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Phase 2 Geoenvironmental Investigation Report For A Proposed Residential Development At William Street Littleborough

On Behalf of Diamora Construction

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1 Introduction

This report presents the findings of an intrusive geoenvironmental Phase 2 investigation undertaken on behalf of Diamora Construction (the 'Client') in relation to the proposed construction of four semi-detached and two detached two-storey residential dwellings, and a detached bungalow, including private residential gardens, an access road and car parking areas, on the site of a former engineering works on Willian Street, Littleborough OL15 8JP.

At the time of this investigation, the site was no longer active, and had been vacated.

A Phase 1 desk study report for the site was previously prepared by Demeter Environmental Ltd, dated November 2020 (Report Ref. 20-11-03), which should be read in conjunction with this report.

Based on the Phase 1 report, the site is anticipated to be underlain by glacial Till above the Pennine Lower Coal Measures. Glacial Till is typically a low permeability clay soil which restricts vertical and horizontal movement of contamination, unless there are buried sand and gravel channels within the deposits, which can allow off-site migration of contamination, such as hydrocarbons and solvents for example.

The earliest use of the site was reportedly a Cotton Mill, which is not particularly contaminative, although coal fired boilers are likely to have been present on the site. The ash from coal combustion to heat water may have been spread across the site.

Some dyestuffs may also have been stored and used on the site, but at the time of the cotton mill operations, dyes were based on natural pigments and coal tar derived chemicals (aniline etc.).

The current owner reported that they have occupied the site since closure of a bakery located on the site, after closure of the earlier cotton mill. The site was operated by the current owner as a workshop used for the maintenance of large timber sawing equipment, but no manufacture of saw machinery was undertaken. There was no reported use of chlorinated solvents for degreasing, and no evidence of such empty drums or containers of such fluids.

Machine lubricants (oil and grease) were used inside the building on a concrete surfacing.

The Phase 1 report identifies on-site tanks in the south-east of the site in front of the compound occupied by a telecoms mast.

It was reported by the landowner that the site was used for a short time by a company that supplied heating oil. The tanks were above ground and located on a concrete slab (probably a tank bund).

The Phase 1 report recommends analysis a soil contamination screening suite based on the previous uses of the site and recommends 9 samples be tested.

It was noted that the soils are likely to comprise shrinkable clays, hence testing for Atterberg Limits was also proposed to determine the minimum founding depth, and also the depth and need for heave precautions from foundations located within the radius of influence of existing trees (whether to remain or be removed).

It was also recommended that samples should also be tested to establish if any special protection measures are required for buried concrete against acid and sulphate attack.

The key objectives of this Phase 2 investigation are to:

- Assess the risks from any known potentially contaminated past or current uses of the site to potential future users of the site, buildings and other environmental receptors such as controlled waters and ecological receptors, from contamination on or beneath the site and surrounding area.
- Provide a remediation options appraisal and preferred strategy to address soil contamination issues.
- Confirm the nature and engineering properties of the soils.
- Discuss appropriate foundation solutions, allowable bearing capacities, potential issues with construction, drainage, and road pavements.
- Identify the key potential constraints to redevelopment of the site due to the ground conditions prevalent beneath the site.
- Provide a report on the findings for submission to the Local Authority Environmental Health Department to assist with satisfying planning conditions relating to potential contamination.

2 Site Location And Description

The site occupies a roughly rectangular area measuring 0.18 hectares with the former Engineering Works building located in the north central part of the site adjacent to William Street.

Additional photographs showing inside the Engineering Works to supplement the Phase 1 report walkover survey are included within Appendix 1 of this report, including the basement.

The site falls from 143.9 metres above Ordnance Datum (AOD) in the north-west corner of the site to 141.78 metres AOD in the south-east corner of the site (a fall of 2.12m), with a fall across the frontage along William Street, from 143.9m AOD in the west to around 142m AOD in the east.

There is a steep bank along the southern half of the eastern site boundary from 141.78m AOD to 139.66m AOD in the south-east corner (a drop of 2.12m).

The level difference across the site is accommodated by a bank running north-south across the site, dividing the site into a lower area occupying the eastern third of the site area, and an elevated area across the western two-thirds of the site.

The level difference is around a metre in the north adjacent to the south-east corner of the engineering works building, where there is a retaining wall to support a rear access, falling to around 0.6m at the southern end of the bank.

There is also a steep site bank along the southern boundary of the site, which is around 1.50 metres to 2.0 metres in height, dropping to the industrial units to the south (rear) of the site.

There is a telecoms mast in the south-east of the site.

The site was overgrown at the time of the investigation, with scattered fly-tipped materials from various sources, and a steel cabin along the western site boundary.

There are a few larger trees locally near the southern boundary and on adjacent property to the west and east, which may potentially impact on the bungalow foundations, but generally the site is covered with brambles, weeds and self-setting saplings.

3 Intrusive Ground Investigation Works

3.1 Scope of Intrusive Ground Investigation Works

The investigation comprised the drilling of 9 No. windowless sampler boreholes (WS1 to WS6a, WS6b, WS6c and WS7) by dynamic sampling methods on 28th January 2022 to depths generally of between 3.45 metres and 5.45 metres below existing ground level (m bgl).

Borehole WS6a, 6b and 6c terminated at 1 metre below existing ground level on an obstruction. It is assumed that this is the base of the former bund of the above ground heating oil storage tanks.

Boreholes WS6a to 6c were located to investigate the ground in the vicinity of the former heating oil tanks, which are located within the rear gardens of the Plots 5 and 6.

Borehole WS1 was positioned to target the north-west corner of the footprints of the proposed row of dwellings to assist with foundation design, and also to target the front garden area of Plots 1 and 2.

Borehole WS2 was located in the proposed rear garden of Plot 7 (the bungalow) to assist with foundation design and for contamination assessment purposes. Borehole WS4 was also positioned to assist with foundation design for the bungalow.

Boreholes WS3, WS5 and WS7 were positioned to assist with both foundation design, and to target proposed residential garden areas.

Standpipes were installed to the base of boreholes WS2, WS3 and WS7 on completion to facilitate groundwater level monitoring, and monitoring for hazardous ground gases.

In situ Standard Penetration Tests (SPTs) were undertaken within the boreholes to assist with the assessment of soil strength and/or relative density, supplemented by pocket penetrometer testing where appropriate.

The site works were supervised by a Chartered Geologist from GeoInvestigations Ltd, who took sub-samples from the boreholes and logged the soil arisings.

The locations of the boreholes are shown on the appended Drawing 591-D-01, and the borehole logs are presented within Appendix 1.

Samples were taken at regular intervals for chemical laboratory and geotechnical laboratory testing. These were stored in appropriate containers provided by the laboratory.

The samples were collected by courier for delivery to the laboratory of i2 Analytical, Daventry.

3.2 Strata Encountered

<u>Made Ground</u>

Made ground was identified in all boreholes to proven depths of between 0.6 metres and 2.0 metres below existing ground level.

Beneath a thin surface layer of roadstone aggregates, the made ground beneath essentially comprises granular made ground materials (sand, gravel and cobbles) with variable percentages of fine soils.

The gravel and cobble content of the made ground includes variable percentages of slag, clinker (i.e. 'ash'), natural rock (mudstone, sandstone, siltstone, limestone, igneous lithologies), quartzite pebbles, brick, concrete, burnt shale and a minor percentage of porcelain locally.

Natural Superficial Deposits

Beneath the made ground, soft grey silty clay with some sandstone gravel, locally with organic matter, considered potentially to represent recent alluvium, was identified within all boreholes except WS7 (and WS6a to 6c), extending from depths of 0.95 metres to 2 metres below existing ground level (m begl).

Below the alluvium, firm and stiffer red-brown fissured clay was proven with occasional to much gravel of various natural lithologies including predominantly angular, sub-angular sandstone, mudstone, and ironstone fragments. These deposits are considered representative of a glacial Till. It is locally soft to firm consistency near the upper surface.

In borehole WS7, gravel was absent from these glacial clay deposits.

There are also deposits considered representative of glaciofluvial materials within borehole WS3, comprising medium dense clayey sand with some angular tabular rock fragments, proven from 2.65m to 3.30m begl.

A lower layer of sand with thin laminations and black speckling of fine coal fragments was also proven in borehole WS3 from 3.65m to 5.40m begl.

At the base of borehole WS2 and WS4 a layer of medium dense orangish brown fine to medium sand was also proven, containing angular sandstone lithorelicts within borehole WS4.

These deposits may potentially be completely weathered sandstone bedrock, or possibility glaciofluvial deposits.

Solid Geology

Deposits considered representative of possible weathered Pennine Coal Measures mudstone were proven in borehole WS2 from 3.20m to 3.60m, comprising stiff friable mid to dark red-brown mottled and streaked grey (fissured) silty to fine sandy clay with black oxide partings, on possible relict bedding planes.

However, this is underlain by sand as described above, hence it may also be of glacial origin.

Borehole WS3 terminated on laminated sandstone, considered representative of the Coal Measures bedrock.

None of the other boreholes were considered to have reached in situ bedrock.

3.3 Groundwater Observations

Groundwater was not detected in any borehole prior to backfilling, or within the standpipe installations on completion of the site works.

Groundwater levels may rise seasonally, or after allowing time for groundwater levels to reach equilibrium after standpipe installation.

3.4 Laboratory Testing

Chemical laboratory analysis was undertaken on 5 selected samples of the made ground, and in accordance with a general contamination screening suite (i2 standard spectrum suite), including: -

Asbestos Screen & ID, pH, TOC, Total Sulphate, Sulphide, Monohydric Phenols, Total Cyanide, W/S Boron, As, Cr, Cr(VI) (4 No.), Cu, Pb, Se, Zn, Cd, Hg, Ni, Speciated PAH (16 USEPA priority compounds), TPH (C_{10}-C_{40}) & TPH CWG (with aromatic/aliphatic split & carbon banding, 'BTEX' and MTBE).

A further three samples of shallow made ground were subject to asbestos screening.

One additional sample of made ground was subject to analysis for pH, toxic heavy metals (as above, including Cr(VI)0, PAHs (16 USEPA priority compounds) and %SOM.

Three selected samples were subject to analysis for volatile organic compounds and TPH CWG analysis (with 'BTEX' and MTBE), selected from the location of above ground fuel tanks, the sample at the base of the made ground in WS5 (1.80m to 2.00m), and one other general sample from the base of made ground within borehole WS2.

Five made ground samples were subject to analysis in accordance with the full BRE SD1 suite to assist with assessment of protection requirements for buried concrete against acid and sulphate attack.

Five representative samples of the natural soils were also subject to pH, and water-soluble sulphate analysis to establish if protection requirements against acid and sulphate attack are required for buried concrete.

Five samples of the clay soils were subject to plasticity index testing and natural moisture content determination, to confirm the volume change potential and shrink/swell potential.

Three samples of natural granular soils were also subject to particle size distribution analysis to confirm classification.

The laboratory test certificates are presented in Appendix 2 and Appendix 3 for chemical laboratory testing and geotechnical testing respectively.

4 Contamination Assessment

4.1 Assessment Criteria

The contamination test data for the soils have been compared against published 'Tier 1' generic assessment criteria (GAC), for a 'residential with home grown produce' land use.

The Tier 1 GAC's adopted in the first instance comprise the LQM/CIEH S4ULs (Suitable For Use Screening Levels) for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication No. S4UL3429. All rights reserved).

The S4ULs currently exclude Lead, hence the Defra approved Category 4 Screening Levels[1] (C4SLs) have been adopted. For the proposed development, the C4SL for a 'residential with home grown produce' land use is relevant, for which 200 mg/kg is considered acceptable for total Lead in soil.

On the 19th April 2021, the Environment Agency updated their Land Contamination Risk Management (LCRM) guidance, advising that the C4SLs are suitable for the assessment of land contamination under the planning regime, as well as for Part 2A assessments. They also state that where there is a Soil Guideline Value (SGV) and a C4SL value, the C4SL value should be adopted for the assessment.

The S4ULs are more conservative than the C4SLs, and have been adopted in the first instance, as a conservative screening tool to identify potential contaminants of concern. Where a S4UL is exceeded, the C4SL value is consulted to establish if remedial works may be necessary, or further detailed site-specific risk assessment to derive a development specific assessment criterion.

A peer reviewed in house generic assessment criteria of 40 mg/kg has been adopted for total cyanide for screening purposes.

Where a determinand exceeds one or more GAC, further consideration of the risk is required to establish if remedial works are required. This can include statistical analysis of the soils, supported by further sampling and analysis were appropriate.

4.2 Soil Chemical Contamination Test Results

The appended Table A presents all the soil chemical test results and the adopted generic assessment criteria (GAC) for each determinand. Samples exceeding one or more GAC are highlighted.

The table below is an extract from Table A which presents a summary of the results that exceed their respective GACs.

[1] CL:AIRE. SP1010. 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.' 20.12.13.

William Street, Littleborough		WS1	WS2	WS3	WS4	WS5	WS5	WS6a	WS6c	GAC [1]
Summary of Results Exceeding GACs	Depth, m begl -->	0.20-0.40	0.30-0.40	0.25-0.40	0.00-0.20	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00	Residential with home grown produce
Determinand	**Unit**									
%Soil Organic Matter		5.70%	3.10%	6.50%	16.50%	3.30%			5%	
Arsenic (As)	mg/kg	20	50	84	13	29	-	-	26	37
Copper (Cu)	mg/kg	96	120	230	350	67	-	-	110	2,400
Lead (Pb)	mg/kg	1500	290	120	180	330	-	-	250	200
Naphthalene	mg/kg	37 (13)	0.74	7.1 (13)	0.78	< 0.05	-	-	1.9	2.3
Phenanthrene	mg/kg	390 (440)	16	150 (440)	5.2	1.7	-	-	19	95
Fluoranthene	mg/kg	420 (890)	11	140	6.7	2.6	-	-	33	280
Benzo(a)anthracene	mg/kg	180 (13)	4.9	74 (13)	4.1	1.7	-	-	18 (11)	7.2
Chrysene	mg/kg	160 (27)	4.2	56 (27)	3.3	1.3	-	-	15 (22)	15
Benzo(b)fluoranthene	mg/kg	160 (3.7)	3.2 (3.3)	48 (3.7)	3.2 (3.7)	1.3	-	-	18 (3.3)	2.6
Benzo(a)pyrene	mg/kg	120 (5)	2.7 (5)	53 (5)	3.3 (5)	1.4	-	-	14 (5)	5
Indeno(1,2,3-cd)pyrene	mg/kg	64 (41)	2	24	1.9	0.87	-	-	8.2	27
Dibenz(a,h)anthracene	mg/kg	18 (0.3)	0.64 (0.28)	6.9	0.48	0.22	-	-	2.2 (0.28)	0.24
Aromatic >C16 - C21	mg/kg	-	24	520 (930)	42	50	350	370 (540)	170	260

[1] GAC = LQM/CIEH S4ULs SOM 1%
Numbers in brackets are the GAC at the appropriate %Soil Organic Matter

The above results show that all of the six samples of made ground tested show elevated toxic heavy metals. Results highlighted in green are considered to present a potential risk to new planting.

