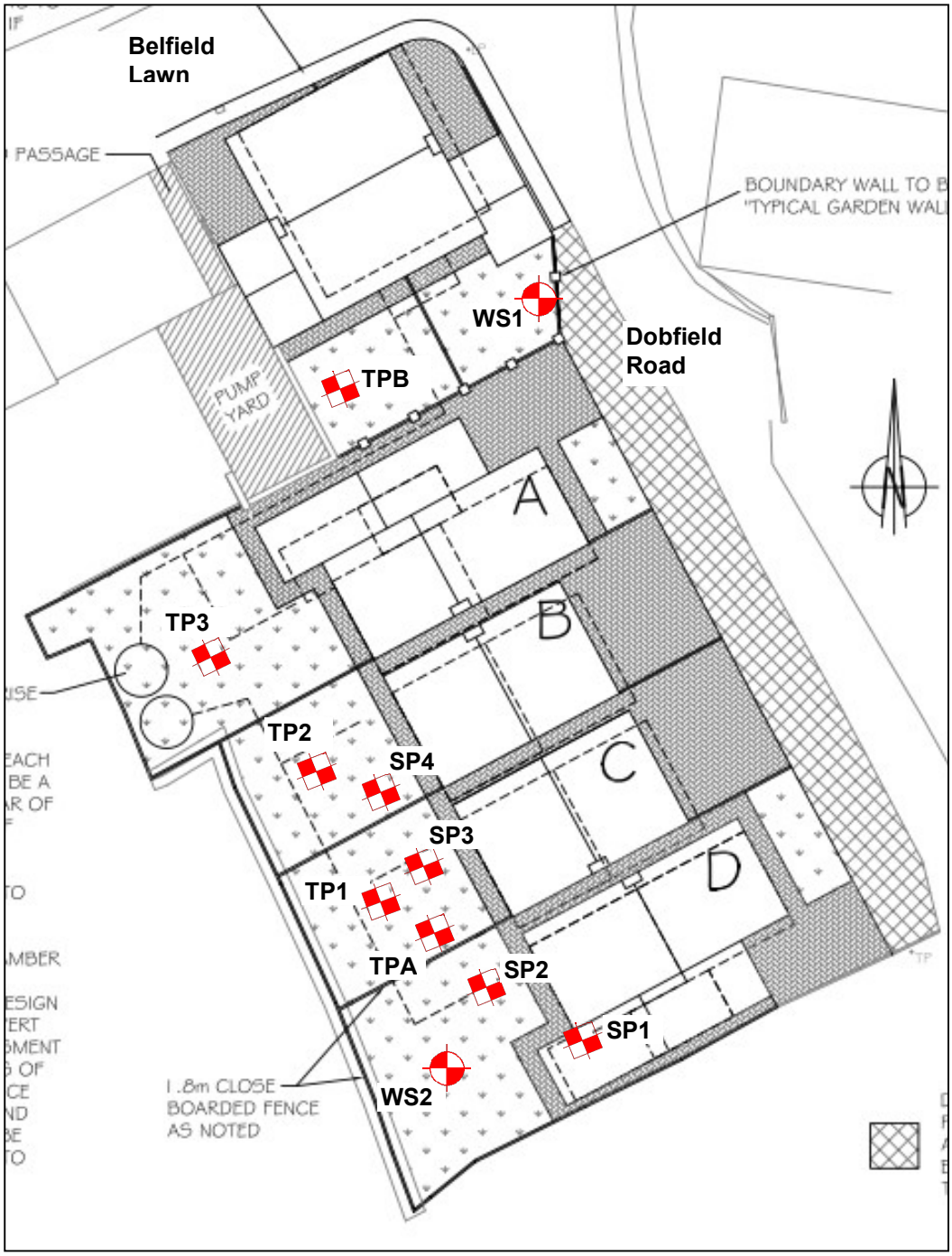


Not to scale

Project : Belfield Lawn, Belfield Mill Lane, Rochdale, Lancashire **Client :** Michael Brereton	**GROUND ENGiNEERiNG LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C12263A**

Exploratory Hole Location Plan

Based on plan provided by the client.



Not To Scale

Project : Belfield Lawn, Belfield Mill Lane, Rochdale, Lancashire **Client :** Michael Brereton	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No. C12263A**

GROUND ENGINEERING
L I M I T E D
Tel: 01733-566566
www.groundengineering.co.uk

Site: **BELFIELD MILL LANE, ROCHDALE**

WINDOW SAMPLE
WS1

Date: 16/05/19

Hole Size: 87mm dia to 2.00m
77mm dia to 3.00m
57mm dia to 5.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.20	D1				MADE GROUND - Brown and dark grey, gravelly, sandy SILT with cobbles of limestone. Gravel is angular to sub-rounded quartzite, sandstone, mudstone, slate, coal, ash and clinker.		0.30	
0.60	D2				MADE GROUND - Soft, brown and grey, slightly gravelly, sandy CLAY. Gravel is angular to rounded quartzite, sandstone, coal, ash and slate.		1.00	
0.90	D3							
1.20	D4				MADE GROUND - Grey, brown and orange brown, silty SAND AND GRAVEL. Gravel is angular to rounded quartzite, sandstone, mudstone, slate and brick fragments.		1.40	
1.20-2.00	U1		▼s					
			▼s		Firm, closely fissured, brown and orange brown, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded quartzite and sandstone. Becoming stiff below 1.70m depth.			
2.00-3.00	U2		▼s					
			▼					
3.00-4.00	U3				(TILL)			
4.00-5.00	U4			BENEATH INSTALLATION				
				BENEATH INSTALLATION				
				BENEATH INSTALLATION			4.45	
				BENEATH INSTALLATION	Brown, slightly gravelly, silty SAND. Gravel is angular to sub-rounded sandstone and siltstone.			
			▼c	BENEATH INSTALLATION	(TILL)		5.00	

REMARKS

Borehole completed at 5.00m depth

1. Starter pit excavated from 0.00m to 1.20m depth
2. Live roots observed to 2.10m depth
3. Gas monitoring standpipe installed to 4.00m depth

Project No 12263A

Scale 1:25 | Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▼ Water Strike
▼c Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed
1	2.00		seepage		

Groundwater Observations

Date	Depth m Hole	Depth m Casing	Depth m Water
16/05/19	5.00		4.80
23/05/19	4.00	1.00	1.97
31/05/19	4.00	1.00	1.52
13/06/19	4.00	1.00	1.46

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Site: **BELFIELD MILL LANE, ROCHDALE**

WINDOW SAMPLE
WS2

Date: 16/05/19

Hole Size: 87mm dia to 2.00m
77mm dia to 3.00m
57mm dia to 5.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.30	D1				MADE GROUND - Brown, dark grey and black, silty SAND AND GRAVEL. Gravel is angular and sub-angular mudstone, coal, ash, clinker, brick, asbestos and wood fragments.			
0.60	D2							
							0.80	
0.90	D3				MADE GROUND - Soft, brown and grey, slightly gravelly, sandy CLAY. Gravel is sub-angular to rounded sandstone, wood, slate, quartzite, brick and ash.			
							1.10	
1.20	D4				MADE GROUND - Brown and grey, very clayey SAND AND GRAVEL. Gravel is angular to rounded quartzite, slate, sandstone, ash and brick fragments.			
1.20-2.00	U1						1.30	
					Loose, brown and orange brown, silty SAND AND GRAVEL. Gravel is angular to rounded sandstone, quartzite and slate.			
2.00-3.00	U2				(TILL)			
2.15-2.45	C	N4						
							2.60	
					Stiff, fissured, brown, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded quartzite, sandstone and slate.			
3.00-4.00	U3							
					(TILL)			
4.00-5.00	U4		▼s		BENEATH INSTALLATION			
					BENEATH INSTALLATION			
					BENEATH INSTALLATION			
					BENEATH INSTALLATION			
					BENEATH INSTALLATION		5.00	

REMARKS

Borehole completed at 5.00m depth

1. Starter pit excavated from 0.00m to 1.20m depth
2. Live roots observed to 2.50m depth
3. Gas monitoring standpipe installed to 4.00m depth

Project No 12263A

Scale 1:25 | Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▼ Water Strike
▼c Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Depth m Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Depth m Hole	Casing	Water
16/05/19	5.00		dry
23/05/19	4.00	1.00	dry
31/05/19	4.00	1.00	dry
13/06/19	4.00	1.00	3.98

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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
TPA

