Phase II Geoenvironmental Site Assessment

Site: Lordship Close, Moston
Reference: 16-713-R2
Date: May 24



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EXECUTIVE SUMMARY

Site Address	Land south of Lordship Close, Moston, Manchester, M9 4FX
Grid Reference	E386804, N402120
Site Area	0.15 Ha
Proposed Development	One Manchester Developments Limited intend to construct a low-rise residential development comprising c. 9 dwellings with associated gardens, estate roads and infrastructure.
Current Site Use	The site is an irregularly shaped parcel of land and is located to the south of Lordship Close in the centre of a residential estate. The site is generally level; however, the centre of the site is circa 1.0 m higher. No retaining walls are present. The site is predominantly covered in soft standing with two mature trees in the north of the site and one present in the east of the site. There are small areas of concrete paving stones in the south and centre of the site. All former structures have now been demolished. The site's current use is an informal playing field with a football net in the centre of the site. There is further evidence that the site is used for recreational activities as dog toys, tennis balls and litter including food and beverage packing was noted during the intrusive investigation
Site History	On mapping originating from circa 1848, the site is unoccupied agricultural land with a field boundary and trees recorded on site. By 1893, the site had been developed into eleven terraced houses and associated gardens. Three additional buildings were constructed circa 1933 in the northeast of the site, with a footpath also recorded running through the buildings in the south. By 1981, the site had been redeveloped with ten buildings now occupying the site. All structures were removed from the site prior to 2010, with the site remaining vacant since.

ENVIRONMENTAL SETTING

Geology	Drift Geology	Till (Devensian – CLAY)
	Bedrock Geology	Collyhurst Sandstone Formation - SANDSTONE
	Faults	No geological faults have been recorded in close proximity to the site.
Hydrogeology	A secondary (undifferentiated) aquifer has been recorded on site in the drift geology with a principal aquifer in the bedrock geology.	
	The site is not recorded to be in a Source Protection Zone. Furthermore, no groundwater abstractions have been identified within a 1 km radius.	
Hydrology	The nearest surface water feature is Boggart Hole Clough watercourse which is located 200 m north. Due to the local topography, it is likely that any shallow groundwater, if present, will flow in a northerly direction towards the Boggart Hole Clough watercourse.	
	The site is located within Flood Zone 1 - no risk of fluvial flooding	
Utility Locations	An overhead BT line is present in the north of the site, as well as a foul sewer and clean water main on Lordship Close.	
Utility Locations (Continued)	Gas mains are present on the western boundary of the site along Winston Road as well as the southern boundary. In the centre of the site is a gas main that runs to the houses on the south of Lordship Close.	

	Electricity is also present along the boundaries on the east and west of the site.
Landfill Sites and Waste Sites	Historical landfill 220 m south - Land at Moston College. First input – 31/12/1947. Last input not recorded. The site has undergone some historical development and ground working, with Made Ground being a potential source of hazardous ground gases such as methane and carbon dioxide.
Radon	Radon Class 1 - less than 1% of homes are estimated to be at or above the Action Level. No radon protection measures required.
Unexploded Ordnance	Moderate risk UXO area – Brimstone has undertaken a desk-based Preliminary Risk Assessment (Ref: PRA-24-2384, dated Feb 24) concluding no further detailed investigation for UXO is required.
PFAS	No potential current or historical sources of PFAS have been identified on site. No further risk assessment required.
Hazardous Installations	No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.

PREVIOUS REPORTS

The following previous reports have been completed for the site:

- Phase I Geoenvironmental Site Assessment Lordship Close, Moston 16-713-R1 July 2023

A full summary of findings is provided in section 1.5.

E3P GROUND INVESTIGATION

Ground Investigation Works	E3P has completed an intrusive ground investigation comprising: - 11 x mechanically excavated trial pits, - 3 x window sample boreholes, and - Construction of environmental monitoring installations.
Ground Conditions	**Made Ground – 0.00 m bgl to 2.30 m bgl** Made Ground was encountered within all exploratory hole locations to a maximum proven depth of 2.30 m bgl (WS102), however, typically Made Ground deposits were encountered at depths of less than 1.00 m bgl. The Made Ground in the majority of locations comprised brown sandy clay (reworked topsoil), with frequent rootlets in the upper 0.20–0.30 m bgl with the exception of TP101 and TP102 which had additional anthropogenic materials such as fragments of plastic and glass. The Made Ground deposits underlying the reworked topsoil generally comprised brown/dark brown to black sandy clay or clayey gravel with gravels formed of mudstone, ash and clinker with fragments of concrete, brick, plastic and glass. In addition to this, WS103 had fragments of timber noted as well. Three mechanically excavated trial pits (TP107, TP110 and TP111) were unable to confirm the full depth of Made Ground due to brick foundations still being identified, believed to be from former buildings.

Ground Conditions (Continued)	A sweet, sight hydrocarbon odour and black staining has been noted within WS103 between 0.70—1.00 m bgl. It should be noted that this odour was not encountered in any of the other exploratory hole locations across the site.
	Drift – 0.30 m bgl to 4.43 m bgl Drift deposits were encountered in eleven out of fourteen locations below the Made Ground deposits between 0.30 m bgl to 4.43 m bgl (WS103). These deposits generally comprised of firm to very stiff brown gravelly CLAY with gravels comprising of fine to coarse, angular to sub-rounded sandstone. Within TP102 a brown fine to medium SAND was encountered between 1.10–1.40 m bgl. The full extent of this stratum was not proven as the trial pit was terminated due to instability within this band of granular deposits.
	Solid – Not Encountered The solid geology was not encountered during this phase of intrusive investigation. Based on BGS data the site is underlain by the Collyhurst Sandstone Formation. However, no boreholes in proximity to the subject site encountered bedrock therefore, at this time the depth to bedrock is unknown.
	Groundwater One groundwater strike was encountered during the intrusive investigation in TP102 at 1.30 m bgl.

CONTAMINATED LAND ASSESSMENT

Initial Conceptual Site Model	**Human Health** **Source** • Made Ground – heavy metals, PAH, TPH, ACM. **Pathway** • Dermal contact and ingestion. • Vapour inhalation and dust inhalation. **Receptors** • Future site users. Adjacent land users. **Controlled Waters** **Source** • Made Ground – heavy metals, PAH, TPH, **Pathway** • Vertical and lateral migration **Receptors** • Principal bedrock aquifer **Ground Gas** **Source** • Made Ground **Pathway** • Inhalation and accumulation **Receptors** • Future site users

Human Health	Elevated lead within TP102 and elevated PAHs within TP101 have been encountered within the Made Ground deposits on site. Elevated lead and non-volatile PAHs have primary exposure pathways related to dermal contact and ingestion of soils and consumption of homegrown vegetables The chronic risk to human health associated with the elevated concentrations of inorganic heavy metals and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils. With regards to the elevated TPH C12-16, this presents potential volatilisation to indoor air risk. This elevated concentration has only been identified within one area of the site (TP111). E3P has carried out a more detailed assessment of the TPH C12—16 exceedance identified within TP111 at 0.50 m bgl. As part of this assessment, due to the high Total Organic Carbon (TOC%) of 3.1% within the sample a revised Soil Organic Matter (SOM) of 2.5% SOM can be utilised. The revised SOM% in turn increases the GAC from 140 mg/kg to 330 mg/kg. Following this increase of the GAC the identified concentration of 270 mg/kg is no longer considered to be a risk to future end users of the site. E3P has also undertaken further PAH assessment due to an exceedance of dibenzo(a,h)anthracene. This assessment used the PAH profiling tool and indicated that in this instance it would be appropriate to use the screening values for benzo(a)pyrene and this confirms there are no exceedances. Not with standing the recommendation for a cover system would mitigate any risk to the end users. Chemical analysis of the natural clay drift deposits has identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples may be required to meet regulatory sampling frequency. There are no suitable sources of topsoil available on the site due to the anthropogenic nature of the reworked material that is currently present onsite. It should be noted that no exceedances of TPH, PAH or S/VOC were noted within WS103 at 0.70 m bgl where visual and olfactory evidence of impact was noted during the site investigation.
Controlled Waters	The ICSM developed within the context of the site setting has a pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying principal bedrock. The ground investigation has identified that the Made Ground is predominantly underlain by clay which will reduce potential migration pathways. The groundwater sampling undertaken by E3P has not indicates that there are exceedances when compared to DWS values. Thus, the current risk to controlled waters is considered to be low.
Ground Gas	Elevated carbon dioxide above 5% has been identified within WS103. The Qhg remains below the CS2 characterisation. It is recommended that the full ground gas assessment is completed and recommended protection measures (if applicable) are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

Ground Gas (Continued)	The site is in an area where less than 1% of homes are affected by Radon Action Level, therefore basic radon protection measures will not be required for any proposed new dwellings.
Potable Water Infrastructure	Based on the assessment of current site conditions it is unlikely that barrier pipe will be required at the proposed development, however, further assessment may be required due to the exceedance noted outside of the pipeline depth.

COAL MINING ASSESSMENT

Preliminary Assessment	The site is located within a Coal Mining Reporting Area but there are no seams or shafts recorded within proximity to the site. Furthermore, the site is not within a Development High Risk Area.

GEOTECHNICAL ASSESSMENT

Underground Obstructions and Subterranean hazards	Made Ground was encountered across the site between 0.00—2.30 m bgl. Within TP107, TP109, TP110, TP111 and WS102 and WS103 brick obstructions have been noted throughout the Made Ground deposits and are indicative of former structures. Within TP107, TP110 and TP111 the former foundations could not be penetrated the full depth of Made Ground could not be confirmed. As part of the process of creating a suitable platform for development, all subterranean obstructions will need to be excavated and removed beneath new structures and infrastructure.
Allowable Bearing Capacity (ABC)	The natural CLAY has an allowable bearing capacity ranging from 155–259 kN/m^2 for firm to stiff CLAY between 0.50—2.00 m bgl increasing to between 176—447 kN/m^2 below 2.00 m bgl.
Foundation Options	Several foundation options should be considered for low-rise residential properties based on confirmed soil mechanics, cost, and construction feasibility. In this instance, it is thought that the following foundation options for low-rise residential properties: • Strip foundations bearing on the stiff high strength clay; • Trench fill foundations should be considered where the target bearing stratum is greater than 1.50 m below the proposed level; • VSC within areas of reduced strength clay, variable ground conditions or potential tree influence. It is advisable to consult with geotechnical engineers and foundation specialists who can assess the specific ground conditions and design an appropriate Vibro Stone Column system to meet the project's requirements.
Foundations Near Trees	Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content.
Heave Precautions Near Trees	Given that the underlying clay is of medium volume change potential, heave precautions will not be required for the internal face of a foundation less than 1.5 m in depth. Heave precautions will be required to the underside of floor slabs (where there is no 250 mm void) and pile ground beams are required within the modelled influencing distance of trees.
Building Floor Slabs	Ground-bearing floor slabs are not considered viable given the anticipated depths of Made Ground > 600 mm and shallow cohesive soils.

Soakaway Drainage	It is unlikely that soakaway drainage will be suitable due to the presence of Made Ground and cohesive natural soils. To assess the suitability of soakaways across the site a BRE 365 assessment should be undertaken.
Sulphate Assessment	Concrete classification will be DS1 AC1s.
Enabling Earthworks	Development levels are unknown at this time; however, it is unlikely that significant cut-and-fill works will be required onsite.
Civil Engineering Excavations	Trial pits were generally stable in the natural strataand site observations indicated that excavations should be feasible in the near-surface with normal plant. Obstructions have been identified, including former foundations. It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works.
Civil Engineering Excavations	If local pumping of groundwater is required for the advancement of excavations for the proposed foundations, then consideration should be given to the potential for dewatering granular Made Ground in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.
Waste Characterisation	Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: *Waste Classification – Guidance on the classification and assessment of waste*. This can be done upon request and inline with the Environment Agency sampling frequencies.

