



INVESTIGATE



REMEDiate



REGENERATE



PFAS RISK ASSESSMENT REPORT

**FOR
ARKADY INDUSTRIAL ESTATE,
BRISCOE LANE,
NEWTON HEATH,
GREATER MANCHESTER**

**PREPARED FOR
CASSEL & FLETCHER
CONSTRUCTION LIMITED**

**REPORT NO. 6921H
OCTOBER 2022**

SUB SURFACE NORTH WEST LIMITED

3 Peel Street
Preston
Lancashire
PR2 2QS

Tel: (01772) 561135 Fax: (01772) 204907

Email: preston@subsurface.co.uk

Website: www.subsurface.co.uk



CONTENTS

1. INTRODUCTION	1.1 Site Location and Description
	1.2 Proposed Development and Purpose of the Ground Investigation
	1.3 Previous Investigations
2. DESK BASED RESEARCH	2.1 Trade Directory Search
	2.2 Historical Planning Search
2. GROUND INVESTIGATION	2.1 Investigation Details
	2.2 Sub Surface Detail
3. SAMPLING, TESTING AND MONITORING	3.1 Sampling
	3.2 Installations and Monitoring
	3.3 Laboratory Testing
4. APPRAISAL AND RECOMMENDATIONS	4.1 Comments on the Profile
	4.2 Environmental Setting & Groundwater Regime
	4.3 PFAS Analyses
	4.4 Conclusions and Recommendations
	4.5 General
APPENDICES	Groundwater Monitoring Results
	RTW Groundwater Breakthrough Times
	RTW Surface Water Breakthrough Times
	Groundwater Contamination Analysis results
	Soil Contamination Analysis results
	Mini Borehole Record sheets
	Figures

**PFAS RISK ASSESSMENT FOR ARKADY INDUSTRIAL ESTATE,
BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER, M40 2XG**

CLIENT: CASSEL & FLETCHER CONSTRUCTION LIMITED

1. INTRODUCTION

This report has been prepared in accordance with an email dated 23rd June 2022, from the Client.

The brief was set out in our estimate, ref. E5797 and dated 15th June 2022, with amendments as the investigation proceeded and includes:

- 5 No. mini boreholes
- Contamination analyses
- Installation of standpipes followed by groundwater monitoring
- Provision of an interpretative report on the above.

This current phase of investigation has been undertaken in response to comments received from the Environment Agency, as summarised in their correspondence ref. SO/2022/122080/01-L01 and dated 17th May 2022, and in support of Planning Application 123295/FO/2019.

The following Reports have previously been carried out for the site which should be read in conjunction with this report:

- Phase II Ground Investigation Report, ref. NTH 2707, dated March 2020, by Mini Soil Surveys
- Phase I Desk Study Report, ref. 6921, dated March 2020, Sub Surface Consultants Limited
- Phase I Coal Mining Risk Assessment Report, ref. 6921A, dated April 2020, Sub Surface Consultants Limited
- Phase II Ground Investigation Ref. 6921C, Sub Surface Consultants Limited
- Ground Gas Update Report, ref. 6921F, dated October 2021, Sub Surface Consultants Limited

1.1 Site Location and Description

The site is located at 230 Briscoe Lane in the Newton Heath district of Greater Manchester, as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is 386920, 399500.

As shown on Figure 2, the 'L' shaped about 0.46 hectare site is bounded to the south east by Briscoe Lane with a cemetery beyond, to the south west by the premises of Anglo-European, to the north west by the premises of Mont Blanc Coldstore Company with a triangular railway junction beyond, to the east by derelict industrial premises and to the south east by the premises of Basic Welding Services (former Public House) with the junction of Briscoe Lane and Riverpark Road beyond.

1.2 Proposed Development and Purpose of the Ground Investigation

The site is currently being developed with the construction of an 'L' shaped light industrial unit, with associated hardstanding, as shown on Figure 2.

The purpose of the investigation was to undertake desk based research to identify current and historic potential sources of per and polyfluoroalkyl substances (PFAS) contamination on the site and to carry out additional monitoring and sampling for contamination analyses and assessment in order to assess the potential risks to controlled waters from PFAS contamination.

1.3 Previous Investigations

The Phase I desk study identified that the site was previously occupied by a factory which was damaged by fire in 2018 and subsequently demolished. Consequently, it was assumed that fire fighting foams containing perfluoroalkyl and polyfluoroalkyl Substances (PFAS) would have been used on site which could have permeated the ground and contaminated the underlying groundwater.

During the Phase II investigation two shallow soil samples (M1A at 0.50m and M6 at 0.10m) were subjected to analyses for a suite of PFAS substances which found all the compounds tested for to be below the limit of detection. However analyses undertaken on groundwater samples taken from the standpipes installed in M1A and M6 found measurable amounts of several PFAS compounds as detailed in the table below:

TABLE 1 PREVIOUS GROUNDWATER PFAS ANALYSES

Determinant	LOD (ng/l)	M1A 0.80m (ng/l)	M6 0.50m (ng/l)
PFBA Perfluoro-n-butanoic acid	2	10.7	<7
PFPA Perfluoro-n-pentanoic acid	1	20.3	<2.5
PFHxA Perfluoro-n-hexanoic acid	1	28.4	3.74
PFBS Perfluoro-1-butanedisulfonate	1	<1	<1
PFHpA Perfluoro-n-heptanoic acid	1	29.1	11
6:2FTS Perfluoro-octane sulfonate 6:2	1	7.24	3.03
PFOA Perfluoro-n-octanoic acid	0.65	14.6	6.65
PFHxS Perfluoro-1-hexanedisulfonate	1	2.87	4.16
PFNA Perfluoro-n-nonanoic acid	1	<1	1.48
PFHpS Perfluoro-1-heptanedisulfonate	1	1.39	1.07
PFDA Perfluoro-n-decanoic acid	1	<1	1.49
Linear PFOS	0.65	48.2	36.5
Branched PFOS	1	41.4	26.7
PFUnA Perfluoro-n-undecanoic acid	1	<1	<1
PFDoA Perfluoro-n-dodecanoic acid	1	<1	<1
PFOSA Perfluoro-octanedisulfonamide	2	<2	<2
PFDS Perfluoro-1-decanedisulfonate	1	<1	<1
PFPeS Perfluoro-1-pentanedisulfonate	1	<1	<1
Total PFOS	1	89.6	63.2

6921H Arkady Ind. Estate, Manchester

The analyses were undertaken by ALS Lifesciences Limited subcontracted by Eurofins Chemtest Limited. The sample containers were plastic bottles supplied by Eurofins Chemtest Limited and we have received confirmation that the containers they provide do not contain PFAS compounds.

The Phase II report concluded that given the presence of the relatively low permeable cohesive deposits beneath the site and the distance to sensitive receptors the risk to controlled waters from PFAS contamination was low.

During the monitoring period standpipes installed in M1A, M5, M6 and M9 were lost/removed. In order to continuing monitoring after the fourth visit on 14 May 2021, four mini boreholes (M1B, M5A, M6A and MA) were taken out on 16 July 2021 and standpipes were installed.

2. DESK BASED RESEARCH

In order to augment the findings of the Phase I Desk Study and determine whether any past industrial activity in the vicinity is likely to have contributed to the PFAS pollutant load beneath the site, a search of trade directories, local news sites and historical planning application has been undertaken.

2.1 Trade Directory Search

No records relating to the site were able to be found in publicly available historic trade directories (Slaters Directories, Kelly's Directories). A search of current Trade directories (Yell, Cylex), local news sites (Manchester Evening News), and Google Streetview™, found that at the time of the fire the site was occupied by a kitchen design company, and a book storage facility. Adjacent properties currently comprise an import and export haulage depot to the west, a refrigerated haulage and distribution depot to the north, and a welding company to the east. The findings of the search are summarised in the following table:

TABLE 1 STRATA

Location	Occupier	Source
Site	It's All in the Image (Kitchen design and fitting services) Book storage.	Yell: https://www.yell.com/biz/its-all-in-the-image-manchester-7739290/ MEN: https://www.manchestereveningnews.co.uk/news/greater-manchester-news/newton-heath-fire-live-updates-14916500
West (No. 228 Briscoe Lane)	Anglo European Import Export Limited (haulage)	Cylex: https://manchester.cylex-uk.co.uk/company/anglo-european-import-export-ltd-15642491.html
North, Unit 2 Arkady Ind. Estate.	Mont Blanc Transport (cold storage and refrigerated haulage)	Cylex: https://manchester.cylex-uk.co.uk/company/mont-blanc-12921691.html
East (No. 232 Briscoe Lane)	Basic Welding Services	Cylex: https://manchester.cylex-uk.co.uk/company/basic-welding-services-19947824.html

None of the above industries are particularly associated with the use of PFAS compounds.

2.2 Historical Planning Search

A search of historical planning records on the Manchester City Council Planning Portal found the following lands uses on and adjacent to the site:

TABLE 1 STRATA

Location	Date	Occupier	Planning Reference
Site	1974	Commercial Truck Services Limited.	FO1550
	1979	Slaters Foods Services.	F12477
	1984	Slaters Food Services.	02294
	1991	British Arkady Company (Bakery)	038800
West (No. 228 Briscoe Lane)	1975	Hide and Skin Yard Vehicle sales, repair garage and MOT centre.	FO3898 029716/FU/2010/NI
South East (No. 222 Briscoe Lane, now demolished)	2006	Change of use from Car Sales to a Cycle Repair Training Centre.	079772/FU/2006/NI
East (No. 232 Briscoe Lane)	1994	George Jones and Sons (Food Trade Suppliers)	046846/A0/NORTH2/94

6921H Arkady Ind. Estate, Manchester

None of the above industries are particularly associated with the use of PFAS compounds, with the possible exception of the hide and skin yard which could conceivably include leather processing, although we consider this to be unlikely.

On the basis of the information uncovered to date in our opinion the most likely source of PFAS contamination on the site remains the use of firefighting foams used to suppress the 2018 fire.

3. GROUND INVESTIGATION

2.1 Investigation Details

At the time of the PFAS investigation the proposed building had been partially constructed and buried infrastructure was in place which restricted access to some of the locations chosen for exploratory holes in our preliminary proposals. In addition, the previous standpipes were lost during the construction process.

Five mini boreholes were put down to depths of between 0.50m and 4.00m using a Dart Mini Sampling Rig fitted with windowless sample tubes of 84mm reducing to 64mm diameter at the positions determined and set out by Sub Surface North West Limited, as shown on Figure 2. The samples were subsequently logged in accordance with BS EN ISO 14688-1: 2018 and BS EN ISO 14689-1: 2018 and the resulting Mini Borehole Records are appended.

M11 was terminated on a bituminous macadam obstruction at a depth of 0.50m. The hole was moved over twice but encountered the same obstruction and was therefore abandoned after the third attempt.

Ground levels at the exploratory hole positions have been interpolated from spot heights given on the topographical survey plan commissioned by ourselves, ref. 6921B dated April 2020. The reduced levels are related to Ordnance Datum.

2.2 Sub Surface Detail

Details of the strata encountered in the ground investigation are given on the appended Mini Borehole Records and conjectured cross sections are given on Figures 4 to 7. The exploratory holes found Made Ground underlain by apparent glacial drift deposits. A general summary of the strata found is as follows:

2.2.1 Made Ground

Made ground was encountered to depths of 0.30m to 1.20m. The ground surface generally comprised compact brown silty sandy gravel sized fragments of stone, brick, concrete and occasional clinker, and cobble sized fragments of concrete, becoming clayey with depth, broadly consistent with the findings of the previous investigation.

The base of the made ground was found to vary from 0.15m depth (north western margin) to 2.50m depth (south eastern margin) in the previous investigation.

2.2.2 Drift Deposits

Natural drift deposits were encountered at depths of between 0.30m and 1.20m and comprised mainly firm, stiff or very stiff high strength locally medium strength locally thinly laminated brown and occasionally grey mottled slightly gravelly silty clay consistent with finding of the previous investigation.

6921H Arkady Ind. Estate, Manchester

2.2.3 Bedrock

No bedrock was encountered in any of the exploratory holes during this or the previous investigation. A review of local historic borehole data held by the British Geological Survey (BGS) found that drift strata have been encountered on the site to depth of at least 8.20m (Record SJ89NE2471), while records in the general surrounding area (SJ89NE2323, SJ89NE518, SJ89NE633, SJ89NE2508, SJ89NE469) suggest the bedrock is likely to comprise mudstone and is anticipated to be present at a depth of some 15m to 20m.

2.2.4 Groundwater

No groundwater was encountered in the exploratory holes although it should be noted that they were only left open for a short period of time and groundwater levels may be subject to seasonal and/ or climatic variations.

One groundwater monitoring visit was undertaken on 1st August 2022. In the M1C and M6B standpipes targeting the made ground a standing water depth of 1.20m was recorded in both standpipes, in the M5B and M10 standpipes in the natural clay standing water depths of 2.50m and 1.50m were recorded respectively.

3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Continuous core, bulk disturbed, and small disturbed environmental samples were obtained for the strata encountered and were subjected to careful examination. Groundwater samples were also obtained from the monitoring standpipes.

Each environmental soil sample comprised a 750g plastic tub and each environmental water sample comprised a 200ml polyethylene bottle, both supplied by ALS Environmental and verified to be free of PFAS compounds. The samples were transported to the testing laboratory in insulated containers.

Due to the very low thresholds and limits of detection associated with PFAS compounds and their prevalence in various materials commonly found in site clothing and personal protective equipment (PPE), field blanks were taken to check for environmental contamination during sampling. The soil field blank comprised clean sand while that water blank comprised clean de-ionised water (both supplied by, and verified to be free of PFAS by ALS Environmental Limited). The blanks were dispensed into sampling containers in the field following the same procedures as for the soil and groundwater samples.

The site operative taking the samples used tools and wore PPE and clothing that were known to be free of PFAS compounds. Tools were cleaned between samples using de-ionised water supplied by ALS Environmental and verified to be free of PFAS compounds.

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

3.2 Installations and Monitoring

Monitoring of the standpipes for groundwater has been undertaken on one occasion using portable equipment. The results of the monitoring are given on the appended Groundwater Monitoring Results sheet. We have confirmed with our supplier that the pipes and fitting used are free from PFAS compounds.

The response zones of the M1C and M6B standpipes straddled the made ground and natural clay interface, whilst M5B and M10 response zones were installed entirely within the natural strata.