Five of the six samples tested also show one or more elevated polycyclic aromatic hydrocarbons (PAH's).

This would be expected within soils containing ashy made ground, including fragments of clinker and slag typically associated with boiler ashes and foundry wastes.

It is not possible to define a specific area of the site free from these deposits, which are generally ubiquitous.

One of the eight samples analysed for petroleum hydrocarbons (TPH CWG) shows elevated aromatic fraction >C_{16}-C_{21} hydrocarbons. This was taken from borehole WS5 (1.80m to 2.0m) from the material at the base of the made ground having a faint odour of aged diesel.

This is based on an assumed 1% soil organic matter content in the absence of an analysis for soil organic matter.

No other samples displayed any visual or olfactory evidence of hydrocarbon impact, although there is evidence of residual petroleum hydrocarbons present below the GAC in several of the samples. A summary of all the total PAH and TPH CWG results is presented below.

		WS1	WS2	WS3	WS4	WS5	WS5	WS6a	WS6b	WS6c	No.	Range	
	Depth, m begl -->	0.20-0.40	0.30-0.40	0.25-0.40	0.00-0.20	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00	0.00-1.00		Min	Max
Determinand	**Unit**												
Total EPA-16 PAHs	mg/kg	2270	67.7	832	41.3	15.9	-	-	-	180	6	15.9	2270
Total Aromatic and Aliphatic	mg/kg		282	1650	740	440	1490	1056	710	740	8	282.0	1650

None of the samples tested for asbestos (8 No.) were found to contain any, and none of the three samples of volatile organic compounds were found to contain such compounds above detection limit.

4.3 Remediation Strategy and Verification Plan

The layers of imported ashy made ground across the site contain widespread elevated toxic heavy metals and a number of PAH compounds.

Such material is not considered suitable for location at shallow depth beneath residential garden areas.

It is not considered feasible to identify specific areas of the site where the made ground is not contaminated, hence all the made ground is considered potentially contaminated.

There are two options for addressing the contaminated layer: -

1) Strip the impacted made ground from the proposed soft landscaped garden areas and replace with imported subsoil and topsoil materials.

2) Leave the contaminated made ground layer in situ and place a cover layer of imported subsoil and topsoil to a depth of 600mm.

A combination of the two options is also acceptable if proposed site levels can be raised, but by less than 600mm.

Topsoil will be required to be imported to provide a suitable growth medium, and subsoils to restore levels beneath the topsoil layer.

The imported subsoil and topsoil should ideally be obtained from 'greenfield' sources. Other materials from non-greenfield sources such as other brownfield sites, or soil recycling centres is discouraged and attract a higher degree of risk of rejection on import and increased testing frequency.

The source of the subsoil and topsoil should be recorded along with the nature of the source site (i.e. greenfield, brownfield, recycled/manufactured, previously remediated), and chemical testing appropriate to the known uses of the source material site and nature of the soils should be undertaken.

The standard chemical contamination suite should include as a minimum pH, asbestos screening, toxic heavy metals and metalloids, speciated polycyclic aromatic hydrocarbons (PAH's), and speciated petroleum hydrocarbons. Other determinands should also be selected, based on the known usage of the source site.

Testing of the soils may be undertaken at source but testing after import is mandatory.

The chemical test results should be compared against published generic assessment criteria (GAC) for a residential use with consumption of home-grown vegetables as identified within Section 4.1 above.

The frequency of testing depends on the nature of the source site, whether it is natural topsoil from a greenfield site, a brownfield site, recycled (i.e. manufactured by screening and blending of material from a variety of sources).

As advised above, recycled/manufactured soil is not recommended for import to a residential site as it can contain materials from a large variety of unknown sources blended together. It is heterogeneous in nature and batches vary in quality and consistency is similarly variable.

Topsoil should also comply with the British Standard Specification for topsoil, BS3882:2015 and not exceed 300mm in thickness, but should be at least 200mm deep.

The following sampling frequencies for imported soils should be adopted;

- Greenfield soils and topsoil manufactured using natural materials: minimum of three or 1 per 250m^3 (whichever is greater).
- Brownfield/screened soils: minimum of six or 1 per 100m^3 (whichever is greater).

Imported topsoil materials should be stockpiled separately to await validation sampling and assessment of the results prior to placement within the required areas.

Records of the site strip and topsoil importation is required including: -

- Details of the imported material source sites and tonnages imported.
- Chemical test certificates from an accredited laboratory for materials imported to the site.
- Assessment of the chemical test data for the imported topsoil.
- Photographs showing the stripped soft landscaped garden areas, with depth measurements from string lines at proposed top of topsoil level down to base of excavation, at 5m intervals across the excavation, to confirm depth of excavation.
- Excavation of two hand dug pits in each rear garden to area to confirm thickness of imported sub-soil and topsoil materials, and to obtain samples for testing if not already undertaken on imported stockpiled material.

Excavation into the root protection zone of any trees to remain will cause damage to the tree, as does raising levels. Hence excavation using techniques that do not damage the tree roots must be adopted in these areas, including either hand excavation, vacuum extraction and water jetting, or compressed air-blade excavation.

Placing topsoil and sub-soil on the steep bank in the south-east of the site requires consideration, as slippage of the soils may occur if the slope is too steep, and hence terracing/retaining walls may be required.

Based on the available petroleum hydrocarbon test results protection for water supply pipes should be adopted, (e.g. 'Protecta-line' or similar barrier pipe), subject to the approval of the water supply authority.

A watching brief is advised during the removal of the existing building floor slab for potential contamination not already identified, including potential asbestos containing material used within sub-base, or any odourous materials (diesel or solvent), oil staining or any other unusually coloured or stained soils.

If any such odours or suspect materials is identified during demolition or construction, the contractor should stop work and inform the construction project manager.

A geoenvironmental consultant should also be instructed to attend the site to inspect the suspect material and an assessment of the need for any further remedial measures undertaken.

An asbestos survey is required prior to demolition of the existing building.

4.4 Hazardous Ground Gases

The Phase 1 report did not identify any potential sources of hazardous ground gases beneath the site, or within the surrounding area.

However, as the made ground beneath the site exceeds a thickness of 1.0 metre, it is considered appropriate to undertake hazardous ground gas monitoring in accordance with the guidance presented within British Standard BS 8576:2013, 'Guidance on Investigations of Ground Gas'.

A minimum of 6 gas monitoring visits is recommended to determine the concentrations of methane, carbon dioxide, oxygen, carbon monoxide, and hydrogen sulphide. In additional, gas flow rates, barometric pressure, differential pressure, and groundwater levels should be measured.

Alternatively, subject to the approval of the Local Authority, adoption of basic gas protective measures meeting NHBC Amber 1 conditions for the dwellings may be installed and independently verified without undertaking hazardous ground gas monitoring.

4.5 Controlled Waters Risk Assessment

Groundwater was not proven in any of the boreholes hence the groundwater table lies at depth within the Coal Measures strata beneath the site.

Downward migration of leachable contaminants within the made ground is severely restricted by the presence of low permeability clay soils beneath the made ground, and a deep unsaturated zone.

The glacial Till is a Secondary (undifferentiated) aquifer, and the bedrock is a Secondary 'A' aquifer. The groundwater within these aquifers is of 'Low' vulnerability.

The site lies outside any Source Protection Zones for groundwater abstractions.

The nearest surface water course is located 32 metres south-west of the site (Featherstall Brook).

The surface water is not considered at unacceptable risk from surface run-off or migration of contamination within groundwater given the distance and nature of strata between the site and the brook.

After development, infiltration will be reduced through the construction of drained hard surfacing and building footprints, which will in turn further reduce the risk to groundwater and surface water.

5 Engineering Considerations

5.1 Soil Engineering Properties

As clay (i.e. shrinkable) soils are present beneath the site, the depth of foundations and need for heave precautions will be influenced by the proximity to any trees, the water demand and the mature height of the trees.

It must be assumed that trees that are not removed may in future grow to their full height, causing further shrinkage, but also may die or be removed in future, resulting in swelling/heave.

Foundations taken deeper than 1.50 metres below existing ground levels are also assumed to potentially cut through roots, which can result in heave within the building footprint.

All trees and other significant vegetation within the radius of influence of proposed foundations should be taken into account whether to remain, be removed or have been removed recently.

The depth of foundations and need for heave precautions should be taken into account by the structural engineer when designing foundations. It is advised that the recommendations of NHBC Chapter 4.2 guidance be adopted in this respect.

In order to establish the volume change potential of the soils, five selected representative samples were subject to plasticity index testing.

The plasticity index test results have been modified in accordance with NHBC guidance to take into account the percentage of coarse material present within the soil, not passing through the 425 micron sieve.

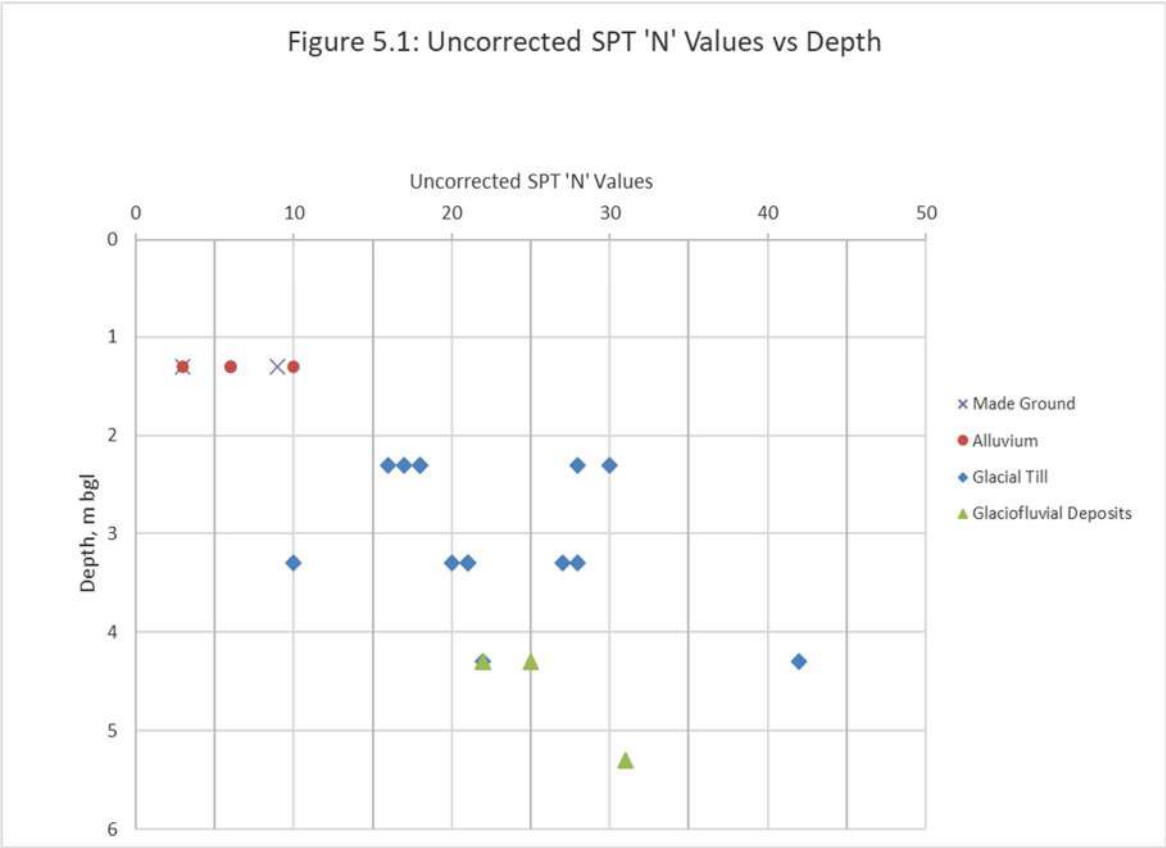
The samples analysed included two samples of the alluvial clay, two samples of the glacial Till and one of a borderline glacial clay and glacial sand.

The maximum modified plasticity index was 21.8% for a sample of the glacial Till.

In accordance with the guidance presented within NHBC Chapter 4.2, the worse-case result should be adopted, hence the soils beneath the site should be classified as 'Medium' volume change potential. On this basis, a minimum foundation depth of 0.90 metres below existing ground level, or proposed ground level (whichever results in the greater depth), is required.

A tree survey is recommended to identify all relevant vegetation within the radius of influence of the proposed foundations.

Figure 5.1 below presents the uncorrected Standard Penetration Test (SPT) 'N' values plotted against depth for the soils.



5.2 Foundations and Floor Slabs

Figure 5.1 above shows that loose fill and soft alluvial clay extends to a depth of between 1.50m to 2.00m below existing ground level.

Examination of the borehole logs indicates that the firm and stiffer glacial Till is reached at the followings depths within each borehole:

WS1: 1.75m
WS2: 2.00m
WS3: 1.60m
WS4: 2.00m
WS5: 2.00m
WS7: 1.55m

Apart from one of the Standard Penetration Test (SPT) results for the glacial Till, the majority of the SPT 'N' values exceed 16. There is one 'N' value of 10 for the glacial Till at 3.0m below ground level in borehole WS7, where there are occasional softer bands.

In accordance with CIRIA publication C504 'Engineering in glacial tills' (1999) provide a correlation of mass undrained shear strength of clay, c_u ,with SPT N value, where.

$c_u = 5.2 \times N$

On this basis, an 'N' value of 10 would give an undrained shear strength of 52 kPa.

The adoption of an undrained shear strength of 52 kPa for the glacial clay deposits beneath the site gives a net allowable bearing pressure of 120 kPa for a 600mm wide foundation at 1.5 metres below existing ground level.

Foundations may potentially require further deepening locally due to the presence of trees within the radius of influence of the proposed building. Foundation depths and the need for heave precautions should be determined in accordance with the NHBC guidance Chapter 4.2, based on the findings of the tree survey.