RECOMMENDATIONS

Based on the findings of the Geoenvironmental site assessment and the various conclusions drawn, the following additional works are recommended to be completed in due course:

- Plot-specific foundation schedule (upon receipt of the final development levels).
- Remediation and enabling works strategy.

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DRAWING LIST

16-713-R1-001 - Site Location Plan
16-713-R1-002 - Proposed Development Plan
16-713-R1-003 - Historical Features Plan
16-713-R1-004 - Site Features Plan
16-713-R1-005 - Exploratory Hole Location Plan
16-713-R1-006 - Depth of Made Ground Plan
16-713-R1-010 - Conceptual Site Model
16-713-R1-016 - Cross Sections
16-713-R1-018 - Contamination Issues Plan

1. INTRODUCTION

1.1. BACKGROUND

Alan Johnston Partnership (the client) on behalf of One Manchester commissioned commissioned E3P to undertake a Phase II Geoenvironmental Site Assessment at Lordship close, Moston, Manchester, M9 4FX.

This report is required to determine potential contaminated land liabilities, remediation requirements and geotechnical engineering works that will be required as part of the proposed development for a low-rise residential development.

1.2. PROPOSED DEVELOPMENT

One Manchester Developments Limited intends to construct a low-rise residential development comprising c. 9 residential dwellings with associated gardens, estate roads and infrastructure. Drawing 16-713-002 (APPENDIX IV) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.

Figure 1 Snapshot of Proposed Development



1.3. OBJECTIVES AND SCOPE

The objectives of the geoenvironmental investigation are as follows:

- Review historical plans, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available to complete a desk study in line with Environment Agency (EA) document Land Contamination: Risk Management (LCRM) (updated June 2023).
- Undertake a phase of sampling and analysis to provide an overview of the environmental issues identified.
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site concerning the site's future use and off-site receptors.
- Assess the geotechnical information and provide recommendations concerning foundations, pavement construction and floor slabs.
- Assess the coal mining-related information and provide recommendations regarding any future treatment; and,
- Provide recommendations regarding future works required.

1.4. SCOPE OF WORKS

The scope of work includes the elements included in Table 1.

Table 1 Scope of Works

GROUND INVESTIGATION
Design of suitable ground investigation
Window sample probeholes with the construction of environmental monitoring installations
Mechanically excavated trial pits
Soil and groundwater sampling
TESTING AND MONITORING
In-situ geotechnical testing
Chemical and geotechnical analysis
Groundwater monitoring
Ground gas monitoring
ASSESSMENT AND REPORTING
Factual and interpretative reporting
Contamination risk assessment and conceptual site model
Geotechnical assessment and interpretation

1.5. PREVIOUS REPORTS

The following previous site investigation reports have been provided to E3P for review:

Table 2 Previous Reports

AUTHOR	TITLE / REFERENCE	CLIENT	DATE
E3P	Phase I Geoenvironmental Site assessment Lordship Close, Moston 16-713-R1	Alan Johnston Partnership	July 2023

The key findings of the previous site investigation reports are summarised below, and where necessary, data has been used to support the E3P geoenvironmental site assessment.

- The site comprises three parcels of grassland separated by footpaths. There are no buildings located on-site, however, there are three semi-mature trees located within the site boundary. Dismantled football goalposts are located in the centre of the site and the site is surrounded by metal railings.
- Due to the previously developed nature of the site, it is likely that Made Ground deposits will underlie the site throughout, mainly associated with former residential housing and the Public House. Therefore, heavy metals, TPHs, PAHs and asbestos cannot be discounted on site.
- Made Ground is likely to underlie the site and an infilled pond has been identified c. 80 m east of the site on historical mapping. Both may be potential sources of ground gas. Given the age of the infill and the likelihood for intervening cohesive clays between the feature and the subject site, the risk from migrating ground gases is reduced.
- Historical slabs and foundations are likely to be present across the site associated with the previous use as residential housing. All existing underground foundations and obstructions beneath the proposed development will require grubbing out in their entirety.

1.6. LIMITATIONS

The limitations of this report are presented in APPENDIX I.

1.7. RISK CLASSIFICATION

The description of risk classification and the likely action required as set out in CIRIA C552 are included in APPENDIX III.

1.8. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the report's contents, written approval must be sought from E3P; a charge may be levied against such consent.

2. E3P GROUND INVESTIGATION

2.1. GENERAL OVERVIEW

A ground investigation has been designed based on the findings of the desk study, with exploratory holes advanced to target specific potential contaminant sources summarised in Section 1.5. The investigation has also been used to collect geotechnical information to assist in the design and construction of the proposed development.

Exploratory fieldwork was completed on the 11th of April 2024. The works are summarised in Table 3.

2.2. LIMITATIONS OF THE INVESTIGATION

Limitations on prospective exploratory hole locations were encountered due to live underground services that are present on site. The services are:

- An overhead BT line is present in the north of the site.
- A foul sewer and clean water main are present on Lordship Close in the north of site.
- Gas mains is present on the western boundary along Winston Road as well as the southern boundary. Furthermore, in the centre of the site a gas main is present that runs to the houses on the south of Lordship Close.
- Electricity is also present, along the eastern and western boundaries of the site.

Therefore, easement zones were employed on site to ensure safe working practices with buffer zones >5 m being employed across the site. Supplementary to this, all window sample probeholes were hand pitted to 1.20 m bgl to further ensure safe working practices.

2.3. SCOPE OF INVESTIGATION

A summary of the fieldwork completed are included in Table 3.

Table 3 Summary of Fieldwork

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
General Ground Conditions Including the Presence/Nature of Obstructions	WS101	Window Sample Probehole	3.42	1.00—3.00
	WS102		3.39	1.00—2.00
	WS103		4.43	2.00—4.00
	TP101	Mechanically Excavated Trial Pit	1.80	N/A
	TP102		1.40	N/A
	TP103		2.20	N/A
	TP104		2.30	N/A
	TP105		2.20	N/A
	TP106		2.40	N/A
	TP107		0.60	N/A
	TP108		2.20	N/A
	TP109		1.30	N/A
	TP110		1.20	N/A
	TP111		1.10	N/A

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples, spatially distributed to offer the maximum site coverage whilst also being advanced to target specific contaminant sources.

Window sample boreholes were advanced to undertake in-situ detailed geotechnical testing, obtain environmental samples of the underlying subsoils and install groundwater and ground gas monitoring wells.

The sampling locations are illustrated in Drawing 16-713-005 (APPENDIX IV). The ground conditions encountered are indicated on the logs, which are provided in APPENDIX VII.

The locations were recorded using hand-held GPS and what3words to an accuracy of 3 metres.

Return visits were made to monitor installations for groundwater level and gas concentrations. In addition, selected wells were purged and samples of groundwater were recovered for chemical analysis.

2.4. IN-SITU STANDARD PENETRATION TESTING (SPT)

In-situ geotechnical testing was conducted using the standard penetration test (SPT) and, where the ground is granular, a 60° cone (SPT(C)) was used instead of the sampling tube. The results are shown in the probehole logs in APPENDIX VI, presented in Table 21 and discussed in Section 5.

2.5. LABORATORY ANALYSIS

Selected soil samples were submitted for a range of chemical analysis, summarised in Table 4.

Table 4 Summary of Laboratory Analysis

CHEMICAL ANALYSIS
Metals
pH, total sulphate, water-soluble sulphate (2:1 extract)
Sulphide
Cyanide
Phenols
Total and speciated polycyclic aromatic hydrocarbons (PAHs)
Semi-Volatile Organic Compounds (SVOCs)
Volatile Organic Compounds (VOCs)
Asbestos identification and quantification
Speciated and banded total petroleum hydrocarbons (TPHs)
Total Organic Carbon (TOC)
GEOTECHNICAL ANALYSIS
Atterberg limits determinations
Dry Density/Water Content Relationship

2.6. STORAGE, PRESERVATION AND TRANSPORT OF SAMPLES

Measures taken to ensure the quality and integrity of the collected samples, from collection to receipt of the samples by the laboratory, are summarised in Table 5.

Table 5 Sample Integrity Information

SUBJECT	CHEMICAL SAMPLING	
Storage	**Soil**	**Groundwater**
	Glass jars supplied by the laboratory were used for the collection of soil samples to be analysed for VOCs. Plastic tubs were used to collect soil samples for metals analysis, PFAS testing and asbestos screening.	Glass vials supplied by the laboratory were used for the collection of samples to be analysed for VOCs. Samples to be analysed for lower volatility compounds were stored in laboratory-prepared glass jars. Samples to be tested for PFAS compounds were stored in laboratory-supplied HDPE bottles.
Preservation	Soil and groundwater sample containers were filled to minimise headspace prior to sealing and stored at a low temperature within cool boxes with cooling aids to minimise the loss of volatile contaminants and reduce microbial activity during the collection of samples. Cooling aids that may contain PFAS compounds (such as blue ice) were not utilised to prevent cross-contamination with samples.	
Sample Integrity	**Soil**	**Groundwater**
	Dedicated disposable nitrile gloves were worn and changed between sample collections to prevent cross-contamination.	Groundwater samples were collected using dedicated plastic tubing, which was changed between monitoring well locations to prevent cross-contamination.
Transport	Samples were stored and shipped in dedicated sample boxes provided by the laboratory. Sample details were recorded on the laboratory chain of custody form enclosed with the samples prior to dispatch. Scheduling information for the samples was confirmed with the laboratory via email.	

Chemical analysis has been undertaken by an accredited laboratory with the testing results summarised and discussed in Section 4 and the testing certificates included in APPENDIX VIII.

Geotechnical samples were collected as required per location immediately after excavation, labelled and sealed to minimise moisture loss. The geotechnical samples were collected and couriered by a dedicated courier to an accredited geotechnical testing laboratory. The testing results are summarised and discussed in Section 5 and the testing certificates included in APPENDIX IX.

3. GROUND AND GROUNDWATER CONDITIONS

3.1. SUMMARY OF GROUND CONDITIONS

The ground investigation generally confirms the published geology and identifies the strata set out in Table 6.

Table 6 Summary of Strata

HOLE	DEPTH TO STRATUM (m bgl)					
	MADE GROUND	Firm CLAY	Firm to stiff CLAY	Stiff CLAY	Very Stiff CLAY	Fine to medium SAND
WS101	0.00–0.50	–	–	0.50–2.00	2.00–3.42	–
WS102	0.00–2.30	–	–	–	2.30–3.39	–
WS103	0.00–1.10	–	–	–	1.10–4.43	–
TP101	0.00–0.30	0.30–1.80	–	–	–	–
TP102	0.00–0.50	0.50–0.10	–	–	–	1.10–1.40
TP103	0.00–0.50	–	1.00–2.20	0.50–1.00	–	–
TP104	0.00–1.00	–	–	1.00–2.30	–	–
TP105	0.00–0.70	–	–	0.70–2.20	–	–
TP106	0.00–1.20	–	1.20–2.40	–	–	–
TP107	0.00–0.60*	–	–	–	–	–
TP108	0.00–0.90	0.90–2.20	–	–	–	–
TP109	0.00–0.90	–	–	0.90–1.30	–	–
TP110	0.00–1.20*	–	–	–	–	–
TP111	0.00–1.10*	–	–	–	–	–

Note
* Made Ground could not be penetrated

3.2. MADE GROUND

Made Ground was encountered within all exploratory hole locations to a maximum proven depth of 2.30 m bgl (WS102), however, typically Made Ground deposits were encountered at depths of less than 1.00 m bgl.

The majority of locations comprised brown sandy clay (reworked topsoil), with frequent rootlets in the upper 0.20–0.30 m bgl with the exception of TP101 and TP102 which had additional anthropogenic materials such as fragments of plastic and glass.