Date: 24/05/19

Pit Size: 1.70m L x 0.45m W x 2.00m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.10	D1			Orange brown and brown, slightly silty SAND AND GRAVEL. Gravel is angular to rounded quartzite, igneous rock and slate.			
0.50	D2						
1.06	D3						
1.50	D4						
						1.80	
2.00	D5			Firm, brown and grey, slightly gravelly, silty CLAY. Gravel is fine and medium, sub-rounded igneous rock and slate. (TILL)		2.00	
				Pit completed at 2.00m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. No live roots observed
2. Pit dry
3. Pit sides unstable from ground level

Project No 12263A

Scale 1:25

Page 1/1

SOAKAWAY TEST RESULTS

BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Belfield Cottage, Mill Lane, Rochdale
Client: Michael Brereton

Project No: C12263A
Sheet No: 1/2

Trial Pit: TPA
Depth: 2.00
Length: 1.70
Width: 0.45

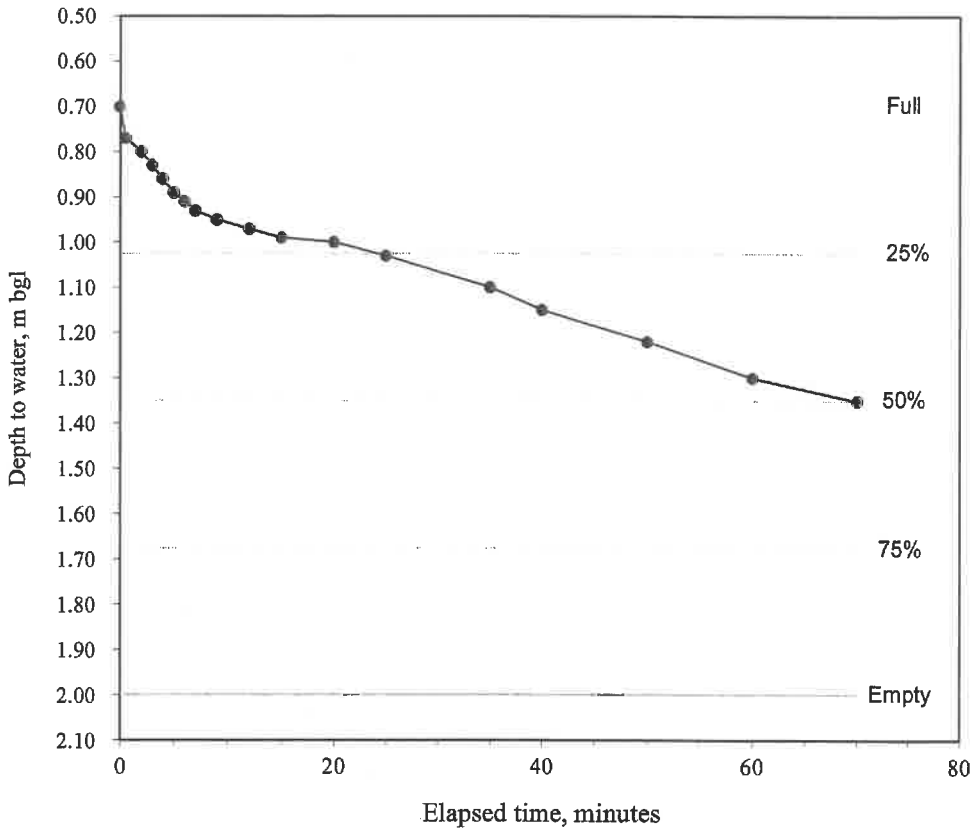
FIRST FILLING

Description of Stratum under test: Slightly silty SAND AND GRAVEL over firm, slightly gravelly, silty CLAY.

Depth to water prior to test: (below ground level) Dry

Elapsed Time min	Depth to Water m
0	0.70
1	0.77
2	0.80
3	0.83
4	0.86
5	0.89
6	0.91
7	0.93
9	0.95
12	0.97
15	0.99
20	1.00
25	1.03
35	1.10
40	1.15
50	1.22
60	1.30
70	1.35

DEPTH TO WATER vs ELAPSED TIME



f = (V75-V25)/A50(T75-T25)

V75-V25 = 0.497

A50 = 3.560

T75-T25 = 90 (extrapolated)

All dimensions given in metres

Extrapolated Soil Infiltration Rate **f = 2.59E-05 m/s**

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SOAKAWAY TEST RESULTS

BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Belfield Cottage, Mill Lane, Rochdale
Client: Michael Brereton

Project No: C12263A
Sheet No: 2/2

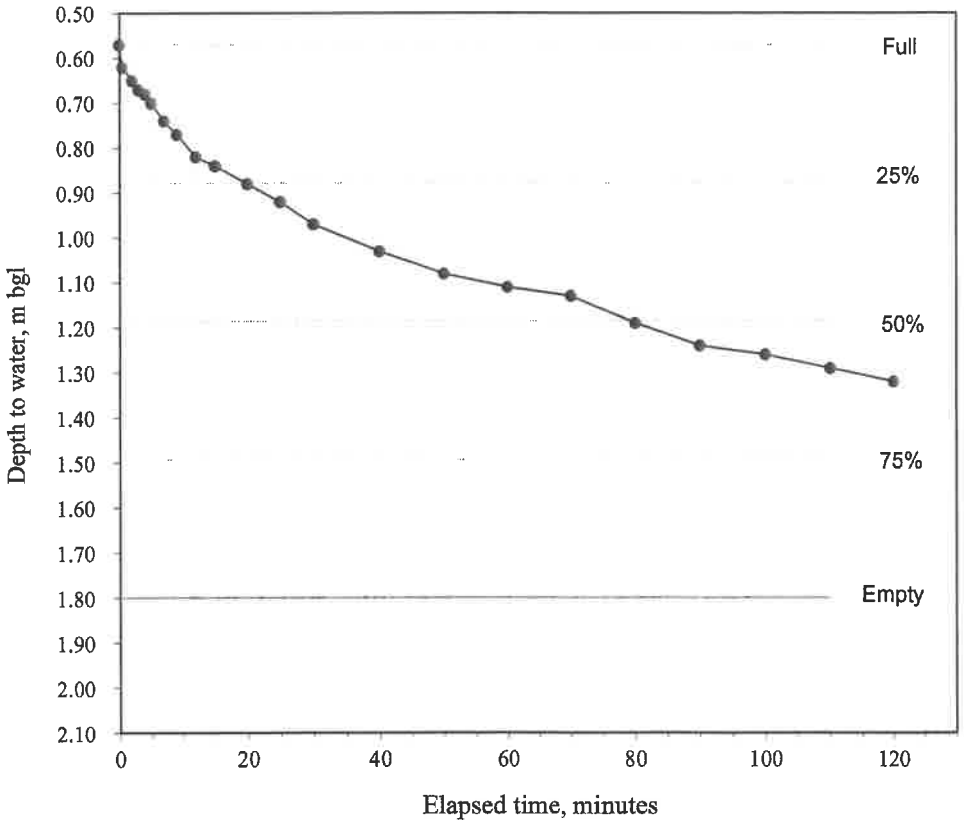
Trial Pit: TPA SECOND FILLING
Depth: 1.80
Length: 1.70
Width: 0.80

Description of Stratum under test: Slightly silty SAND AND GRAVEL over firm, slightly gravelly, silty CLAY.

Depth to water prior to test: (below ground level) Dry

Elapsed Time min	Depth to Water m
0	0.57
1	0.62
2	0.65
3	0.67
4	0.68
5	0.70
7	0.74
9	0.77
12	0.82
15	0.84
20	0.88
25	0.92
30	0.97
40	1.03
50	1.08
60	1.11
70	1.13
80	1.19
90	1.24
100	1.26
110	1.29
120	1.32

DEPTH TO WATER vs ELAPSED TIME



f = (V75-V25)/A50(T75-T25)

V75-V25 = 0.836

A50 = 4.435

T75-T25 = 168 (extrapolated)

All dimensions given in metres

Extrapolated Soil Infiltration Rate f = **1.87E-05** m/s

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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
TPB

Date: 24/05/19

Pit Size: 1.90m L x 0.30m W x 2.00m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.30	D1			MADE GROUND - Brown and dark brown, clayey/silty SAND AND GRAVEL. Gravel is angular to sub-rounded brick, concrete, sandstone, clinker and quartzite.		0.50	
0.70	D2			Soft, grey, yellow brown and orange brown, slightly gravelly, sandy CLAY. Gravel is sub-angular to rounded quartzite.			
1.00	D3					1.60	
1.70	D4			Dark, orange brown and brown, slightly clayey, silty SAND AND GRAVEL. Gravel is angular to sub-rounded igneous rock, quartzite and mudstone. (TILL)		1.80	
2.00	D5			Stiff, brown and grey, slightly gravelly, silty CLAY. Gravel is fine and medium, sub-rounded igneous rock. (TILL)		2.00	
				Pit completed at 2.00m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Live roots observed to 0.70m depth
2. Pit dry
3. Pit sides stable