Suspended floor slabs are recommended due to the thickness of the made ground beneath the site.

Groundwater inflows are not anticipated generally, but if there are inflows they would be expected to slow seepages associated with localised perched water at the base of the made ground.

Excavations are anticipated to remain largely open in the short term, but any excavations through non-engineered made ground may be prone to localised collapse, and hence some overbreak may occur.

Trial trenches excavated through the made ground are advised to establish the stability of excavations through the made ground, but at this stage an allowance for the provision of support of the excavation sides to minimise local collapse of loose made ground is advised.

There is a single height basement within the central part of the existing building, which requires consideration in relation to the construction of new foundations that should be taken through the base of the existing basement floor slab onto the natural ground beneath.

New foundations should be taken through any existing foundations and floor slabs to bear on natural strata beneath.

5.3 Buried Concrete Protection Requirements

Both natural soil and made ground show elevated water soluble sulphate concentrations up to 740 mg/l, generally with neutral to alkaline pH conditions (lowest pH of 6.8 units).

On the basis of all the available results for soil and groundwater, the site falls into Design Sulphate Class 'DS-2' with an Aggressive Chemical Environment for Concrete (ACEC) classification of 'AC-2', in accordance with BRE Special Digest 1:2005, 'Concrete in aggressive ground', assuming mobile groundwater.

There is no evidence of elevated oxidisable sulphides as a result of the presence of pyrite within the natural ground or made ground.

5.4 Soil Infiltration Potential

Soakaways are not considered to provide a suitable option for the disposal of surface/storm water from the site as the predominant strata is clay.

Although there are sand beds, these are localised and deep hence unlikely to provide a viable solution as the lateral extent of these deposits is unknown and these bodies may be isolated bodies within the clays.

5.5 Waste Disposal

All surplus arising from excavations are considered wastes, whether contaminated or uncontaminated, natural or man-made, and should be disposed of at a facility licensed or permitted to accept the wastes.

It is recommended that the results of this intrusive investigation be forwarded to a local waste disposal contractor or waste disposal facility operator to confirm the waste classification and cost of disposal.

The concentrations of hydrocarbons, polycyclic aromatic hydrocarbons and metals suggest that the made ground may be potentially classified as hazardous waste.

Under the waste regulations there is a need to pre-treat hazardous wastes prior to disposal, and this can be achieved by separation of hazardous from non-hazardous, hence there should be an attempt to separate the ashy made ground from the natural soils beneath.

The two material types should be placed in separate stockpiles and subject to sampling and testing to confirm the waste classification.

6 Key Recommendations

This investigation has identified a layer of contaminated made ground across the site, containing ashy material with elevated toxic and phytotoxic heavy metals (arsenic, lead, and copper), PAH compounds and petroleum hydrocarbons locally.

It is recommended that all the made ground be stripped from proposed soft landscaped areas and replaced with imported proven acceptable sub-soil and topsoil to provide a 600mm cover system.

No volatile organic compounds have been identified hence no protection to prevent ingress of volatile organic compounds into new buildings is required.

Hazardous ground gas monitoring is recommended as the made ground exceeds a thickness of 1.00 metre. With the agreement of the Local Authority, it may be acceptable to install basic ground gas protection within buildings to meet NHBC Amber 1 conditions without undertaking any hazardous ground gas protection measures.

Stripping/excavation within any root protection zones of trees that are to remain requires further consideration to avoid damage to trees.

The remedial works will require inspection and verification by a geoenvironmental consultant.

The surplus made ground material may exceed the limits for hazardous landfills. It is recommended that the results of this intrusive investigation be forwarded to a local waste disposal contractor or waste disposal facility operator to confirm the waste classification and cost of disposal of surplus soils.

Shallow strip foundations are considered appropriate for the site, with a net allowable bearing pressure of 120 kPa for a 600mm wide foundation at the minimum anticipated foundation depth of 1.50 metres below existing ground level.

At this stage, an allowance for the support of foundation excavations is recommended through the made ground. Excavation of trial foundation excavation trenches is advised to enable an assessment of the support requirements for foundation excavations, which will be required to reach 2 metres below existing ground level.

Suspended floor slabs are required due to the thickness of the made ground.

The advice of an arboriculturist is required to establish the species and water demand of the trees (existing and recently removed) within the radius of influence of foundation, to enable the foundation depths to be determined in accordance with NHBC guidance, Chapter 4.2.

The arboriculturist should also be able to advise on appropriate measures required to protect proposed new foundations that are close to the trees within the hedgerows from root damage.

Protection for buried concrete protection against acid soils is required, and concrete mixes should be designed to meet DS-2/AC-2 conditions (BRE SD1).

The ground conditions are not considered appropriate for soakaways.

TABLES

William Street, Littleborough

TABLE A: Summary of Soil Chemical Laboratory Test Results

William Street, Littleborough		2158349	2158350	2158351	2158352	2158353	2158354	2158355	2158356	2158357	2158358	2158359	2158360	2158361		Range		GAC [1]
		WS1	WS2	WS2	WS3	WS4	WS4	WS5	WS5	WS6a	WS6b	WS6c	WS7	WS7	No.			
TABLE A: Soil Chemical Test Results	Depth, m begl -->	0.20-0.40	0.30-0.40	0.75-0.95	0.25-0.40	0.00-0.20	1.80-2.00	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-0.10	0.40-0.50		Min	Max	Residential with home grown produce
Determinand	**Unit**																	
Asbestos in Soil Screen / Identification Name	**Type**																	
Asbestos in Soil	**Type**	Not-detected	Not-detected	-	Not-detected	Not-detected	-	Not-detected	-	-	-	Not-detected	Not-detected	Not-detected	8			
Asbestos Quantification (Stage 2)	**%**																	
Asbestos Quantification Total	**%**																	
pH	pH Units	8	10	7.8	7.3	7.1	7.4	8	9.5	-	8.5	8.1	-	7.9	11	7.1	10	6-9
Total Cyanide	mg/kg	-	< 1.0	-	< 1.0	1	-	< 1.0	-	-	-	< 1.0	-	-	5	<1	1	40
Total Sulphate as SO_4	mg/kg	-	2400	-	1500	1000	-	590	-	-	-	640	-	-	5	590.0	2400	
Total Sulphate as SO4	%	-	-	0.063	-	-	0.025	0.059	-	-	0.104	-	-	0.064	5			
W/S Sulphate as SO_4 (2:1)	g/l	-	0.74	0.047	0.25	0.016	0.033	0.024	0.4	-	0.11	0.023	-	0.019	10	0.016	0.74	
W/S Sulphate as SO_4 (2:1)	mg/l	-	-	46.8	-	-	32.6	24.1	-	-	115	-	-	18.6	5	18.6	115	
Sulphide	mg/kg	-	17	-	3.9	2.6	-	2.5	-	-	-	10	-	-	5	2.5	17	
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	-	-	2.6	-	-	2.1	3.3	-	-	11	-	-	2.2	5	2.1	11	
Total Sulphur	mg/kg	-	-	0.069	-	-	0.017	0.034	-	-	0.074	-	-	0.039	5	0.0	0.074	
Ammonical Nitrogen as NH4	mg/kg	-	-	< 0.5	-	-	< 0.5	< 0.5	-	-	1	-	-	< 0.5	5	<0.5	1	
Ammonium as NH4 (10:1 leachate equivalent).	mg/l	-	-	< 0.05	-	-	< 0.05	< 0.05	-	-	0.1	-	-	< 0.05	5	<0.05	0.1	
Organic Matter (auto)	%	5.7	-	-	-	-	-	-	-	-	-	-	-	-	5	5.7	5.7	
Total Organic Carbon (Auto)		-	1.8	-	3.8	-	-	1.9	-	-	-	2.9	-	-	5	1.8	3.8	
Total Organic Carbon (Manual)		-	-	-	-	9.6	-	-	-	-	-	-	-	-				
Water Soluble Nitrate (2:1) as N, (leachate equivalent)	mg/l	-	-	< 2.0	-	-	< 2.0	< 2.0	-	-	3.5	-	-	< 2.0	5	3.5	3.5	
Arsenic (As)	mg/kg	20	50	-	84	13	-	29	-	-	-	26	-	-	6	13.0	84	37
W/S Boron	mg/kg	0.4	0.2	-	0.4	2	-	< 0.2	-	-	-	0.4	-	-	6	0.2	2	290
Cadmium (Cd)	mg/kg	< 0.2	< 0.2	-	< 0.2	2.1	-	1.1	-	-	-	< 0.2	-	-	6	1.1	2.1	11
Chromium (hexavalent)	mg/kg	< 1.2	< 1.2	-	< 1.2	-	-	< 1.2	-	-	-	< 1.2	-	< 1.2	6	<4.0	<4.0	6
Chromium (Cr)	mg/kg	15	26	-	26	31	-	49	-	-	-	25	-	-	6	15.0	49	910
Copper (Cu)	mg/kg	96	120	-	230	350	-	67	-	-	-	110	-	-	6	67.0	350	2,400
Lead (Pb)	mg/kg	1500	290	-	120	180	-	330	-	-	-	250	-	-	6	120.0	1500	200
Mercury (Hg)	mg/kg	< 0.3	< 0.3	-	< 0.3	< 0.3	-	< 0.3	-	-	-	< 0.3	-	-	6	0.0	0.0	40
Nickel (Ni)	mg/kg	32	49	-	72	46	-	20	-	-	-	49	-	-	6	20.0	72	180
Selenium (Se)	mg/kg	< 1.0	< 1.0	-	< 1.0	< 1.0	-	3.2	-	-	-	< 1.0	-	-	6	<1	<1	250
Zinc (Zn)	mg/kg	55	200	-	130	300	-	130	-	-	-	200	-	-	6	55.0	300	3,700
Magnesium (water soluble)	mg/kg	-	-	8.9	-	-	12	12	-	-	< 5.0	-	-	7.7	5	7.7	12	
Magnesium (leachate equivalent)	mg/l	-	-	4.5	-	-	5.9	5.9	-	-	< 2.5	-	-	3.9	5	3.9	5.9	
Total Phenols (monohydric)	mg/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	-	-	-	< 1.0	-	-	5	0.0	0	280
Naphthalene	mg/kg	37	0.74	-	7.1	0.78	-	< 0.05	-	-	-	1.9	-	-	6	0.7	37.0	2.3
Acenaphthylene	mg/kg	< 0.05	< 0.05	-	1.5	< 0.05	-	< 0.05	-	-	-	0.25	-	-	6	0.3	1.5	170
Acenaphthene	mg/kg	79	3.1	-	24	0.89	-	0.22	-	-	-	3.2	-	-	6	0.2	79	210
Fluorene	mg/kg	65	2.8	-	26	0.71	-	< 0.05	-	-	-	2.3	-	-	6	0.7	65	170
Phenanthrene	mg/kg	390	16	-	150	5.2	-	1.7	-	-	-	19	-	-	6	1.7	390	95
Anthracene	mg/kg	88	2.7	-	25	1.1	-	0.39	-	-	-	3.2	-	-	6	0.4	88	2400
Fluoranthene	mg/kg	420	11	-	140	6.7	-	2.6	-	-	-	33	-	-	6	2.6	420	280
Pyrene	mg/kg	350	10	-	130	5.9	-	2.4	-	-	-	27	-	-	6	2.4	350	620
Benzo(a)anthracene	mg/kg	180	4.9	-	74	4.1	-	1.7	-	-	-	18	-	-	6	1.7	180	7.2
Chrysene	mg/kg	160	4.2	-	56	3.3	-	1.3	-	-	-	15	-	-	6	1.3	160	15
Benzo(b)fluoranthene	mg/kg	160	3.2	-	48	3.2	-	1.3	-	-	-	18	-	-	6	1.3	160	2.6
Benzo(k)fluoranthene	mg/kg	59	1.4	-	37	1.7	-	0.79	-	-	-	4.4	-	-	6	0.8	59	77
Benzo(a)pyrene	mg/kg	120	2.7	-	53	3.3	-	1.4	-	-	-	14	-	-	6	1.4	120	2.2
Indeno(1,2,3-cd)pyrene	mg/kg	64	2	-	24	1.9	-	0.87	-	-	-	8.2	-	-	6	0.9	64	27
Dibenz(a,h)anthracene	mg/kg	18	0.64	-	6.9	0.48	-	0.22	-	-	-	2.2	-	-	6	0.2	18	0.24
Benzo(ghi)perylene	mg/kg	77	2.3	-	27	2.1	-	0.96	-	-	-	8.7	-	-	6	1.0	77	320
Total EPA-16 PAHs	mg/kg	2270	67.7	-	832	41.3	-	15.9	-	-	-	180	-	-	6	15.9	2270	
TPH C_{10}-C_{40}	mg/kg	-	350	-	1700	1000	-	670	-	-	-	880	-	-	5	350.0	1700	
Benzene	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	0.087
Toluene	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	130
Ethylbenzene	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	47
p & m-xylene	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	56
o-xylene	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	60
MTBE	ug/kg	-	< 1.0	-	< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	-	8	<1	<1	
Aliphatic >C5 - C6	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	42
Aliphatic >C6 - C8	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	100
Aliphatic >C8 - C10	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	27
Aliphatic >C10 - C12	mg/kg	-	< 1.0	-	3.9	< 1.0	-	< 1.0	5	2	< 1.0	< 1.0	-	-	8	2.2	5	130
Aliphatic >C12 - C16	mg/kg	-	12	-	5.5	< 2.0	-	< 2.0	120	5	11	9	-	-	8	5.1	120	1100
Aliphatic >C16 - C21	mg/kg	-	35	-	20	16	-	15	300	8	17	19	-	-	8	8.2	300	65000
Aliphatic >C21 - C34	mg/kg	-	160	-	220	470	-	120	260	41	80	110	-	-	8	41.0	470	65000
Total Aliphatic (C5 - C34)	mg/kg	-	200	-	250	490	-	140	690	56	110	140	-	-				
Aromatic >C5 - C7	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	70
Aromatic >C7 - C8	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	130
Aromatic >C8 - C10	mg/kg	-	< 0.001	-	< 0.001	< 0.001	-	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	-	8	0.0	0	34
Aromatic >C10 - C12	mg/kg	-	< 1.0	-	17	< 1.0	-	< 1.0	1.2	19	1.5	4	-	-	8	1.2	19	74
Aromatic >C12 - C16	mg/kg	-	16	-	120	< 2.0	-	< 2.0	71	98	18	27	-	-	8	16.0	120	140
Aromatic >C16 - C21	mg/kg	-	24	-	520	42	-	50	350	370	190	170	-	-	8	24.0	520	260
Aromatic >C21 - C35	mg/kg	-	43	-	710	210	-	250	370	530	390	400	-	-	8	43.0	710	1100
Total Aromatic (C5 - C35)	mg/kg	-	82	-	1400	250	-	300	800	1000	600	600	-	-				
Total Aromatic and Aliphatic	mg/kg		282		1650	740		440	1490	1056	710	740			8	282.0	1650	