The Made Ground deposits underlying the reworked topsoil generally comprised brown/dark brown to black sandy clay or clayey gravel with gravels formed of mudstone, ash and clinker with fragments of concrete, brick, plastic and glass. In addition to this, WS103 had fragments of timber noted as well.

Three mechanically excavated trial pits (TP107, TP110and TP111) were unable to confirm the full depth of Made Ground due to brick foundations still being identified, believed to be from former buildings present on site.

A sweet, sight hydrocarbon odour and black staining have been noted within WS103 between 0.70–1.00 m bgl. It should be noted that this odour was not encountered in any of the other exploratory hole locations across the site.

A Depth of Made Ground Plan is presented as Drawing 16-713-006 in APPENDIX IV.

3.3. DRIFT DEPOSITS

Drift deposits were encountered in eleven out of fourteen locations below the Made Ground deposits between 0.30 m bgl to 4.43 m bgl (WS103). These deposits generally comprised firm to very stiff brown gravelly CLAY with gravels comprising of fine to coarse, angular to sub-rounded sandstone.

Within TP102 a brown fine to medium SAND was encountered between 1.10–1.40 m bgl. The full extent of this stratum was not proven due to the trial pit being terminated due to instability.

3.4. SOLID GEOLOGY

No solid geology was encountered during this phase of intrusive investigation.

Based upon BGS data the site is underlain by the Collyhurst Sandstone Formation – SANDSTONE. However, no boreholes in proximity to the subject site encountered bedrock, consequently, the depth to solid geology is currently unknown.

3.5. GROUNDWATER

Groundwater strikes were encountered as seepages. The depth of the seepages are shown on the exploratory hole records in APPENDIX VII and are summarised in Table 7.

Table 7 Summary of Groundwater Strikes

LOCATION	DEPTH TO STRIKE (m)	NOTES
TP102	1.30	Slow ingress – granular deposits

3.6. VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION

Visual and olfactory evidence of potential contamination has been identified during the site investigation and these are summarised in Table 8.

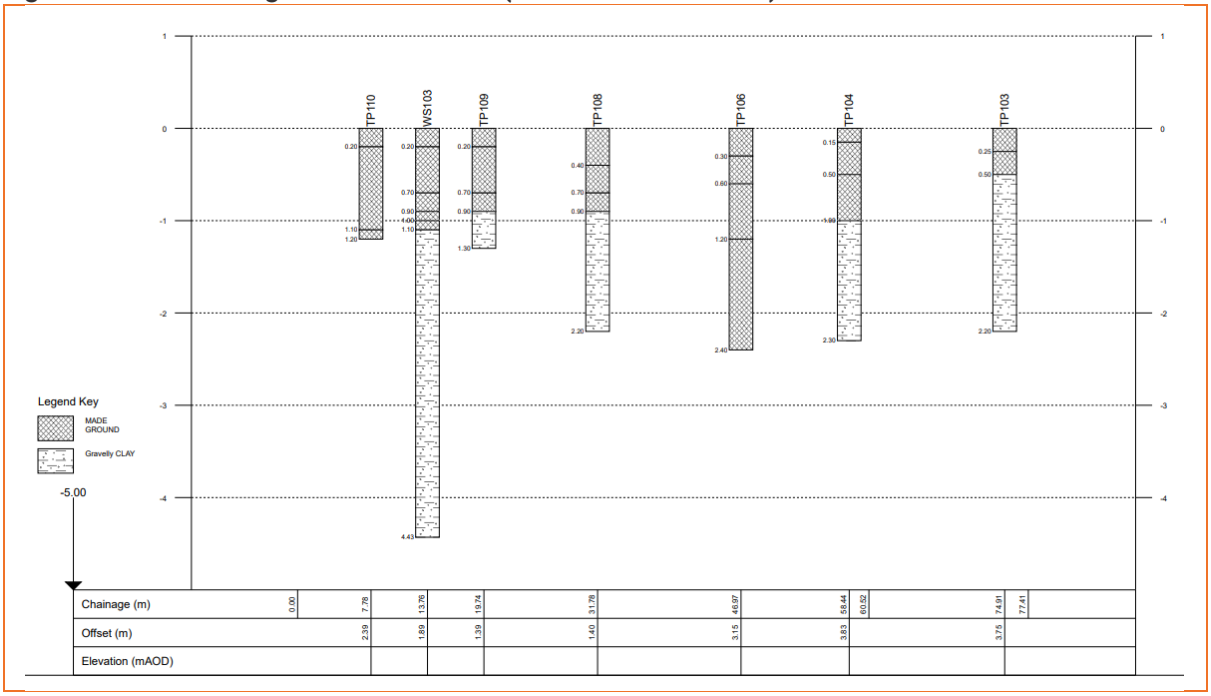
Table 8 Summary of Visual and Olfactory Evidence of Contamination

LOCATION	DEPTH (m)	STRATUM	NOTES
WS103	0.70	Made Ground	Sweet, slight hydrocarbon odour / Black staining

3.7. GEOLOGICAL CROSS SECTION

A geological cross-section is included in APPENDIX IV as Drawing 16-713-016, and a snapshot is shown below in Figure 2. The cross section trends northwest to southeast across the site taking into account both trial pits and window sample borehole data.

Figure 2 Geological Cross Section (Northwest-Southeast)



3.8. OBSTRUCTIONS

Obstructions were identified in several locations across the site, with their positions summarised in Table 9, marked on the depth of Made Ground drawing 16-713-006 (APPENDIX IV).

Table 9 Summary of Obstructions

LOCATION	DEPTH (m)	STRATUM	NOTES
TP107	0.60	Made Ground	Relict foundations and brick structures – Could not be penetrated
TP109	0.70—0.90	Made Ground	Relict foundations and brick structures
TP110	1.10	Made Ground	Relict foundations and brick structures – Could not be penetrated
TP111	1.00	Made Ground	
WS102	1.20—2.00	Made Ground	Relict foundations and brick structures
WS103	0.90—1.10	Made Ground	Relict foundations – concrete

4. TIER 2 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 2 qualitative land risk assessment with respect to human health, controlled waters and ground gas to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. DEVIATING SAMPLES

Best practice sampling procedures including the use of appropriate sampling containers and adhering to the laboratory holding times for each contaminant analysis, were undertaken in order to avoid samples being deviating.

Consequently, no samples have returned from the lab as deviating.

4.2. SAMPLE ANALYSIS POPULATION

Table 10 summarises the chemical analysis testing scheduled.

Table 10 Summary of Testing Schedule

TYPE OF SAMPLE	NO. OF SAMPLES	DETERMINANDS
Made Ground: (re-worked topsoil)	3	Speciated PAH
	3	pH, total metals, asbestos ID, TOC
	3	Speciated TPH
Made Ground	7	Speciated PAH
	7	pH, total metals, asbestos ID, TOC
	7	Speciated TPH
	1	S/VOC
Natural CLAY	3	Speciated PAH
	3	pH, total metals, TOC
	3	Speciated TPH

4.3. HUMAN HEALTH RISK ASSESSMENT

At Tier 2 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

Where Tier 2 screening values are not provided by LQM, other screening values have been used and these are referenced in Table 11.

The Tier 2 screening values for residential with plant uptake have been utilised for this assessment due to the proposed development being a residential end-use. To remain conservative at an early stage, the screening values based on a 1% SOM have been initially utilised for this assessment.

The results of the comparison have been summarised in Table 11.

Table 11 Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use (with plant uptake)

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PL	ASSESSMENT
Arsenic	mg/kg	37	13	22	N/A	1	No Further Action
Cadmium	mg/kg	11	13	0.85	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.0	13	<0.50	N/A	1	No Further Action
Lead	mg/kg	200**	13	240	TP102 0.30 m	1	Further Action
Mercury	mg/kg	1.2	13	0.59	N/A	4	No Further Action
Nickel	mg/kg	130	13	32	N/A	1	No Further Action
Selenium	mg/kg	250	13	1.1	N/A	1	No Further Action
Copper	mg/kg	2400	13	80	N/A	1	No Further Action
Zinc	mg/kg	3700	13	200	N/A	1	No Further Action
Cyanide – Total	mg/kg	791	13	1.3	N/A	1	No Further Action
Phenols – Total	mg/kg	120	13	<0.10	N/A	1	No Further Action
Asbestos	Fibres	NFD	9	NFD	N/A	3	No Further Action
Naphthalene	mg/kg	2.3	13	0.13	N/A	4	No Further Action
Acenaphthylene	mg/kg	170	13	<0.10	N/A	2	No Further Action
Acenaphthene	mg/kg	210	13	0.35	N/A	1	No Further Action
Fluorene	mg/kg	170	13	0.22	N/A	1	No Further Action
Phenanthrene	mg/kg	95	13	2.4	N/A	2	No Further Action
Anthracene	mg/kg	2400	13	0.56	N/A	2	No Further Action
Fluoranthene	mg/kg	280	13	3.7	N/A	2	No Further Action
Pyrene	mg/kg	620	13	3.2	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	13	1.7	N/A	2	No Further Action
Chrysene	mg/kg	15	13	1.8	N/A	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	13	2.4	N/A	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	13	0.86	N/A	2	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	13	2.2	N/A	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	13	1.4	N/A	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	13	0.42 0.25	TP101 0.10 m TP103 0.40 m	2	Further Action
Benzo(ghi)Perylene	mg/kg	320	13	1.4	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	42	13	<1.0	N/A	4	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	100	13	<1.0	N/A	4	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	27	13	5.3	N/A	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	74	13	40.00	N/A	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	140	13	270	TP111 0.50 m	4	Further Action
TPH C16-C21 (aromatic)*	mg/kg	260	13	160	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	1100	13	48	N/A	1	No Further Action

Notes
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation

Abbreviations: GAC = general assessment criteria, N = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; PL = Contaminant Pathway; NFD = no fibres detected.

The pathway noted in the table is the primary pathway, however it may not be the only pathway of that contaminant
* The Tier 2 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 2 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 2 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.
** Tier 2 GAC for lead taken from C4SL CL:AIRE

Referring to Table 11, the results of this direct comparison indicates that the data exceeds the screening criteria for a residential end use for the following contaminants:

Inorganics

- Lead

Organics

- Dibenzo(a,h)Anthracene.
- TPH C12-C16 (aromatic).

The exceedances for all determinants are associated with made Ground deposits up to a proven depth of 0.50 m bgl.

It should be noted that no exceedances of TPH, PAH or S/VOC were noted within WS103 at 0.70 m bgl where visual and olfactory evidence of impact was noted during the site investigation.

4.3.1. EXPOSURE PATHWAYS

The main exposure pathways based on the Tier 2 exceedances are:

- Soil ingestion (PL1);
- Vapour inhalation (indoor) (PL4);
- Dermal contact and ingestion (PL2); and
- Consumption of homegrown vegetables (PL1).

4.3.2. HUMAN HEALTH RISK ASSESSMENT AND MITIGATION

Inorganic Heavy Metals and Non-volatile PAH

Elevated lead within TP102 and elevated non-volatile PAHs within TP101 all have primary exposure pathways related to dermal contact and ingestion of soils (PL2) and consumption of homegrown vegetables (PL1). The risk to chronic human health associated with elevated concentrations of inorganic heavy metals and on-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, landscaping and public open space to remove any potential for direct exposure to impacted soils.

The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.

Organic Contamination

With regards to the elevated TPH C12-16, this presents a potential volatilisation to indoor air risk. This elevated concentration has only been identified within one area of the site (TP111).

E3P has carried out a more detailed assessment of the TPH C12—16 exceedance identified within TP111 at 0.50 m bgl. As part of this assessment, due to the high Total Organic Carbon (TOC%) of 3.1% within the sample a revised Soil Organic Matter (SOM) of 2.5% SOM can be utilised. The revised SOM% in turn increases the GAC from 140 mg/kg to 330 mg/kg. Following this increase of the GAC the identified concentration of 270 mg/kg is no longer considered to be a risk to future end users of the site.