Project No 12263A

Scale 1:25

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SOAKAWAY TEST RESULTS

BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Belfield Cottage, Mill Lane, Rochdale — Project No: C12263A
Client: Michael Brereton — Sheet No: 1/1

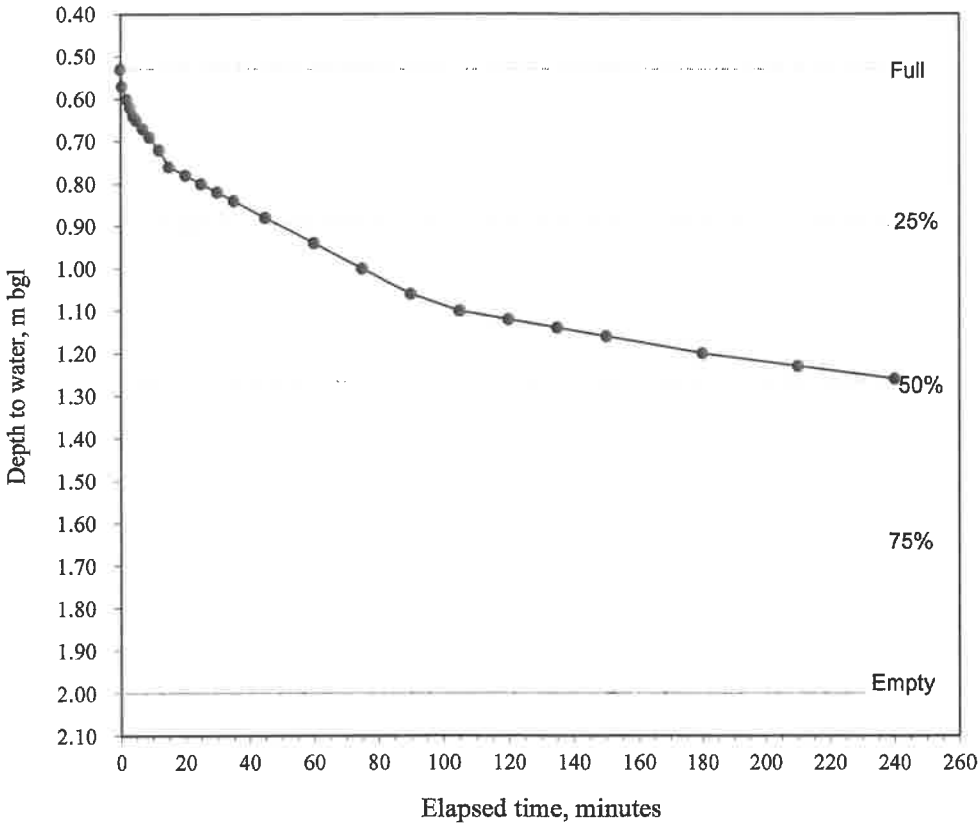
Trial Pit: TPB — FIRST FILLING
Depth: 2.00
Length: 1.90
Width: 0.30

Description of Stratum under test: SAND and GRAVEL over stiff, slightly gravelly, silty CLAY

Depth to water prior to test: (below ground level) Dry

Elapsed Time min	Depth to Water m
0	0.53
1	0.57
2	0.60
3	0.62
4	0.64
5	0.65
7	0.67
9	0.69
12	0.72
15	0.76
20	0.78
25	0.80
30	0.82
35	0.84
45	0.88
60	0.94
75	1.00
90	1.06
105	1.10
120	1.12
135	1.14
150	1.16
180	1.20
210	1.23
240	1.26

DEPTH TO WATER vs ELAPSED TIME



f = (V75-V25)/A50(T75-T25)

V75-V25 = 0.419
A50 = 3.804
T75-T25 = 660 (extrapolated)

Extrapolated Soil Infiltration Rate **f = 2.78E-06 m/s**

All dimensions given in metres

GROUND ENGINEERING LIMITED, Peterborough

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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
TP1

Date: 16/05/19

Pit Size: 0.30m L x 0.30m W x 0.50m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.10	D1			MADE GROUND - Soft, dark brown, slightly gravelly, sandy CLAY. Gravel is angular to sub-rounded brick, mortar, ash, clinker, asbestos and quartzite.			
0.30	D2						
0.50	D3					0.50	
				Pit completed at 0.50m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Live roots observed to at least 0.50m depth
2. Pit dry

Project No 12263A

Scale 1:25

Page 1/1

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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
TP2

Date: 16/05/19

Pit Size: 0.30m L x 0.30m W x 0.50m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.10	D1			MADE GROUND - Dark grey and black, gravelly, very silty SAND. Gravel is angular and sub-angular brick, mortar, sandstone, ash and glass.			
0.30	D2						
0.50	D3					0.50	
				Pit completed at 0.50m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Live roots observed to at least 0.50m depth
2. Pit dry

Project No 12263A

Scale 1:25

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GROUND ENGINEERING LIMITED
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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
TP3

Date: 16/05/19

Pit Size: 0.30m L x 0.30m W x 0.50m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.10	D1			MADE GROUND - Brown and grey, gravelly, very silty SAND. Gravel is angular to sub-rounded brick, mortar, coal, clinker, asbestos and ash.			
0.30	D2						
0.50	D3					0.50	
				Pit completed at 0.50m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Live roots observed to at least 0.50m depth
2. Pit dry

Project No 12263A

Scale 1:25

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Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
SP1

Date: 24/05/19

Pit Size: 0.30m L x 0.30m W x 0.30m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.30	D1			MADE GROUND - Dark grey, silty SAND AND GRAVEL. Gravel is angular to rounded igneous rock, clinker, brick, tree roots and quartzite.		0.30	

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS 1. Stockpile

Project No 12263A

Scale 1:10

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Site: BELFIELD MILL LANE, ROCHDALE

TRIAL PIT
SP2

Date: 24/05/19

Pit Size: 0.30m L x 0.30m W x 0.30m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.30	D1			MADE GROUND - Dark grey, silty SAND AND GRAVEL. Gravel is angular to rounded igneous rock, clinker, glass, mortar, coal, brick and quartzite.		0.30	

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS 1. Stockpile

Project No 12263A

Scale 1:10

Page 1/1

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
SP3

Date: 24/05/19

Pit Size: 0.30m L x 0.30m W x 0.30m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
				MADE GROUND - Dark brown and orange brown, silty SAND AND GRAVEL. Gravel is angular to rounded quartzite, slate, clinker, brick and igneous rock.			
0.30	D1					0.30	

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS 1. Stockpile

Project No 12263A

Scale 1:10

Page 1/1

GROUND ENGINEERING LIMITED

Tel: 01733-566566
www.groundengineering.co.uk

Site: **BELFIELD MILL LANE, ROCHDALE**

TRIAL PIT
SP4

Date: 24/05/19

Pit Size: 0.30m L x 0.30m W x 0.30m D.

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.30	D1			MADE GROUND - Dark brown and orange brown, slightly clayey SAND AND GRAVEL. Gravel is angular to rounded quartzite, slate, clinker, brick and igneous rock.		0.30	

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS 1. Stockpile

Project No 12263A

Scale 1:10

Page 1/1

Groundwater & Gas Monitoring Record

Site: **Belfield Mill Lane, Rochdale**

Report Ref: **C12263A**

Date	Borehole No.	Methane (% v/v)		Methane LEL %	Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (mbgl)	Depth to Groundwater (mbgl)	Comments
		Peak	Steady		Peak	Steady	Min.	Max.					
24/05/19	WS1	<0.1	<0.1	<0.1	3.5	3.5	12.7	12.7	<0.1	998	4.00	1.97	
24/05/19	WS2	<0.1	<0.1	<0.1	4.5	4.5	16.4	16.4	<0.1	998	4.00	Dry	
31/05/19	WS1	<0.1	<0.1	<0.1	5.5	5.5	13.5	13.5	<0.1	1005	4.00	1.52	
31/05/19	WS2	<0.1	<0.1	<0.1	4.8	4.8	16.1	16.1	<0.1	1005	4.00	Dry	
13/06/19	WS1	<0.1	<0.1	<0.1	3.5	3.5	10.5	10.5	<0.1	995	4.00	1.46	
13/06/19	WS2	<0.1	<0.1	<0.1	5.5	5.5	15.6	15.6	<0.1	995	4.00	3.98	