3.3 Laboratory Testing

Contamination analyses have been performed by an MCERTS and UKAS accredited laboratory (ALS Environmental) on seven soil samples plus one blank soil sample, and four samples of groundwater plus one blank water sample taken on 1st August 2022 from the standpipes installed in M1C, M5B, M6B and M10 to determine concentrations of the following PFAS compounds:

PFBA Perfluoro-n-butanoic acid	PFOA Perfluoro-n-octanoic acid	PFUnA Perfluoro-n-undecanoic acid
PFPA Perfluoro-n-pentanoic acid	PFHxS Perfluoro-1-hexanesulfonate	PFDoA Perfluoro-n-dodecanoic acid
PFHxA Perfluoro-n-hexanoic acid	PFNA Perfluoro-n-nonanoic acid	PFOSA Perfluoro-octanesulfonamide
PFBS Perfluoro-1-butanesulfonate	PFHpS Perfluoro-1-heptanesulfonate	PFDS Perfluoro-1-decanesulfonate
PFHpA Perfluoro-n-heptanoic acid	PFDA Perfluoro-n-decanoic acid	PFPeS Perfluoro-1-pentanesulfonate
6:2FTS Perfluoro-octane sulfonate 6:2	Linear PFOS	Total PFOS
	Branched PFOS	

The results of the above analyses are appended. The testing suite was designed based on the published guidance and consultation with ALS Environmental.

4. APPRAISAL AND RECOMMENDATIONS

4.1 Comments on the Profile

At the outset it should be appreciated that only a small proportion of the area to be developed has been investigated and consequently the recommendations made and opinions expressed in this report can only be applied to such conditions as were encountered in the exploratory holes. The exploratory holes indicate a nature and degree of similarity to the extent that we consider them likely to be representative of the natural ground conditions.

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

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

4.2 Environmental Setting & Groundwater Regime

4.2.1 Topography

The topography of the general area surrounding the site has been assessed using Ordnance Survey Open Data (Terra 50 contours and points), and Environment Agency LiDAR data (SJ89NE DTM). While the site is generally flat the topography of the surrounding area slopes generally down to the south south west, towards the River Medlock.

4.2.2 Surface Water

The Phase I Desk Study found that based on Ordnance Survey data there are no watercourses (river, stream or canal) within 250m of the site boundary, and no surface water features (ponds or lakes) were identified within 250m of the site boundary according to the Ordnance Survey.

The Water Framework Directive (WFD) indicates that the site is within the catchment of the River Medlock which is located some 330m to the east south east.

4.2.3 Hydrogeology

The Glacial Till drift deposits beneath the site were indicated to be a secondary undifferentiated aquifer, while the bedrock was anticipated to be Pennine Upper and/or Middle Coal Measures Formation (the site being adjacent to the conjectured boundary of both formations as depicted on Figure 10) comprising mudstone, siltstone and sandstone, and which were indicated to be a Secondary A aquifer.

The vulnerability of groundwater to a pollutant found within the site and its immediate surrounding area was assessed as low.

Groundwater monitoring undertaken on the site found perched groundwater at variable depths. A three point assessment based on the average standing water depths taken from M1B, M6A and M9A on the 24th August 2021 and the 17th September 2021 suggests a groundwater gradient of some 0.02 towards to the south, which is generally consistent with the topography of the area.

The standpipes installed during the previous investigation found groundwater depths of between 1.25m and 4.50m, while the current investigation found depths of 1.20m in the standpipes installed in the made ground and 1.50m to 2.50m in the standpipes installed in the natural strata. The groundwater in the standpipes is thought to be superficial perched water held in the made ground above the clay stratum.

A review of local historic borehole data held by the British Geological Survey (BGS) found that the main groundwater table is generally very deep in the area of the site with the majority of the boreholes inspected being dry. We do not have permission to reproduce the logs, however they can be viewed on the BGS online viewer. The borehole logs we have inspected are:

TABLE 1 BGS BOREHOLE RECORDS

Borehole Reference	Location	Total Depth (m)	Depth of Glacial Till/Bedrock Interface (m)	Groundwater Depth (m)
SJ89NE2471	On Site.	8.30	8.20**	DRY
SJ89NE2323	Alan Turing Way, 211m West of the site.	10.00	>10.0	3.10 (perched)
SJ89NE518	Ring Road, 330m south west of the site.	38.59	15.70	DRY
SJ89NE633	Lower Medlock, 379m south of the site.	30.10	6.75m	28.11
SJ89NE2508	Weir Pumps, 385m north east of the site.	23.60	23.20*	DRY
SJ89NE469	Norton Street, 450m north north west of the site.	60.00	21.80	36.00

*possibly deeper, borehole terminated on large boulder.

**Terminated on dense sand.

The groundwater flow rate through the Glacial Till has been estimated using the Remedial Targets Methodology (RTM) Spreadsheet. The hydraulic conductivity and effective porosity were assumed using conservative values from literature (Domenico and Schwartz 1998). Based on the above we anticipate the groundwater flow rate in the clay stratum to be of the order of $1.90 \times 10^{-11} \text{ m}^3/\text{s}$ which would result in a time to reach a hypothetical receptor 50m away of some 4.62×10^9 years.

If the dense sand stratum encountered at 8.20m comprises a bed of significant thickness rather than a localised thin band as typically found in Glacial Till strata, then we estimate the groundwater flow rate might be expected to increase to some $4.75 \times 10^{-9} \text{ m}^3/\text{s}$ resulting in a time to reach a hypothetical receptor 50m away of some 2.04×10^7 years. For the River Medlock water receptor some 330m to the south the breakthrough time are anticipated to increase to 3.05×10^{10} years for the Till strata and 1.34×10^8 years for the sand strata.

Based on the information obtained to date the perched water does not appear to be in hydraulic continuity with the deeper water table in the vicinity of the site.

4.2.4 Former Clay Pit

The site is shown on the early Ordnance Survey maps (1908 to 1932) to be within the boundary of a clay pit which was depicted as infilled, possibly with refuse by 1949.

The exploratory holes taken out on site found the infilled ground to comprise mainly inert gravely slightly sandy silty clay with the gravel component comprising stone, brick and localised slag and concrete. The depth of made ground varied from 0.15m to 2.50m, with the deeper made ground being in the southern part of the site.

We have produce a conjectured profile for the made ground/natural clay interface using inverse distance weighting (IDW) interpolation of the spot depths recorded in the exploratory holes. The resulting elevation model overlaid over the 1931 Ordnance Survey plan is given on the appended Figure 8. The elevation model shows the depths of made ground recorded in the boreholes are generally concordant with the layout of the former clay pits as indicated on the 1931 survey.

Based on the above we do not expect the clay pit excavations to have impacted the strata beneath the site below a maximum depth of about 2.50m.

4.2.5 Potential Artificial Pathways

We understand that the new building has been constructed on rectangular concrete pad foundations placed at a maximum of 3.00m below the finished ground floor level. No deep foundations such as piles or vibro stone columns have been adopted and in our opinion no significant potential pollution pathways will have been introduced by the shallow pad foundation scheme.

The site is surfaced with concrete with surface water drains on the periphery, which discharge to the existing main sewer on Briscoe Lane. This arrangement will allow for minimal surface infiltration and in our opinion the risk of perched water mobilisation due to the drainage arrangement on site is very low.

4.3 PFAS Analyses

4.3.1 Assessment (Soil)

In order to provide an assessment of the presence of contamination nine soil samples (including one field blank) have been analysed for a suite of determinants and the results are appended.

Limited generic assessment criteria for the protection of human health are currently available for per and polyfluoroalkyl substances which are regarded as being emerging contaminants. For the purposes of this risk assessment we have compared the perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) results with soil screening values published by the Environment Agency for assessing ecological risks (from '*Derivation and Use of Soil Screening Values for Assessing Ecological Risks*' Report-ShARE id26 Rev.2022).

The speciated PFAS analyses found no concentrations above the limit of detection levels. The limits of detection for PFOA and PFOS (1µg/kg) are below the SSVs (0.019mg/kg PFOA and 0.013mg/kg PFOS).

In the sand field blank, all PFAS compounds tested for were below the limit of detection.

4.3.2 Assessment (Water)

Four samples of groundwater taken from the standpipes installed in M1C, M5B and M6B and M10 on 1st August 2022 have been analysed for a suite of PFAS compounds and the results are appended.

As an emerging contaminant only limited allowable thresholds have been published for the assessment of groundwater and surface water contamination.

To assess the risk to surface water bodies the PFOS results have been compared with the Environmental Quality Standard (EQS) and the PFOA results have been compared with the Australian ESL for freshwater.

To assess the risk to groundwater resources the PFOA and total PFOS results have been compared with the UK Health Security Agency recommendations for PFOS and PFOA (Based on The Drinking Water Inspectorate Guidance 2021). For PFHxS Perfluoro-1-hexanesulfonate, PFNA Perfluoro-n-nonanoic acid, Linear PFOS, and Branched PFOS, the US ATSDR Minimum Risk Level (MRL) has been used. No appropriate thresholds were found for the other PFAS compounds tested for.

We have listed the samples from the current and previous investigations where measurable PFAS compounds were recorded and where the levels of contamination have exceeded the EQS, ESL, UK HSA and/ or US MRL values, as follows:

TABLE 1 GROUNDWATER PFAS ANALYSES

Determinant	LOD (ng/l)	Environmental Thresholds		Human Health Thresholds		Previous		Current
		EQS (ng/l)	Australian ESL Freshwater (ng/l)	US MRL (ng/l)	UK DWS (ng/l)	M1A 0.80m (ng/l)	M6 0.50m (ng/l)	M6B 1.20m (ng/l)
PFBA	2	-	-	-	-	10.7	-	89.1
PFPA	1	-	-	-	-	20.3	-	-
PFHxA	1	-	-	-	-	28.4	3.74	-
PFBS	1	-	-	-	-	-	-	7.03
PFHpA	1	-	-	-	-	29.1	11	31.8
6:2FTS	1	-	-	-	-	7.24	3.03	3.42
PFOA	0.65	-	19000	21	100	14.6	6.65	42.6
PFHxS	1	-	-	140	-	2.87	4.16	3.99
PFNA	1	-	-	21	-	-	1.48	4.03
PFHpS	1	-	-	-	-	1.39	1.07	-
PFDA	1	-	-	-	-	-	1.49	6.23
Linear PFOS	0.65	-	-	14	-	48.2	36.5	8.83
Branched PFOS	1	-	-	14	-	41.4	26.7	5.8
Total PFOS	1	0.65	0.23	-	100	89.6	63.2	14.6

In the blank water sample all PFAS compounds tested for were below the limit of detection.

The results were generally found to be below the published limit thresholds apart from Linear PFOS and Branched PFOS which were found to exceed the US MRL values in both samples from the previous investigation and Total PFOS which was found to exceed the EQS in both previous samples and in the sample taken from M6B in the current investigation. There were no significant exceedances of the human health thresholds.

4.4 Conclusions and Recommendations

On the basis of the information uncovered to date in our opinion the most likely source of PFAS contamination on the site remains the use of firefighting foams used to suppress the 2018 fire. The perched water contamination appears to be low scale and derived from the single fire fighting event. No evidence of any other historical or ongoing sources of PFAS contamination were found in our desk-based data search.

No PFAS contamination was found in the soil samples tested and therefore we concluded that there is no significant soil source leaching into the perched groundwater.

The infilled former clay pit shown to cover the site on the early Ordnance Survey Plan has been demonstrated to extend to a maximum depth of 2.50m below ground level and therefore does not represent a potential preferential flow pathway to the deeper groundwater. In addition, the foundations for the new build have been placed at a maximum depth of 3.00m and therefore do not introduce any artificial flow pathways beyond this depth.

The groundwater found in the standpipes is thought to be perched and is not anticipated to be in hydraulic continuity with deeper groundwater in the vicinity of the site due to the presence of significant relatively low permeability Till deposits (at least 5.5m below foundation level, probable much greater) and the anticipated depth to the groundwater table (circa 20m).

PFAS contamination was only found in one of the groundwater samples from the current investigation suggesting that there is no significant contaminant migration within the perched groundwater held in the made ground. We conclude that the PFAS contamination is localised and low scale with the former concrete slab and external surface mitigating much of the infiltration of run-off during the firefighting operations.

The hydraulic gradient on site appears to be very shallow and lateral migration is likely to be impeded by the relatively low permeability of the Glacial Till strata. The estimated breakthrough times for a hypothetical receptor 50m away are of the order of 4.62×10^9 years in the cohesive strata and some 2.04×10^7 years if the dense sand stratum recorded at 8.20m on the BGS log comprises a bed of significant thickness rather than a localised thin band.

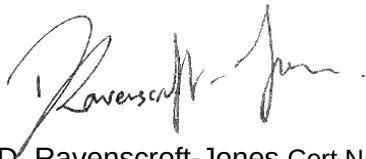
Therefore, based on the above, in our opinion the concentrations of PFAS contamination recorded in M6A and previously in M1A and M6 are such that they are unlikely to present a significant risk to sensitive controlled water receptors and are highly unlikely to have a significant impact on the quality of the deep groundwater table.