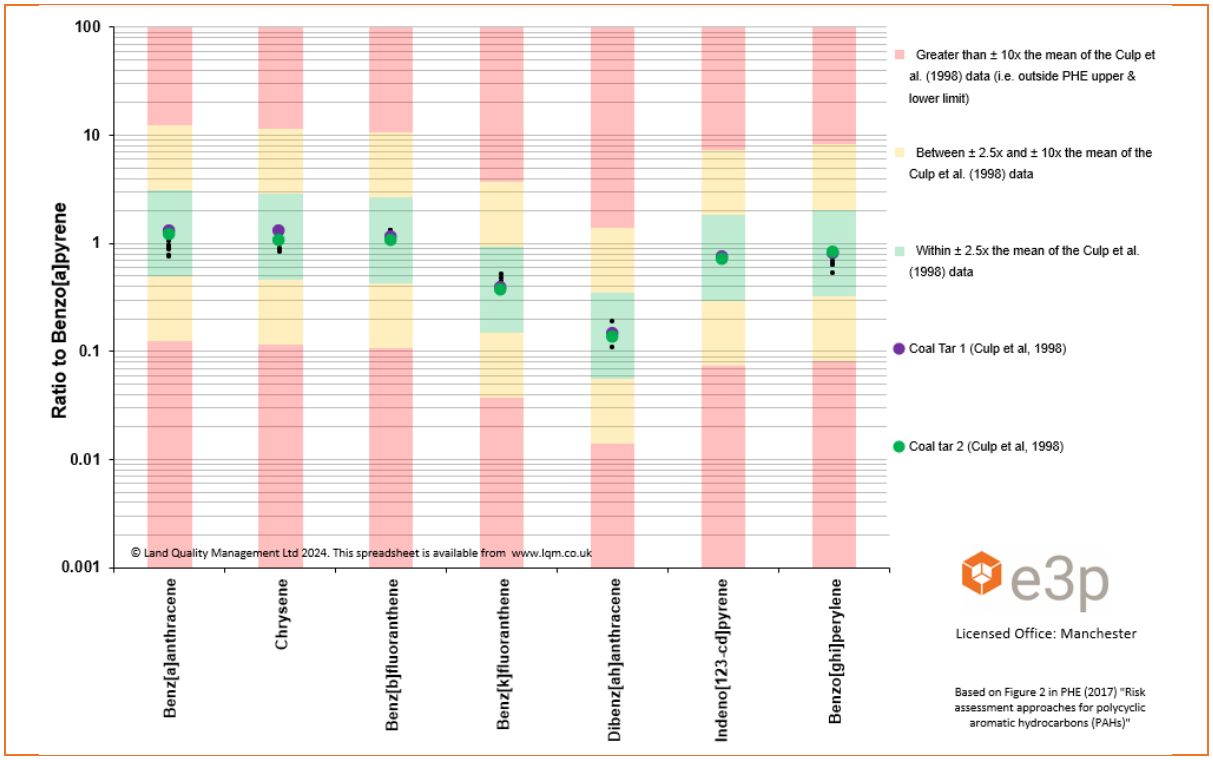
As these deposits have not been identified in other areas of the site and this Made Ground is not seen to be uniform during the remediation and earthworks on site it would be prudent to further test this material to truly assess if there is a pertinent human health risk.

PAH Profiling Tool And Surrogate Marker

Public Health England recommends the use of a surrogate marker approach for soils affected by PAH contamination. In order to determine whether a surrogate marker approach is valid, PAH profiling must be completed.

The PAH profiling tool determines if the PAH profile in the soil sample deviates from that of coal tar and so determine whether a surrogate marker approach is appropriate. Figure 3 includes a snapshot of the PAH profiling tool.

Figure 3 PAH Profiling Tool



The PAH profiling tool indicates that the dataset falls within the 'green' area, therefore the surrogate marker approach can be used.

The surrogate marker approach assumes the cancer risk of the PAHs in a complex mixture is proportional to the concentration of a surrogate marker PAH.

Benzo(a)pyrene is typically used as the surrogate marker given it is usually present on all sites affected by PAH contamination (and is present on the subject site).

Considering the stratum where the elevated PAH has been identified are in the same strata as that of the benzo(a)pyrene, the data can be compared to the screening values for benzo(a)pyrene which confirms there are no exceedances.

Chemical analysis of the natural clay drift deposits has identified these soils to be acceptable for use as subsoil within the proposed garden areas; however, further chemical validation samples may be required to meet regulatory sampling frequency.

There are no suitable sources of topsoil available on the site

4.4. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 12.

Table 12 Controlled Waters Conceptual Model and Sensitivity Profile

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground Isolated heavy metal and PAH contamination are present as a result of the Made ground infill material from historical features on-site.		**Medium**
Pathway		
Vertical and Lateral Migration CLAY deposits have been identified below the site thus it is considered unlikely that mobile phase contaminants will migrate.		**Low**
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary undifferentiated aquifer.	**Medium**
Aquifer Classification in Bedrock	Principal aquifer.	**High**
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not affected.	**Low**
Distance to the Closest Groundwater Abstraction Point	None identified within a 1 km radius.	**Low**
Is the Site Located Within 50 m of a Surface Watercourse?	The nearest watercourse is Boggart Hole Clough located 200 m north of the site.	**Low**
The ICSM developed within the context of the site setting has identified that there is a limited pollutant pathway due to the presence of CLAY that offers protection to the underlying principal bedrock aquifer.		

The Tier 2 assessment in line with LCRM (2023) has included a comparison of a singular groundwater sample to drinking water standards (DWS).

Water samples were obtained utilising a bailer.

These are presented in Table 13.

Table 13 Comparison of Groundwater Analysis with Tier 2 Screening Levels

DETERMINAND	UNIT	DWS [3,4]	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	ASSESSMENT
Arsenic	µg/l	10	1	0.9	N/A	No Further Assessment
Cadmium	µg/l	5	1	<0.11	N/A	No Further Assessment
Chromium (VI)	µg/l	–	1	<0.5	N/A	No Further Assessment
Chromium (III)	µg/l	50	1	<0.5	N/A	No Further Assessment
Copper	µg/l	2000	1	5.3	N/A	No Further Assessment
Total Cyanide	µg/l	50	1	<0.05	N/A	No Further Assessment
Lead	µg/l	10	1	<0.5	N/A	No Further Assessment
Mercury	µg/l	1.0	1	<0.05	N/A	No Further Assessment
Nickel	µg/l	20	1	6.3	N/A	No Further Assessment
Selenium	µg/l	10	1	10	N/A	No Further Assessment
Zinc	µg/l	–	1	6.5	N/A	No Further Assessment
pH	6–9		1	7.7	N/A	No Further Assessment
Naphthalene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Anthracene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Benzo[b]fluoranthene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Benzo[k]fluoranthene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Benzo(a)pyrene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Indeno(123-cd)pyrene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Fluoranthene	µg/l	10*	1	<0.5	N/A	No Further Assessment
Benzo(ghi)perylene	µg/l	10*	1	<0.5	N/A	No Further Assessment
TPH C5-C7 (benzene)	µg/l	1	1	<0.1	N/A	No Further Assessment
TPH C7-C8 (toluene)	µg/l	700	1	<0.1	N/A	No Further Assessment
TPH C8-C10 (xylene)	µg/l	300	1	<0.1	N/A	No Further Assessment
TPH C10-C12 (naphthalene)	µg/l	90	1	<0.1	N/A	No Further Assessment
TPH C12-C16	µg/l	90	1	<0.1	N/A	No Further Assessment
TPH C16-C35	µg/l	90	1	<0.1	N/A	No Further Assessment

DETERMINAND	UNIT	DWS [3,4]	NO. OF GW SAMPLES	MAX CONC. IN GROUNDWATER	LOCATION OF EXCEEDANCE	ASSESSMENT
TPH C5-C6	µg/l	1000[5]	1	<0.1	N/A	No Further Assessment
TPH C6-C8	µg/l	1000[5]	1	<0.1	N/A	No Further Assessment
TPH C8-C10	µg/l	300	1	<0.1	N/A	No Further Assessment
TPH C10-C12	µg/l	300	1	<0.1	N/A	No Further Assessment
TPH C12-C16	µg/l	300	1	<0.1	N/A	No Further Assessment
TPH C16-C21	µg/l	300**	1	<0.1	N/A	No Further Assessment
TPH C21-C35	µg/l	300**	1	<0.1	N/A	No Further Assessment
Tetrachloroethylene	µg/l	10	1	<2	N/A	No Further Assessment
Trichloroethylene	µg/l	10	1	<10	N/A	No Further Assessment
Trichlorobenzene	µg/l	–	1	<1	N/A	No Further Assessment
Trichloromethane	µg/l	–	1	<1	N/A	No Further Assessment
Dichloromethane	µg/l	200	1	<1	N/A	No Further Assessment
Vinyl Chloride	µg/l	0.3	1	<1	N/A	No Further Assessment

Notes
Solubility <0.01µg/l
AA – Annual Average
** Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water*
*** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.*

1. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)
2. The Water Supply (Water Quality) Regulations 2018 (legislation.gov.uk)
3. Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum (who.int)
4. CL:AIRE publishes Petroleum Hydrocarbons in Groundwater guidance (claire.co.uk)
5. *A total TPH criteria of 1000 mg/kg will act as a surrogate criterion for remaining aliphatic and aromatic TPH fractions.*

4.4.1. CONTROLLED WATER RISK ASSESSMENT AND MITIGATION

This comparison indicates that there are no exceedances when compared to DWS values. Thus the current risk to controlled waters is considered to be low.

4.4.2. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Historically, the site has been subjected to historical development. During the construction and demolition of historical land use change, chemical compounds within the Made Ground may have subsequently leached into the underlying ground and contaminated groundwater both within the Made Ground and natural drift deposits.

The site is underlain by uniform geology, generally comprising of granular Made Ground deposits underlain by cohesive low permeability CLAY drift deposits. Therefore, this will reduce the potential for downward and lateral migration. Consequently, the controlled water receptors (principal aquifer) is deemed to be at a low risk from onsite contamination.

4.5. GROUND GAS RISK ASSESSMENT

4.5.1. RATIONALE

Hazardous ground gas qualitative risk assessment is based on a conceptual site model (CSM) similar to that used for soil and groundwater contamination sources (i.e., source pathway receptor pollutant linkages).

The risk can be assessed based on knowledge of the ground conditions and CSM and a measure of hazardous gas concentrations and gas flow at the site within monitoring standpipes.

4.5.2. SOURCES AND PATHWAYS OF GROUND GAS

Table 14 summarises the potential sources and pathways of ground gas within the context of the recorded site setting and proposed development.

Table 14 Identified Potential Sources of Ground Gas

SOURCE
Made Ground Made Ground was encountered within all exploratory hole locations to a maximum proven depth of 2.30 m bgl (WS102), however, typically Made Ground deposits were encountered at depths of less than 1.00 m bgl. The majority of locations comprised brown sandy clay (reworked topsoil), with frequent rootlets in the upper 0.20–0.30 m bgl with the exception of TP101 and TP102 which had additional anthropogenic materials such as fragments of plastic and glass. The Made Ground deposits underlying the reworked topsoil generally comprised brown/dark brown to black sandy clay or clayey gravel with gravels formed of mudstone, ash and clinker with fragments of concrete, brick, plastic and glass. In addition to this, WS103 had fragments of timber noted as well. A sweet, sight hydrocarbon odour and black staining have been noted within WS103 between 0.70—1.00 m bgl. It should be noted that this odour was not encountered in any of the other exploratory hole locations across the site.