LEL – Lower Explosive Limit

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	19-17102-1
Initial Date of Issue:	29-May-2019
Client	Ground Engineering Limited
Client Address:	Newark Road Peterborough Cambridgeshire PE1 5UA
Contact(s):	Simon Weatherley
Project	SW/C12263A Belfield Mill Lane, Rochdale

Quotation No.:		**Date Received:**	21-May-2019
Order No.:		**Date Instructed:**	21-May-2019
No. of Samples:	5		
Turnaround (Wkdays):	5	**Results Due:**	28-May-2019
Date Approved:	29-May-2019		

Approved By:



Details: Martin Dyer, Laboratory Manager

Chemtest
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Results - Soil

Project: SW/C12263A Belfield Mill Lane, Rochdale

Client: Ground Engineering Limited					**Chemtest Job No.:**	19-17102	19-17102	19-17102	19-17102
Quotation No.:					**Chemtest Sample ID.:**	829615	829616	829617	829618	829619
					Client Sample ID.:	D1	D2	D1	D2	D2
					Sample Location:	WS1	WS2	TP1	TP2	TP3
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.30	0.60	0.10	0.30	0.30
					Date Sampled:	16-May-2019	16-May-2019	16-May-2019	16-May-2019	16-May-2019
					Asbestos Lab:	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
pH	U	2010		N/A		8.0	8.4	8.8	7.9	8.0
Moisture	N	2030	%	0.020		13	9.8	17	15	14
Stones and Removed Materials	N	2030	%	0.020		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		0.46	0.49	0.69	0.58	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.017	< 0.010	0.069	< 0.010	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50	1.1	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		2.1	3.6	2.3	3.5	3.3
Arsenic	U	2450	mg/kg	1.0		12	12	17	26	11
Cadmium	U	2450	mg/kg	0.10		0.19	0.23	0.48	0.48	0.17
Chromium	U	2450	mg/kg	1.0		21	25	26	27	18
Copper	U	2450	mg/kg	0.50		49	29	57	74	27
Mercury	U	2450	mg/kg	0.10		0.19	< 0.10	0.10	0.33	< 0.10
Nickel	U	2450	mg/kg	0.50		37	35	25	26	22
Lead	U	2450	mg/kg	0.50		160	80	250	600	130
Selenium	U	2450	mg/kg	0.20		< 0.20	< 0.20	0.28	0.54	< 0.20
Zinc	U	2450	mg/kg	0.50		120	83	170	150	60
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40		17	8.3	4.5	9.7	7.9
Acenaphthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	0.40	0.91
Acenaphthylene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	0.39	0.62
Anthracene	U	2700	mg/kg	0.10		< 0.10	0.52	0.42	0.53	2.2
Benzo[a]anthracene	U	2700	mg/kg	0.10		< 0.10	2.1	1.4	2.6	2.3
Benzo[a]pyrene	U	2700	mg/kg	0.10		< 0.10	3.0	1.5	2.4	2.1
Benzo[b]fluoranthene	U	2700	mg/kg	0.10		< 0.10	3.4	1.5	2.3	1.8
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10		< 0.10	2.8	< 0.10	4.2	1.5
Benzo[k]fluoranthene	U	2700	mg/kg	0.10		< 0.10	0.88	0.91	1.6	1.4
Chrysene	U	2700	mg/kg	0.10		< 0.10	1.9	1.9	3.4	2.6
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10		< 0.10	0.58	< 0.10	0.98	0.18
Fluoranthene	U	2700	mg/kg	0.10		0.15	3.2	3.1	5.3	6.7
Fluorene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	0.33	1.1
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10		< 0.10	2.3	< 0.10	2.7	0.57
Naphthalene	U	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10	0.23	0.43
Phenanthrene	U	2700	mg/kg	0.10		< 0.10	1.8	1.9	2.9	8.0
Pyrene	U	2700	mg/kg	0.10		0.17	3.7	3.3	5.4	6.2
Total Of 16 PAH's	U	2700	mg/kg	2.0		< 2.0	26	16	36	39
Total Phenols	U	2920	mg/kg	0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
ACM Type	U	2192		N/A		-	Fibres/Clumps	Fibres/Clumps	-	Fibres/Clumps

Chemtest
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Results - Soil

Project: SW/C12263A Belfield Mill Lane, Rochdale

Client: Ground Engineering Limited			**Chemtest Job No.:**		19-17102	19-17102	19-17102	19-17102	19-17102
Quotation No.:			**Chemtest Sample ID.:**		829615	829616	829617	829618	829619
			Client Sample ID.:		D1	D2	D1	D2	D2
			Sample Location:		WS1	WS2	TP1	TP2	TP3
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.60	0.10	0.30	0.30
			Date Sampled:		16-May-2019	16-May-2019	16-May-2019	16-May-2019	16-May-2019
			Asbestos Lab:		LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	Chrysotile	Chrysotile	No Asbestos Detected	Chrysotile
ACM Detection Stage	U	2192		N/A	-	Stereo Microscopy	Stereo Microscopy	-	Stereo Microscopy
Total TPH >C6-C40	U	2670	mg/kg	10	< 10	550	30	550	61

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

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Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

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

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

APPENDIX 1

ENVIRONMENTAL DATABASE SEARCH

The Coal Authority

Groundsure
LOCATION INTELLIGENCE



Enviro All-in-One

Residential search report

BELFIELD LAWN, BELFIELD, ROCHDALE, OL16 3AN

Professional findings

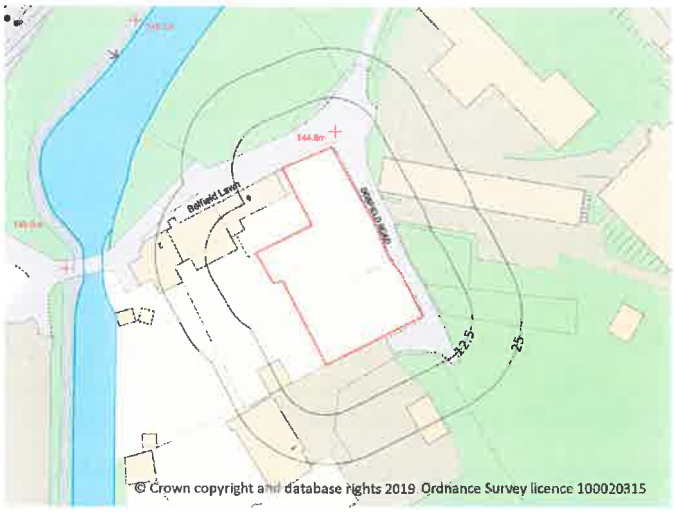
Coal Mining
None identified
Page 5

Contaminated Land Liability
Passed
Page 4

Flood Risk
Low
Page 12

Addresses the Law Society guidance on Coal mining risks, Contaminated Land and Flood risk.

Site plan



Further guidance

Other Ground Stability
Not identified

Radon
Passed

Planning Constraints
Identified
page 16

Screenings

Energy
Identified
page 13

Transportation
Identified
page 15

Planning Applications
Identified
page 16

Full assessments for these risks are available in other Groundsure searches including the Groundsure Avista 7 in 1 report. Contact Groundsure or your search provider for further details.

Enviro All-in-One

Coal Authority ref: 81002902857001
Reference: 51002125768001
Your reference: SWC12263a
Grid reference: 391754 413954
Date: 16 May 2019

Useful contacts

Rochdale Metropolitan Borough Council:
http://www.rochdale.gov.uk/
council@rochdale.gov.uk
01706 647 474

Environment Agency National Customer Contact Centre (NCCC):
enquiries@environment-agency.gov.uk
03708 506 506

Overview of findings and recommendations

Coal mining

According to the records held by the Coal Authority at the time the report was produced, the search report did not identify any areas of concern regarding coal mining.

Environmental Findings

To save you time when assessing the report, we only provide maps and data tables of features within the search radius that we have identified to be of note. These relate to environmental risks that may have liability implications, affect insurance premiums, property values and/or a lender's willingness to lend.

You can view the fully comprehensive library of information we have searched on **page 21**.

Contaminated Land

The property has passed Groundsure's Contaminated Land Liability assessment. Historical land uses (detailed in the Contaminated Land section of this report) may necessitate further assessment should the property be developed. The Local Planning Authority may formally request this through planning conditions. Occupation and enjoyment of the property for ongoing, continued use should not be affected.