4.5 General

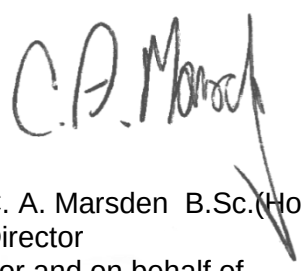
We recommend that consultation should be undertaken with, and the written approval obtained from, the Local Authority Environmental Health Officer and the Local Authority Building Control Officer prior to commencing development.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Ms Anna Marsden at our Preston office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. 6921H
OCTOBER 2022



D. Ravenscroft-Jones Cert Nat Sci (Open), BSc.(Hons.), MSc., CEnv, MEnvSc, AMRSC
Principal Geoenvironmental Engineer
For and on behalf of
Sub Surface Consultants Limited



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

GROUNDWATER MONITORING RESULTS

Site: ARKADY INDUSTRIAL ESTATE, BRISCOE LN, NEWTON HEATH.
Client: CASSEL & FLETCHER CONSTRUCTION LIMITED
Engineer:

Job Number	6921H
------------	-------

Sheet: 1/1

Groundwater Monitoring Results Sheet

[illegible]

Remarks:



Site: ARKADY INDUSTRIAL ESTATE, BRISCOE LN, NEWTON HEATH.
Client: CASSEL & FLETCHER CONSTRUCTION LIMITED
Engineer:

Job Number:
6921H
Sheet:
1/1

Primary Flow Direction

Bearings relative to Point H

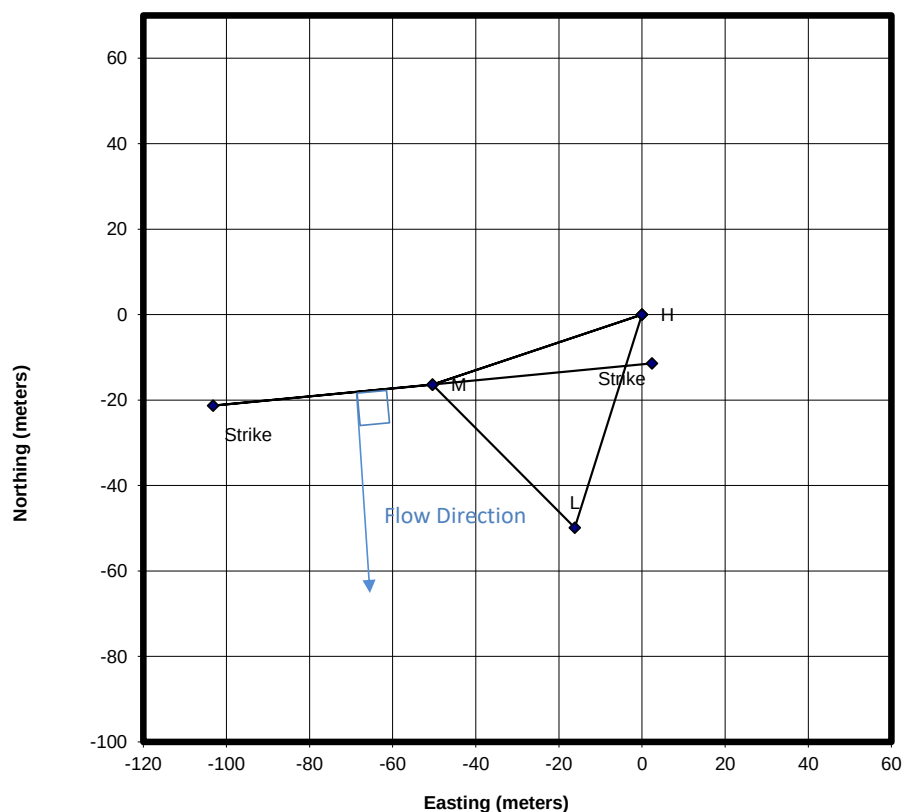
	Azimuth	Distance	Elevation	Inclin.	Strike*	Dip*
H	N/A	N/A	63.03	N/A	84.64	1.16
M	199.00	19.14	63.03	0.254	Azimuth of Flow*	-185
L	154.00	20.97	63.03	1.065		

*angles are in degrees

Location	Level	Mean GW Level**
M1B (M)	63.890	62.790
M6A (H)	63.730	63.025
M9A (L)	63.500	62.050

Gradient (Fraction)
0.020
Direction
South

Three Point Problem



Remarks

**Based on average of readings taken on the 24th August 2021 and 17th September 2021

**REMEDIAL TARGETS WORKSHEET OUTPUT
GROUNDWATER BREAKTHROUGH TIMES**

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol	unit	justification
Hydraulic conductivity	K	2.00E-06 m/d	Assumed: Domenico & Schwartz 1993
Hydraulic gradient	i	2.00E-02 unitless	Measured from Standpipes
Effective porosity of aquifer	n	6.00E-01 fraction	Assumed: Domenico & Schwartz 1993
Thickness of saturated aquifer	b	8.20E+00 m	Estimated
Width of aquifer perpendicular to flow	w	5.00E+00 m	Estimated
Distance to receptor	x	5.00E+01 m	Hypothetical compliance point.
Bulk density of aquifer materials	ρ	1.07E+00 g/cm ³	From EA SR3
Soil-water partition co-efficient	Kd	1.26E+03 l/kg	From literature
Retardation factor of pollutant	R	2248	

Groundwater flow velocity	v(GW)	7.72E-13 m/s	6.67E-08 m/day	2.43E-05 m/year
Time for groundwater to reach receptor	t(GW)	6.48E+13 seconds	7.50E+08 days	2.05E+06 years
Rate of groundwater flow through aquifer	Q	1.90E-11 m ³ /s	1.64E-06 m ³ /day	5.99E-04 m ³ /year

Contaminant flow velocity	v(contam)	3.43E-16 m/s	2.97E-11 m/day	1.08E-08 m/year
Time for contaminant to reach receptor	t(contam)	1.46E+17 seconds	1.69E+12 days	4.62E+09 years

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol	unit	justification
Hydraulic conductivity	K	5.00E-04 m/d	Assumed: Domenico & Schwartz 1993
Hydraulic gradient	i	2.00E-02 unitless	Measured from Standpipes
Effective porosity of aquifer	n	4.60E-01 fraction	Assumed: Domenico & Schwartz 1993
Thickness of saturated aquifer	b	8.20E+00 m	Estimated
Width of aquifer perpendicular to flow	w	5.00E+00 m	Estimated
Distance to receptor	x	5.00E+01 m	Hypothetical compliance point.
Bulk density of aquifer materials	ρ	1.18E+00 g/cm ³	From EA SR3
Soil-water partition co-efficient	Kd	1.26E+03 l/kg	From literature
Retardation factor of pollutant	R	3233.173913	

Groundwater flow velocity	v(GW)	2.52E-10 m/s	2.17E-05 m/day	7.93E-03 m/year
Time for groundwater to reach receptor	t(GW)	1.99E+11 seconds	2.30E+06 days	6.30E+03 years
Rate of groundwater flow through aquifer	Q	4.75E-09 m ³ /s	4.10E-04 m ³ /day	1.50E-01 m ³ /year
Contaminant flow velocity	v(contam)	7.78E-14 m/s	6.72E-09 m/day	2.45E-06 m/year
Time for contaminant to reach receptor	t(contam)	6.42E+14 seconds	7.44E+09 days	2.04E+07 years

REMEDIAL TARGETS WORKSHEET OUTPUT
SURFACE WATER BREAKTHROUGH TIMES

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol	unit	justification
Hydraulic conductivity	K	2.00E-06 m/d	Assumed: Domenico & Schwartz 1993
Hydraulic gradient	i	2.00E-02 unitless	Measured from Standpipes
Effective porosity of aquifer	n	6.00E-01 fraction	Assumed: Domenico & Schwartz 1993
Thickness of saturated aquifer	b	8.20E+00 m	Estimated
Width of aquifer perpendicular to flow	w	5.00E+00 m	Estimated
Distance to receptor	x	3.30E+02 m	Measured distance to R. Medlock
Bulk density of aquifer materials	ρ	1.07E+00 g/cm ³	From EA SR3
Soil-water partition co-efficient	Kd	1.26E+03 l/kg	From literature
Retardation factor of pollutant	R	2248	

Groundwater flow velocity	v(GW)	7.72E-13 m/s	6.67E-08 m/day	2.43E-05 m/year
Time for groundwater to reach receptor	t(GW)	4.28E+14 seconds	4.95E+09 days	1.36E+07 years
Rate of groundwater flow through aquifer	Q	1.90E-11 m ³ /s	1.64E-06 m ³ /day	5.99E-04 m ³ /year

Contaminant flow velocity	v(contam)	3.43E-16 m/s	2.97E-11 m/day	1.08E-08 m/year
Time for contaminant to reach receptor	t(contam)	9.61E+17 seconds	1.11E+13 days	3.05E+10 years

Simple hydrogeological calculations

(These are not specific to, or required in, the Remedial Targets Methodology)

Parameter	symbol	unit	justification
Hydraulic conductivity	K	5.00E-04 m/d	Assumed: Domenico & Schwartz 1993
Hydraulic gradient	i	2.00E-02 unitless	Measured from Standpipes
Effective porosity of aquifer	n	4.60E-01 fraction	Assumed: Domenico & Schwartz 1993
Thickness of saturated aquifer	b	8.20E+00 m	Estimated
Width of aquifer perpendicular to flow	w	5.00E+00 m	Estimated
Distance to receptor	x	3.30E+02 m	Measured distance to R. Medlock
Bulk density of aquifer materials	ρ	1.18E+00 g/cm ³	From EA SR3
Soil-water partition co-efficient	Kd	1.26E+03 l/kg	From literature
Retardation factor of pollutant	R	3233.173913	

Groundwater flow velocity	v(GW)	2.52E-10 m/s	2.17E-05 m/day	7.93E-03 m/year
Time for groundwater to reach receptor	t(GW)	1.31E+12 seconds	1.52E+07 days	4.16E+04 years
Rate of groundwater flow through aquifer	Q	4.75E-09 m ³ /s	4.10E-04 m ³ /day	1.50E-01 m ³ /year
Contaminant flow velocity	v(contam)	7.78E-14 m/s	6.72E-09 m/day	2.45E-06 m/year
Time for contaminant to reach receptor	t(contam)	4.24E+15 seconds	4.91E+10 days	1.34E+08 years

GROUNDWATER CONTAMINATION ANALYSIS RESULTS



Unit 7-8 Hawarden Business Park

Manor Road (off Manor Lane)

Hawarden

Deeside

CH5 3US

Tel: (01244) 528777

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Sub Surface Laboratories Ltd
3 Peel Street
Preston
Lancashire
PR2 2QS

Attention: David Ravenscroft-Jones

CERTIFICATE OF ANALYSIS

Date of report Generation:	24 August 2022
Customer:	Sub Surface Laboratories Ltd
Sample Delivery Group (SDG):	220803-8
Your Reference:	69219
Location:	Arkady ind.est Newton Heath
Report No:	658725
Order Number:	

We received 5 samples on Wednesday August 03, 2022 and 5 of these samples were scheduled for analysis which was completed on Wednesday August 24, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 220803-8
Client Ref.: 69219

Report Number: 658725
Location: Arkady ind.est Newton Heath

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26674440	BR10071250 CONTROL			01/08/2022
26674444	BR10071215 (M10)		2.50	01/08/2022
26674442	BR10071186 (M5B)		1.50	01/08/2022
26674443	BR10071224 (M6B)		1.20	01/08/2022
26674441	BR10071201 (MIC)		1.20	01/08/2022

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220803-8

Report Number: 658725

Superseded Report:

Client Ref.: 69219

Location: Arkady ind.est Newton Heath

Results Legend



Test



No Determination
Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)

Customer
Sample Reference

AGS Reference

Depth (m)

Container

Sample Type

PFAS Liquids

All

NDPs: 0
Tests: 5

26674441	BR10071201 (MIC)		1.20	500ml Plastic (ALE208)	GW
26674443	BR10071224 (M8B)		1.20	500ml Plastic (ALE208)	GW
26674442	BR10071186 (M8B)		1.50	500ml Plastic (ALE208)	GW
26674444	BR10071215 (M10)		2.50	500ml Plastic (ALE208)	GW
26674440	BR10071250 CONTROL			500ml Plastic (ALE208)	GW
X	X	X	X	X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 220803-8

Report Number: 658725

Superseded Report:

Client Ref.: 69219

Location: Arkady ind.est Newton Heath

Table of Results - Appendix

Method No	Reference	Description
TM337	PFAS in Environmental Water Matrices	Analysis of PFAS

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 220803-8
Client Ref.: 69219

Report Number: 658725
Location: Arkady ind.est Newton Heath

Superseded Report:

Test Completion Dates

Lab Sample No(s)	26674444	26674442	26674443	26674441	26674440
Customer Sample Ref.	BR10071215 (M10)	BR10071186 (M5B)	BR10071224 (M6B)	BR10071201 (MIC)	BR10071250 CONT ROL
AGS Ref.					
Depth	2.50	1.50	1.20	1.20	
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
PFAS Liquids	17-Aug-2022	22-Aug-2022	24-Aug-2022	24-Aug-2022	16-Aug-2022



CERTIFICATE OF ANALYSIS

SDG: 220803-8
Client Ref: 69219

Report Number: 658725
Location: Arkady ind.est Newton Heath

Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

SOIL CONTAMINATION ANALYSIS RESULTS



Unit 7-8 Hawarden Business Park

Manor Road (off Manor Lane)

Hawarden

Deeside

CH5 3US

Tel: (01244) 528777

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Sub Surface Laboratories Ltd
3 Peel Street
Preston
Lancashire
PR2 2QS

Attention: David Ravenscroft-Jones

CERTIFICATE OF ANALYSIS

Date of report Generation:	12 August 2022
Customer:	Sub Surface Laboratories Ltd
Sample Delivery Group (SDG):	220726-25
Your Reference:	69219
Location:	Arkady ind.est Newton Heath
Report No:	657644
Order Number:	

We received 8 samples on Tuesday July 26, 2022 and 8 of these samples were scheduled for analysis which was completed on Friday August 12, 2022. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager



CERTIFICATE OF ANALYSIS

Validated

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
26636390	879 M11		0.30 - 0.50	20/07/2022
26636389	881 M10		0.10 - 0.30	20/07/2022
26636388	M6B		2.60 - 2.60	21/07/2022
26636386	858 M6B		1.00 - 1.20	20/07/2022
26636385	866 M5B		1.00 - 1.20	20/07/2022
26636384	MIC		2.30 - 2.30	21/07/2022
26636383	874 MIC		1.00 - 1.20	20/07/2022
26636393	888 Test			20/07/2022

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Results Legend

- X** Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)			26636393	26636383	26636384	26636385	26636386	26636388	26636389	26636390
Customer Sample Reference			888 Test	874 MIC	MIC	866 M5B	858 M6B	M6B	881 M10	879 M11
AGS Reference										
Depth (m)				1.00 - 1.20	2.30 - 2.30	1.00 - 1.20	1.00 - 1.20	2.60 - 2.60	0.10 - 0.30	0.30 - 0.50
Container			1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)	1kg TUB with Handle (ALE260)
Sample Type			S	S	S	S	S	S	S	S
PFAS Solids	All	NDPs: 0 Tests: 8								
			X	X	X	X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 8								
			X	X	X	X	X	X	X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
26636390	879 M11	0.30 - 0.50	Dark Brown	Loamy Sand	Stones	Vegetation
26636389	881 M10	0.10 - 0.30	Dark Brown	Loamy Sand	Stones	Vegetation
26636386	858 M6B	1.00 - 1.20	Dark Brown	Sandy Silt Loam	Stones	Vegetation
26636385	866 M5B	1.00 - 1.20	Dark Brown	Clay	Stones	None
26636383	874 MIC	1.00 - 1.20	Dark Brown	Sandy Clay Loam	Stones	Vegetation
26636393	888 Test		Light Brown	Sand	Stones	None
26636388	M6B	2.60 - 2.60	Dark Brown	Silty Clay	Vegetation	None
26636384	MIC	2.30 - 2.30	Dark Brown	Silty Clay	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

[illegible]



Superseded Report:

Location: Arkady ind.est Newton Heath

Page 6 of 9



CERTIFICATE OF ANALYSIS

Validated

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM338	PFAS In Solids	Analysis of perfluoroalkylsulfonates and perfluorocarboxylic acids in Solids

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 220726-25
Client Ref.: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Test Completion Dates

Lab Sample No(s)	26636390	26636389	26636386	26636385	26636383	26636393	26636388	26636384
Customer Sample Ref.	879 M11	881 M10	858 M6B	866 M5B	874 MIC	888 Test	M6B	MIC
AGS Ref.								
Depth	0.30 - 0.50	0.10 - 0.30	1.00 - 1.20	1.00 - 1.20	1.00 - 1.20		2.60 - 2.60	2.30 - 2.30
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
PFAS Solids	02-Aug-2022	02-Aug-2022	12-Aug-2022	02-Aug-2022	02-Aug-2022	02-Aug-2022	02-Aug-2022	12-Aug-2022
Sample description	27-Jul-2022	27-Jul-2022	27-Jul-2022	27-Jul-2022	27-Jul-2022	27-Jul-2022	27-Jul-2022	27-Jul-2022