SOURCE
Drift Strata No PEAT deposits or organic material were encountered during the intrusive investigation. The site was proven to be underlain by cohesive CLAY deposits.
Solid Strata No solid strata were encountered during the intrusive investigation. Based on BGS data the site is underlain by the Collyhurst Sandstone Formation. This strata would be considered a potential source of ground gas.
Landfill Sites Historical landfill 220 m south - Land at Moston College. First input – 31/12/1947. The last input is not recorded. Based on the distance from the site and the underlying low permeability drift this is not considered to be a significant source of ground gas risk to the subject site.
Other Gases The BGS reports that full radon protective measures are not necessary in the construction of new dwellings or extensions as the site is situated within an area where <1% of properties are impacted by Radon ground gas. Visual and olfactory evidence of hydrocarbon impact was noted within WS103, however as part of laboratory analysis no exceedances of TPH, PAH, S/VOC were recorded.

4.5.3. MONITORING FREQUENCY

The CIRIA C665 guidance on gas risk assessment includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source.

The proposed development comprises private residential properties, which would be classified as a Type A development (high sensitivity) in accordance with BS8485:2015+A1:2019. However, it is considered that the likely generation potential of the identified gas sources (taking into account the likelihood of future increases in gas generation) would be best classified as low.

Therefore within the context of the proposed residential end-use and ground gas generation potential, the gas assessment requires six visits over three months, with at least two sets of readings at low or falling atmospheric pressure.

4.5.4. GROUND GAS RISK ASSESSMENT METHODOLOGY

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in:

- CIRIA Report 665 – Assessing risks posed by hazardous ground gases to buildings (2007).
- BS8485:2015+A1:2019 – Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation (CS) and the proposed development based on building type.

Therefore, in accordance with BS8485, based on the measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) shall be derived for each monitoring point, from which the site characteristic hazardous gas flow rate (Q_{hgs}), and then the Characteristic Situation (CS) can be determined.

The following equation should be utilised:

$$Q_{hg} = q\left(\frac{C_{hg}}{100}\right)$$

Where:
q is the measured flow rate (in litres per hour) of combined gases from the monitoring standpipe
C_{hg} is the measured hazardous gas concentration (in percentage volume/volume).

The subsequent derived gas screening value (GSV) should be the maximum Q_{hg} (flow rate x concentration as a percentage volume) for all the monitoring events.

A 'worst case check' may be carried out using the maximum recorded flow in any hole with the maximum concentration in any hole to present the plausible worst case conditions. Adoption of the worst case Q_{hg} requires thorough justification and reference to the CSM.

The final derived GSV can then be used to characterise the site as summarised in Table 15.

Table 15 Site Characterisation by GSV (BS8485:2015)

CS	HAZARD POTENTIAL	GSV (L/HR) FOR METHANE AND CARBON DIOXIDE	ADDITIONAL FACTORS
CS1	Very Low	< 0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	< 0.70	Typical measured flow rate <70 l/h (otherwise consider an increase to CS3)
CS3	Moderate	< 3.5	N/A
CS4	Moderate to High	< 15	N/A
CS5	High	< 70	N/A
CS6	Very High	> 70	N/A

Notes

1) *The CS is equivalent to the characteristic GSV in CIRIA C665.*
2) *The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter should be considered.*
3) *Gas Screening Value is the Borehole Gas Volume Flow Rate, in litres per hour, multiplied by the concentration in the air stream of the particular gas being considered.*
4) *The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.*

It should be noted that in the first instance, this assessment has been carried out in accordance with BS8485:2015+A1(2019) and the thresholds given in

4.5.5. MONITORING METHODOLOGY

Concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) were measured using a calibrated infrared gas analyser (GFM435) with gas flow rates measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 300 seconds (5 minutes) at each location, increasing to 600 seconds if elevated concentrations identified, at which point the maximum concentration of CH_4 and CO_2, together with the lowest concentration of O_2 were recorded.

The results of the ground gas monitoring are presented in Table 16.

In addition to the raw data, the results for each individual standpipe have been assessed with reference to guidance provided in BS8485. Based on the initial peak measured flow rates and hazardous gas concentrations, individual hazardous gas flow rates (Q_{hg}) have been derived for each monitoring point, from which an individual Characteristic Situation (CS) can ultimately be determined.

4.5.6. SUMMARY OF MONITORING RESULTS

Table 16 presents of the ground gas and groundwater monitoring results to date.

Table 16 Summary of Ground Gas Monitoring Results

WELL	STRATA	DATE	CH_4 PEAK (%V/V)	CH_4 STEADY (%V/V)	CH_4 Q_{hg} (l/hr)	CO_2 PEAK (%V/V)	CO_2 STEADY (%V/V)	CO_2 Q_{hg} (l/hr)	O_2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	PEAK FLOW (l/hr)	STEADY FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS101	Natural CLAY Drift	24/04/2024	0.1	0.1	0.0001	0.2	0.2	0.0002	20.10	1005	Falling	0.1	0.1	1.00-3.00	2.83	**0.77**
		16/05/2024	0.1	0.1	0.0001	1.4	1.4	0.0014	17.7	994	Steady	0.1	0.1		2.81	**0.98**
WS102	Made Ground	24/04/2024	0.1	0.1	0.0001	0.2	0.2	0.0002	19.70	1005	Falling	0.1	0.1	1.00-2.00	1.81	Dry
		16/05/2024	0.1	0.1	0.0001	1.7	1.7	0.0017	16.1	993	Steady	0.1	0.1		1.80	Dry
WS103	Natural CLAY Drift	24/04/2024	0.1	0.1	0.0001	9.9	9.8	0.0099	7.30	1005	Falling	0.1	0.1	2.00-4.00	3.94	3.48
		16/05/2024	0.1	0.1	0.0001	9.1	9.1	0.0091	11	994	Steady	0.1	0.1		3.95	3.86

Notes

CIRIA Characteristic Situation		*Q_{hg}*		
	CS1	*<0.07*	*Typical Max CO2 <5 % Typical Max CH4 <1 %*	*Values in BOLD exceed CS1 Thresholds*
	CS2	*<0.7*	*Flow rate not to exceed 70 l/hr otherwise consider increase to CS3*	*Values in BLUE denote water above level of response zone (flooded)*
	CS3	*<3.5*		
	CS4	*<15*	*Quantitative Risk Assessment required to evaluate scope of protective measures*	

4.5.7. GROUNDWATER

WS101 has been recorded to be flooded during the preliminary rounds of ground gas monitoring.

Water levels within WS103 have fallen from 3.48 m during the first round of monitoring to 3.86 m during the second round.

Groundwater strikes were not observed during the intrusive investigation within WS102, this has been mirrored during the return visits to the site, with the monitoring well recorded as dry during the preliminary rounds of monitoring.

4.5.8. BAROMETRIC PRESSURE

Visit 1 has been undertaken during a period of falling pressure, with pressure recorded to be 1005 m bar. Whereas visit 2 has been undertaken during a period of steady pressure at 994 m bar.

During future monitoring visits falling and rising pressure periods will be targeted. This will allow the representative site conditions to be assessed.

4.5.9. GAS FLOW

Throughout the monitoring period, flow rates were recorded to be 0.1 l/hr (limit of detection of the analyser).

4.5.10. GAS CONCENTRATIONS

The maximum methane value recorded within the monitoring wells was 0.10% v/v (limit of detection of the analyser).

Carbon dioxide concentrations were recorded at concentrations ranging from 0.20% v/v to 9.90% v/v (WS103).

4.5.11. RADON RISK

Ground gas monitoring to date suggests that the site will fall into the bracket for Characteristic Situation 1, furthermore, the site is in an area where less than 1% of homes are above the Radon Action Level, therefore basic radon protection measures will not need to be incorporated into any proposed new dwellings.

All sites registered from 1st December 2022 onwards will have been assessed against the updated radon maps by NHBC and will be required to have radon protection measures installed in accordance with the updated mapping.

Figure 4 indicates that less than 1% of properties are affected and the site falls under a Radon Potential Class of 1. A Radon potential class of 1 indicates that basic Radon Measures are not required in all new dwellings, as shown in Figure 5.

Figure 4 Radon Affected Area Potential Class

Radon Potential Class*	Is the property in a Radon Affected Area?	Additional information
1	No	The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). The property is not in a radon affected area.
2	Yes	The property is in an Intermediate probability radon area (1 to 3% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
3	Yes	The property is an Intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
4	Yes	The property is in an Intermediate probability radon area (5 to 10% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
5	Yes	The property is in a Higher probability radon area (10 to 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
6	Yes	The property is in a Higher probability radon area (more than 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.

*The Radon Potential Class number should not be included in answers.

Source: User Guide for the HPA-BGS Joint Radon Potential Dataset for Great Britain (Ref: IR/11/044, dated 2011)

Figure 5 Radon Affected Area Measures Required

Radon Potential Class*	What level of radon protective measures are required for new buildings in England and Wales?	What level of radon protective measures are required for new dwellings in Scotland?
1	None**	None**
2	None	Stage 1
3	Basic	Stage 1
4	Basic	Stage 1
5	Full	Stage 2
6	Full	Stage 2

*The Radon Potential Class number should not be included in answers.

** in 2008 HPA recommended that building regulations be amended to ensure that all new buildings, extensions etc. include basic radon protective measures. At the time of writing, relevant UK authorities were considering this advice.

Source: User Guide for the HPA-BGS Joint Radon Potential Dataset for Great Britain (Ref: IR/11/044, dated 2011)

4.5.12. CONCLUSION

The determined Characteristic Situation for each standpipe for each visit is presented in Table 17. This indicates that based on the peak flow rates the majority of the monitoring visits classify as Characteristic Situation (CS)1 – Very Low Gas Risk.

Table 17 Gas Risk Profile and Location

WELL	DEPTH TO WATER (m bgl)	MAX FLOW (l/hr)	MAX CH_4 (%V/V)	MAX CH_4 Q_{hg} (l/hr)	MAX CO_2 (%V/V)	MAX CO_2 Q_{hg} (l/hr)	CHARACTERISTIC SITUATION
WS101	Flooded during the preliminary monitoring						
WS102	Dry	0.1	0.1	0.0001	0.20	0.0002	CS1
WS103	3.48	0.1	0.1	0.0001	9.90	0.0099	CS2

It is recommended that the full ground gas assessment is completed and recommended protection measures (if applicable) are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

4.6. POTABLE WATER SUPPLY

This section provides a summary of the site investigation data with reference to the selection of potable water supply pipework. The assessment is made with reference to the UK Water Industry Research (UKWIR) publication "Guidance on the selection of Water Supply Pipes to be used in Brownfield Sites"

Table 18 Pipeline Selection PE Threshold Concentrations

CONTAMINANT GROUP	PE-THRESHOLD (mg/kg)	CONCENTRATIONS AT CURRENT PIPELINE DEPTH (mg/kg)
Total VOC	0.5	N/A
Total BTEX And MTBE	0.1	N/A
Total SVOCs (Excluding PAH and those substances marked with an *)	2	N/A
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2	N/A
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10	N/A
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500	N/A
Phenols (From SVOC Analysis)*	2	N/A
Cresols and Chlorinated Phenols (From SVOC Analysis)	2	N/A
Ethers*	0.5	N/A
Nitrobenzene*	0.5	N/A
Ketones*	0.5	N/A
Aldehydes*	0.5	N/A
Amines	Fail	N/A
Other Consideration		
Are there any exceedances of the PE threshold outside of the pipeline depth?	Yes EC12-16 at TP111 at 0.50 m bgl	
Is free product present in soil and groundwater?	None	
Could hydrocarbon impact at greater depth than current pipeline depth be mobilised by rising groundwater levels?	No – heavy end hydrocarbon impact and low solubility PAH have been identified within Made Ground. Groundwater levels are generally significantly deeper than pipeline depth.	
Will soils impacted with above determinands likely be utilised elsewhere on site?	No	

CONTAMINANT GROUP	PE-THRESHOLD (mg/kg)	CONCENTRATIONS AT CURRENT PIPELINE DEPTH (mg/kg)
Will soils be imported to site as part of any future earthworks	Currently unknown, however, it is unlikely soils will be required to be imported to the site.	