Flood Risk

Groundwater
The property is assessed to have a groundwater flood risk of moderate or higher. Key recommended next steps:

- if the property has a basement or other section below ground, investigate whether tanking is possible. This is a process where basement areas are sealed with a watertight material to prevent groundwater seeping in
- look at the search result in the context of its locality. Discuss with the seller (and potentially their neighbours) to see if groundwater flooding is common there and what measures are in place to combat it

- consider conducting a visual check at the property looking for water staining, damp patches or mould growth. Be aware of any damp smells. It is also worth checking the survey to see if any of these things have been reported
- further advice on groundwater flooding has been produced by Environment Agency and the Local Government Association and can be found at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf

Other considerations

These are potential actions associated with non-environmental search returns such as mobile masts and planning constraints.

Planning constraints

Environmental designations

The property lies within 50m of an environmentally protected site or area. Key recommended next steps:

- seek further guidance from the local planning department on any likely restrictions if considering any property development

Visual and cultural designations

The property lies within 50m of a visually or culturally protected site or area. Key recommended next steps:

- seek further guidance from the local planning department on any likely restrictions if considering any property development

Planning

Mobile phone masts

The property lies within 250m of an existing or planned mobile phone mast. Key recommended next steps:

- ensure the presence of a mobile phone mast near the property is considered before the transaction completes

Enviro All-in-One

Coal Authority ref: 81002902857001
Reference: 51002125768001
Your reference: SWC12263a
Grid reference: 391754 413954
Date: 16 May 2019

Environmental summary

Environmental searches are designed to ensure that significant hazards and risks associated with this property are identified and considered alongside the investment in or purchase of a property.
Please see **page 2** for further advice.

Contaminated Land

Our Contaminated Land searches have found some potential contamination risks, although these are not considered to be significant under Contaminated Land legislation. If any part of the site was to be (re)developed it is possible that you might have to investigate the presence of contamination from these land uses further.
Please see **page 10** for details of the identified issues and **page 23** for our assessment methodology.

Contaminated Land Liability	Passed
Past Land Use	Identified
Waste and Landfill	Passed
Current and Recent Industrial	Passed

Flood Risk

Property's overall risk assessment for river, coastal, surface water and groundwater flooding is low.

Further explanation of flood risk assessment can be seen here groundsure.com/understanding-flood-risk

River and Coastal Flooding	Very Low
Groundwater Flooding	Moderate
Surface Water Flooding	Negligible
Past Flooding	Not identified
Flood Storage Areas	Not identified

Floodability Rating Green — The rating is compiled by JBA, the UK's leading flood expert. Please see **page 24**

Ground stability

No significant concerns have been identified as a result of the ground stability searches. No action required.

Natural Ground Stability	Negligible-Very low
Non-Natural Ground Stability	Not identified

Radon

Local levels of radon are considered normal. Percentage of affected homes in your local area is: Less than 1%.

Not in a radon affected area

Enviro All-in-One

Coal Authority ref: 81002902857001
Reference: 51002125768001
Your reference: SWC12263a
Grid reference: 391754 413954
Date: 16 May 2019

Coal Mining

This report is based on, and limited to, the records held by the Coal Authority, at the time we answer the search.



Key

Approximate position of enquiry boundary shown

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Ordnance Survey Licence number: 100020315

Map data

Detailed findings

1. Past underground coal mining
The property is not within a surface area that could be affected by any past recorded underground coal mining.

2. Present underground coal mining
The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining
The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

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

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries
There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

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

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

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

8. Future opencast coal mining
There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

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

9. Coal mining subsidence

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

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

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

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

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

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. This report is prepared in accordance with the Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.

Insurance is included as part of this residential report to cover loss in property value arising from any changes in the information contained in this report. Please refer to the attached Certificate of Insurance for the terms and conditions of this insurance. The insurance does not cover non-residential property or further recommended reports.

Disclaimer

The Coal Authority owns the copyright in this report and the information used to produce this report is protected by our database rights. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

Alternative formats

If you would like the coal mining section of this report in an alternative format, please contact the Coal Authority's communications team on 0345 762 6848 or email communications@coal.gov.uk.

Coal Mining Report Insurance Policy

On behalf of the insurer

Schedule

Policy number: **25811086**

The insurer: **Liberty Legal Indemnities – underwritten by Liberty Mutual Insurance Europe SE**

Binding Authority contract number: **RNMFP1903841**

Property: **BELFIELD LAWN, BELFIELD, ROCHDALE, OL16 3AN**

Reference: **81002902857001**

Limit of cover: **£50,000**

Dated: **16 May 2019**

This policy and schedule shall be read together and any word or expression to which a specific meaning has been attached in either shall bear such meaning wherever it may appear.

Where a Coal Mining Report has been obtained in connection with a sale of the property, cover is provided for the benefit of a purchaser and their lender; in the case of a re-mortgage or where the existing owner chooses to obtain a Coal Mining Report, cover is provided for the benefit of the owner and their lender.

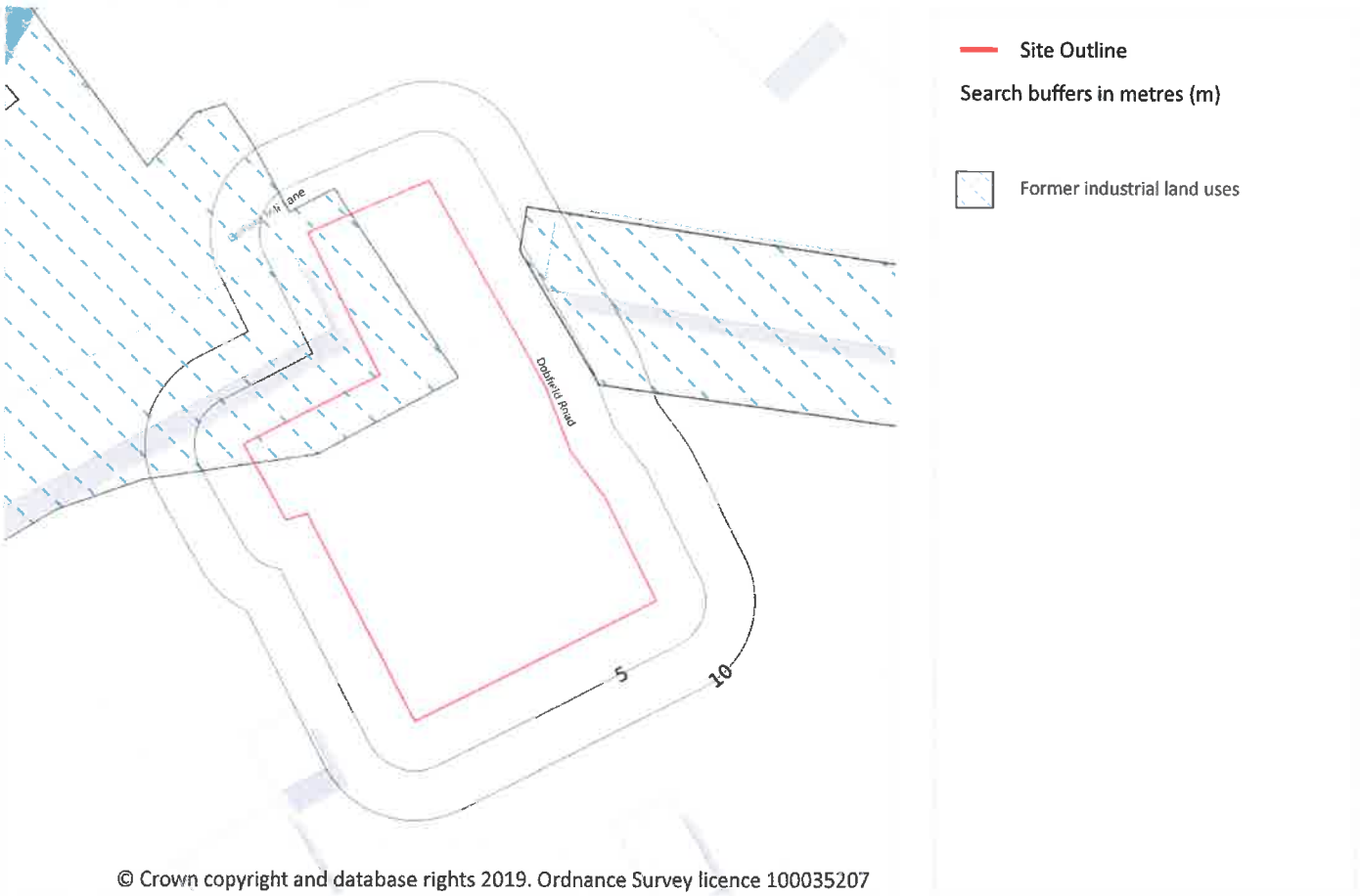
The policy offers protection against loss sustained by the owner of the property if any new problems or adverse entries are revealed in a subsequent Coal Mining Report which were not revealed by the original report to which the policy was attached.