[1] GAC = LQM/CIEH S4ULs SOM 1%

DRAWINGS

0 10m 20m 30m 40m 50m 100m

SCALE BAR



Station	Easting	Northing	Level
STN1	393194.080	416125.219	141.969
STN2	393162.142	416122.354	143.723
STN3	393161.530	416095.073	143.660
STN4	393195.365	416101.131	142.218

NOTES

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Rev	Date	Details
01	06.10.20	General Revision

Drawing Status:

PRELIMINARY

PROGRESSIVE

Progressive Architecture,
4 Lewisham Road, Slaithwaite, West Yorkshire, HD7 5AL. Tel: 01484 846786

Client:

Dimora Construction

Site:

William Street
Littleborough OL15 8JP

Drawing Title:

Location Plan

Project Number:	Drawing Number:	Revision:
P1018	01	01
Date:	Scale:	Drawn:
10-07-19	1:1250 @ A4	IWW



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Rev	Date	Details

Drawing Status:

PRELIMINARY

PROGRESSIVE

Progressive Architecture,
4 Lewisham Road, Slaithwaite, West Yorkshire, HD7 5AL. Tel: 01484 846786

Client:

Dimora Construction

Site:

William Street
Littleborough OL15 8JP

Drawing Title:

Existing Site Plan

Project Number:	Drawing Number:	Revision:
P1018	02	-
Date:	Scale:	Drawn:
17-12-20	1:200 @ A3	IWW



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FINISHES KEY

- 600x600 PERMEABLE PAVING
- PERMEABLE DECORATIVE PAVING / TILING TO ENTRANCE DOORS
- PERMEABLE HERRINGBONE INTERLOCK TO DRIVEWAYS
- TARMAC – 232m2
- PRIVATE GARDEN – SEEDED GRASS
- PUBLIC GREEN SPACE – LOW MAINTENANCE SHRUBS
- 1.8m HIGH TIMBER GARDEN FENCE WITH MATCHING TIMBER GATES
- 2m HIGH SOLID TIMBER FENCE
- 0.45m HIGH BRICK WALL
- 0.9m HIGH BRICK WALL
- 142.39 EXISTING LEVEL
- +142.40 PROPOSED LEVEL / FINISHED FLOOR LEVEL

Rev	Date	Details
04	11.11.21	Vehicle Entrance Widened
03	22.06.21	Boundary fence and plot 7 amended
02	21.10.20	General Revision
01	06.10.20	General Revision

Drawing Status:

PRELIMINARY

PROGRESSIVE

Progressive Architecture,
4 Lewisham Road, Slaithwaite, West Yorkshire, HD7 5AL. Tel: 01484 846786

Client:

Dimora Construction

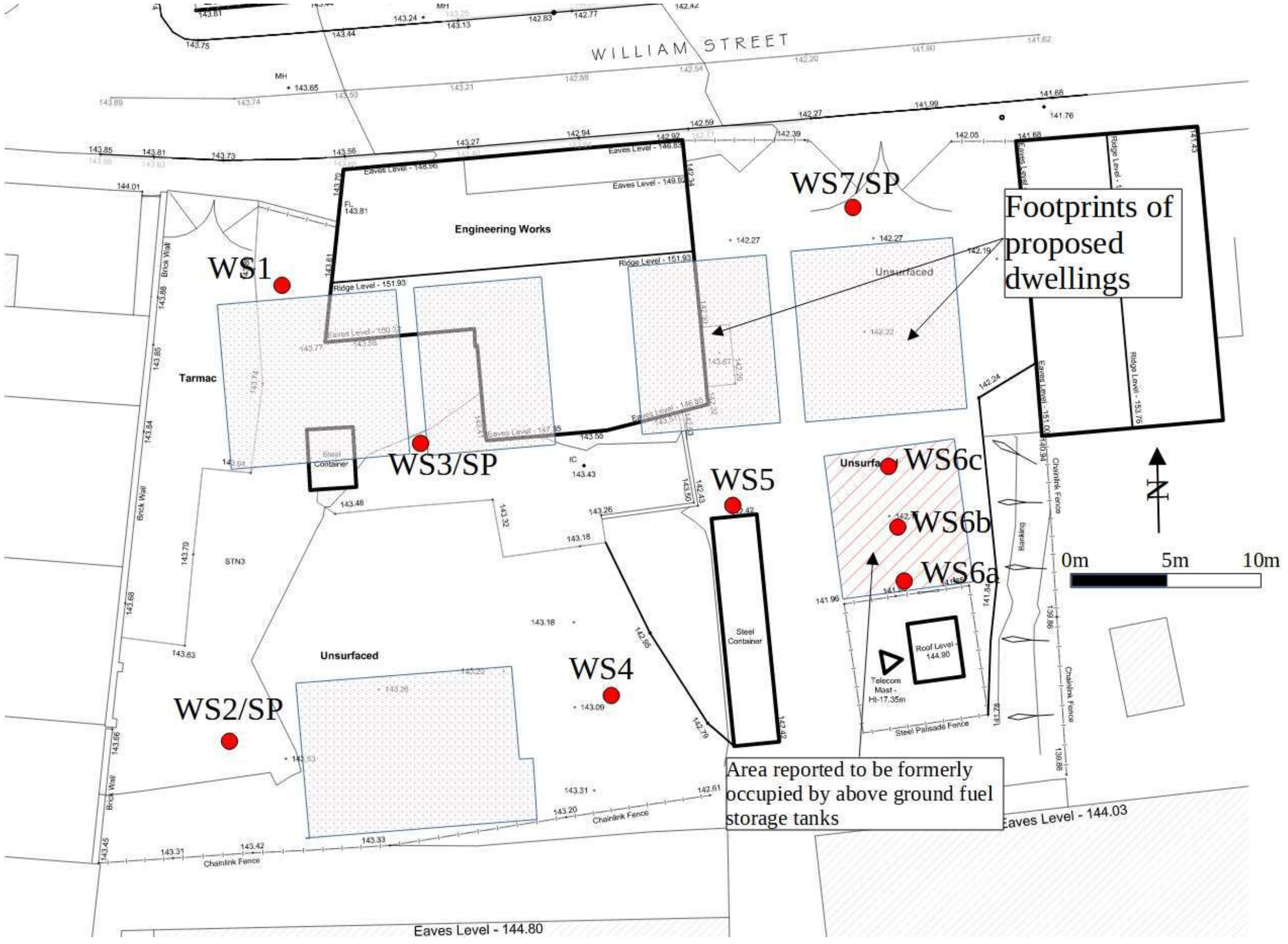
Site:

William Street
Littleborough OL15 8JP

Drawing Title:

Site Plan

Project Number:	Drawing Number:	Revision:
P1018	05	04
Date: 10-07-19	Scale: 1:200 @ A3	Drawn: JCM



Notes

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KEY

- WS1 to WS7 Windowless Sampler Borehole Locations 28.1.22

SP = Standpipe Installation

REV	DATE	AMENDMENT	BY

GeoInvestigations Ltd

paul@geoinvestigations.co.uk

CLIENT

Diamora Construction

PROJECT

William Street, Littleborough

TITLE

Borehole Location Plan

Date	Drawn by:
Feb 2022	PJP

Scale	Size	Checked	Apprvd
NTS			PJP

DRAWING No. 591-D-01

Rev

APPENDIX 1

Exploratory Hole Logs

GeoInvestigations
9 Greenlands Business Centre
Studley Road
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B98 7HD
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Borehole Logging Record :WS1

GeoInvestigations

DRILLING DETAILS

Drilling Company: P&J Drilling

Drilling Method: WS

Drilling Date: 28th January 2021

Location: William Street, Littleborough

Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)

Bore Diameter: (mm)

TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
1		0.00		MG: Soft brown very gravelly clay with many rootlets, Gravel is medium to coarse angular 'roadstone' aggregate (dark fine grained limestone and/or dolerite).			
		0.50		MG: Dark grey, black and dark orange-brown mottled sand and gravel of mainly fine to medium with a little coarse slag (black, low density, vesicular), a little to some greenish grey fine grained sandstone, fine red brick, medium yellow sandstone and a cobble of light grey sandstone, stained orange-brown.			
2		1.00		MG: Firm friable dark brown very silty clay with a little fine to medium slag.		0,0,1,2,1,2 (6)	
				Firm friable mid to grey silty CLAY.			
3		1.50		Soft orange mottled light grey plastic CLAY with rare gravel including rounded grey mudstone, medium weak yellow sandstone and fine angular light grey sandstone. (ALLUVIUM).			
		2.00		Stiff, fissured, red-brown CLAY with some to much fine to medium gravel of angular to subangular rusty orange-brown ironstone, grey sandstone, weathered coal, rounded flat grey siltstone and mudstone and weak, friable, orange-brown and grey mottled sandstone. Below 2.00m: Becoming firm consistency. Below 3.10m: Generally stiff consistency. 3.80m to 3.90m: Bed of compact brown clayey silt. (GLACIAL TILL).		2,3,3,4,5,5 (17)	
4		2.50					
		3.00				5,5,6,6,7,9 (28)	
		3.50					
		4.00				4,6,9,10,10, 13 (42)	
		4.50					
		5.00					
		5.50					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

GeoInvestigations
9 Greenlands Business Centre
Studley Road
Redditch
B98 7HD
paul@geoinvestigations.co.uk

Borehole Logging Record :WS2

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
5		0.00		MG: Grey sandy medium to coarse angular gravel of strong fine grained sandstone with a little sand and fine gravel matrix.			
		0.50		MG: Black sandy fine to medium of black low density shiny vesicular slag.			
6				MG: Sandy fine to coarse gravel of red brick with a little porcelain fragments near the top and admixed sandy gravel of slag and clinker below. Tree root at 0.65m.			
		1.00		MG: Dark grey to black sandy mainly fine to medium, with a little coarse gravel of slag (low density, vesicular), clinker (boiler ash), burnt shale, yellow-brown sandstone.			
7				Firm friable black very silty organic CLAY. (ALLUVIUM).		1,1,1,2,1,2 (6)	
		1.50		Soft, borderline firm locally, but generally soft mid-grey slightly silty CLAY with black streaks and a little gravel including coarse smooth rounded grey mudstone. Core missing 1.50m to 2.00m. (ALLUVIUM).			
		2.00				6,6,7,7,7,7 (28)	
8				Firm to stiff fissured orange-brown mottled grey slightly sandy CLAY with a little to some fine to medium gravel of mainly weak dark orange stained sandstone (possible ironstone or ferriginous sandstone). 2.85m to 3.00m: Soft to firm and sandy to very sandy. (GLACIAL TILL).			
		2.50					
		3.00		Soft grey brown sandy CLAY with a little fine subangular grey sandstone.		4,5,6,7,6,8 (27)	
		3.50		Stiff, friable, mid to dark red-brown, mottled and streaked grey, silty to fine sandy CLAY with black oxide mottling on horizontal joint planes. (Glacial Till or possible Weathered Coal Measures bedrock).			
9				Medium dense light slightly orangish brown fine to medium SAND. (Possible completely weathered sandstone bedrock or a glaciofluvial deposit).		6,6,7,6,6,6 (25)	
		4.00					
		4.50					
		5.00					
		5.50					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS3

GeoInvestigations

DRILLING DETAILS

Drilling Company: P&J Drilling

Drilling Method: WS

Drilling Date: 28th January 2021

Location: William Street, Littleborough

Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)

Bore Diameter: (mm)

TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test
		0.00	MG: Cobbles of light grey medium to coarse sandstone setts.		
10		0.50	MG: Dark grey sandy gravel of black low density vesicular (coke-like) slag and clinker/boiler ash.		
			MG: Firm friable dark grey organic CLAY (buried topsoil/sub-soil?).		
		1.00	MG: Soft to firm, fissured, mid to dark grey slightly silty sandy CLAY with black mottling, root markings, root holes and rare strong gravel of fine to medium angular mudstone. (ALLUVIUM).		0,2,2,2,3,3 (10)
		1.50	Soft to firm becoming soft brown, mottled bluish grey plastic CLAY with a little to some gravel of mainly fine to medium angular to subangular yellow-brown sandstone, coal, angular to subangular grey fine grained sandstone and mudstone. (Probable Alluvium).		
		2.00	Stiff red-brown streaked and fissured light grey, CLAY with a little mainly fine gravel of yellow brown sandstone and grey mudstone. (GLACIAL TILL).		2,2,4,4,4,4 (16)
		2.50	Soft brown silty very sandy CLAY and/or clayey silty sand, with some fine to medium gravel of sandstone and mudstone.		
			Stiff red-brown CLAY.		
11		3.00	Medium dense very clayey SAND with some fine to coarse gravel of mainly angular to subangular tabular slightly greenish grey brown siltstone/mudrock and fine grained sandstone. (GLACIOFLUVIAL DEPOSIT).		2,2,2,3,6,9 (20)
		3.50	Firm brown very silty CLAY.		
			Medium dense slightly orangish brown fine to medium SAND, with thin laminations and speckling throughout of black finely divided coal. (GLACIOFLUVIAL DEPOSIT).		
		4.00			6,6,6,5,5,6 (22)
		4.50			
12		5.00			5,4,5,6,8,12 (31)
		5.50	Strong orangish brown mottled light brown and light grey fine grained very thinly bedded or laminated sandstone. (Probable weathered sandstone bedrock).		
		6.00			

Piezometer Construction Details And Groundwater Levels

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS4

GeoInvestigations

DRILLING DETAILS

Drilling Company: P&J Drilling

Drilling Method: WS

Drilling Date: 28th January 2021

Location: William Street, Littleborough

Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)

Bore Diameter: (mm)

TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
13		0.00		MG: Dark brown sandy fine to medium gravel of angular tabular sandstone and mudstone, and brick fragments.			
				MG: Red brick cobbles.			
		0.50		MG: Light grey angular gravel and cobbles of limestone. (Sub-base).			
				MG: Dark brown and black sandy gravel of clinker and slag. Below 0.80m: With cobbles of light brown and orange-brown sandstone with occasional brick fragments, and a thin bed of orange brown clay. Roots observed to 0.95m.			
		1.00		MG: Black sand and fine to medium gravel of slag (low density, vesicular), and rare grey angular gravel of sandstone.		2,1,0,1,1,1 (3)	
		1.50					
14				Soft, plastic, light brown, orange-brown and orange mottled silty CLAY with many rootlets and spotting of soft black coal. (ALLUVIUM).			
		2.00		Firm to stiff consistency red-brown CLAY with black oxide stained patches, angular grey, orange mottled sandstone, occasional fine to coarse tabular gravel of fine grained tabular grey sandstone, stained orange. Occasional thin softened beds, and soft to firm beds from 2.80m to 3.00m. (GLACIAL TILL).		3,3,4,4,4,6 (18)	
15		2.50					
		3.00		Firm, borderline soft to firm, brown sandy CLAY with grey fissures and black soft carbonaceous streaks and patches with rare medium angular red to purplish brown sandstone and black oxide lined root holes. (GLACIAL DEPOSIT).		3,4,5,5,5,6 (21)	
		3.50					
		4.00		Medium dense light, slightly orangish brown, fine to medium SAND with medium to coarse light brown fine grained sandstone gravel sized lithorelicts. (Possible weathered sandstone bedrock or glaciofluvial deposit).		5,5,6,6,5,5 (22)	
		4.50					
		5.00					
		5.50					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS5

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
		0.00		Light grey clayey sandy gravel of angular sandstone with roots and rare plastic sheet fragments.			
16		0.50		MG: Dark grey, dark brown and black clayey silty sandy fine to coarse gravel including brick fragments, angular limestone, light grey fine to medium grained igneous rock, weak to medium strong, black, very fine grained slag with irregular fracture (possible tar/bitumen), green glazed pottery and coarse light brown fine to medium blocky sandstone.			
		1.00				5,3,1,1,5,2 (9)	
		1.50		MG: Cobbles of angular to subangular blocks of light brown fine grained sandstone, with a very clayey sand matrix below 1.50m.			
				MG: Gravel of concrete.			
17		2.00		MG: Dark grey clayey silty sandy gravel of quartzite with faint odour of aged diesel. Stiff, fissured grey, red-brown CLAY becoming firm below 3.00m. (GLACIAL TILL).		3,3,4,4,5,5 (18)	
		2.50					
		3.00				3,3,4,4,6,7 (21)	
		3.50					
		4.00					
		4.50					
		5.00					
		5.50					
		6.00					

SPT (blows/300mm) scale: 0 10 20 30 40 50

General Observations:

Soil wet at 1.85m to 2.00m.

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Borehole Logging Record :WS6a

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm) 0 10 20 30 40 50	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
18		0.00		MG: Dark brown clayey, silty fine to coarse sandy, fine to coarse gravels including light brown medium to coarse blocky angular sandstone, angular to subangular brick fragments, angular igneous roadstone aggregate, occasional concrete, coarse possible tar or bitumen (tarry odour), rare to occasional slag, slate and a piece of glass. Organic rich and clayey near top. Terminated on probable concrete slab.			
		1.00					
		2.00					
		3.00					
		4.00					
		5.00					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS6b

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm) 0 10 20 30 40 50	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
19		0.00		MG: Dark brown clayey silty fine to coarse sand and fine to coarse gravel including grey sandstone, clinker/ash, concrete, brick, coarse angular blocky coarse grained limestone, rare porcelain, angular roadstone and yellow-brown medium grained sandstone, fine grained limestone and igneous rock (roadstone aggregate). Organic rich and clayey near top. Borehole terminated on probable concrete slab.			
		0.50					
		1.00					
		1.50					
		2.00					
		2.50					
		3.00					
		3.50					
		4.00					
		4.50					
		5.00					
		5.50					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS6c

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm) 0 10 20 30 40 50	In Situ/ Lab Test	Piezometer Construction Details And Groundwater Levels
20		0.00		MG: Very dark grey-brown sandy gravel including brick, mortar, sandstone, slate, refractory brick, slags. Organic rich and clayey near top. Borehole terminated on probable concrete obstruction.			
		0.50					
		1.00					
		1.50					
		2.00					
		2.50					
		3.00					
		3.50					
		4.00					
		4.50					
		5.00					
		5.50					
		6.00					

General Observations:

No groundwater observed during drilling and on backfilling.

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Borehole Logging Record :WS7

GeoInvestigations

DRILLING DETAILS
Drilling Company: P&J Drilling
Drilling Method: WS

Drilling Date: 28th January 2021
Location: William Street, Littleborough
Ground Elevation: (mAMSL)

Drilled Depth: (mBGL)
Bore Diameter: (mm)
TOC Elevation: (mAGL)

Sample Reference	Sample Range	Depth (mBGL)	Graphic Log	Soil or Rock Field Material Description	SPT (blows/300mm)	In Situ/ Lab Test
21		0.00		MG: Dark brown organic rich loam with many rootlets.		
22		0.50		MG: Sandy, angular medium to coarse gravel of bluish-grey fine grained sandstone. 0.4m to 0.55m: With admixed dark brown sand to fine grained gravel of clinker. Below 0.60m: with small pockets of clinker and ash.		
		1.00		MG: Black sandy fine to medium gravel of ash (shiny black low density slag (coke-like). Soft greenish grey silty CLAY with occasional medium gravel sized pockets of completely weathered orange-brown sandstone. (ALLUVIUM).		3,1,0,1,1,1 (3)
23		1.50		Firm, becoming stiff below 1.60m, red-brown mottled bluish grey CLAY with occasional gravel of weak angular fine grained sandstone, with occasional soft/soft to firm pockets. (GLACIAL TILL).		
		2.00				4,5,7,8,6,9 (30)
B24		2.50				
		3.00				3,2,2,3,3,2 (10)
		3.50				
		4.00				6,5,6,5,5,6 (22)
		4.50				
		5.00				
		5.50				
		6.00				

Piezometer Construction Details And Groundwater Levels

General Observations:

No groundwater observed during drilling and on backfilling.

Photographs of borehole soil cores (top left is ground level, bottom right of picture is the base of the borehole arisings).



Borehole WS1 soil cores.



Borehole WS2 soil cores.



Borehole WS2, showing close-up of glacial clay.



Borehole WS3 soil cores.



Borehole WS4 soil cores.



Borehole WS5 soil cores.

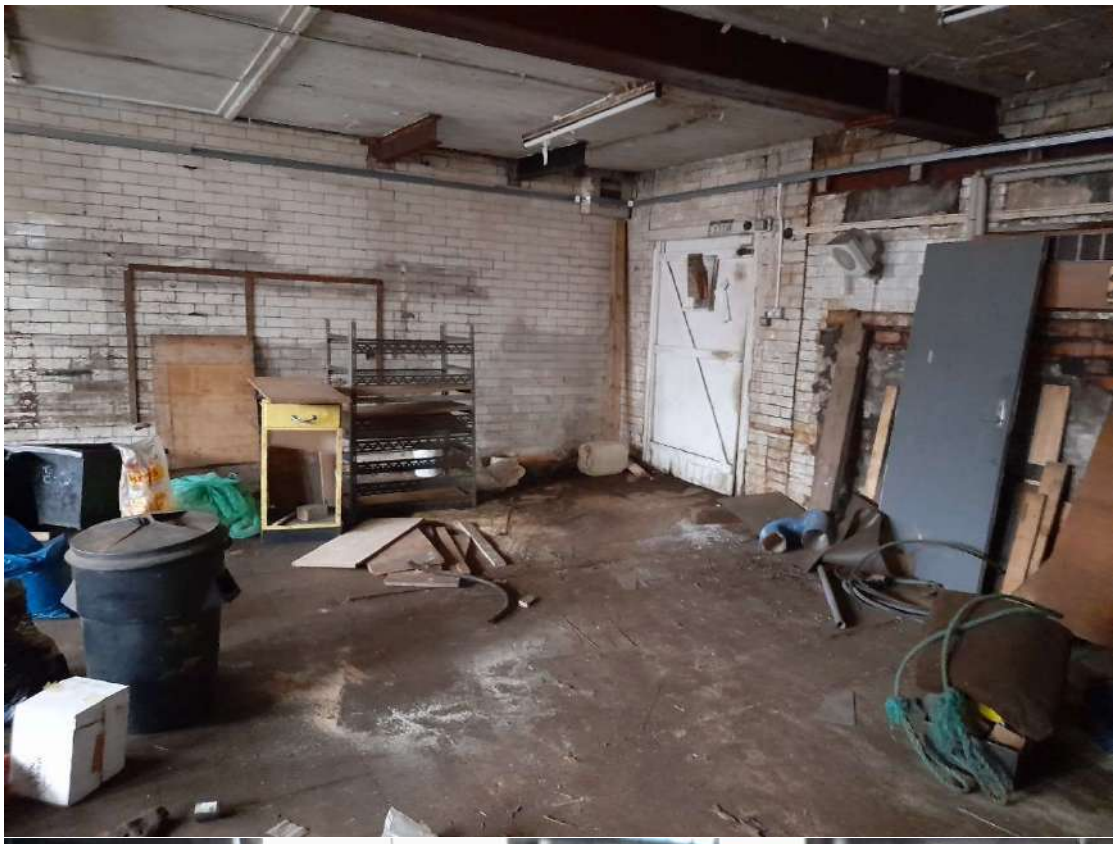


Borehole WS6 a-c typical soil arisings.

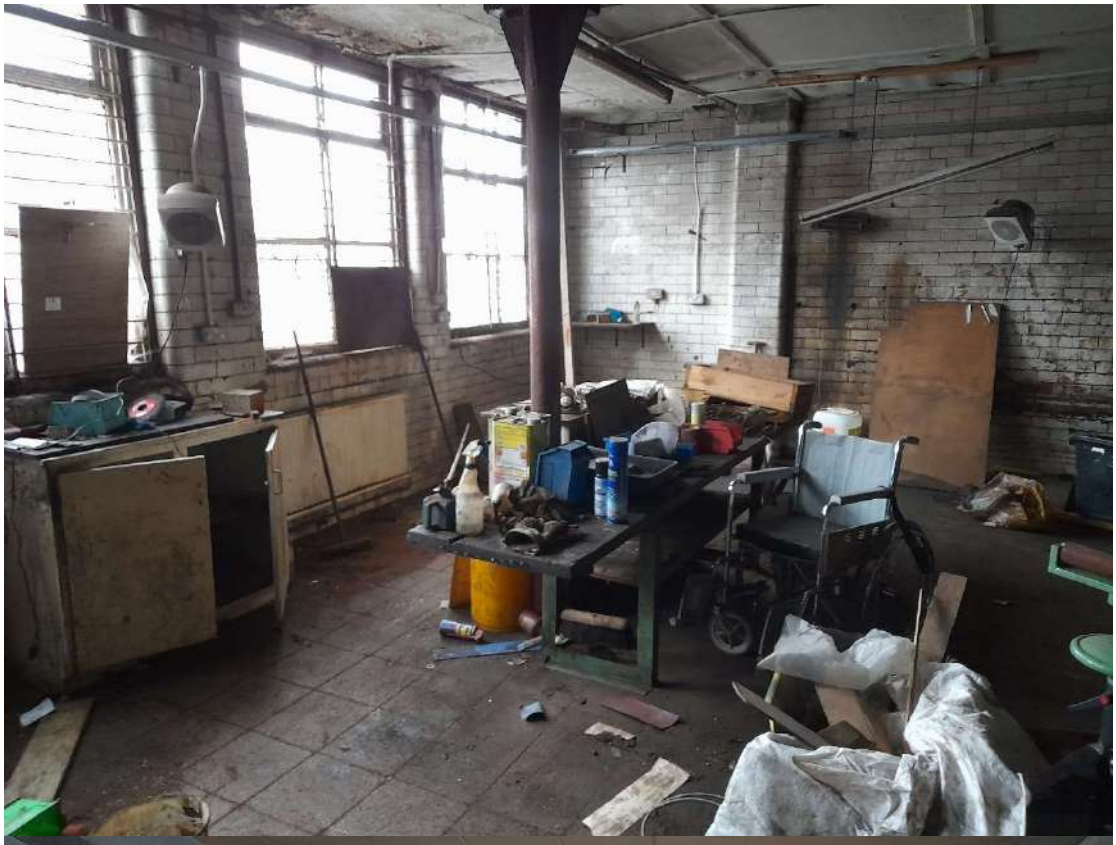


Borehole WS7 soil cores.

Views inside the vacant/disused engineering works building: -











Basement area.



Possible former bakery ovens within northern end of basement.