CERTIFICATE OF ANALYSIS

SDG: 220726-25
Client Ref: 69219

Report Number: 657644
Location: Arkady ind.est Newton Heath

Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

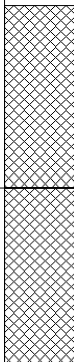
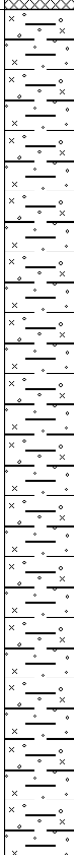
Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

MINI BOREHOLE RECORD SHEETS

<div><div><div></div><div></div></div><div><div>SUB SURFACE</div><div>SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907</div></div></div>							Site ARKADY INDUSTRIAL ESTATE		Borehole Number M1C	
Boring Method MINI PERCUSSIVE		Casing Diameter		Ground Level (mOD) 63.89		Client CASSEL & FLETCHER CONSTRUCTION LIMITED		Job Number 6921G		
		Location AS PLAN		Dates 20/07/2021		Engineer		Sheet 1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.10-0.30	B					(0.60)	MADE GROUND: brown slightly sandy slightly silty fine to coarse gravel sized fragments of stone, brick, concrete and clinker.		▽1	
0.60-0.80	B				63.29	0.60 (0.60)	MADE GROUND: greyish brown gravelly slightly sandy silty clay. Gravel sized fragments are fine to coarse stone, brick and clinker.			
1.00-1.20 1.00-1.20	B ES			Seepage (1) at 1.00m.						
1.20-2.00	C			1.20m to 2.00m - 100% Recovery	62.69	1.20	Stiff high strength becoming firm medium strength thinly laminated brown and occasional grey mottled slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium sandstone, coal, quartz and siltstone.			
2.00-3.00	C			HV at 1.70m c=130+kPa 2.00m to 3.00m - 50% Recovery		(2.80)				
3.00-4.00	C			3.00m to 4.00m - 80% Recovery						
				HV at 3.70m c=71kPa HV at 3.80m c=72kPa						
				30/08/2022:0.90m	59.89	4.00	Complete at 4.00m			
<div>Remarks</div> <div>Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. Core diameter: 86mm to 2.00m, 76mm to 3.00m and 66mm to 4.00m. HV = Hand Shear Vane test. On completion backfilled with bentonite and installed a 50mm dia hdpe gas monitoring standpipe with a gas valve and a gravel surround to 2.50m, a Bentonite seal from 0.50m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.</div>								Scale (approx) 1:25	Logged By CB/VW	
								Figure No. 6921G.M1C		



**Borehole
Number**
M5B

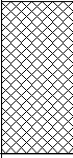
Job Number
6921G

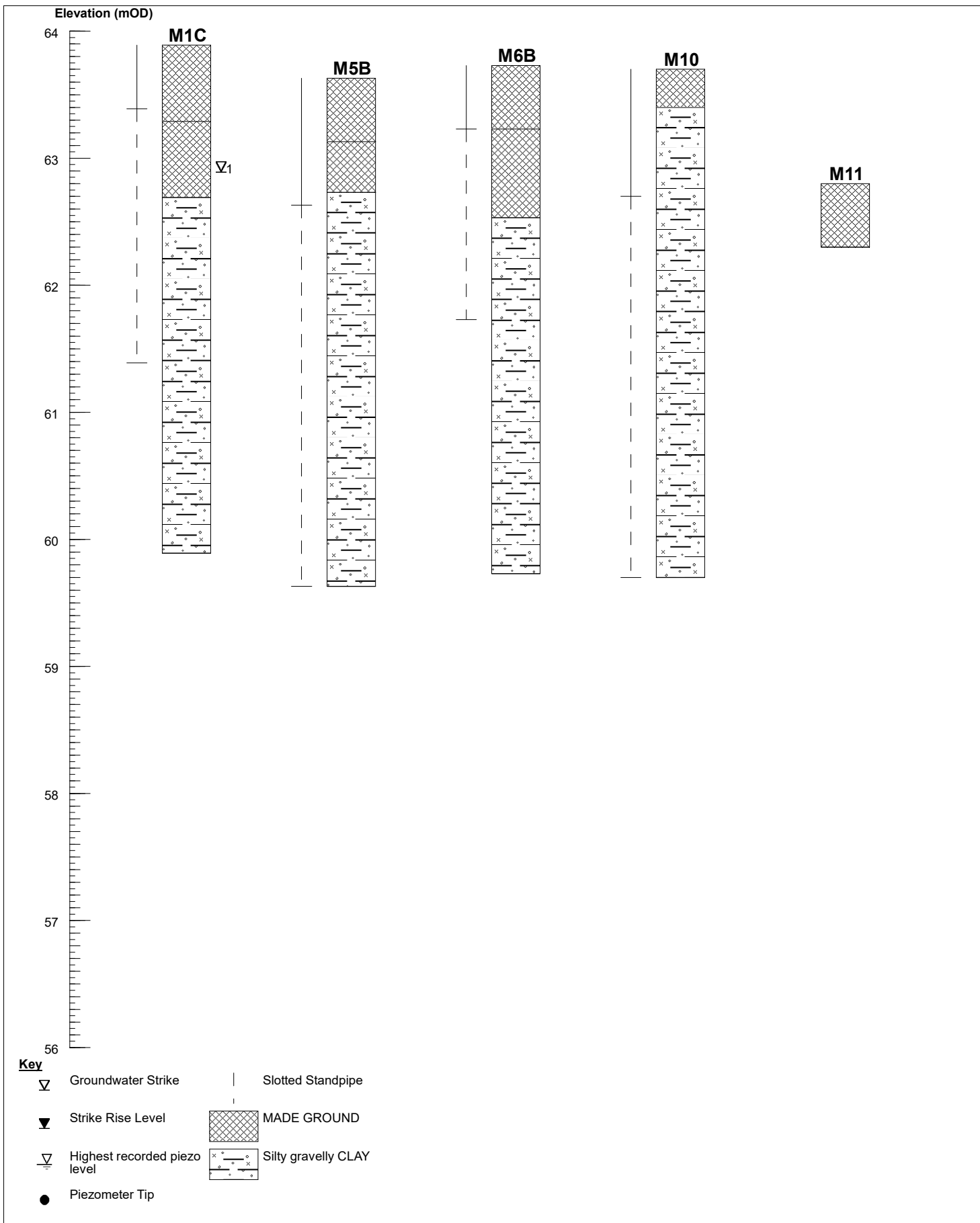
Sheet
1/1

Remarks Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. Core diameter: 86mm to 2.00m, 76mm to 3.00m and 66mm to 4.00m. No groundwater encountered. NV = Hand Shear Vane test. On completion backfilled with arisings and installed a 50mm dia hdpe gas monitoring standpipe with a gas valve and a gravel surround to 4.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.	Scale (approx) 1:25	Logged By CB/VW
	Figure No. 6921G.M5B	

 SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907							Site ARKADY INDUSTRIAL ESTATE		Borehole Number M6B
Boring Method MINI PERCUSSIVE		Casing Diameter		Ground Level (mOD) 63.73		Client CASSEL & FLETCHER CONSTRUCTION LIMITED		Job Number 6921G	
		Location AS PLAN		Dates 20/07/2022		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30	B					(0.50)	MADE GROUND: brown slightly clayey slightly silty fine to coarse gravel sized fragments of stone, brick, concrete and clinker.		
0.50-0.70	B				63.23	0.50 (0.70)	MADE GROUND: grey clayey slightly silty slightly sandy fine to coarse gravel sized fragments of stone, brick and clinker.		
1.00-1.20 1.00-1.20	B ES								
1.20-2.00	C			1.20m to 2.00m - 100% Recovery	62.53	1.20	Firm thinly laminated high strength thinly laminated brown and occasional grey mottled slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sandstone, siltstone and quartz.		
2.00-3.00	C			HV at 1.80m c=90kPa HV at 1.90m c=92kPa 2.00m to 3.00m - 50% Recovery		(2.80)			
3.00-4.00	C			3.00m to 4.00m - 100% Recovery					
				30/08/2022: DRY	59.73	4.00	Complete at 4.00m		
Remarks Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. Core diameter: 86mm to 2.00m, 76mm to 3.00m and 66mm to 4.00m. No groundwater encountered. HV = Hand Shear Vane test. On completion backfilled with bentonite and installed a 50mm dia hdpe gas monitoring standpipe with a gas valve and a gravel surround to 2.00m, a Bentonite seal from 0.50m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.								Scale (approx) 1:25	Logged By CB/VW
								Figure No. 6921G.M6B	

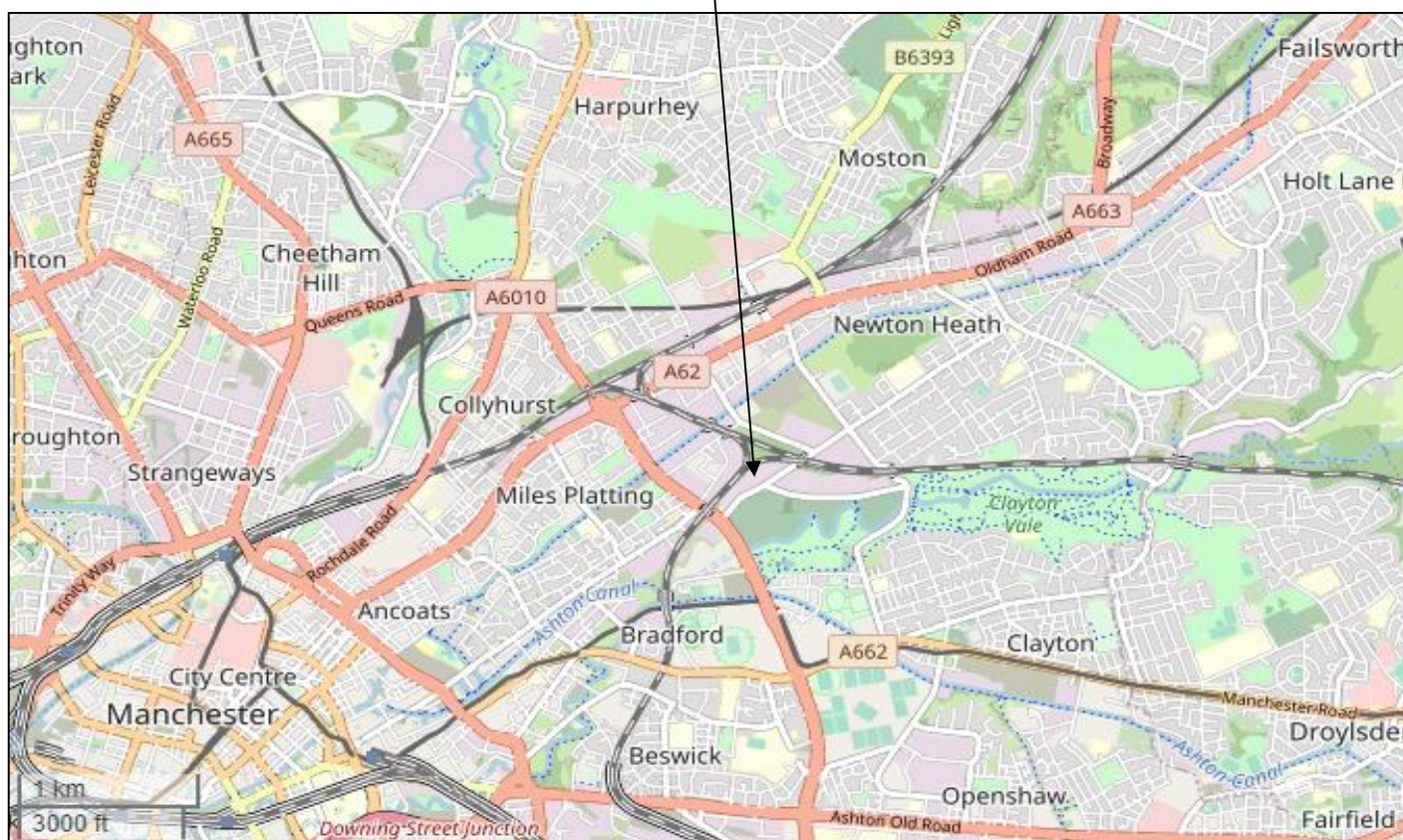
SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907							Site ARKADY INDUSTRIAL ESTATE		Borehole Number M10	
Boring Method MINI PERCUSSIVE		Casing Diameter			Ground Level (mOD) 63.70		Client CASSEL & FLETCHER CONSTRUCTION LIMITED		Job Number 6921G	
		Location AS PLAN			Dates 20/07/2022		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.10-0.30 0.10-0.30	B ES				63.40	(0.30) 0.30	MADE GROUND: brown slightly sandy slightly silty fine to coarse gravel sized fragments of stone, brick, concrete and cobble sized fragments of concrete.			
1.00-1.20	B						Very stiff to stiff thinly high strength thinly laminated brown and occasional grey mottled slightly gravelly silty CLAY. Gravel is subangular to subrounded fie to coarse sandstone, siltstone and quartz.			
1.20-2.00	C			1.20m to 2.00m - 100% Recovery						
2.00-3.00	C			HV at 1.70m c=124kPa HV at 1.80m c=127kPa HV at 1.90m c=130+kPa 2.00m to 3.00m - 45% Recovery		(3.70)				
3.00-4.00	C			3.00m to 4.00m - 100% Recovery						
				HV at 3.75m c=91kPa						
				30/08/2022:DRY	59.70	4.00	Complete at 4.00m			
Remarks Hand dug inspection pit from GL to 1.20m to check for services - 1 hour. Core diameter: 86mm to 2.00m, 76mm to 3.00m and 66mm to 4.00m. No groundwater encountered. HV = Hand Shear Vane test. On completion backfilled with arisings and installed a 50mm dia hdpe gas monitoring standpipe with a gas valve and a gravel surround to 4.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.								Scale (approx) 1:25	Logged By CB/VW	
								Figure No. 6921G.M10		

 SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907							Site ARKADY INDUSTRIAL ESTATE		Borehole Number M11	
Boring Method HAND EXCAVATION		Casing Diameter		Ground Level (mOD) 62.80		Client CASSEL & FLETCHER CONSTRUCTION LIMITED		Job Number 6921G		
		Location AS PLAN		Dates 20/07/2022		Engineer		Sheet 1/1		
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.30-0.50 0.30-0.50	B ES			20/07/2022: DRY	62.30	<div style="display: flex; align-items: center;"> <div style="width: 100px; border-left: 1px solid black; margin-right: 5px;"></div> <div> (0.50) 0.50 </div> </div>	MADE GROUND: brown slightly silty sandy fine to coarse gravel sized fragments of stone. ...at 0.50m bituminous macadam obstruction. Complete at 0.50m			
Remarks Hand dug inspection pit from GL to 0.50m to check for services - 1 hour. On completion backfilled with arisings. Location moved twice but obstruction still encountered.							Scale (approx) 1:25	Logged By WP/DJ		
Logged in accordance BS5930:1999 A2							Figure No. 6921G.M11			



SUB SURFACE SITE INVESTIGATION SPECIALISTS, GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, Lancashire, PR2 2QS. Tel: (01772) 561135 Fax: (01772) 204907		Nominal Section		
Site ARKADY INDUSTRIAL ESTATE	Date Drawn 05/10/2022	Date Checked	Sheet 1/1	Job Number 6921G
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By	Checked By	Scale 1:40[V]	Figure No. 6921G.1

FIGURES



SUB SURFACE

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

Site

ARKADY INDUSTRIAL ESTATE, BRISCOE LANE,
NEWTON HEATH, GREATER MANCHESTER

Client

CASSEL & FLETCHER CONSTRUCTION LIMITED

Site Location

Date Drawn

26/05/2022

Date Checked

Orientation



Job No.