The insured shall at all times comply with the requirements of the Conditions of this Policy.

Coal Mining Report Terms and Conditions can be viewed online at this link:
https://www.groundstability.com/insurance/terms/20190404/terms.html

Contaminated Land

Past land use



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Former industrial land use (1:10,560 and 1:10,000 scale)
These historical land uses have been identified from 1:10,560 and 1:10,000 scale Ordnance Survey maps dated from the mid to late 1800s to recent times. They have the potential to have caused ground contamination. Please see the Environmental Summary to find out how these could impact the site.

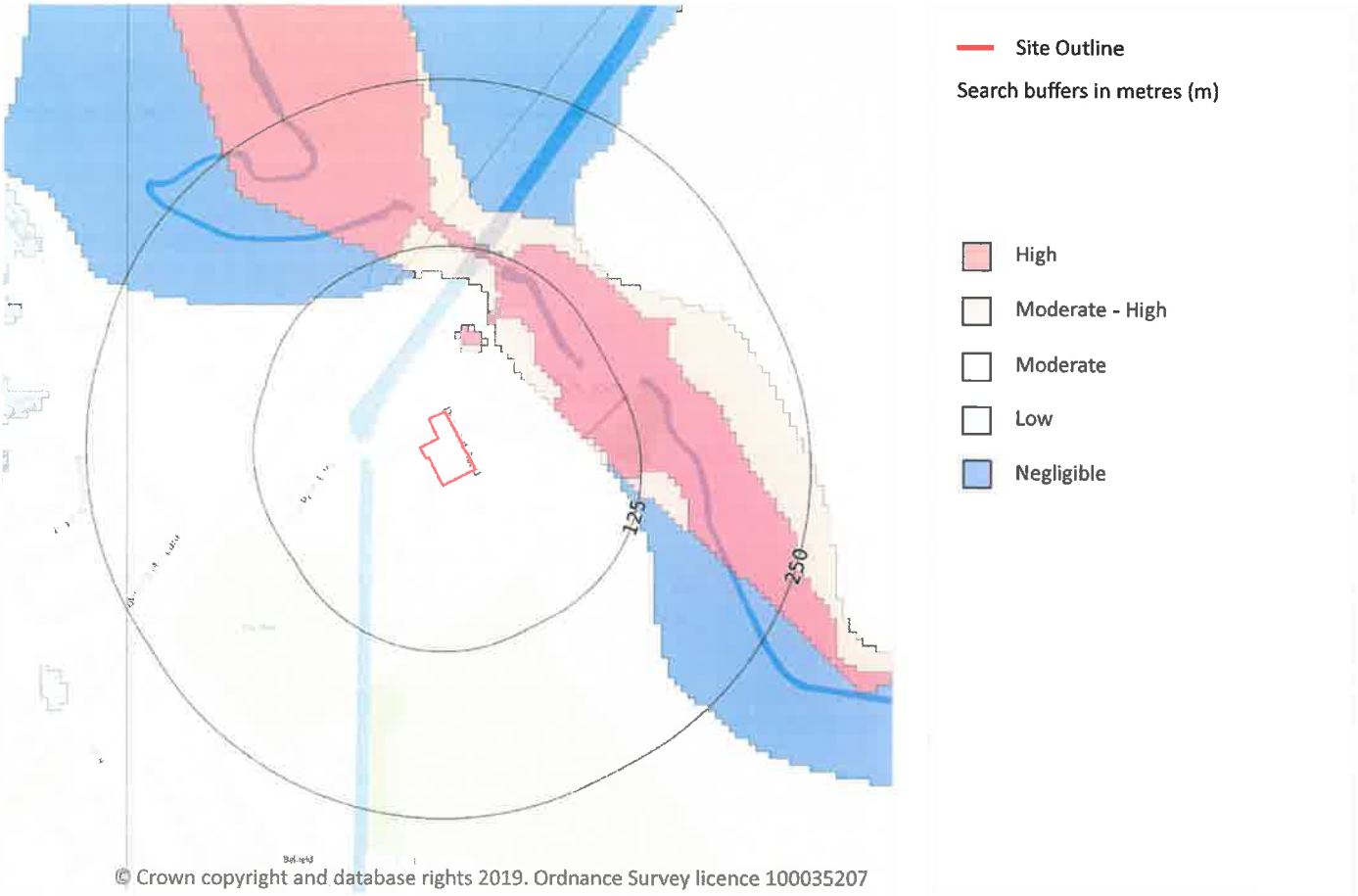
Please see **page 2** for further advice.

Distance	Direction	Use	Date
0	on site	Fulling Mill	1851
5 m	NE	Unspecified Mill	1967
5 m	NE	Unspecified Mill	1976

This data is sourced from Ordnance Survey/Groundsure.

Flood Risk

Groundwater flooding



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JBA data indicates that the property is in an area with a moderate risk of groundwater flooding. Should a 1 in 100-year (1%) design groundwater flood occur, groundwater levels could peak at between 0.5 and 5m below the ground surface. There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.

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Enviro All-in-One

Coal Authority ref: 81002902857001
Reference: 51002125768001
Your reference: SWC12263a
Grid reference: 391754 413954
Date: 16 May 2019

Energy summary

The property has been identified to lie within 5km of one or more energy features. The Enviro-All-in-One report summarises these on this page.

If required, full details on these energy features including a detailed location plan relative to the property are available when you purchase a Groundsure Energy and Transportation Report via your preferred searches provider.

Oil and Gas

Active or planned wells or extraction areas (such as fracking sites) have been identified near the property.

Oil and Gas Areas	Identified
Oil and Gas Wells	Not identified

Wind and Solar

Our search of existing and planned renewable wind and solar infrastructure has identified results.

Planned Multiple Wind Turbines	Identified
Planned Single Wind Turbines	Identified
Existing Wind Turbines	Identified
Proposed Solar Farms	Identified
Existing Solar Farms	Not identified

Energy Infrastructure

Our search of major energy transmission or generation infrastructure and nationally significant infrastructure projects has identified results.

Power stations	Not identified
Energy Infrastructure Projects	Identified
	Not identified

Electricity transmission lines

Electricity transmission lines and pylons
The nearest overhead transmission lines and/or pylon is located 366m from the property.

Overhead power transmission lines are known to emit electromagnetic fields (EMF). For further information on issues associated with transmission lines you may wish to contact the EMF Unit Public Information Line on 0845 7023270 or visit http://www.emfs.info. Guidance on electromagnetic fields resulting from transmission and distribution lines can also be found on the Public Health England (PHE) website.

This data is sourced from the National Grid. Groundsure provide the data for information only and do not make any judgment on the risks or otherwise of EMFs. However, if the existence of overhead power transmission may have a material impact with regard to the decision to purchase the property, Groundsure recommends contacting these organisations.

Transportation summary

The property has been identified to lie within the search radius of one or more transportation features detailed below.

If required, full details on these transportation features including a detailed location plan relative to the property are available when you purchase a Groundsure Energy and Transportation Report via your preferred searches provider.

HS2

No results for Phase 1 or Phase 2 of the HS2 project (including the 2016 amendments) have been identified within 5km of the property. However, HS2 routes are still under consultation and exact alignments may change in the future.

HS2 Route	Not identified
HS2 Safeguarding	Not identified
HS2 Stations	Not identified
HS2 Depots	Not identified
HS2 Noise	Not assessed
HS2 Visual impact	Not assessed

Crossrail

The property is not within 250 metres of either the Crossrail 1 or Crossrail 2 project.

Crossrail 1 Route	Not identified
Crossrail 1 Stations	Not identified
Crossrail 1 Worksites	Not identified
Crossrail 2 Route	Not identified
Crossrail 2 Stations	Not identified
Crossrail 2 Worksites	Not identified
Crossrail 2 Safeguarding	Not identified
Crossrail 2 Headhouse	Not identified

Other Railways

Our search indicates the property is within 250 metres of railways or railway stations, subway or DLR lines, active railways, historical railways or tunnels.
The Underground assessment includes London Underground, DLR, Tyne and Wear Metro, Merseyrail and Glasgow Subway.