APPENDIX 2

Chemical Laboratory Test Results

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Herts,
WD18 8YS

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Analytical Report Number : 22-37015

Project / Site name:	William St Littleborough	**Samples received on:**	31/01/2022
Your job number:	591	**Samples instructed on/ Analysis started on:**	03/02/2022
Your order number:	1433	**Analysis completed by:**	18/02/2022
Report Issue Number:	1	**Report issued on:**	18/02/2022
Samples Analysed:	13 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158349	2158350	2158351	2158352	2158353
Sample Reference				WS1	WS2	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.40	0.30-0.40	0.75-0.95	0.25-0.40	0.00-0.20
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.1	12	15	19	41
Total mass of sample received	kg	0.001	NONE	0.40	0.30	1.4	0.30	0.30

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSA	DSA		BPA	BPA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	10.0	7.8	7.3	7.1
Total Cyanide	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	-	2400	-	1500	1000
Total Sulphate as SO4	%	0.005	MCERTS	-	-	0.063	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.74	0.047	0.25	0.016
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	46.8	-	-
Sulphide	mg/kg	1	MCERTS	-	17	-	3.9	2.6
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	2.6	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.069	-	-
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.05	-	-
Organic Matter (automated)	%	0.1	MCERTS	5.7	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1.8	-	3.8	-
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-	-	9.6
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	< 2.0	-	-

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	37	0.74	-	7.1	0.78
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	1.5	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	79	3.1	-	24	0.89
Fluorene	mg/kg	0.05	MCERTS	65	2.8	-	26	0.71
Phenanthrene	mg/kg	0.05	MCERTS	390	16	-	150	5.2
Anthracene	mg/kg	0.05	MCERTS	88	2.7	-	25	1.1
Fluoranthene	mg/kg	0.05	MCERTS	420	11	-	140	6.7
Pyrene	mg/kg	0.05	MCERTS	350	10	-	130	5.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	180	4.9	-	74	4.1
Chrysene	mg/kg	0.05	MCERTS	160	4.2	-	56	3.3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	160	3.2	-	48	3.2
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	59	1.4	-	37	1.7
Benzo(a)pyrene	mg/kg	0.05	MCERTS	120	2.7	-	53	3.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	64	2.0	-	24	1.9
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	18	0.64	-	6.9	0.48
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	77	2.3	-	27	2.1

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	2270	67.7	-	832	41.3

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158349	2158350	2158351	2158352	2158353
Sample Reference				WS1	WS2	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.40	0.30-0.40	0.75-0.95	0.25-0.40	0.00-0.20
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	50	-	84	13
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.2	-	0.4	2.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	< 0.2	2.1
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	-	< 1.2	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	26	-	26	31
Copper (aqua regia extractable)	mg/kg	1	MCERTS	96	120	-	230	350
Lead (aqua regia extractable)	mg/kg	1	MCERTS	1500	290	-	120	180
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	32	49	-	72	46
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	55	200	-	130	300
Magnesium (water soluble)	mg/kg	5	NONE	-	-	8.9	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	4.5	-	-
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	350	-	1700	1000
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	< 1.0	-	3.9	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	12	-	5.5	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	35	-	20	16
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	160	-	220	470
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	200	-	250	490
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	< 1.0	-	17	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	16	-	120	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	24	-	520	42
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	43	-	710	210
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	82	-	1400	250

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158349	2158350	2158351	2158352	2158353
Sample Reference				WS1	WS2	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.40	0.30-0.40	0.75-0.95	0.25-0.40	0.00-0.20
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Chloroethane	µg/kg	1	NONE	-	-	< 1.0	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
Benzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Styrene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Tribromomethane	µg/kg	1	NONE	-	-	< 1.0	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158349	2158350	2158351	2158352	2158353
Sample Reference				WS1	WS2	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20-0.40	0.30-0.40	0.75-0.95	0.25-0.40	0.00-0.20
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	< 1.0	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	-

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	-	-	ND	-	-

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

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158354	2158355	2158356	2158357	2158358
Sample Reference				WS4	WS5	WS5	WS6a	WS6b
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-2.00	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	29	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	11	19	14	17
Total mass of sample received	kg	0.001	NONE	1.4	0.30	0.30	0.30	0.30
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A		BPA			
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.4	8.0	9.5	-	8.5
Total Cyanide	mg/kg	1	MCERTS	-	< 1.0	-	-	-
Total Sulphate as SO4	mg/kg	50	MCERTS	-	590	-	-	-
Total Sulphate as SO4	%	0.005	MCERTS	0.025	0.059	-	-	0.104
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.033	0.024	0.40	-	0.11
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	32.6	24.1	-	-	115
Sulphide	mg/kg	1	MCERTS	-	2.5	-	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.1	3.3	-	-	11
Total Sulphur	%	0.005	MCERTS	0.017	0.034	-	-	0.074
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	-	-	1.0
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	< 0.05	-	-	0.10
Organic Matter (automated)	%	0.1	MCERTS	-	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1.9	-	-	-
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	-	-	3.5
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	< 1.0	-	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	0.22	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	1.7	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	0.39	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	2.6	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	2.4	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	1.7	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	1.3	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	1.3	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	0.79	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	1.4	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.87	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	0.22	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.96	-	-	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	15.9	-	-	-

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158354	2158355	2158356	2158357	2158358
Sample Reference				WS4	WS5	WS5	WS6a	WS6b
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-2.00	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	29	-	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	1.1	-	-	-
Chromium (hexavalent)	mg/kg	1.2	NONE	-	< 1.2	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	49	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	67	-	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	330	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	20	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	3.2	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	130	-	-	-
Magnesium (water soluble)	mg/kg	5	NONE	12	12	-	-	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	5.9	5.9	-	-	< 2.5
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	-	670	-	-	-
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	< 1.0	5.0	2.2	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	< 2.0	120	5.1	11
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	15	300	8.2	17
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	120	260	41	80
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	140	690	56	110
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	< 1.0	1.2	19	1.5
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	< 2.0	71	98	18
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	50	350	370	190
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	250	370	530	390
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	300	800	1000	600

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158354	2158355	2158356	2158357	2158358
Sample Reference				WS4	WS5	WS5	WS6a	WS6b
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-2.00	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	-	< 1.0	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158354	2158355	2158356	2158357	2158358
Sample Reference				WS4	WS5	WS5	WS6a	WS6b
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.80-2.00	0.50-0.60	1.80-2.00	0.00-1.00	0.00-1.00
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	< 1.0	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	< 1.0	-	< 1.0

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	-	-	ND	-	ND

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

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158359	2158360	2158361
Sample Reference				WS6c	WS7	WS7
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.00-1.00	0.00-0.10	0.40-0.50
Date Sampled				28/01/2022	22/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	-	< 0.1
Moisture Content	%	0.01	NONE	14	-	9.2
Total mass of sample received	kg	0.001	NONE	0.30	-	0.40
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	BPA	BPA	BPA
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	8.1	-	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	-	-
Total Sulphate as SO4	mg/kg	50	MCERTS	640	-	-
Total Sulphate as SO4	%	0.005	MCERTS	-	-	0.064
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.023	-	0.019
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	18.6
Sulphide	mg/kg	1	MCERTS	10	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	2.2
Total Sulphur	%	0.005	MCERTS	-	-	0.039
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	-	-	< 0.5
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.05
Organic Matter (automated)	%	0.1	MCERTS	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.9	-	-
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	< 2.0
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	-
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	1.9	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	0.25	-	-
Acenaphthene	mg/kg	0.05	MCERTS	3.2	-	-
Fluorene	mg/kg	0.05	MCERTS	2.3	-	-
Phenanthrene	mg/kg	0.05	MCERTS	19	-	-
Anthracene	mg/kg	0.05	MCERTS	3.2	-	-
Fluoranthene	mg/kg	0.05	MCERTS	33	-	-
Pyrene	mg/kg	0.05	MCERTS	27	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	18	-	-
Chrysene	mg/kg	0.05	MCERTS	15	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	18	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	4.4	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	14	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	8.2	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	2.2	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	8.7	-	-
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	180	-	-

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158359	2158360	2158361
Sample Reference				WS6c	WS7	WS7
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.00-1.00	0.00-0.10	0.40-0.50
Date Sampled				28/01/2022	22/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	-
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	-	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	250	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	49	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	200	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	-	7.7
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	3.9
Monoaromatics & Oxygenates						
Benzene	µg/kg	1	MCERTS	< 1.0	-	-
Toluene	µg/kg	1	MCERTS	< 1.0	-	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	880	-	-
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	8.9	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	19	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	110	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	140	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	4.1	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	27	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	170	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	400	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	600	-	-

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158359	2158360	2158361
Sample Reference				WS6c	WS7	WS7
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.00-1.00	0.00-0.10	0.40-0.50
Date Sampled				28/01/2022	22/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
VOCs						
Chloromethane	µg/kg	1	ISO 17025	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-

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Analytical Report Number: 22-37015
Project / Site name: William St Littleborough
Your Order No: 1433

Lab Sample Number				2158359	2158360	2158361
Sample Reference				WS6c	WS7	WS7
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.00-1.00	0.00-0.10	0.40-0.50
Date Sampled				28/01/2022	22/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-

VOCs TICs

VOCs TICs Compound Name		N/A	NONE	-	-	-

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

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Analytical Report Number : 22-37015
Project / Site name: William St Littleborough

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2158349	WS1	None Supplied	0.20-0.40	Brown sand with gravel and clinker
2158350	WS2	None Supplied	0.30-0.40	Brown sand with brick and clinker
2158351	WS2	None Supplied	0.75-0.95	Brown sand with rubble and clinker
2158352	WS3	None Supplied	0.25-0.40	Brown gravely sand with clinker.
2158353	WS4	None Supplied	0.00-0.20	Brown loam and sand with vegetation and gravel.
2158354	WS4	None Supplied	1.80-2.00	Light brown clay with vegetation.
2158355	WS5	None Supplied	0.50-0.60	Brown clay and sand with stones and vegetation.
2158356	WS5	None Supplied	1.80-2.00	Grey clay and sand with vegetation and gravel.
2158357	WS6a	None Supplied	0.00-1.00	Brown clay and sand with vegetation and gravel
2158358	WS6b	None Supplied	0.00-1.00	Brown clay and sand with vegetation and gravel
2158359	WS6c	None Supplied	0.00-1.00	Brown clay and sand with plastic and rubble.
2158361	WS7	None Supplied	0.40-0.50	Grey sand with gravel.

Analytical Report Number : 22-37015
Project / Site name: William St Littleborough

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Tentatively identified compounds (VOC) in soil	Determination of volatile organic compounds total ion count in soil by headspace GC-MS followed by a full library scan.	In-house method based on USEPA8260	L073-PL	W	NONE

Analytical Report Number : 22-37015
Project / Site name: William St Littleborough

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L023-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Analytical Report Number : 22-37015
Project / Site name: William St Littleborough

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

Paul Palgrave
GeoInvestigations Ltd
1st Floor,
2 Woodberry Grove
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N120DR

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7 Woodshots Meadow,
Croxley Green
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Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-37152

Project / Site name:	William Street Littleborough	**Samples received on:**	31/01/2022
Your job number:	591	**Samples instructed on/ Analysis started on:**	03/02/2022
Your order number:	1434	**Analysis completed by:**	21/02/2022
Report Issue Number:	1	**Report issued on:**	22/02/2022
Samples Analysed:	5 soil samples		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 22-37152
Project / Site name: William Street Littleborough
Your Order No: 1434

Lab Sample Number				2159057	2159058	2159059	2159060	2163190
Sample Reference				WS1	WS1	WS2	WS4	WS2
Sample Number				2	4	9	15	None Supplied
Depth (m)				0.55-1.00	2.85-3.00	0.55-1.00	2.50-2.65	1.00-1.45
Date Sampled				28/01/2022	28/01/2022	28/01/2022	28/01/2022	28/01/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	13	4.8	12	20
Total mass of sample received	kg	0.001	NONE	1.0	0.50	1.0	1.0	0.20

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2	6.8	8.0	7.6	7.6
Total Sulphate as SO4	%	0.005	MCERTS	0.013	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.056	0.032	0.011	0.029	0.23
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	31.5	11.4	29.4	230
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	6.1	-	-	-	-
Total Sulphur	%	0.005	MCERTS	0.018	-	-	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-	-	-	-

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	27	-	-	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	14	-	-	-	-

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

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-37152
Project / Site name: William Street Littleborough

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2159057	WS1	2	0.55-1.00	Brown clay.
2159058	WS1	4	2.85-3.00	Brown clay.
2159059	WS2	9	0.55-1.00	Brown loam and sand with gravel.
2159060	WS4	15	2.50-2.65	Brown clay.
2163190	WS2	None Supplied	1.00-1.45	Brown clay and sand with gravel.

Analytical Report Number : 22-37152
Project / Site name: William Street Littleborough

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX 3

Geotechnical Laboratory Test Results

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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

UKAS TESTING 4041

Environmental Science

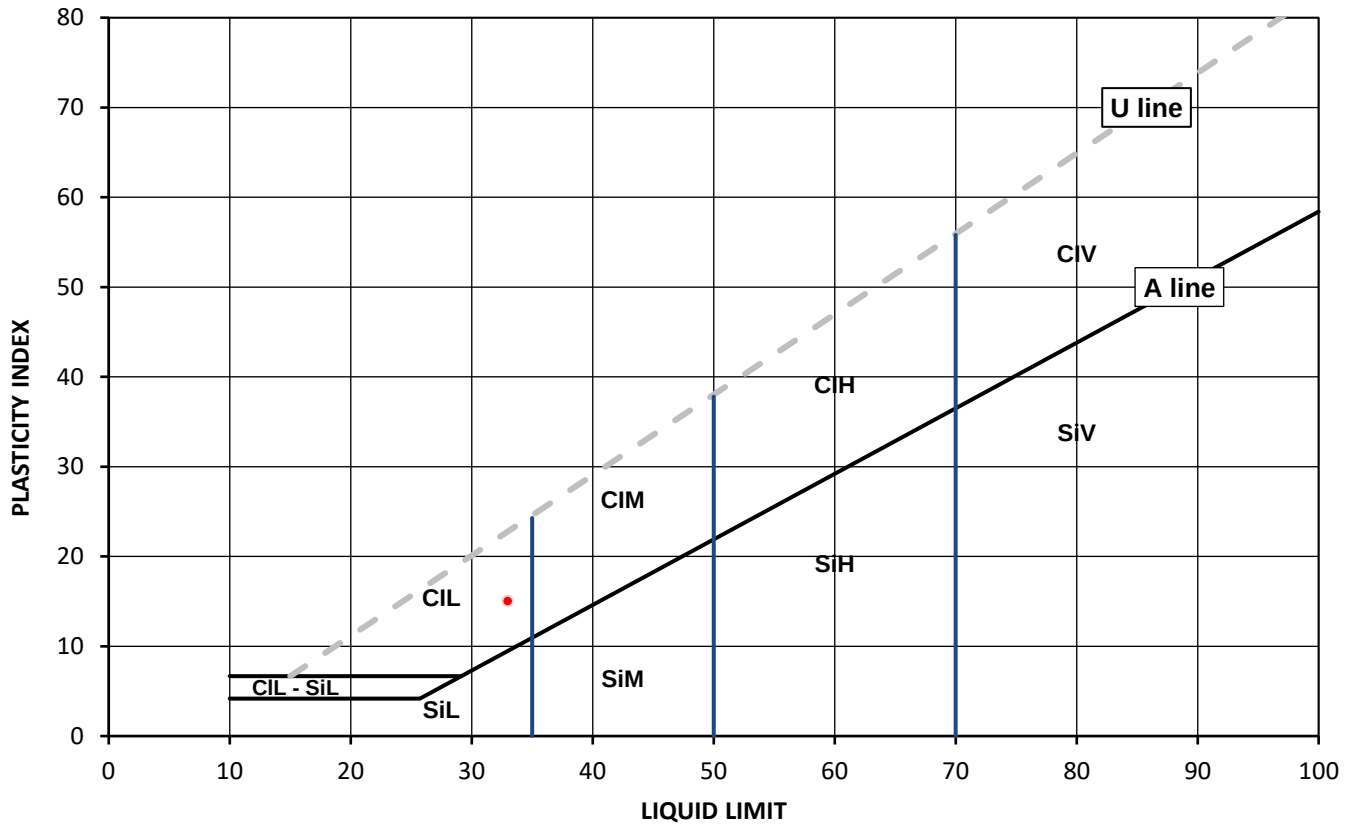
Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158954	Depth Top [m]:	1.55
Hole No.:	WS1	Depth Base [m]:	1.70
Sample Reference:	3	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	33	18	15	90