6921H

Drawn By

DJ

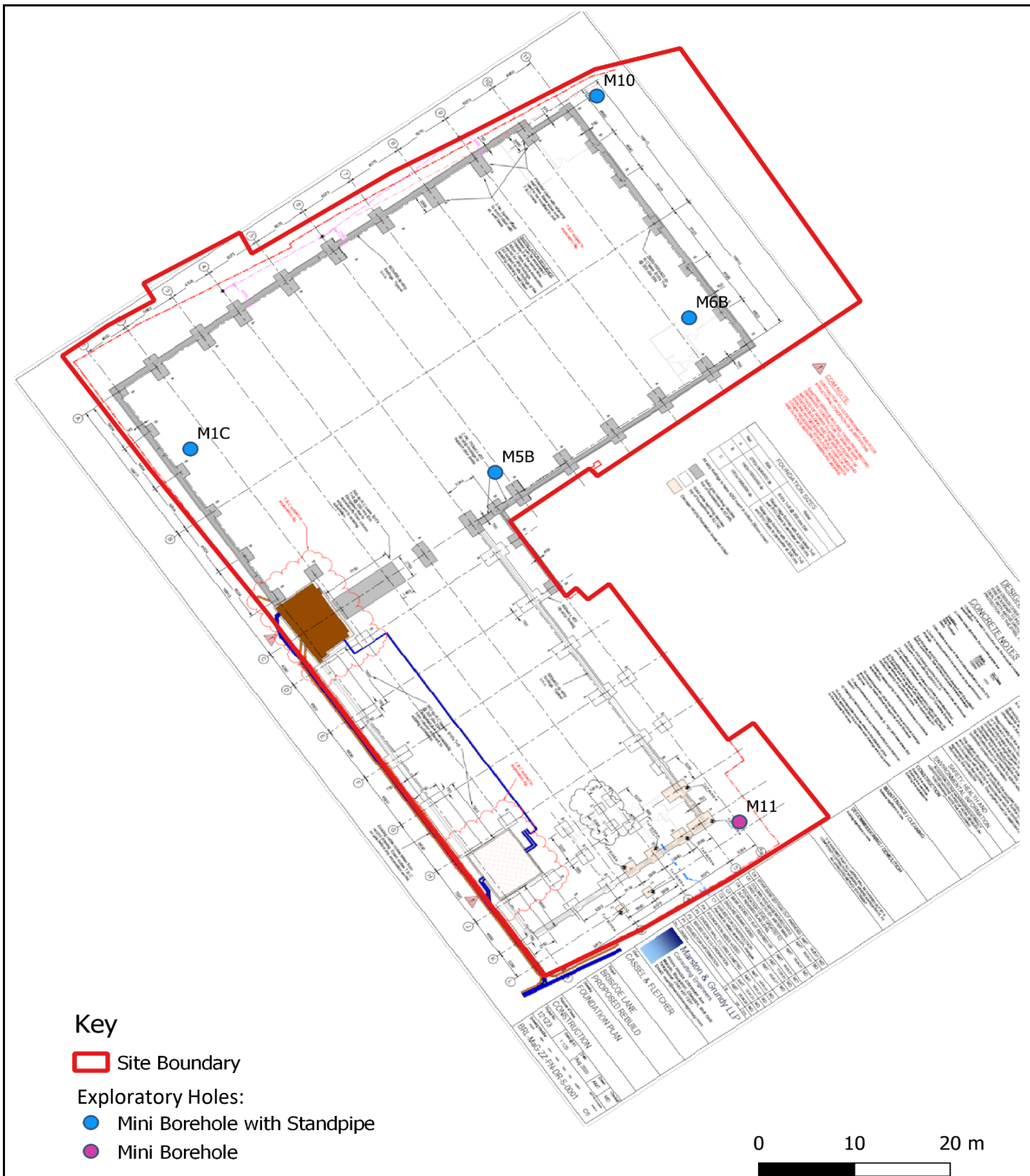
Checked By

Scale

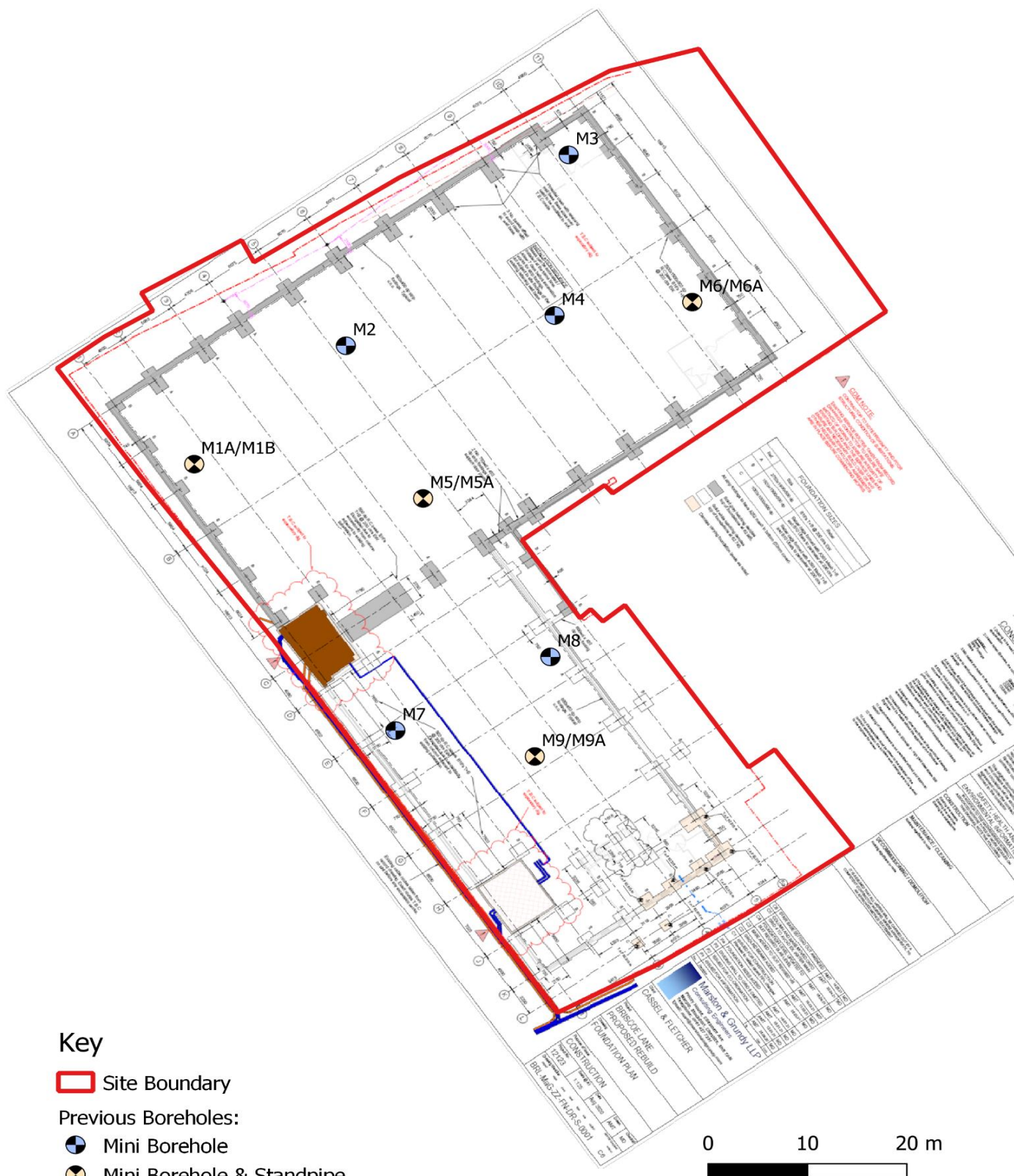
As Shown

Figure No.

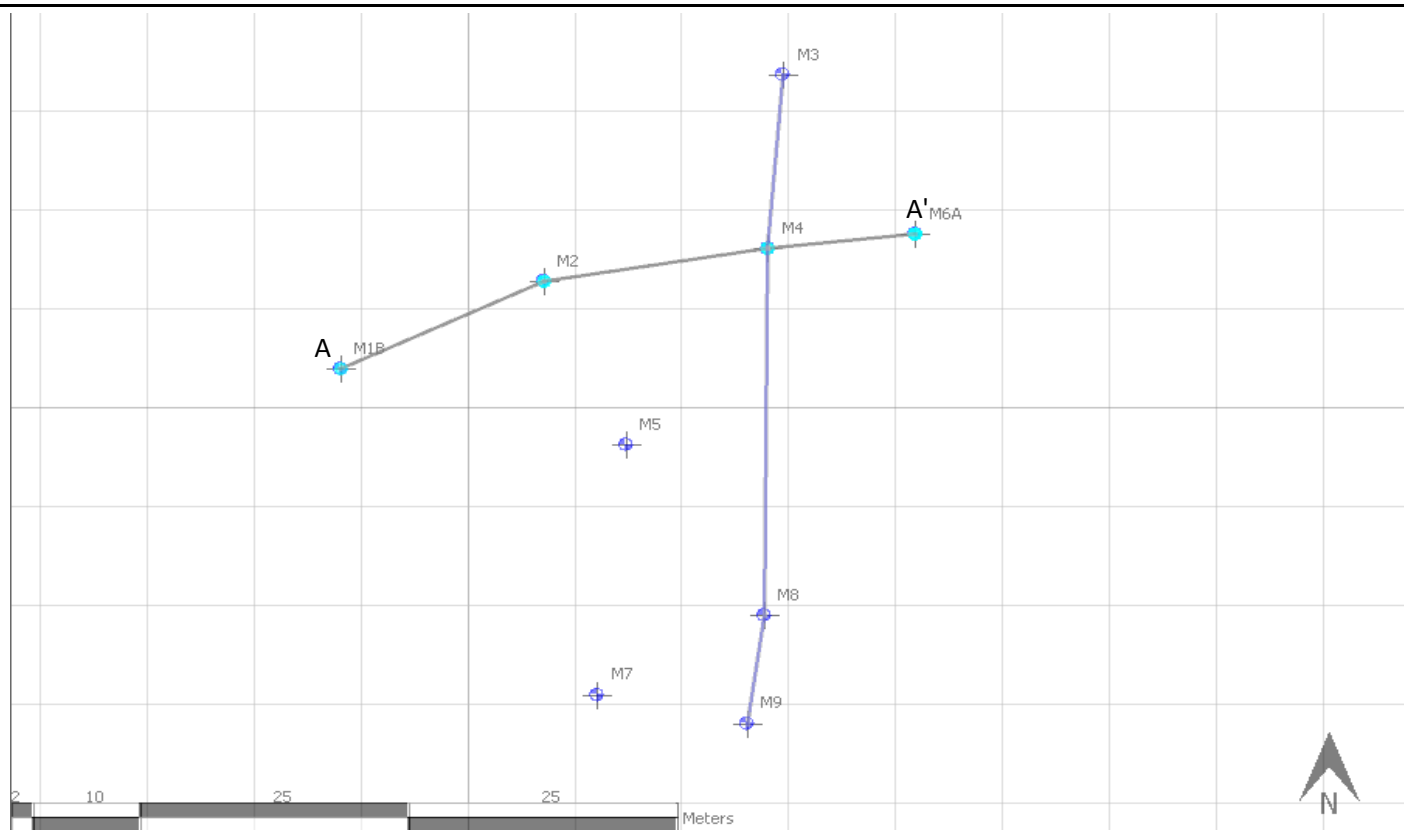
1



 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Proposed Development Layout & Locations of PFAS Sampling Boreholes			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 26-May-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale —	Figure No. 2

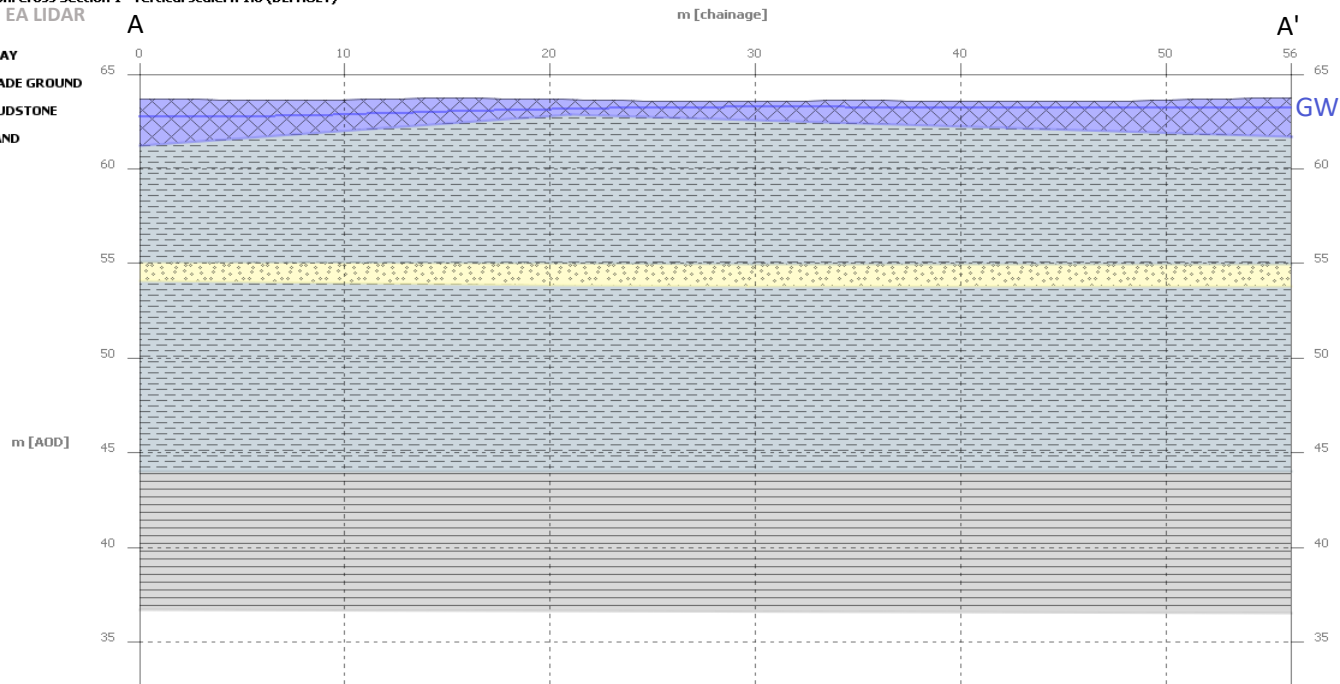


 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Proposed Development Layout & Previous Exploratory Holes			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 26-May-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale -	Figure No. 3