Active Railways and Tunnels	Identified
Historical Railways and Tunnels	Not identified
Railway and Tube Stations	Not identified
Underground	Not identified

Planning summary

Planning Applications

Using Local Authority planning information supplied and processed by Glenigan dating back 10 years, this information is designed to help you understand possible changes to the area around the property. Please note that even successful applications may not have been constructed and new applications for a site can be made if a previous one has failed. We advise that you use this information in conjunction with a visit to the property and seek further expert advice if you are concerned or considering development yourself.

8 **Total applications**

This total includes large developments within 250 m, small developments within 75 m and house extensions within 50 m. If required, full details on these applications including a detailed location plan relative to the property are available when you purchase a Groundsure Planning Report via your preferred searches provider.

Planning constraints

Protected areas have been identified within 50 metres of the property.

Please see **page 17** for details of the identified issues.

Environmental Protected Areas	Identified
Visual and Cultural Protected Areas	Identified

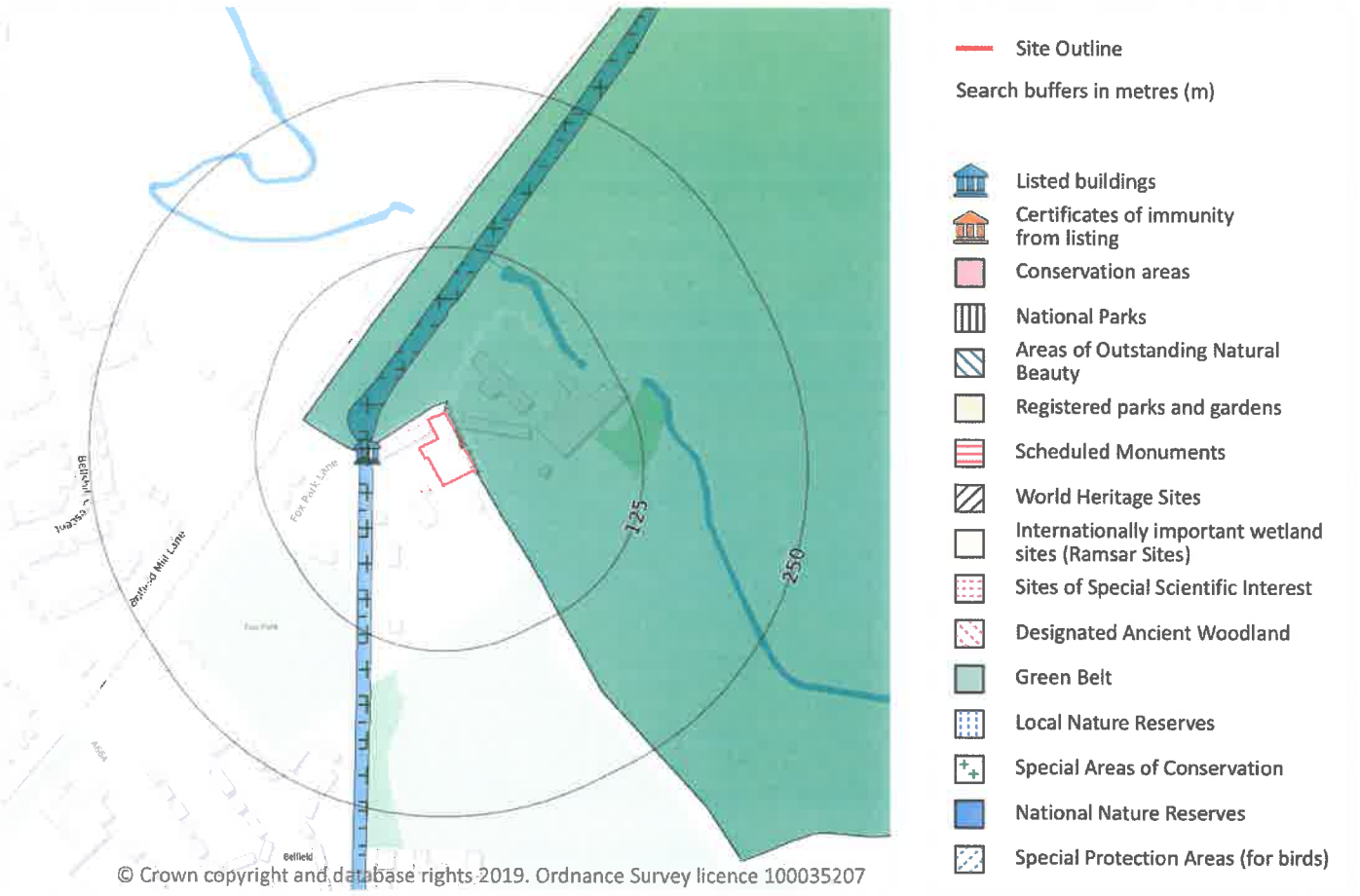
Telecoms

There are mobile masts, mobile phone base stations or planning applications for mobile masts identified within 250 metres of the property.

Mobile phone masts	Identified

If required, full details on these Telecoms results are available when you purchase a Groundsure Planning Report via your preferred searches provider.

Planning Constraints



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Environmental Designations

Sites of Special Scientific Interest

Sites of Special Scientific Interest (SSSIs) are nature conservation sites chosen because they are significantly important natural habitats for animals or plants or significant geologically. They are designated under the Wildlife and Countryside Act 1981. This national network of sites are subject to strict regulations, protecting against any developments on them.

Distance	Direction	SSSI Name	Data Source
35 m	NW	Rochdale Canal	Natural England

This data is sourced from Natural England/Natural Resources Wales/Scottish Natural Heritage. For more information see https://www.gov.uk/guidance/protected-areas-sites-of-special-scientific-interest

Special Areas of Conservation

SACs are strictly protected conservation sites, under the EC Habitats Directive. They are always located within a Site of Special Scientific Interest (SSSI). This additional SAC designation is recognition that some or all of the wildlife habitats and species within the SSSI require additional protection. There will be strict planning constraints for any developments within these areas.

Distance	Direction	SAC Name	Data Source
35 m	NW	Rochdale Canal	Natural England

This data is sourced from Natural England/Natural Resources Wales/Scottish Natural Heritage. For more information please see http://jncc.defra.gov.uk/page-23

Green Belt

Green Belts are intended to prevent inappropriate development by keeping certain areas of land open. The fundamental purpose of Green Belt is to prevent continued growth and merging of urban areas, hence the majority of Green Belt land being located on the fringe of large towns and cities, extending into the countryside. Whilst development can happen in the Green Belt, it should be subject to greater controls on the type and size of the development. However, the presence of a Green Belt designation is not in itself a complete barrier to development and the Local Plan should be consulted if a purchaser is concerned about any potential development in these areas.

Distance	Direction	Green Belt Name	Data Source
0	on site	Liverpool, Manchester and West Yorks Greenbelt	Rochdale

This data is sourced from the Local Authorities (Green Belt data contains Ordnance Survey data © Crown copyright and database right 2019). For more information please see https://www.gov.uk/guidance/national-planning-policy-framework/9-protecting-green-belt-land

Visual and Cultural Designations

Listed Buildings

The presence of listed buildings means there will be extra control over what changes can be made to that building's interior and exterior. If the property itself is a listed building, owners will need to apply for Listed Building Consent for most types of work that affect the 'special architectural or historic interest' of the property and the work approved may increase costs.

Distance	Direction	Name	Grade	Listed building reference number	Listed date
39 m	W	Belfield Bridge	II	1240259	20/01/1976

This data is sourced from Historic England. For more information please see https://historicengland.org.uk/listing/the-list/

Mobile phone masts

Mobile phone masts

There is a mobile phone mast within 62m of the property. See below for details of the mast and its location. Please note that this data may be incomplete or out of date and Groundsure recommends checking for any entries in the Mobile Phone Mast Planned section, as masts added since 2012 may appear there instead.

ID	Distance	Direction	Operator	Type	Antenna	Band	Power(dBW)
B	63 m	SW	Vodafone	UMTS	18	2100	28.9
B	63 m	SW	Vodafone	UMTS	18	2100	28.7
C	84 m	SW	O2	GSM	16.34	900	27.04
C	84 m	SW	O2	UMTS	19.05	2100	27.29
4	89 m	NE	Orange	UMTS	15	2100	29

This database is taken from Ofcom's Sitefinder database, the Government's database of mobile phone base stations. The last update to this database was applied in May 2012, although some operators ceased providing updates some years before then. Neither Ofcom nor Groundsure can accept any liability for any inaccuracies or omissions in the data provided within Sitefinder. The most recent update is based on the following datasets received at the specified times by Ofcom: O2 (May 2012), Network Rail (April 2012), Hutchison (February 2012), Vodafone (October 2011), Airwave (February 2010), Orange (February 2010) and T-Mobile (August 2005). Sites added since these dates will not appear in the database.