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

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

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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

UKAS TESTING 4041

Environmental Science

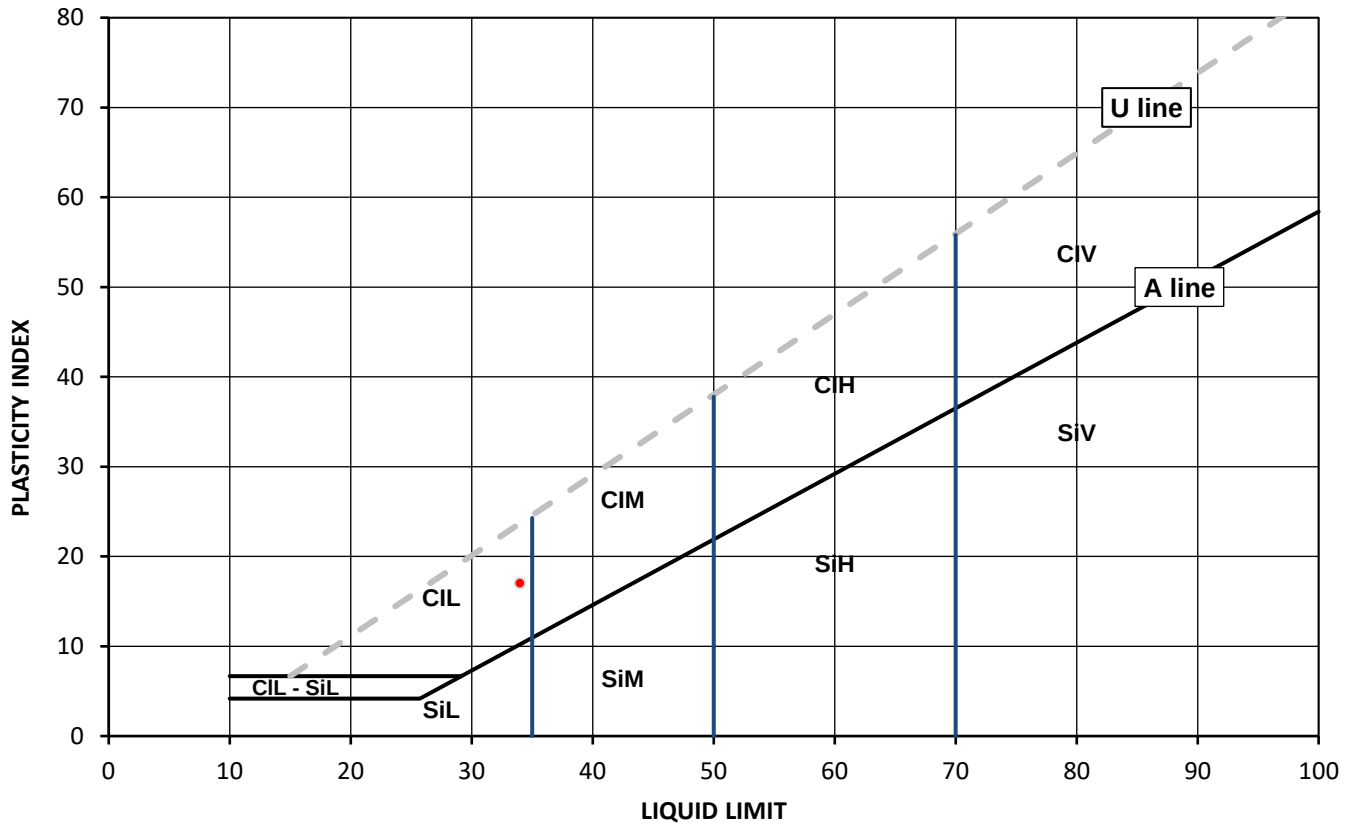
Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158955	Depth Top [m]:	2.85
Hole No.:	WS1	Depth Base [m]:	3.00
Sample Reference:	4	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
14	34	17	17	89



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

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

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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

4041

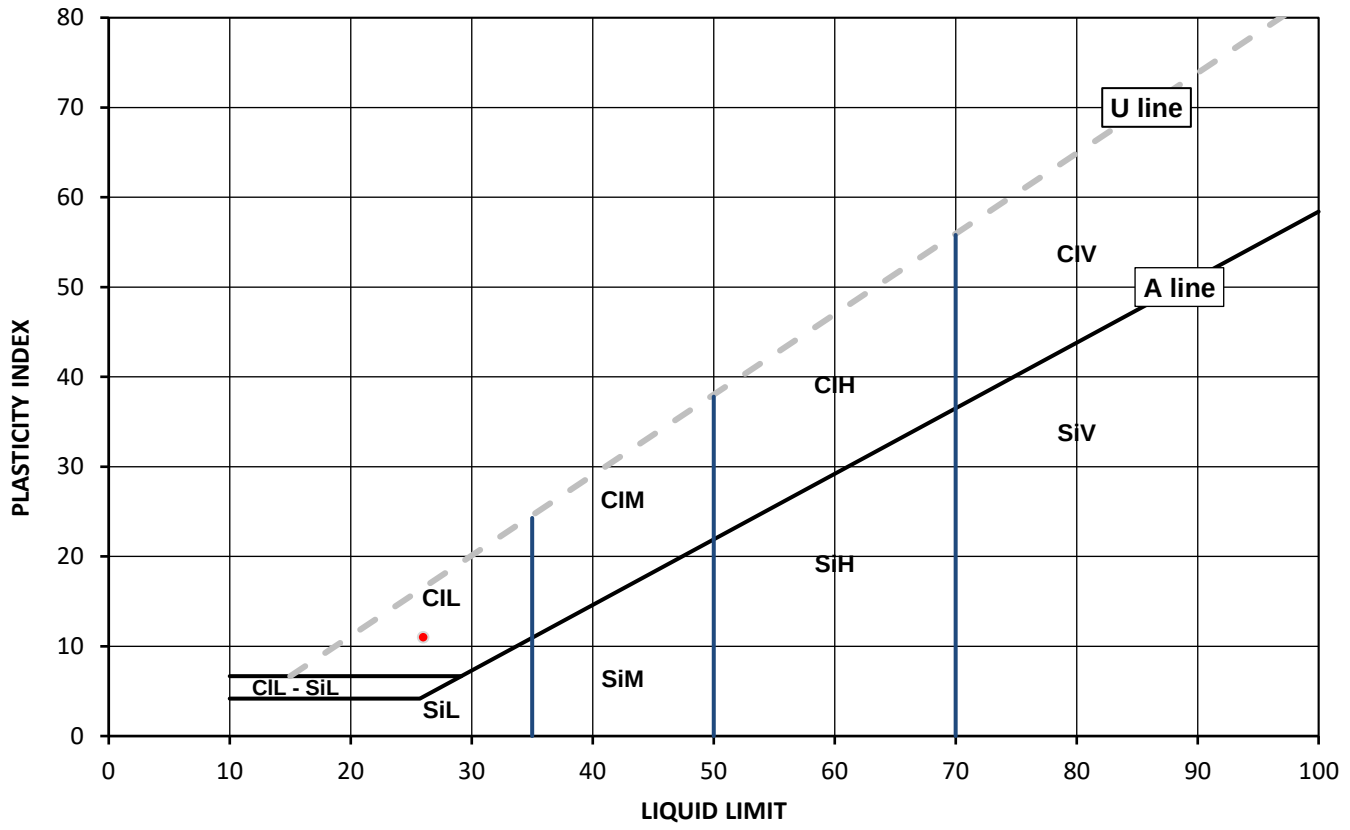
Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158957	Depth Top [m]:	2.65
Hole No.:	WS3	Depth Base [m]:	3.00
Sample Reference:	11	Sample Type:	D
Sample Description:	Brown gravelly very clayey SAND		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
12	26	15	11	59



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

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

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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

UKAS TESTING 4041

Environmental Science

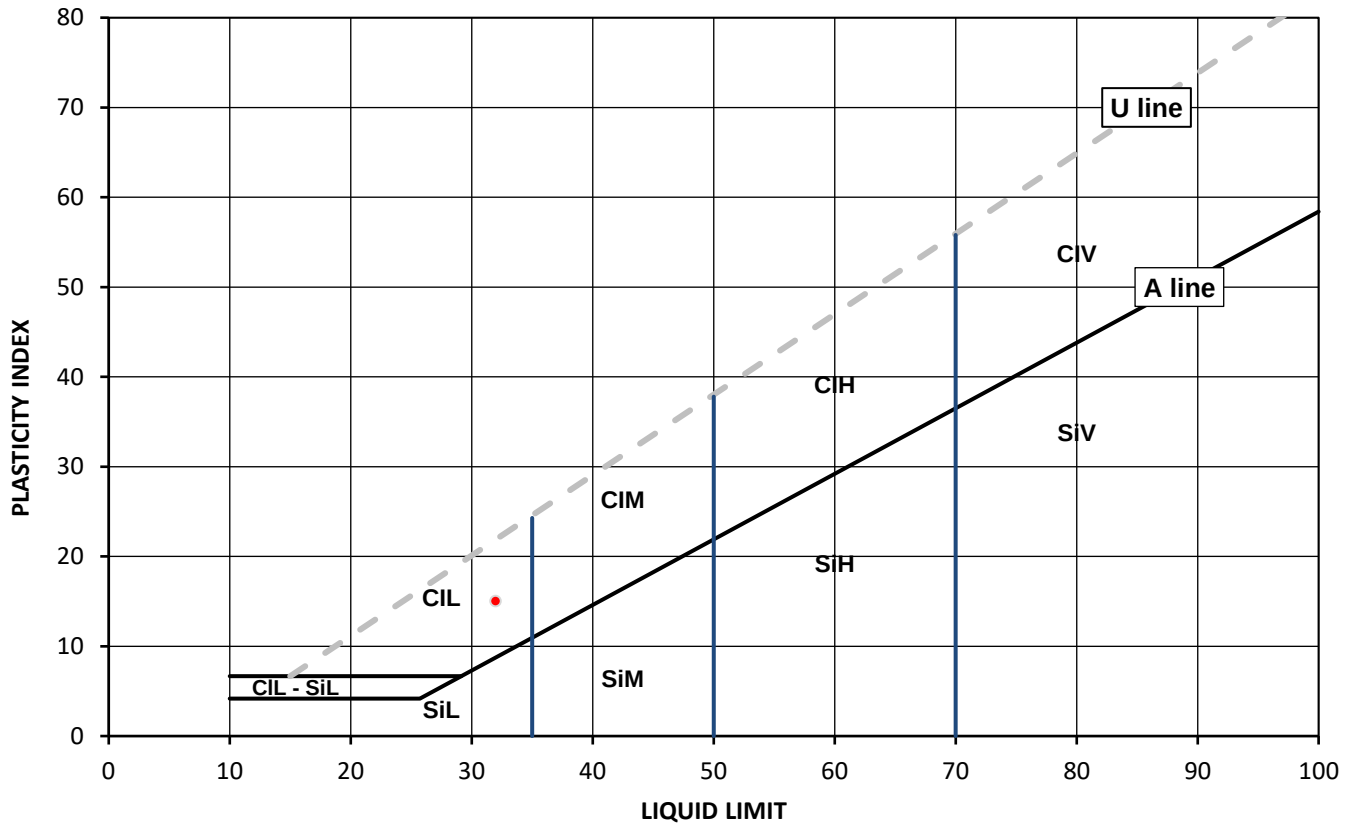
Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158959	Depth Top [m]:	1.55
Hole No.:	WS7	Depth Base [m]:	1.70
Sample Reference:	B23	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
17	32	17	15	90



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

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

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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

UKAS TESTING 4041

Environmental Science

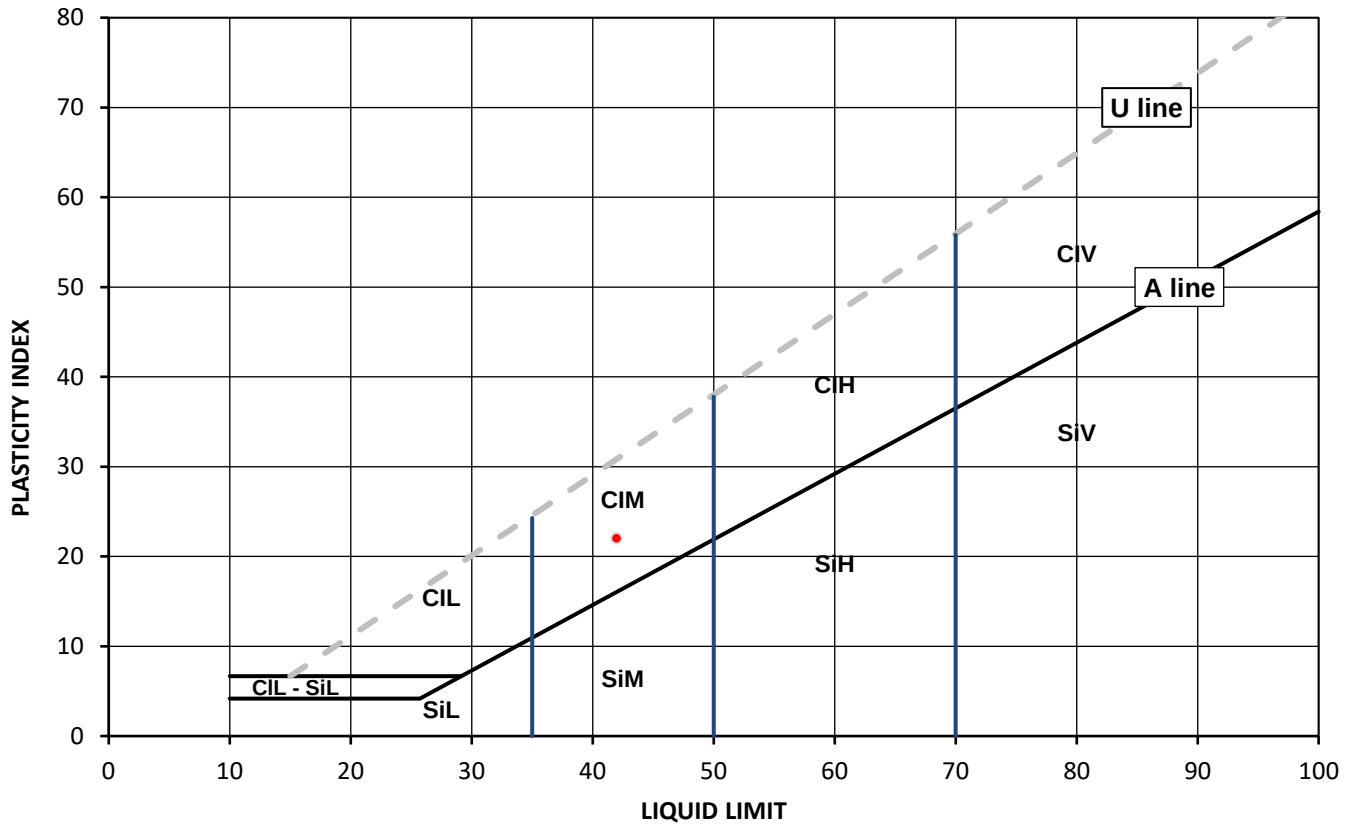
Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	Not Given
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2163141	Depth Top [m]:	1.00
Hole No.:	WS2	Depth Base [m]:	1.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
31	42	20	22	99