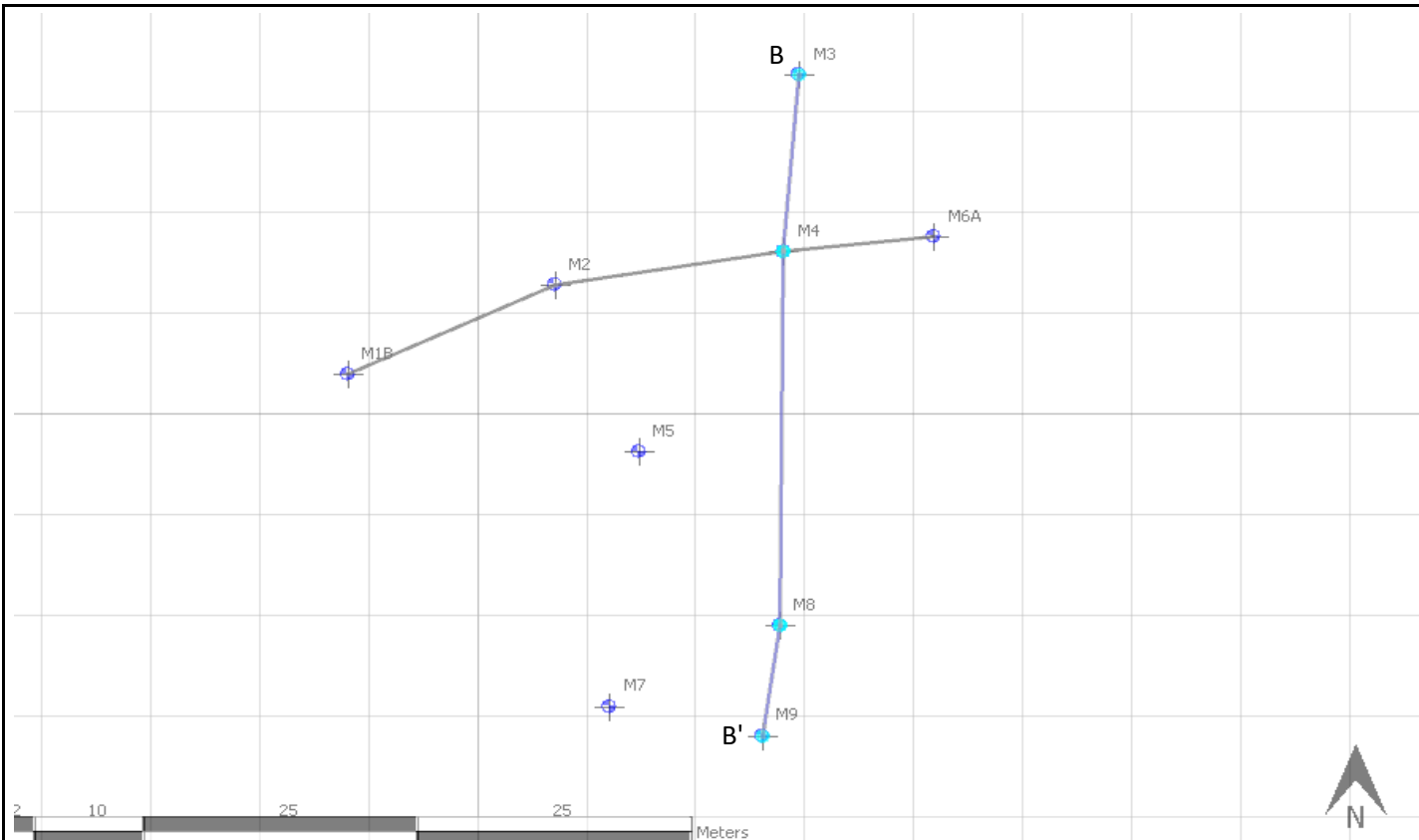
Cross-Section: Cross Section 1 Vertical scale: x 1.0 (DEFAULT)

Profile source: EA LIDAR



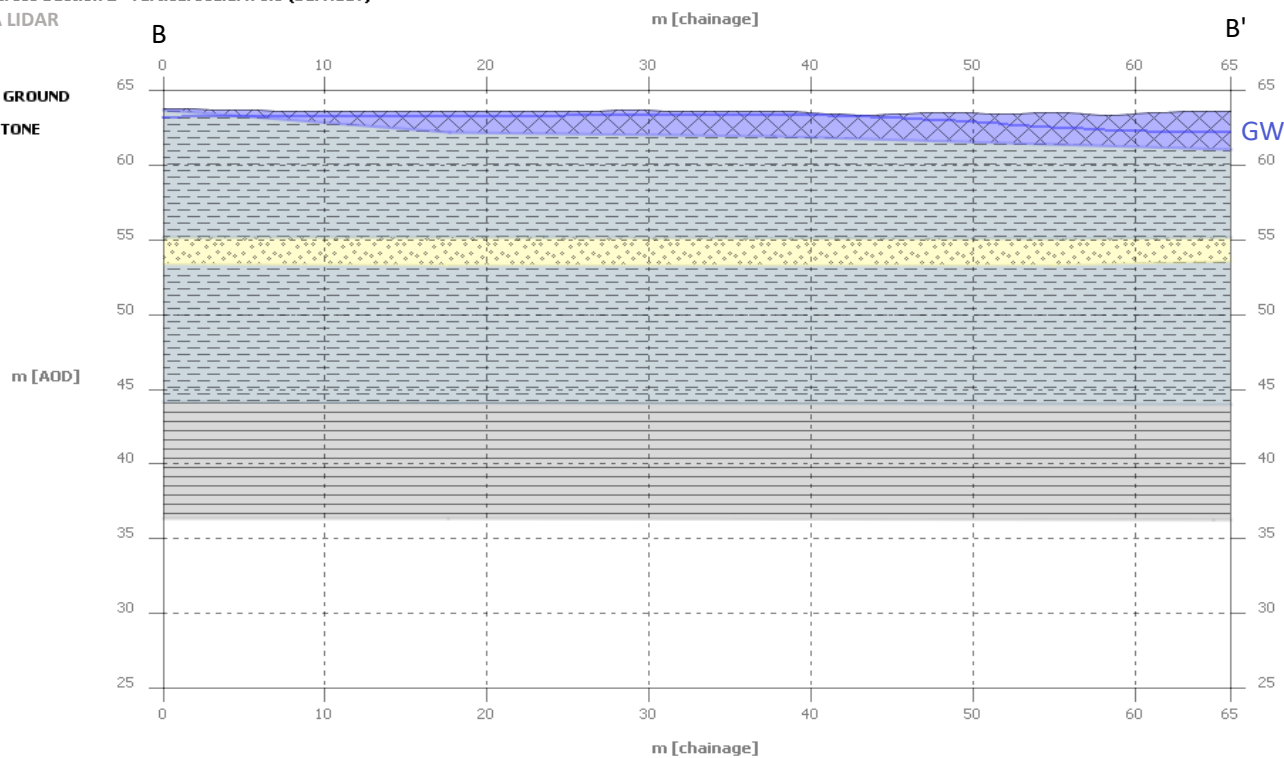
NB: Depth to bedrock and thickness of sand band conjectured, based on the following nearby BGS borehole records.

 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Conjectured Cross Section 1			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 26-May-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale —	Figure No. 4



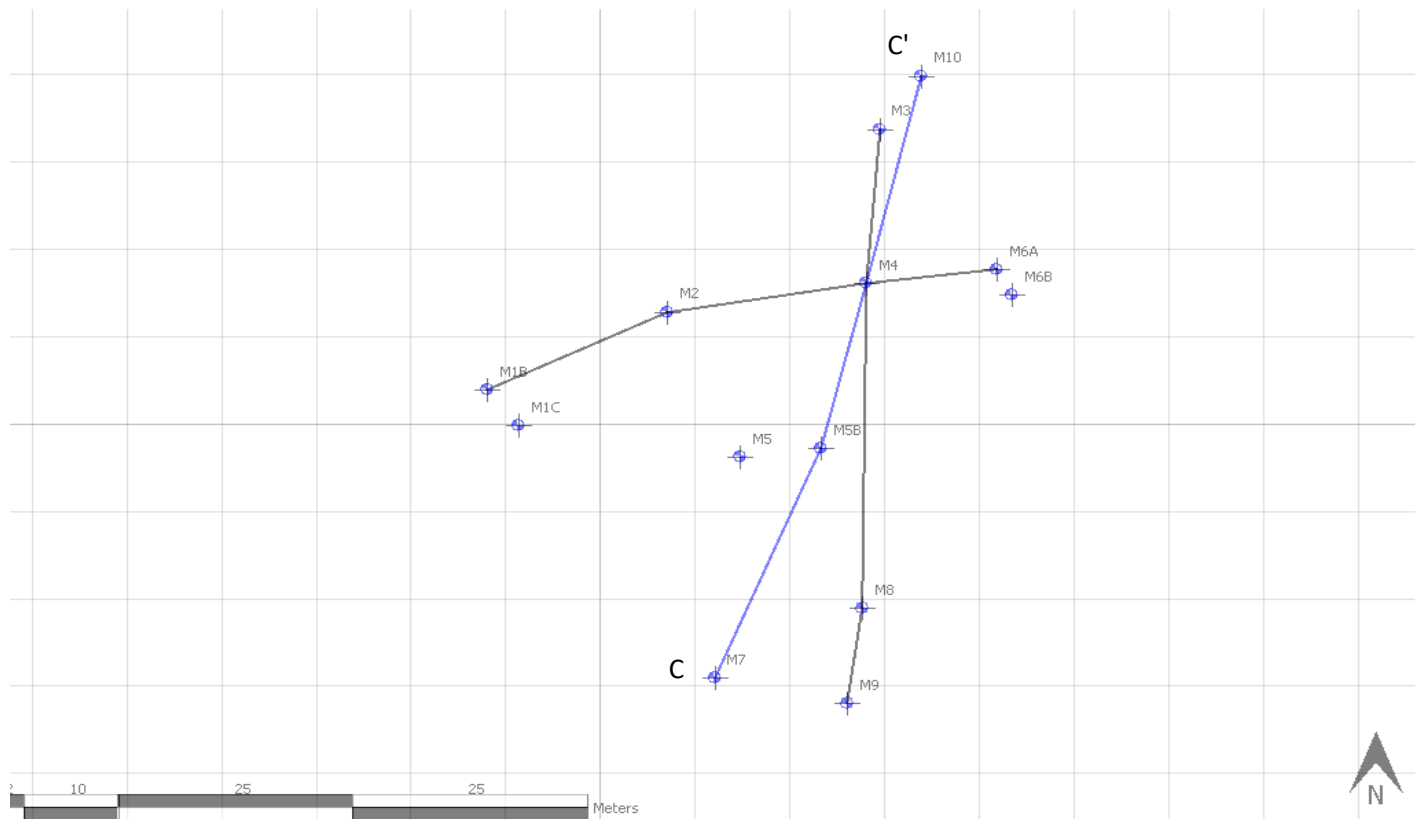
Cross-Section: Cross Section 2 Vertical scale: $\times 1.0$ (DEFAULT)

Profile source: EA LIDAR



NB: Depth to bedrock and thickness of sand band conjectured, based on the following nearby BGS borehole records.

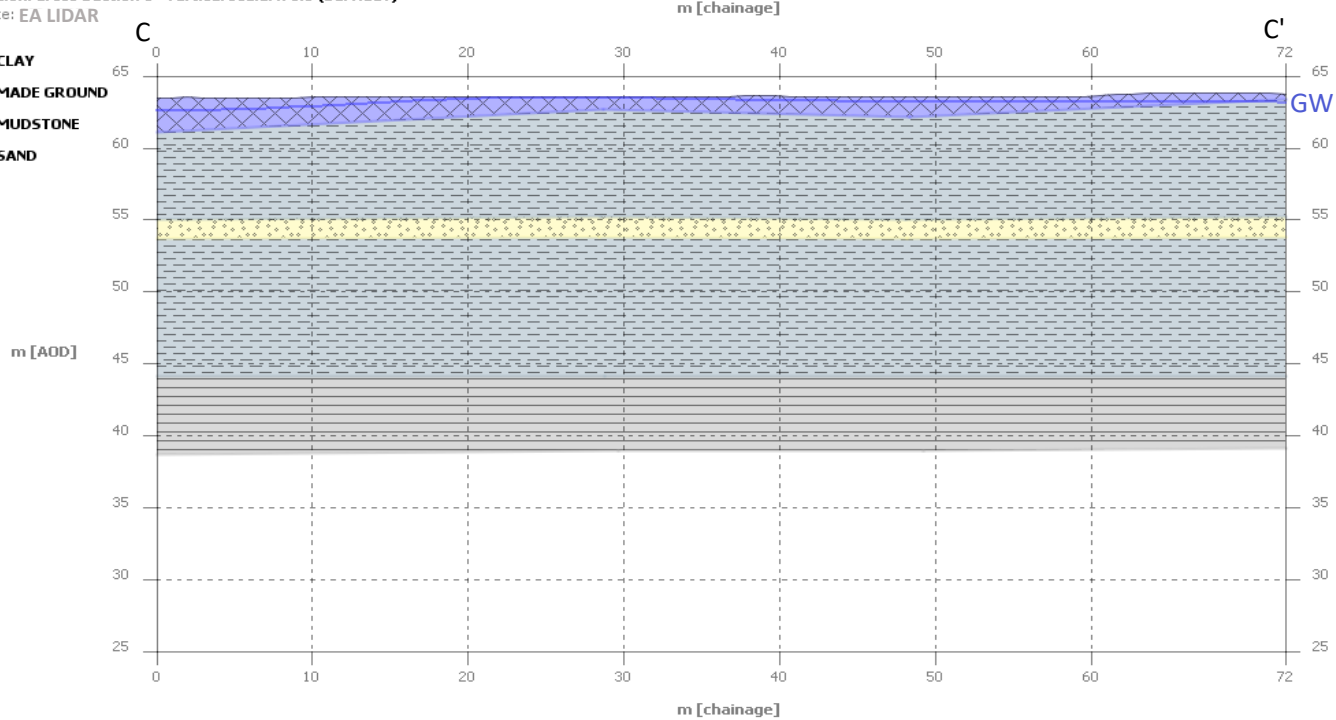
 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Conjectured Cross Section 2			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 26-May-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale —	Figure No. 5



Cross-Section: Cross Section 3 Vertical scale: x 1.0 (DEFAULT)

Profile source: EA LIDAR

- CLAY
- MADE GROUND
- MUDSTONE
- SAND



NB: Depth to bedrock and thickness of sand band conjectured, based on the following nearby BGS borehole records.