Datasets searched

This is a full list of the data searched in this report. If we have found results of note we will state "Identified". If no results of note are found, we will state "Not identified". Our intelligent filtering will hide "Not identified" sections to speed up your workflow.

Contaminated Land	
Former industrial land use (1:10,560 and 1:10,000 scale)	**Identified**
Former tanks	Not identified
Former energy features	Not identified
Former petrol stations	Not identified
Former garages	Not identified
Former military land	Not identified
Former landfill (from Local Authority and historical mapping records)	Not identified
Waste site no longer in use	Not identified
Active or recent landfill	Not identified
Former landfill (from Environment Agency Records)	Not identified
Active or recent licensed waste sites	Not identified
Recent industrial land uses	Not identified
Current or recent petrol stations	Not identified
Hazardous substance storage/usage	Not identified
Sites designated as Contaminated Land	Not identified
Historical licensed industrial activities	Not identified
Current or recent licensed industrial activities	Not identified
Local Authority licensed pollutant release	Not identified
Pollutant release to surface waters	Not identified
Pollutant release to public sewer	Not identified
Dangerous industrial substances (D.S.I. List 1)	Not identified

Contaminated Land	
Dangerous industrial substances (D.S.I. List 2)	Not identified
Pollution incidents	Not identified

Flood Risk	
Risk of flooding from rivers and the sea	Not identified
Flood storage areas: part of floodplain	Not identified
Historical flood areas	Not identified
Areas benefiting from flood defences	Not identified
Flood defences	Not identified
Proposed flood defences	Not identified
Surface water flood risk	Not identified
Groundwater flooding	**Identified**

Ground stability	
Natural ground subsidence	Not identified
Natural geological cavities	Not identified
Non-coal mining	Not identified
Mining cavities	Not identified
Infilled land	Not identified

Radon	
Radon	Not identified

Energy Infrastructure	
Electricity transmission lines and pylons	**Identified**

Planning constraints

Sites of Special Scientific Interest	Identified
Internationally important wetland sites (Ramsar Sites)	Not identified
Special Areas of Conservation	**Identified**
Special Protection Areas (for birds)	Not identified
National Nature Reserves	Not identified
Local Nature Reserves	Not identified
Designated Ancient Woodland	Not identified
Green Belt	**Identified**
World Heritage Sites	Not identified
Areas of Outstanding Natural Beauty	Not identified
National Parks	Not identified
Conservation Areas	Not identified
Listed Buildings	**Identified**
Certificates of Immunity from Listing	Not identified
Scheduled Monuments	Not identified
Registered Parks and Gardens	Not identified

Planning

Mobile phone masts	Identified
Mobile phone masts planning records	Not identified

Contaminated land liability assessment methodology

As part of this report Groundsure provide a professional assessment of the risks posed by key environmental information which could lead to the property being designated as 'Contaminated Land' as defined under Part 2A of the Environmental Protection Act 1990. This assessment is based on the following data:

- historical land use (compiled from 1:10,000 and 1:10,560 maps)
- petrol stations, garages, energy features and tanks (compiled from 1:1,250 and 1:2,500 maps) – for selected areas.
- historic military / ordnance sites
- landfill and waste transfer/treatment or disposal sites (including scrap yards)
- current and recent industrial uses (as defined by PointX data)
- Catalist petrol station
- Part A(1), Part A(2) and Part B Authorisations
- sites determined as Contaminated Land under Part 2A EPA 1990
- Planning Hazardous Substance Consents
- Environment Agency Recorded Pollution Incidents
- Dangerous Substances Inventory Releases (DSI)
- Red List Discharge Consent

The level of risk associated with the property is either Passed or Action Required. If the report result is Action Required it does not necessarily mean that the site is unsuitable for purchase, but only that further assessment of the risk associated with the site is required.

Method Statement

In assessing specific site risk, Groundsure follows principles used extensively throughout the environmental consultancy sector. Our system looks at the potential for specific industries to have generated residual contamination and for this contamination to remain at a site, or to have migrated to neighbouring sites. Sites are scored based on this system and if a site scores highly it indicates a high level of risk.

Limitations of the Study

This report has been prepared with the assumption that the site is in residential use and that no significant (re)development is planned. The screening process reviews historical mapping and a range of current databases. The historical land use database reviewed for this study does NOT include 1:2,500 or 1:1,250 scale maps except for Groundsure's additional information database of selected features namely tanks, energy features, petrol filling stations and garages. This additional information database covers the majority of the UK, but not all. Where 1:2500 or 1:1250 scale maps are utilised all relevant and available map epochs to Groundsure are used. Additionally, this review does NOT include specific enquiries to the Local Authority who may hold additional information and it does NOT include a site visit/inspection. Your attention is drawn to the Terms and Conditions of Groundsure Limited under which this service is provided.

Flood information

The Flood Risk Assessment section is based on datasets covering a variety of different flooding types. No inspection of the property or of the surrounding area has been undertaken by Groundsure or the data providers. The modelling of flood hazards is extremely complex and in creating a national dataset certain assumptions have been made and all such datasets will have limitations. These datasets should be used to give an indication of relative flood risk rather than a definitive answer. Local actions and minor variations, such as blocked drains or streams etc. can greatly alter the effect of flooding. A low or negligible modelled flood risk does not guarantee that flooding will not occur. Nor will a high risk mean that flooding definitely will occur. Groundsure's overall flood risk assessment takes account of the cumulative risk of river, coastal, surface water (pluvial), and groundwater flooding and historic flood events.

Risk of flooding from rivers and the sea
This is an assessment of flood risk for England and Wales produced using local data and expertise, provided by Environment Agency. It shows the chance of flooding from rivers or the sea presented in categories taking account of flood defences and the condition those defences are in. The model uses local water level and flood defence data to model flood risk.

Historic flood events
Over 86,000 events are recorded within this database. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

Surface water flooding
JBA Risk Management surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or "pluvial" flooding. This data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

Proposed flood defences
The data includes all Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards.

Flood storage areas
Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

Groundwater flooding

Groundwater flooding is flooding caused by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within underground structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and it can result in significant damage to property. This risk assessment is based on a 5m Digital Terrain Model (DTM) and a 1 in 100 year return period.

JBA Floodability

The property has been rated as **Green**.

Flood Re is a joint initiative between the Government and insurers. It was set up to help UK residents who are at risk of flooding to obtain flood cover as part of their household insurance. There are several exemptions from the Flood Re scheme including new properties built after 1 January 2009, commercial property, buy to let properties and blocks of flats with four or more units. A full list of exemptions is available on the Flood Re website (https://www.floodre.co.uk/can-flood-re-help-me/eligibility-criteria/).

JBA's Floodability rating provides an indication of the likelihood of a property being ceded into the Flood Re scheme from river, coastal and surface water flood only. It does not consider the many other factors needed for ceding into the Flood Re scheme, nor does it consider the other requirements for obtaining insurance.

The JBA Floodability Index is categorised on a fivefold scale:

Black 2 indicates a level of flood hazard such that standard priced insurance covering flood risk is likely to be subject to increased premiums and non-standard and/or additional terms. There is a very high possibility of insurance companies ceding the property into the Flood Re scheme, especially if the property has flooded in the past.

Black 1 indicates a level of flood hazard such that standard priced insurance covering flood risk is likely to be subject to increased premiums and non-standard and/or additional terms. There is a high possibility of insurance companies ceding the property into the Flood Re scheme, especially if the property has flooded in the past.

Red indicates a level of flood hazard such that standard priced insurance covering flood risk is likely to be subject to increased premiums and non-standard and/or additional terms. There is a moderate possibility of insurance companies ceding the property into the Flood Re scheme particularly if the property has flooded in the past.

Amber indicates a level of flood hazard such that insurance covering flood risk may be available but may be subject to increased premiums and non-standard and/or additional terms. There is a low possibility of insurance companies ceding the property into the Flood Re scheme unless the property has flooded in the past.

Green indicates a level of flood hazard such that insurance covering flood risk may be obtainable relatively easily as part of a standard household insurance contract. There is a very low possibility of insurance companies ceding the property into the Flood Re scheme unless the property has flooded in the past.

N/A indicates that a Floodability rating has not been provided for the property. This is either because the property is a new build and doesn't contain an OS Address Point or the nearest Floodability rating is outside of the 10m search radius. Please contact Groundsure for further assistance.

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- monitor their compliance with the Code

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