Notes - Pipe line depth normally between 0.75m–1.35m

Based on the assessment of current site conditions it is unlikely that barrier pipe will be required at the proposed development, however, further assessment may be required due to the exceedance noted outside of the pipeline depth.

4.7. DEVELOPED CONCEPTUAL SITE MODEL

Following the completion of the intrusive site investigation, chemical analysis and risk assessment, the conceptual model shown in Table 19 has been prepared for the site.

Table 19 Developed Conceptual Model

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
SOIL						
HUMAN HEALTH						
Made Ground Heavy metals (lead) and non-volatile PAH (Dibenzo(a,h)Anthracene) – TP101 & TP102	Accidental ingestion and/or dermal contact with contaminated soil and/or leachate. **PL1/PL2** Inhalation of contaminated dust. **PL3**	Human Health – construction workers Human Health – end users	Likely	Medium	The CSM has identified lead above the assessment criteria within TP102 and elevated non-volatile PAH within TP101, both associated with Made Ground. Site personnel have a greater chance of coming into contact with impacted soils. Particularly during excavation and soil recovery works. **Recommendation:** Construction works to be completed with appropriate PPE and welfare facilities.	Low
		Human Health – end users	Likely	Medium	Development of the engineered clean cover system shall break migration pathways to end users. **Recommendation:** Cover system to garden and landscaped areas will prevent exposure to future site users.	Low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	MIGRATION PATHWAYS	RECEPTORS				
Volatile Compounds Hydrocarbons, volatile PAHs (TP111)	Inhalation of vapours. **PL4** Migration through permeable strata and preferential pathways.	Human Health – end users Human Health – Off-site receptors	Low likelihood	Medium	Visual and olfactory evidence of impact has been identified in WS103, within the Made Ground. Laboratory analysis confirms that no volatile compounds have been identified within this location. GAC analysis for 1% SOM has identified a TPH C12—16 exceedance within TP111 0.50 m bgl. Due to an elevated TOC% a revised GAC using 2.5% SOM, downgrades the exceedance as such is low risk. **Recommendation:** Construction works to be completed with appropriate PPE and welfare facilities. Cover system to garden and landscaped areas will prevent exposure to future site users.	Low
Made Ground Asbestos (Asbestos containing materials (ACM) and loose fibres)	Inhalation (of fibres). Construction works disturbing bound material and releasing fibres. **PL3**	Human Health - Site personnel, end land users, and users of adjacent sites	Low likelihood	High	No evidence of ACM has been identified on-site in the samples submitted for soil analysis. However, ACM may be present within the Made Ground across the site. **Recommendation:** Cover system to garden and landscaped areas.	Low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
Made Ground Sulphate from potential ash within the Made Ground.	Sulphate attack on concrete. **PL6**	Building concrete	Low likelihood	Low	Due to the presence of Made Ground on the Site, the potential for sulphate in ash deposits is high. **Recommendation:** Concrete classification will be DS-1, AC1s.	Very low
Made Ground Organic contaminants such as hydrocarbons, solvents	Ingestion of tainted water supply. **PL7**	Human Health – End Users Water pipeline	Low likelihood	Low	PE pipe is likely to be acceptable for use as part of the proposed redevelopment following the pipeline risk assessment, detailed in Section 4.6.	Low
Made Ground Pytotoxic contaminants	Direct contact (plant uptake). **PL8**	Flora	Likely	Medium	Contaminants present identified in the Made Ground may be taken up by flora in soft landscaping/gardens. **Recommendation:** Cover system to landscaped areas and gardens.	Low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	**MIGRATION PATHWAYS**	**RECEPTORS**				
CONTROLLED WATERS						
Made Ground	Leaching of contaminants from Made Ground through infiltration and percolation of rainwater. **PL5**	Controlled waters, underlying principal aquifer	Low likelihood	Medium	The development of the proposed road (hardstanding and drainage) will reduce the leachate produced from contaminated soils, and therefore reduce the impact to groundwater.	Low
		Infrastructure and services	Low likelihood	Medium	Infrastructure and services shall be designed to resist chemical attack and ingress.	Low
Groundwater	Contact with contaminated groundwater. **PL2**	Human Health	Low likelihood	Medium	No exceedances of DWS values have been identified onsite. If contamination is identified onsite cohesive deposits identified onsite will offer protection to the bedrock aquifer.	Low
GROUND GAS						
Ground gases Methane and carbon dioxide	Inhalation of ground gas. **PL4** Accumulation of ground gas in confined spaces (asphyxiation or explosion)	Human Health – site personnel	Likely	Medium	No significant sources of hazardous ground gases have been identified on or within proximity to the site. **Recommendation:** Initial monitoring suggests that the site can be classified as CS1, however elevated carbon dioxide has been encountered thus further monitoring is required to confirm if protection measures are required.	Moderate/Low
		Human Health – end users	Likely	Medium		Moderate/Low
		Infrastructure and services	Likely	Medium		Moderate/Low

CONTAMINANT RISK			LIKELIHOOD	SEVERITY	MITIGATION DISCUSSION	RESIDUAL RISK
SOURCES	MIGRATION PATHWAYS	RECEPTORS				
Radon	Inhalation of ground gas. **PL4** Accumulation of ground gas in confined spaces (carcinogenic)	Human Health – site personnel	Unlikely	Low	The UK interactive radon map indicates the site is situated in an area where less than 1% of home are above the "Action level" and that full radon protective measures are not necessary in the construction of new dwellings or extensions.	Very low

Main Exposure Pathways:
PL1 = soil ingestion, PL2 = dermal contact and ingestion, PL3 = dust inhalation; PL4 = vapour/gas inhalation; PL5 = vertical / lateral migration; PL6 = corrosion of concrete; PL7=tainting of water supply; PL8 = uptake by plants.

Level of Risk

Very Low
Low
Low/Moderate
Moderate
Moderate/High
High

5. GEOTECHNICAL ASSESSMENT

5.1. SOIL CONSISTENCY

Undrained shear strength values were measured using field hand shear vane tests. Results of the tests are presented in Table 20, which indicates the clay soils to vary between firm and stiff. Strength test data is generally consistent with the field descriptions of the aforementioned soils.

Table 20 Summary of Hand Shear Vane Tests

LOCATION	DEPTH	SHEAR STRENGTH (KPA)	CALCULATED ALLOWABLE BEARING CAPACITY (KN/M^2)
TP101	0.50	68.90	161.93
TP101	1.00	73.21	172.05
TP102	0.60	66.32	155.85
TP103	0.50	101.63	238.84
TP103	1.00	94.74	222.65
TP104	0.50	100.77	236.82
TP104	1.00	114.55	269.20
TP105	1.00	107.66	253.01
TP106	1.40	77.52	182.17
TP108	1.00	74.07	174.07
TP109	1.00	110.25	259.08

Notes: ABC Calculated using Stroud and Butler et al 1974.
** granular content within soil tests may underestimate true shear strength.*

Results of the standard penetration tests, including undrained shear strengths derived from SPTs are included in Table 21.

5.2. SIDE STABILITY AND EASE OF EXCAVATION

The sides of the exploratory trial pit excavations appeared to be generally stable during excavation. Granular deposits within TP102 encountered between 1.10–1.40 m bgl were noted to be unstable.

The presence of brick and concrete cobbles within the Made Ground deposits meant that in certain places, excavation was slow through the Made Ground and in some places, Made Ground could not be fully penetrated. The natural strata was excavated with relative ease.

Table 21 Standard/Cone Penetration Test Results

BOREHOLES	DEPTH (m bgl)	MATERIAL FIELD DESCRIPTION	CPT/SPT "N" VALUE	CORRECTED "N" VALUE $(N_1)_{60}$	TERZAGHI & PECK RELATIVE DENSITY (SANDS)	EUROCODE SOIL STRENGTH	CONSISTENCY (BS 5930)	TERZAGHI & PECK APPROXIMATE UNDRAINED SHEAR STRENGTH (kN/m²)	ALLOWABLE BEARING CAPACITY (kN/m²)*
WS101	1	Brown slightly gravelly CLAY	17	17.14	N/A	High strength	Very Stiff	85.69	176.18
	2	Very stiff CLAY	33	30.15	N/A	Very high strength	Very Stiff	150.73	309.91
	3	Very stiff CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS102	1	MADE GROUND	38	38.31	Dense	N/A	N/A	N/A	383.10
	2		28	25.58	Medium Dense	N/A	N/A	N/A	255.79
	3	Brown slightly gravelly CLAY	50	43.48	N/A	Very high strength	Very Stiff	217.41	447.00
WS103	1	MADE GROUND	10	10.08	Medium Dense	N/A	N/A	N/A	100.81
	2	Brown slightly gravelly CLAY	20	18.27	N/A	High strength	Very Stiff	91.35	187.82
	3		37	32.18	N/A	Very high strength	Very Stiff	160.89	330.78
	4		50	42.24	N/A	Very high strength	Very Stiff	211.21	434.25

NOTES
* The Allowable Bearing Capacity (ABC) should be considered indicative.
The interpretation of in situ mass undrained shear strength (cu) data from SPT Blow Count (N) results and the influence of the Plasticity Index (PI) was reported in Standard Penetration Test in Insensitive Clays and Soft Rocks. Stroud (1974). The standard penetration test and the engineering properties of glacial materials subsequently. Stroud and Butler (1975) and (1989).
Allowable bearing capacity on sands. Soil Mechanics in Engineering Practice Terzaghi, K. & Peck, R.B. 1996.

5.3. SOIL DENSITY/MOISTURE CONTENT RELATIONSHIP

Dry density/moisture content relationship analysis has been conducted on soils using compaction tests with a 2.5 kg rammer. The results of the tests has been summarised in Table 22. The full test results can be found in APPENDIX IX.

Table 22 Summary of Dry Density and Moisture Content

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (m)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5 mm SIEVE (%)	MAX DRY DENSITY (mg/m³)	MATERIAL RETAINED ON 20.0 mm TEST SIEVE (%)
TP105	MADE GROUND	0.40	2.5kg	16	13	0	1.74	1

The compaction test has indicated that the material is wet of the optimum. It should be noted that if this material is excavated for use in a cut/fill operation careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

5.4. SOIL PLASTICITY

The liquid and plastic limits of samples of natural in-situ clay are determined using the cone penetrometer method and the rolling thread test.

The Atterberg limits determinations, summarised in
Table 23, shows the clay to be of moderate plasticity.

Table 23 Summary of Plasticity Index Test results

LOCATION	DEPTH (m)	NATURAL MOISTURE CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING 425 µm SIEVE (%)	MODIFIED PLASTICITY INDEX	NHBC VOLUME CHANGE POTENTIAL
WS101	1.00	19.10	14	34	20	99	19.80	Low
WS103	1.00	25.60	21	49	28	94	26.32	Medium
TP103	1.30	26.70	21	43	22	95	20.90	Medium

The results of the Atterberg limits testing confirmed that the soils would are “Medium Volume Change Potential” in accordance with the classification system utilised by the LABC/NHBC industry guidance.