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

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

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 236.12

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

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

4041

Client: GeoInvestigations Ltd

Client Address: 1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR

Contact: Paul Palgrave

Site Address: Wiliam Street Littleborough

Client Reference: 591
Job Number: 22-37134
Date Sampled: 28/01/2022
Date Received: 31/01/2022
Date Tested: 17/02/2022
Sampled By: Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-2 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
2158954	WS1	3	1.55	1.70	D	Brownish grey slightly gravelly very sandy CLAY	Atterberg 4 Point	19		90	33	18	15						
2158955	WS1	4	2.85	3.00	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	14		89	34	17	17						
2163141	WS2	Not Given	1.00	1.45	D	Brownish grey slightly gravelly sandy CLAY	Atterberg 4 Point	31		99	42	20	22						
2158956	WS2	8	2.30	2.45	D	Brown slightly gravelly slightly sandy CLAY		19											
2158957	WS3	11	2.65	3.00	D	Brown gravelly very clayey SAND	Atterberg 4 Point	12		59	26	15	11						
2158959	WS7	B23	1.55	1.70	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	17		90	32	17	15						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Date Reported: 23/02/2022

GF 238.14

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

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

4041

Client: GeoInvestigations Ltd

Client Address: 1st Floor,, 2 Woodberry Grove,
Finchley, London,
N120DR

Contact: Paul Palgrave

Site Address: Wiliam Street Littleborough

Client Reference: 591
Job Number: 22-37134
Date Sampled: 28/01/2022
Date Received: 31/01/2022
Date Tested: 17/02/2022
Sampled By: Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2158954	WS1	3	1.55	1.70	D	Brownish grey slightly gravelly very sandy CLAY		19	Sample was quartered, oven dried at 107.1 °C			
2158955	WS1	4	2.85	3.00	D	Brown slightly gravelly very sandy CLAY		14	Sample was quartered, oven dried at 107.1 °C			
2163141	WS2	Not Given	1.00	1.45	D	Brownish grey slightly gravelly sandy CLAY		31	Sample was quartered, oven dried at 107.1 °C			
2158956	WS2	8	2.30	2.45	D	Brown slightly gravelly slightly sandy CLAY		19	Sample was quartered, oven dried at 107.1 °C			
2158957	WS3	11	2.65	3.00	D	Brown gravelly very clayey SAND		12	Sample was quartered, oven dried at 106 °C			
2158959	WS7	B23	1.55	1.70	D	Brown slightly gravelly very sandy CLAY		17	Sample was quartered, oven dried at 106 °C			

Comments:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Date Reported: 23/02/2022

GF 099.16

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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

UKAS TESTING 4041

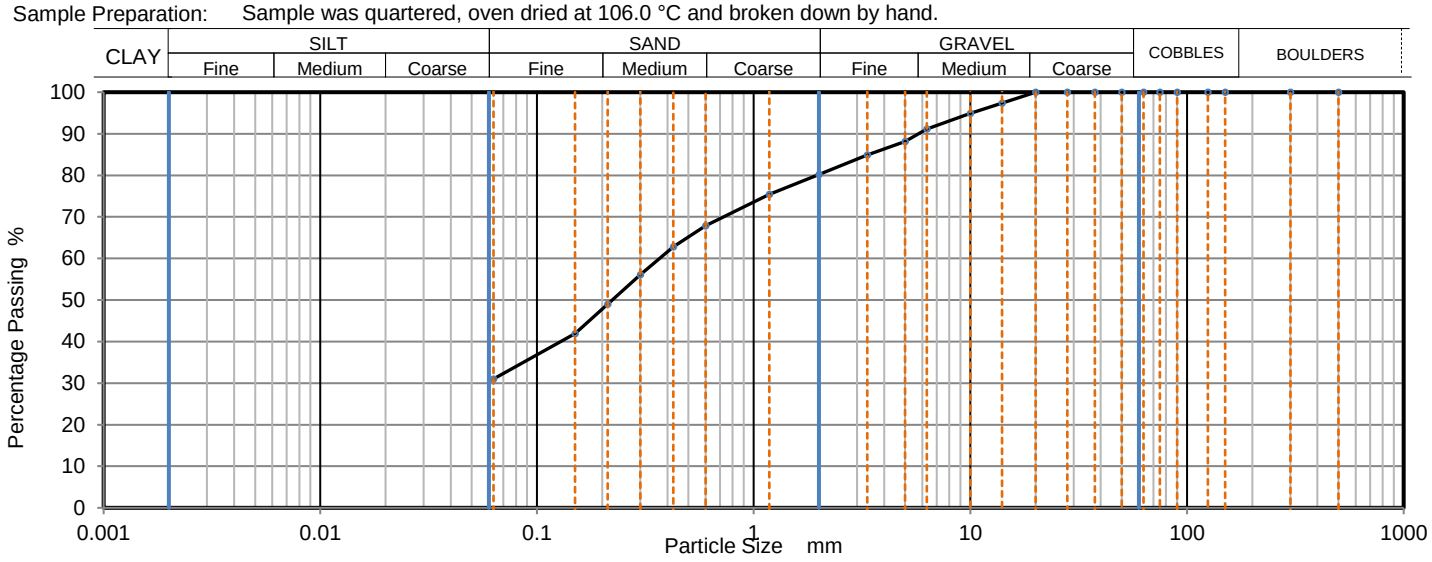
Environmental Science

Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158957	Depth Top [m]:	2.65
Hole No.:	WS3	Depth Base [m]:	3.00
Sample Reference:	11	Sample Type:	D
Sample Description:	Brown gravelly very clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	97		
10	95		
6.3	91		
5	88		
3.35	85		
2	80		
1.18	75		
0.6	68		
0.425	63		
0.3	56		
0.212	49		
0.15	42		
0.063	32		

Sample Proportions	% dry mass
Very coarse	0
Gravel	20
Sand	49
Fines <0.063mm	32

Grading Analysis		
D100	mm	20
D60	mm	0.368
D30	mm	
D10	mm	
Uniformity Coefficient		> 5.8
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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

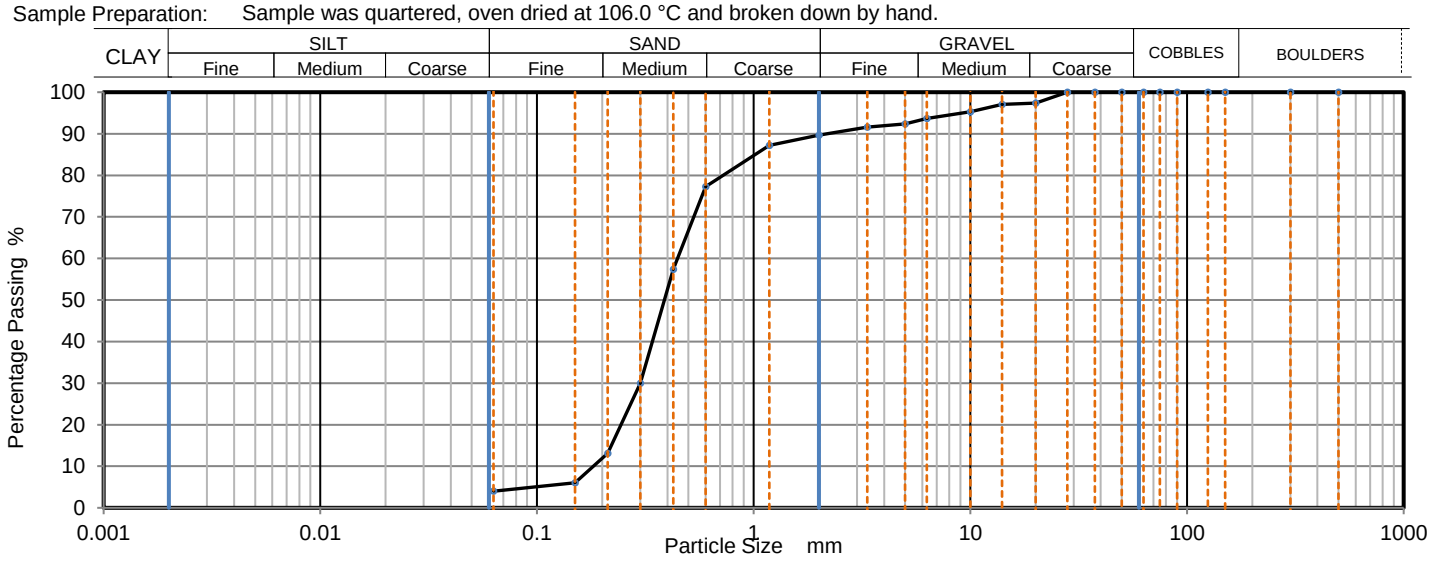
4041

Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158958	Depth Top [m]:	4.50
Hole No.:	WS3	Depth Base [m]:	5.00
Sample Reference:	12	Sample Type:	D
Sample Description:	Brown slightly clayey gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	97		
10	95		
6.3	94		
5	92		
3.35	92		
2	90		
1.18	87		
0.6	77		
0.425	57		
0.3	30		
0.212	13		
0.15	6		
0.063	4		

Sample Proportions	% dry mass
Very coarse	0
Gravel	10
Sand	86
Fines <0.063mm	4

Grading Analysis		
D100	mm	28
D60	mm	0.444
D30	mm	0.3
D10	mm	0.182
Uniformity Coefficient		2.4
Curvature Coefficient		1.1

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: Katarzyna Koziel

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Date Reported: 23/02/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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

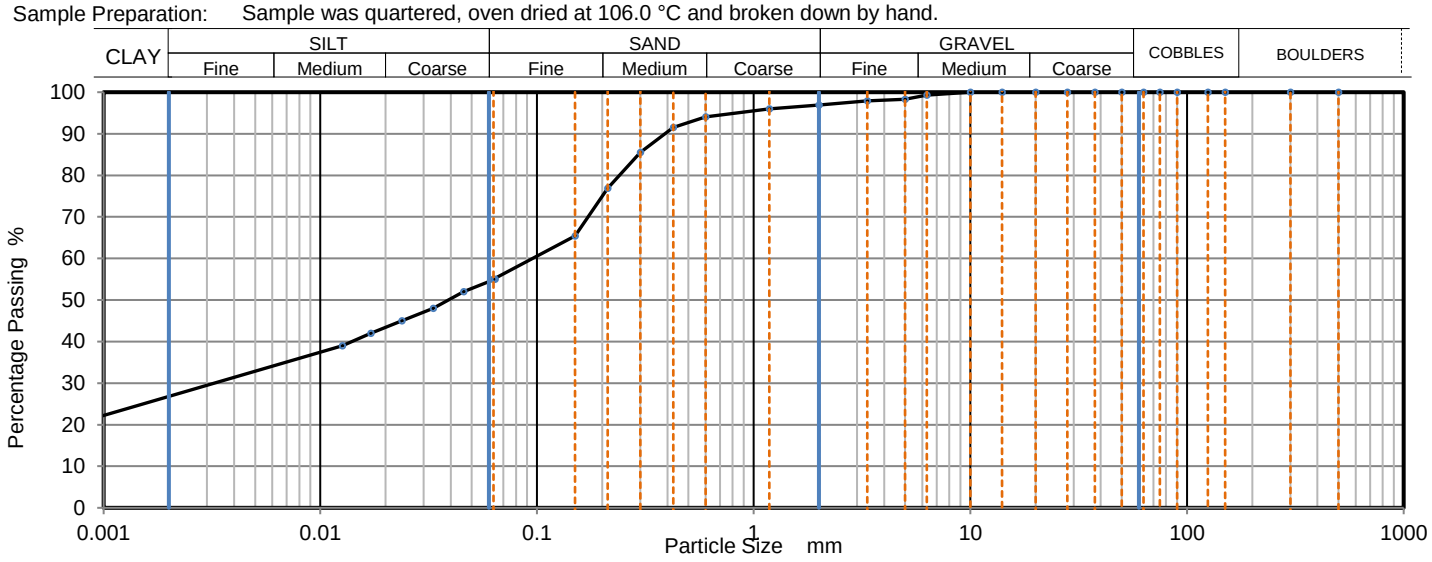
4041

Client:	GeoInvestigations Ltd	Client Reference:	591
Client Address:	1st Floor,, 2 Woodberry Grove, Finchley, London, N120DR	Job Number:	22-37134
		Date Sampled:	28/01/2022
		Date Received:	31/01/2022
Contact:	Paul Palgrave	Date Tested:	17/02/2022
Site Address:	Wiliam Street Littleborough	Sampled By:	Client - PJP

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2158959	Depth Top [m]:	1.55
Hole No.:	WS7	Depth Base [m]:	1.70
Sample Reference:	B23	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0639	55
300	100	0.0459	52
150	100	0.0332	48
125	100	0.0238	45
90	100	0.0171	42
75	100	0.0126	39
63	100	0.0008	21
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	98	Particle density	(assumed)
2	97	2.65	Mg/m3
1.18	96		
0.6	94		
0.425	92		
0.3	86		
0.212	77		
0.15	65		
0.063	55		

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	41
Silt	29
Clay	27

Grading Analysis		
D100	mm	10
D60	mm	0.094
D30	mm	0.00327
D10	mm	
Uniformity Coefficient		> 110
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Date Reported: 23/02/2022

GF 100.21