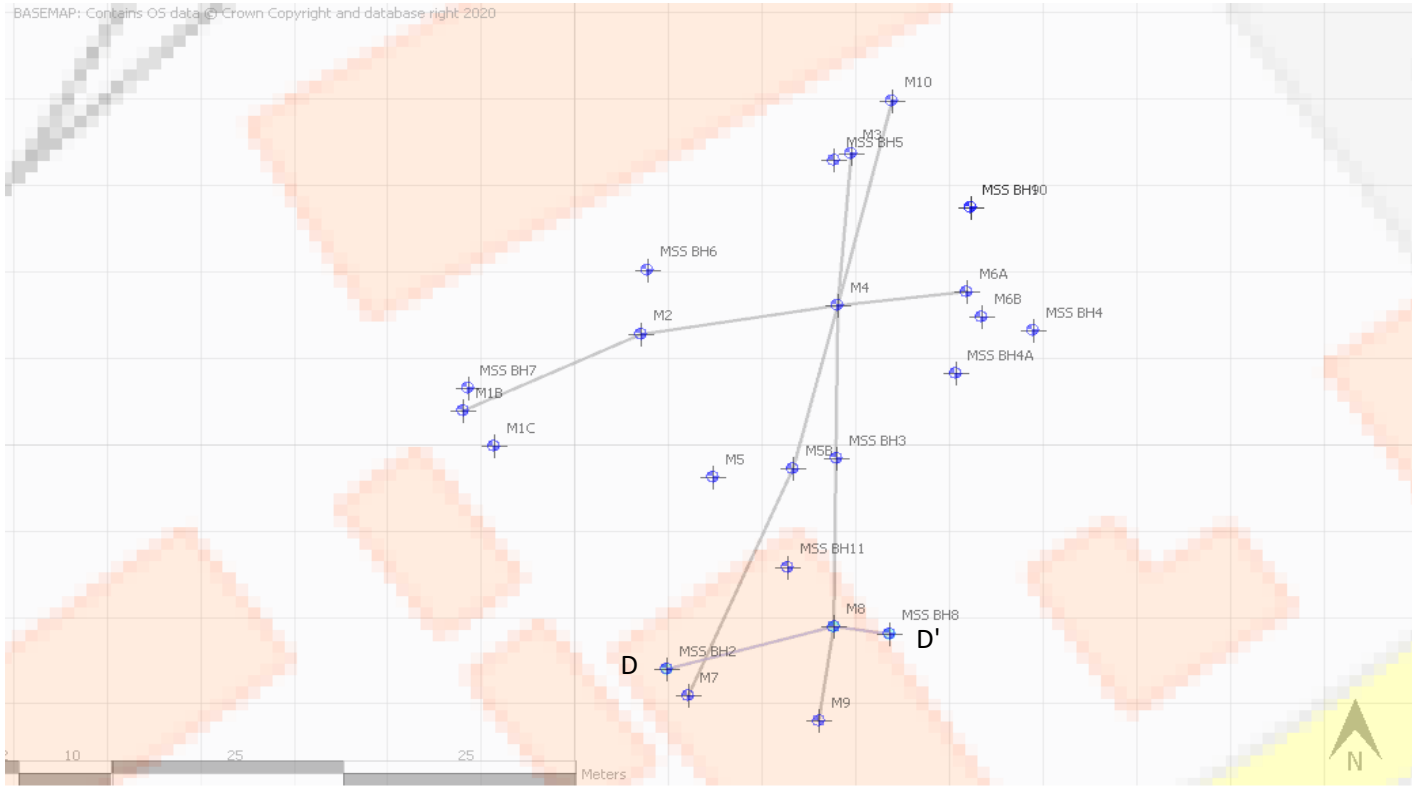


SUB SURFACE

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

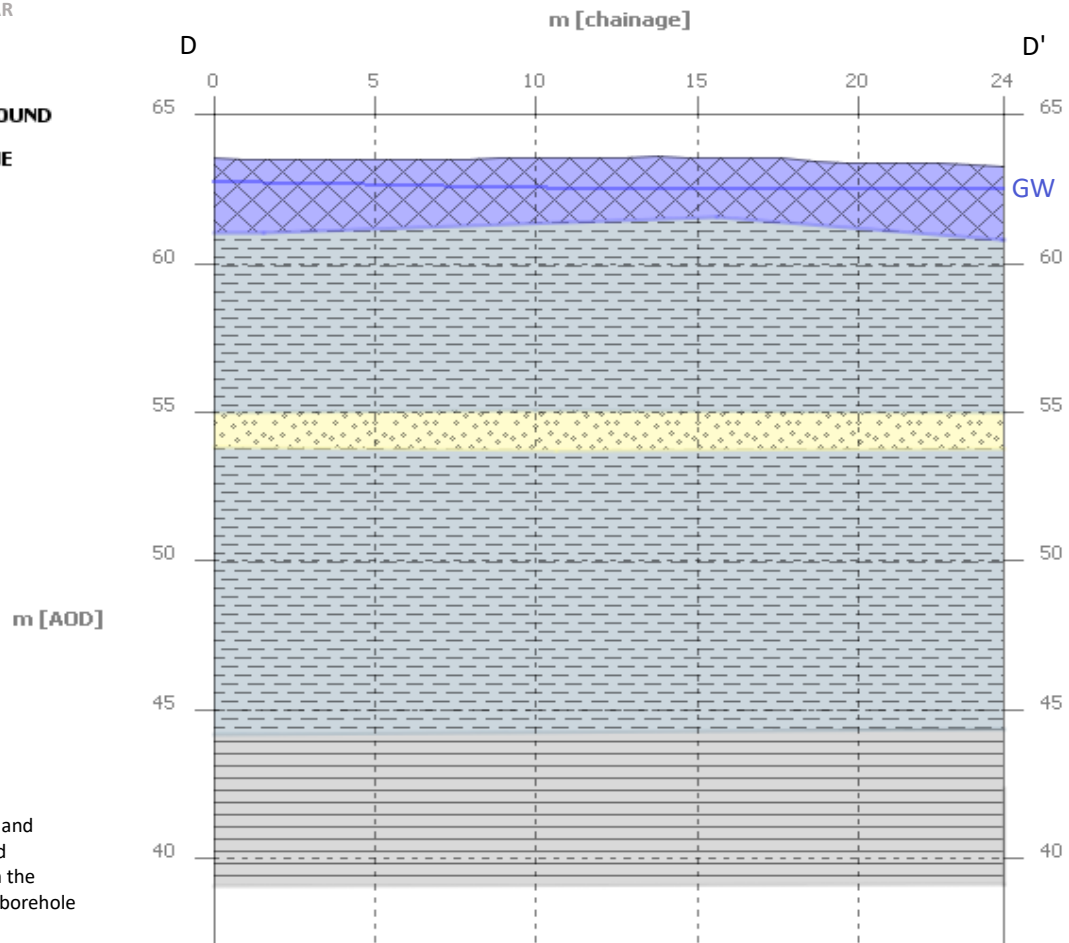
Conjectured Cross Section 3

Site	Date Drawn	Date Checked	Orientation	Job No.
ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	27-Sep-22			6921H
Client	Drawn By	Checked By	Scale	Figure No.
CASSEL & FLETCHER CONSTRUCTION LIMITED	DJ		—	6



Cross-Section: Cross Section 4 Vertical scale: x 1.0 (DEFAULT)

Profile source: EA LIDAR



NB: Depth to bedrock and thickness of sand band conjectured, based on the following nearby BGS borehole records.

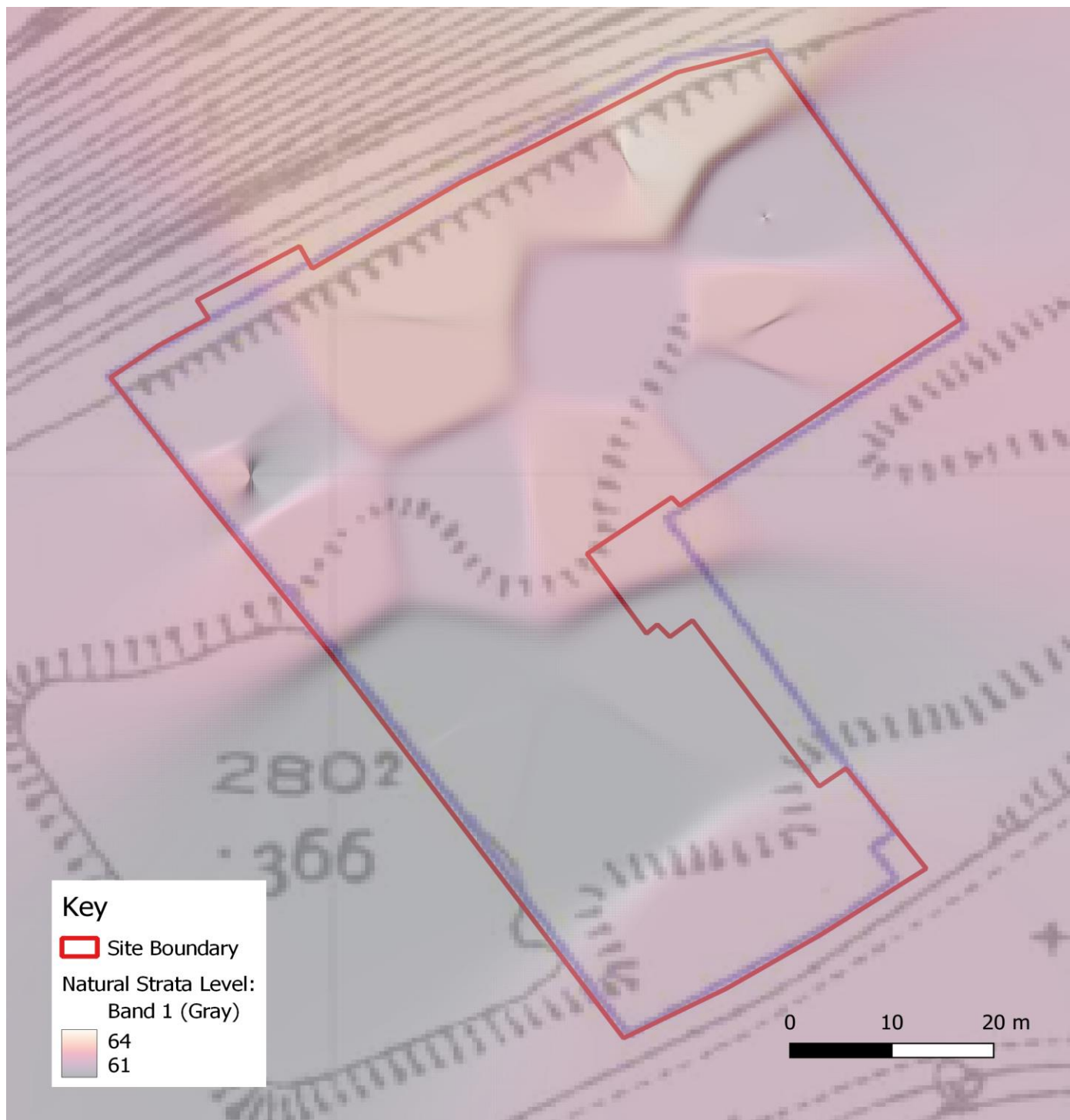


SUB SURFACE

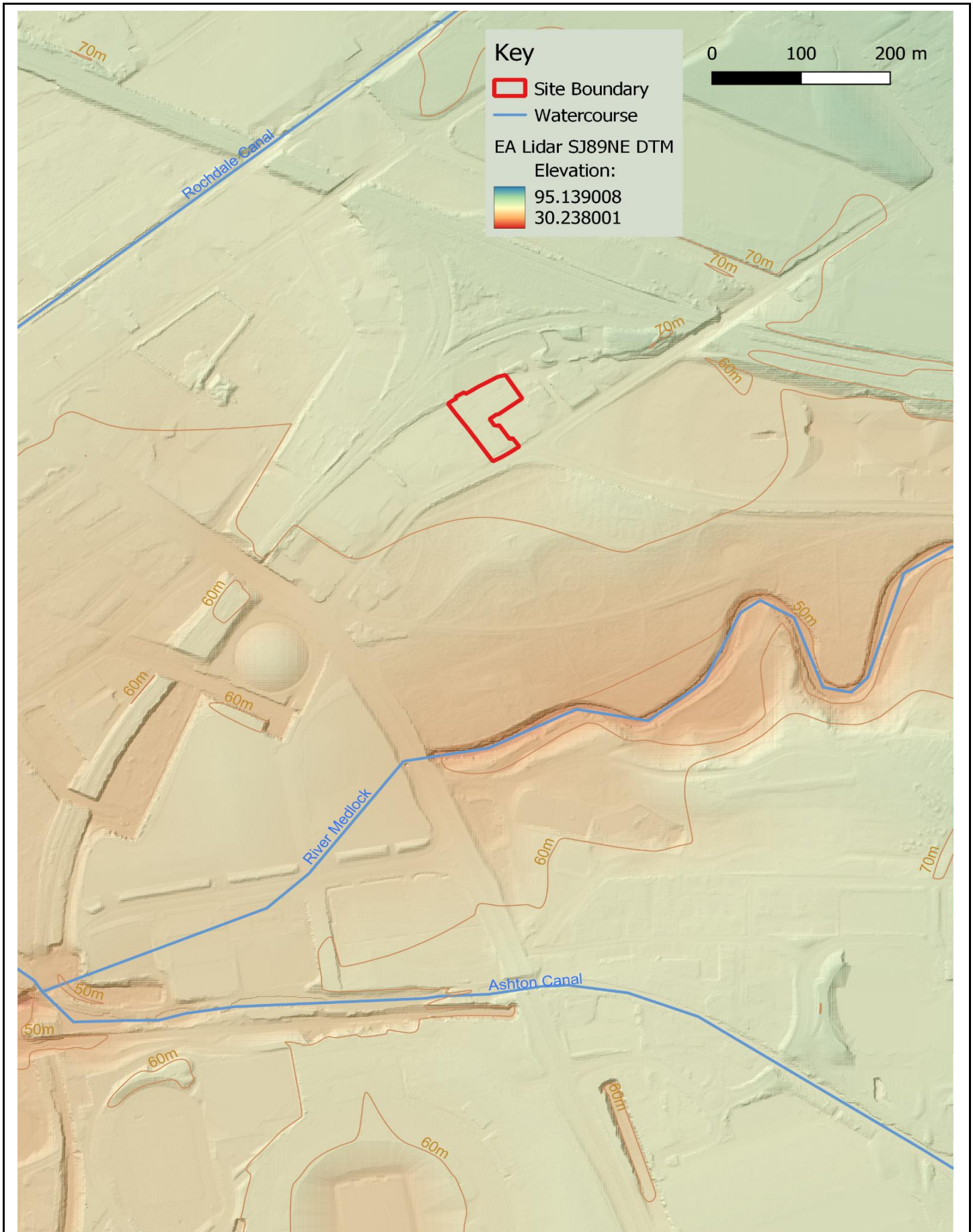
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Conjectured Cross Section 4