5.5. PH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained in APPENDIX VIII (summarised in Table 24), shows that the soils at the site meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

Table 24 Summary of pH and Sulphate Data

LOCATION	DEPTH (m)	SO_4 IN 2:1 WATER/SOIL (g/l)	PH VALUE	CLASSIFICATION
TP101	0.1	<0.01	8.2	DS-1, AC-1
TP101	0.7	0.04	7.4	DS-1, AC-1
TP102	0.3	<0.01	8.5	DS-1, AC-1
TP103	0.4	<0.01	7.9	DS-1, AC-1
TP104	0.1	<0.01	7.2	DS-1, AC-1
TP105	1.3	0.011	7.1	DS-1, AC-1
TP106	0.8	<0.01	8.5	DS-1, AC-1
TP107	0.4	<0.01	8.4	DS-1, AC-1
TP108	0.1	<0.01	7.1	DS-1, AC-1
TP108	1.3	<0.01	7.9	DS-1, AC-1
TP110	0.5	<0.01	8.6	DS-1, AC-1
TP111	0.5	<0.01	8.5	DS-1, AC-1
WS103	0.7	0.20	8.1	DS-1, AC-1

5.5.1. HIGHWAYS AND CONCRETE

MCHW Series 600 provides a criterion of 1500 mg/l for water-soluble sulphate within 500 mm of any concrete structure. A second criterion of 300 mg/l is given concerning soils within 500 mm of steel structures.

5.6. GROUNDWATER

Table 25 Summary of Groundwater Strikes

LOCATION	DEPTH (m bgl)	DESCRIPTION OF STRIKE	STRATA	EVIDENCE OF CONTAMINATION
Site Investigation Waterstrike Information				
TP102	1.30	Slow ingress	Natural SAND Drift	N/A
Location	**Depth Range (m bgl)**	**Period of monitoring (April—May)**	**Weather conditions during monitoring**	**Comments**
Groundwater Monitoring Summary from Installations				
WS101	0.77	24/04/2024	Overcast	N/A
	0.98	16/05/2024	Overcast	
WS103	3.48	24/04/2024	Overcast	N/A
	3.86	16/05/2024	Overcast	

One water strike was encountered during the intrusive investigation in the natural SAND drift strata (TP102). This was the only exploratory hole that encountered SAND, every other location had firm to very stiff gravelly CLAY underlying the MADE GROUND.

5.6.1. INFLUENCING FUNCTIONAL WATERBODIES

There are no surface waterbodies within influencing distance to the subject site.

5.7. SITE PREPARATION

Our assessment has been based on the fact that the site will be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the *Manual of Contract Documents for Highway Works (MCHW).* This should include the following:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill.
- Buried structures and old foundations have been encountered on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

5.8. FOUNDATION CONDITIONS AND ASSESSMENT OF POTENTIAL BEARING CAPACITIES

In due consideration of the identified ground conditions, in-situ and laboratory geotechnical testing, E3P has assessed the safe allowable bearing capacity (ABC) within the underlying natural stratum to assist in the detailed design of foundations and infrastructure and determine the target founding stratum. The results of this assessment are summarised in Table 26.

Table 26 Summary of ABC

COHESIVE SOILS			
Description	**Depth (range m bgl)**	**Undrained Shear Strength (Cu) (kN/m²)**	**Allowable Bearing Capacity (kN/m²)**
Stiff, Gravelly CLAY	0.50–2.00	66—110	155—259
Firm, Gravelly CLAY	0.50–1.00	68—74	161—174
Firm to stiff, Gravelly CLAY (1 Location)	1.40	77.52	182
Very Stiff, Gravelly CLAY	2.00–4.00	85—211	176—447

The above ABC data demonstrates that cohesive CLAYs have an allowable bearing capacity ranging from 155–259 kN/m^2 for firm to stiff CLAY between 0.50—2.00 m bgl increasing to between 176—447 kN/m^2 below 2.00 m bgl.

5.9. FOUNDATIONS OPTIONS APPRAISAL

Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe allowable bearing capacity, the following recommendations have been developed for the site of the potential foundation solutions that may be adopted for future residential development. The suitable target founding stratum has been identified as the underlying firm to very stiff CLAY.

In areas of extensive Made Ground deposits >1.50 m ground improvement may be required in the form of vibo-stone columns (VSC).To determine if VSC is viable at the subject site in area of extensive Made Ground, E3P has completed a Ground Improvement Design Risk Matrix that is summarised in Table 27.

Table 27 Ground Improvement Design Risk Matrix

RISK ITEM	COMMENT	PASS/FAIL
Soft clays with an undrained shear strength less than 30 kN/m²	No results from the intrusive investigation had an undrained shear strength of less than 30 kN/m^2.	PASS
Ground with peat layers close to foundation level or the base of the stone column, or where intermediate layers of peat are thicker than 200 mm, either as a single layer or the sum of the thicknesses of individual layers throughout the length of the stone column	No areas of PEAT have been identified on-site during the investigation.	PASS

RISK ITEM	COMMENT	PASS/FAIL
Voided filled ground, e.g. old water tanks, pottery, glass bottles, concrete rubble or brick fill of unsuitable grading	Made Ground will require removal and processing to render the site suitable for VSC.	PASS – on completion of enabling works
Loose or non-engineered fill not previously subject to rising or fluctuating water levels saturation	None identified.	PASS
Filled ground still settling or expected to settle under its own weight or due to the effects of surcharging/upfilling where there is a high organic content or where decay is continuing	None identified.	PASS
Fill, containing degradable material where organic material forms more than 15% of fill by volume	None identified.	PASS
Clays with a plasticity index greater than 40%	None identified.	PASS
Highly sensitive soils liable to collapse or remoulding	None identified.	PASS
Cohesive soils with trees in influencing distance	Plots where tree influence has been modelled will be assessed and if necessary subject to a piled or mass trench-fill solution.	PASS
Overall Risk Rating and Suitability for Vibratory Ground Improvement		**PASS**

It is advisable to consult with geotechnical engineers and foundation specialists who can assess the specific ground conditions and design an appropriate Vibro Stone Column system to meet the project's requirements. They will consider factors such as soil composition, depth, and spacing of the stone columns to ensure effective ground improvement and proper load distribution for the strip foundation.

5.10. GROUND FLOOR SLABS

Current building control regulations require that where infilled ground is present to depths in excess of 600 mm, or where the substratum is variable in terms of the structure and settlement potential, or where clay soils are present within the influence of existing or proposed trees, a suspended floor slab is required.

In this instance, it is considered that for the majority of substructures, the underlying stratum would have in excess of 600 mm of infill and, as such, a suspended floor slab will be required.

Where a cast in-situ suspended slab is utilised with no subfloor void, appropriate compressible material (heave precautions) will be required in the construction of the substructure.

In clay soils if the foundation depth is greater than 1.5m, allowance should be made in the design for heave. This must incorporate either a clear void of a specified minimum depth under the suspended floor, or a proprietary compressible material/void former below the underside of the floor construction.

Ground bearing slabs should not be used in ground conditions where heave can occur or where the foundation depth is greater than 1.5m. Under these circumstances a suspended floor construction should be used.

5.11. SETTLEMENT

The site has been appraised through desk-based information and site investigation data to inform geotechnical risk where possible. Table 28 below has been formulated to determine if settlement risks are required to be further appraised. Where any item is determined to be appraised a settlement appraisal for the site should be prepared upon receipt of development levels and layout.

Table 28 Summary of Geotechnical Information for Settlement

RISK	COMMENT	ASSESSMENT
Site is located in an area deemed to be at Risk from Ground Dissolution from desk based information	The site is at low risk area of ground dissolution based on BGS data searches.	No Further Assessment Required.
Site is in an area where the geology is reported as having a compressible risk from desk based information	The site is in an area of low risk.	No Further Assessment Required.
Do historical maps indicate relict excavation features such as opencast or ponds that have been infilled.	None identified.	No Further Assessment Required.
Has the site been proven to be underlain by anthropogenic materials to an unknown specification?	Made Ground is present to a maximum proven depth of 2.30 m bgl (WS102).	Removal of the Made Ground is required and backfilled with a suitably engineered fill.
Have Oedometers and/or ground conditions reported compressible stratum on site?	No compressible material identified onsite.	No Further Assessment Required.
Have High walls been identified on site that could result in differential settlement?	None identified.	No Further Assessment Required.
Has any evidence been observed on site indicating settlement (non-structural assessment)	No evidence identified during the intrusive investigation.	No Further Assessment Required.
Is voided ground present beneath the site?	None identified during the intrusive investigation.	No Further Assessment Required.
Is the site in an area where mobile groundwater is present in influencing the distance of foundations and infrastructure?	None identified.	No Further Assessment Required.
Will the site be subject to changes in site levels that may induce heave or settlement?	Minor level variations may take place, however no major engineering works are expected onsite.	No Further Assessment Required.

The site has been appraised as having a limited future settlement risk. In order to determine the level of risk and appropriate mitigation options a detailed settlement appraisal is required for the site. This does not form a part of the structural engineers settlement calculations associated with the sub structure however loadings will need to be considered for surcharging both static and variable pressures.

5.12. HEAVE PRECAUTIONS

The site has been proven to be underlain by clay soils which are susceptible to volumetric instability due to fluctuations in moisture content, particularly within influencing distance of trees as per the NHBC/LABC conjectures zones of influence.

The clay has been determined as being of medium volume change potential. Table 29 shows where heave precautions are required for a trench fill, pier and beam and pile and beam foundation types which are in the zone of influence of trees which are to remain or be removed.

Table 29 Position of Heave Precautions

SITUATION	TRENCH FILL	PIER AND BEAM	PILE AND BEAM
External trench fill and pier foundations. Unless NHBC is satisfied that the soil is not desiccated compressible material should be provided to the:	Inside faces of external wall foundations deeper than 1.5m, based on the appropriate tree height.	All faces of pier foundations deeper than 1.5m, based on the appropriate tree height.	N/A
External ground beams. Unless NHBC is satisfied that the soil is not desiccated, compressible material or void formers should be provided to the:	N/A	Inside faces	Inside faces
Internal trench fill foundations and ground beams. Compressible material required:	No	No	No
External and internal ground beams. Compressible material, void former or void should be provided to the underside of:	N/A	All	All
Heave precautions required for proposed trees where the soil is not desiccated:	No	No	No

Note: Information taken from NHBC Standards 2024, Chapter 4.2, Table 8 – Position of heave precautions

A summary of heave precautions is presented in Table 30.

Table 30 Summary of Heave Precautions

VOLUME CHANGE POTENTIAL	VOID DIMENSION AGAINST SIDE OF FOUNDATION AND GROUND BEAM	VOID DIMENSION UNDER GROUND BEAMS, AND SUSPENDED IN-SITU CONCRETE GROUND FLOOR	VOID DIMENSION UNDER SUSPENDED PRECAST CONCRETE AND TIMBER FLOORS(1)
High	35mm	150mm	300mm
Medium	25mm	100mm	250mm
Low	0mm	50mm	200mm

In addition to the requirements of the 'Drainage' section, drainage near trees should incorporate additional provisions. Where there is a volume change potential within the ground, the provisions include:

- Increased falls to cater for any ground movement.

- Deeper and wider backfill of granular material.
- A drainage system that is capable of movement should heave and shrinkage occur.
- Drainage pipes should not be encased in concrete.
- Additional clearance is required where drains pass through the structure of a building to allow for additional movement.

5.13. HIGHWAYS CONSTRUCTION

A programme of remediation and enabling works will be required to remediate the proposed road subgrade in accordance with the requirements of the Manual of Contract Documents for Highway Works Volume 1 Specification For Highway Works (Series 600-Earthworks) for a method compaction.

5.14. DRAINAGE

Where loose or soft materials have been identified at drainage invert levels, there will need to be consideration for the use of reinforced pipe bedding.

Shrinkage and heave of clay soils can affect pipelines. To protect against the effects of heave, drainage should be designed:

- To take account of potential ground movement as shown in Table 31, including where pipes and services pass through substructure walls or foundations.
- With gradients which may need to be steeper.
- To use alternative means of catering for the movement when sufficient falls cannot be provided, for example, by deepening the excavation and laying pipework on a granular bedding of suitable thickness to reduce the extent of potential movement.

Table 31 Potential Ground Movement for Drainage

VOLUME CHANGE POTENTIAL	HIGH	MEDIUM	LOW
Potential ground movement	150 mm	100 mm	50 mm

5.15. EXCAVATIONS

Trial pits were generally stable in both granular Made Ground and natural strata; as such, it is considered that near-surface excavations will be feasible. In areas where Made Ground exceeded 2 m, excavations were generally less stable.