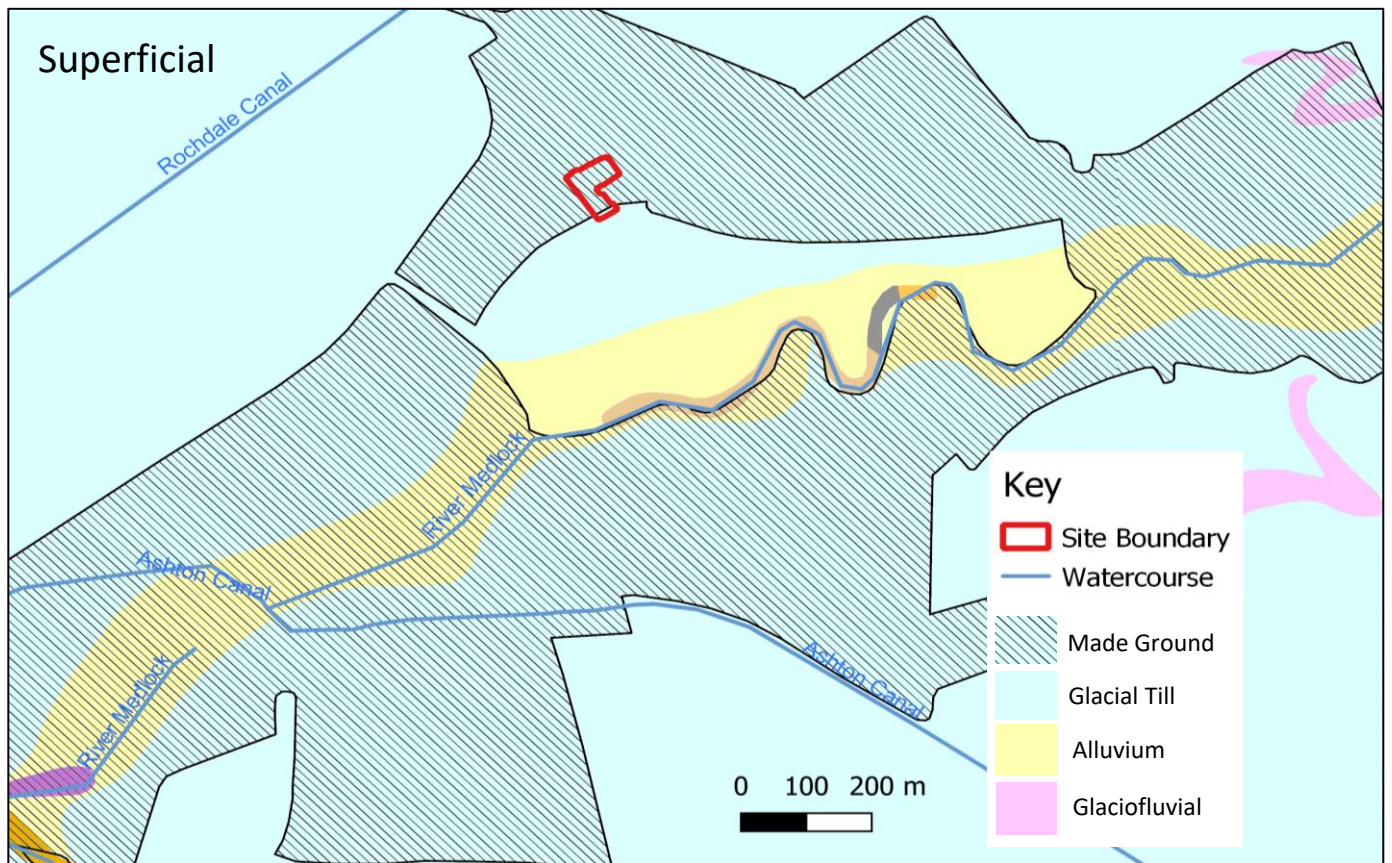
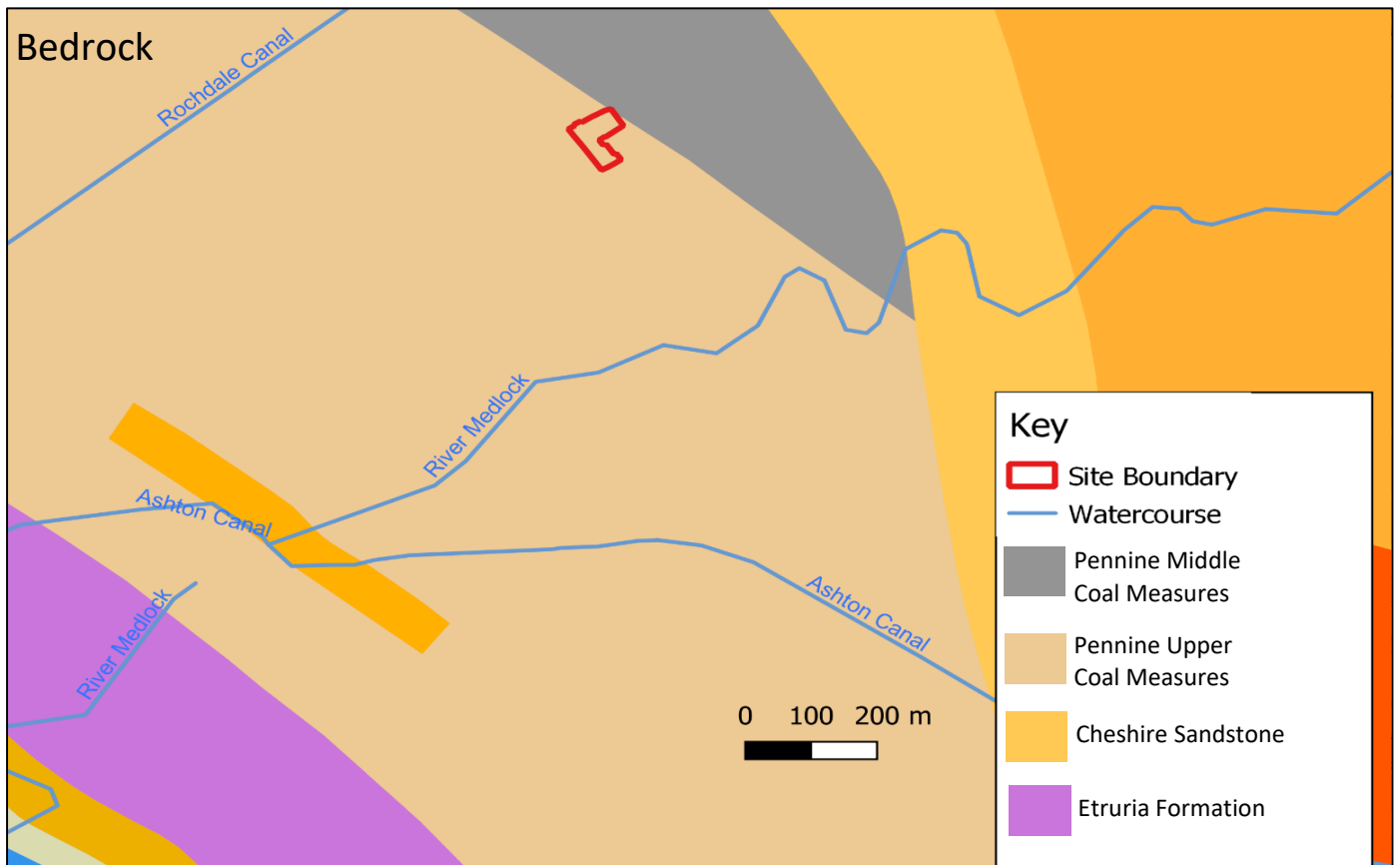
Site	Date Drawn	Date Checked	Orientation	Job No.
ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	27-Sep-22			6921H
Client	Drawn By	Checked By	Scale	Figure No.
CASSEL & FLETCHER CONSTRUCTION LIMITED	DJ		—	7



 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Conjectured Natural Strata Level Overlaid on 1931 Survey.			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 27-Sep-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale —	Figure No. 8



 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Topography (EA Lidar & OS Terra 50 Datasets)			
Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 27-Sep-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale As Shown	Figure No. 9



SUB SURFACE

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

Site
ARKADY INDUSTRIAL ESTATE, BRISCOE LANE,
NEWTON HEATH, GREATER MANCHESTER

Client
CASSEL & FLETCHER CONSTRUCTION LIMITED

Geology
(BGS 1:50,000)

Date Drawn
27-Sep-22

Date Checked

Orientation



Job No.
6921H

Drawn By
DJ

Checked By

Scale
As Shown

Figure No.
10

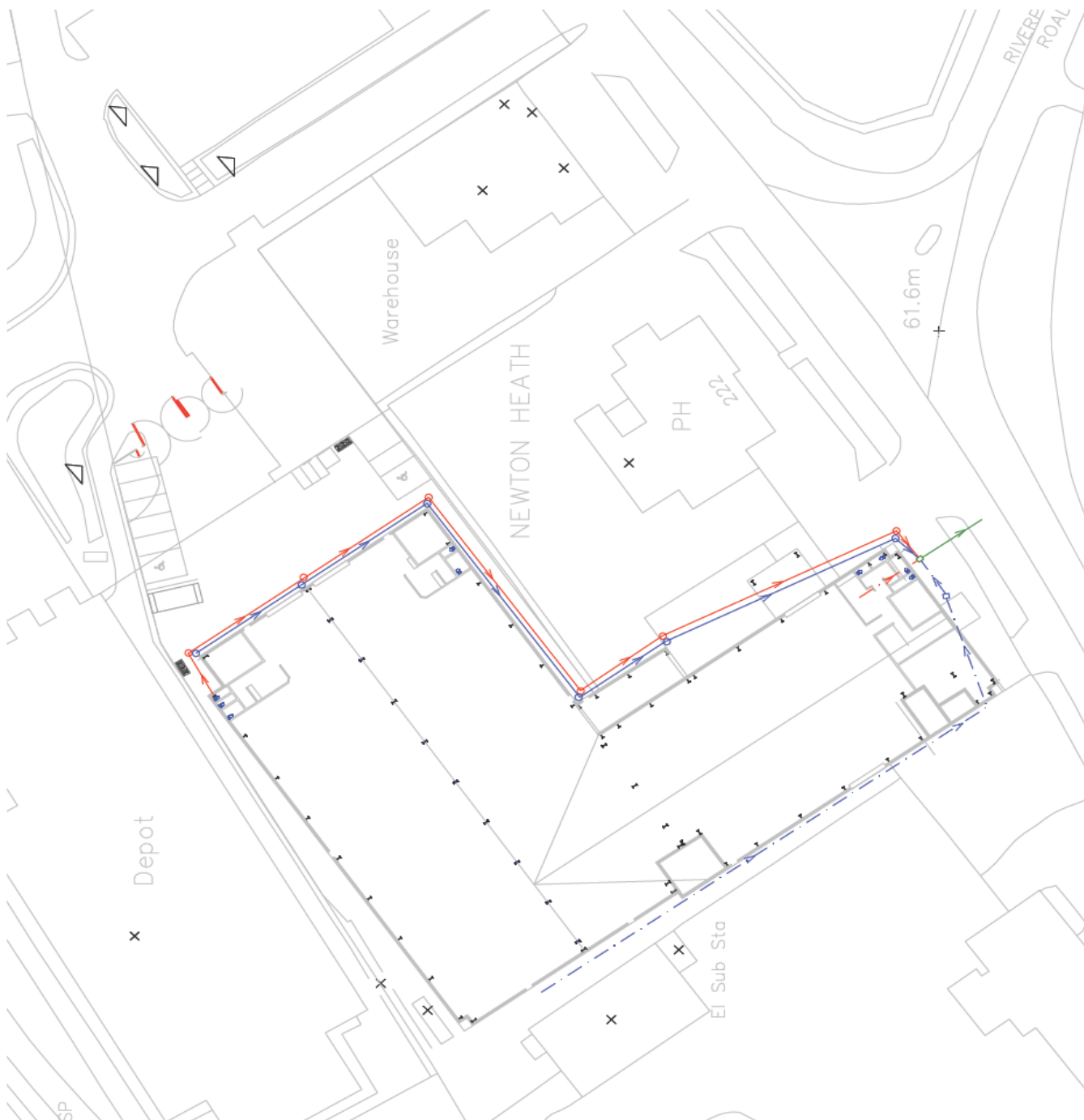
- EXISTING MAIN DRAIN CONNECTION TO SEWERS
- NEW FOUL U/G DRAIN PIPE
- EXISTING FOUL U/G DRAIN PIPE
- NEW SURFACE WATER U/G DRAIN PIPE
- EXISTING SURFACE WATER U/G DRAIN PIPE
- NEW FOUL L.C.
- NEW SURFACE WATER L.C.
- EXISTING PRINCIPAL M.H.
- EXISTING SURFACE WATER M.H.



C-ARTERED BUILDING CONSULTANTS

Contract: PROPOSED REBUILD FOLLOWING FIRE DAMAGE at ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, MANCHESTER		Client: C & G GREENBERG 37 SINGLETON ROAD SALFORD M7 4NN	
DRAWING TITLE: DRAINAGE	PRE/C/007	DRAWING NO.	REV.
PROJECT: SP4018190	SCALE: 1:500 @ A3	DATE: 27 SEP 2022	BY: DJ
		DATE: 27 SEP 2022	BY: DJ

architecture - quantity surveying - management



SUB SURFACE

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

Drainage Scheme

Site ARKADY INDUSTRIAL ESTATE, BRISCOE LANE, NEWTON HEATH, GREATER MANCHESTER	Date Drawn 27-Sep-22	Date Checked	Orientation 	Job No. 6921H
Client CASSEL & FLETCHER CONSTRUCTION LIMITED	Drawn By DJ	Checked By	Scale As Shown	Figure No. 11