Site observations indicated that excavations should be generally feasible on the near-surface with normal plant; however, obstructions were identified in the near-surface, such as deep Made Ground in the centre and north of the site, comprising of relic foundations. It is anticipated that any obstructions will be grubbed out during the reduced-level dig for the substructure works.

However, due to the depth and variability of the Made Ground and the possibility of trench collapse, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.

If local pumping of groundwater is required during the advancement of excavations for the proposed foundations, then consideration should be given to the potential for dewatering gravels in the surrounding areas that may cause structural damage to building substructures in close proximity to the site.

Table 32 Civil Engineering Excavation Risk Matrix

RISK ITEM	PRESENT	COMMENT
Running Sands	No	No running sand has been identified.
Minor Water Ingress	Yes	Minor water ingress will require localised dewatering/sump pumping during the construction of site drainage infrastructure. Ingress of water into foundation excavation will potentially flood foundation excavations, limiting the viability of spread foundations to be constructed.
Shallow Bedrock	No	Shallow bedrock has not been identified during the intrusive investigation.

5.16. CONSTRUCTION ACTIVITY AND INSPECTION

The following activities and inspections should be incorporated into the site works:

- Excavations where access is required should be subject to a risk assessment from a competent person and, where appropriate, mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97 should be utilised.
- It is considered that dewatering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to the provision of space for settling tanks or an attenuation pond.
- Where access to confined spaces is required, appropriate mitigation measures should be addressed within the construction stage health and safety plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed as part of the construction stage health and safety plan and should include measures to design out the risks, reduce their impact and, finally, include the use of personnel protective equipment (PPE).

5.17. DEVELOPED GEOTECHNICAL RISK REGISTER

POTENTIAL ABNORMAL CONSTRAINT	LOCATION ON SITE	ESTIMATED AREA OF SITE AT RISK (%)	ASSESSMENT AND MITIGATION
Remediation of contaminated soils	On site	TBC	Localised elevated concentrations of PAHs (TP101) and lead (TP102) have been identified within the shallow Made Ground deposits. The installation of a cover system will be required in all areas of non-hardstanding.
Bedrock	N/A	N/A	Shallow bedrock has not been identified.
Cohesive Stratum overlying shallow Bedrock (<3.00m)	On site	100%	Cohesive deposits have been encountered across the site.
Obstructions	On site	100%	The site has been subject to historical development and, while above-ground structures have been removed, obstructions from relict substructures are present.
Artificially levelled and filled platforms	On site	100%	The site appears to have been levelled and artificially backfilled, following the demolition of previous structures.
Retaining walls	N/A	N/A	No retaining walls have been identified on-site.
Trench collapse	On site	100%	Made Ground present beneath the site has the potential to be unstable upon excavation. The natural strata were generally noted to be excavated with relative ease and stable. However granular deposits within TP102 were noted to be unstable.
Mature trees	On site	20%	Several mature trees have been noted in the north of the site and east of the site.
Volume change potential clay	On site	100%	The results of the Atterberg limits testing confirmed that the soils to be “Medium Volume Change Potential” in accordance with the classification system utilised by the LABC/NHBC industry guidance.
Peat	N/A	N/A	No PEAT has been identified on-site during the intrusive investigation.
Concrete design	On site	100	Chemical analysis for pH and soluble content show that the soils at the site meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s, in accordance with BRE Special Digest 1 (2005).
Low-permeability ground	On site	100%	The site is underlain by low permeability CLAY therefore, it is unlikely that soakaway drainage will be effective on site.
Services/sensitive structures	On site	30	A number of live services have been noted across the site.
Enabling Earthworks	On site	100	All proposed earthworks will need to be designed by a suitably qualified geotechnical engineer in accordance with NHBC Chapter 4.6. The earthworks design will incorporate a Geotechnical Specification for Earthworks that will define protocols to ensure no unacceptable future risk.

5.18. FURTHER WORKS

Based on the findings of the intrusive site investigation, the following additional works are recommended to be completed in due course:

- Plot-specific foundation schedule (upon receipt of the final development levels).
- Remediation and enabling works strategy.

END OF REPORT

APPENDIX I
LIMITATIONS



GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P “Terms of Business” or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.

6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

9. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.

12. The investigation has been undertaken to provide information concerning either:

    I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or

    II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.

20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.

21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.

22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.

25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.

26. If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatoy Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.

35. The data is presented and will be compared with assessment criteria.

APPENDIX II
GLOSSARY



TERMS

ACM	Asbestos-containing material	**MMP**	Materials management plan
ADS	Acoustic design statement	**ND**	Not detected
AST	Above-ground storage tank	**NDP**	Nuclear density probe
BGS	British Geological Survey	**NMP**	Noise management plan
BSI	British Standards Institute	**NPSE**	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	**NR**	Not recorded
CA	Coal Authority	**PAH**	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	**PCB**	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	**PI**	Plasticity index
CIRIA	Construction Industry Research Association	**PID**	Photo ionisation detector
CLEA	Contaminated land exposure assessment	**POS**	Public open space
CML	Council of Mortgage Lenders	**PPE**	Personnel protective equipment
CoC	Contaminants of concern	**ProPG**	Professional practice guidance
CSM	Conceptual site model	**QA**	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	**SGV**	Soil guideline value
DWS	Drinking water standard	**SPH**	Separate-phase hydrocarbon
EA	Environment Agency	**SPT**	Standard penetration test
EQS	Environmental quality standard	**SVOC**	Semi-volatile organic compound
FFL	Finished floor level	**TPH**	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	**UKWIR**	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	**UST**	Underground storage tank
HCV	Health criteria value	**VCC**	Vibro-concrete column
ICSM	Initial conceptual site model	**VOC**	Volatile organic compound
LEL	Lower explosive limit	**VRSC**	Vibro-replacement stone columns
LMRL	Lower method reporting limit	**VSC**	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	**WHO**	World Health Organisation

MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection

APPENDIX III
RISK CLASSIFICATION



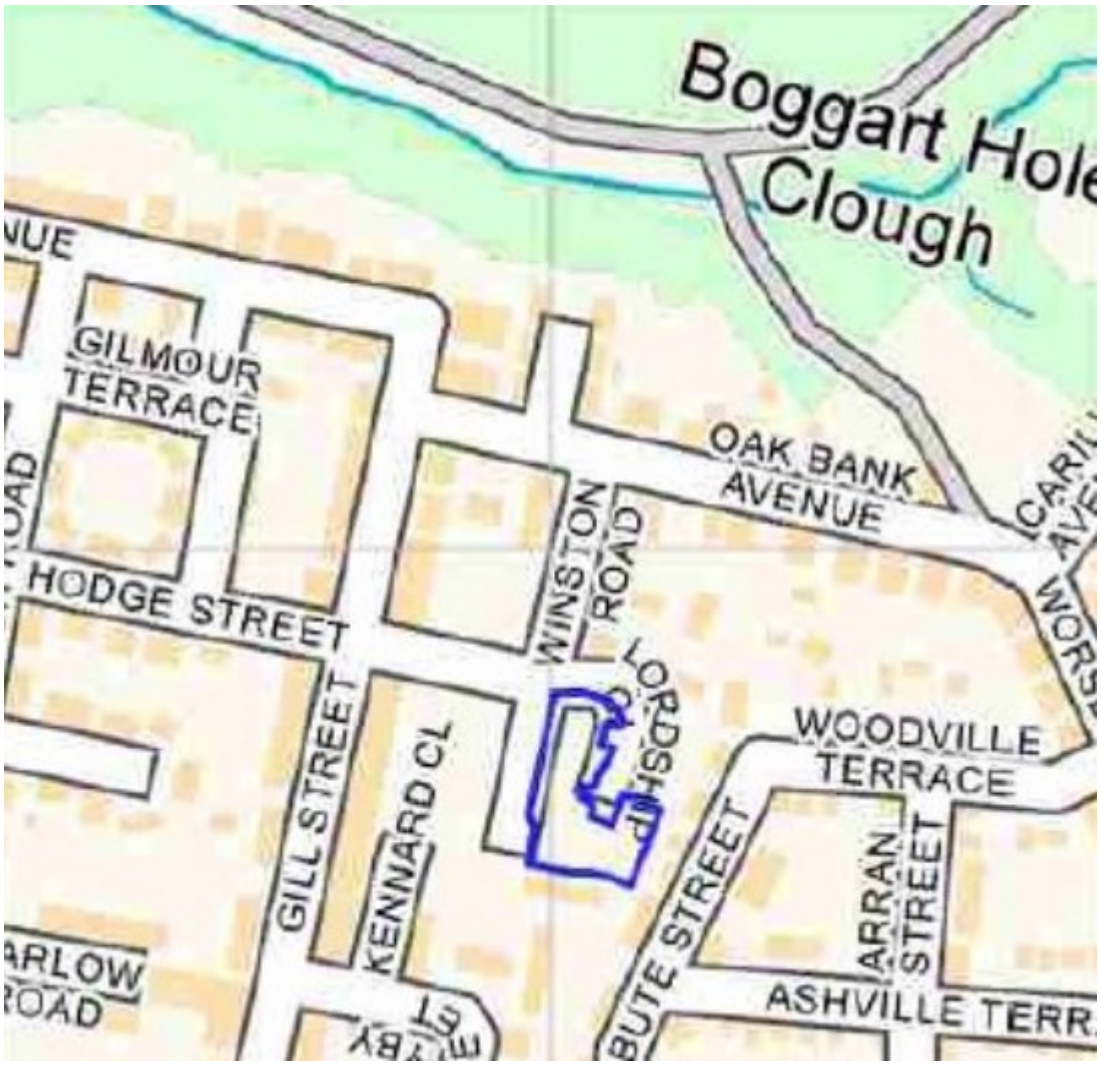
RISK CLASSIFICATION

RISK	DEFINITION
Low	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property.
Low Moderate	There are unlikely to be significant contaminated land liabilities/geotechnical constraints associated with the property with regard to the proposed use. However, minor issues may require further consideration in the event of future redevelopment of the Site.
Moderate	Some potential contaminated land liabilities/geotechnical constraints are likely to affect the property as a result of historical and/or current activities. The risks identified are unlikely to pose an immediate significant issue but the purchaser/developer may wish to make further enquiries of the vendor or undertake further environmental improvements. Redevelopment of the Site will likely require further site investigation.
Moderate High	Some potentially significant contaminated land liabilities/geotechnical constraints have been identified at the property that requires further assessment, including intrusive ground investigations.
High	Significant potential contaminated land liabilities/geotechnical constraints have been identified at the property. Further assessment including intrusive ground investigation will be required to determine the level of risk and associated liability.

APPENDIX IV
DRAWINGS



DRAWING 16-713-001 – SITE LOCATION PLAN





Information

Notes:

Client:
AJP

Job No:
16-713

Date:
16.04.2024

Drawing No:
002

Scale:
N/A

Phase	Issue	Date	Drawn	Checked	PM
P2	REVA	16.04.2024	EB	JS	JS

Job Title:
Lordship Close, Moston

Drawing Title:
Proposed Development

Environmental Engineering Partnership Ltd
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Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Historical Features

- Residential Housing
- Residential Housing
- Outbuildings

Notes:

P1	REVA	28.07.2023	LM	EF
Phase	Issue	Date	Drawn	Checked

Client: AJP

Job No: 16-713

Date: 28.07.2023

Drawing No: 003

Scale: 1:1000 @ A3

Job Title: Lordship Close, Moston

Drawing Title: Historical Features Plan

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Site Features

- Softstanding
- Trees
- Footpaths

Notes:

Client: AJP

Job No: 16-713

Date: 28.07.2023

Drawing No: 004

Scale: 1:1000 @ A3

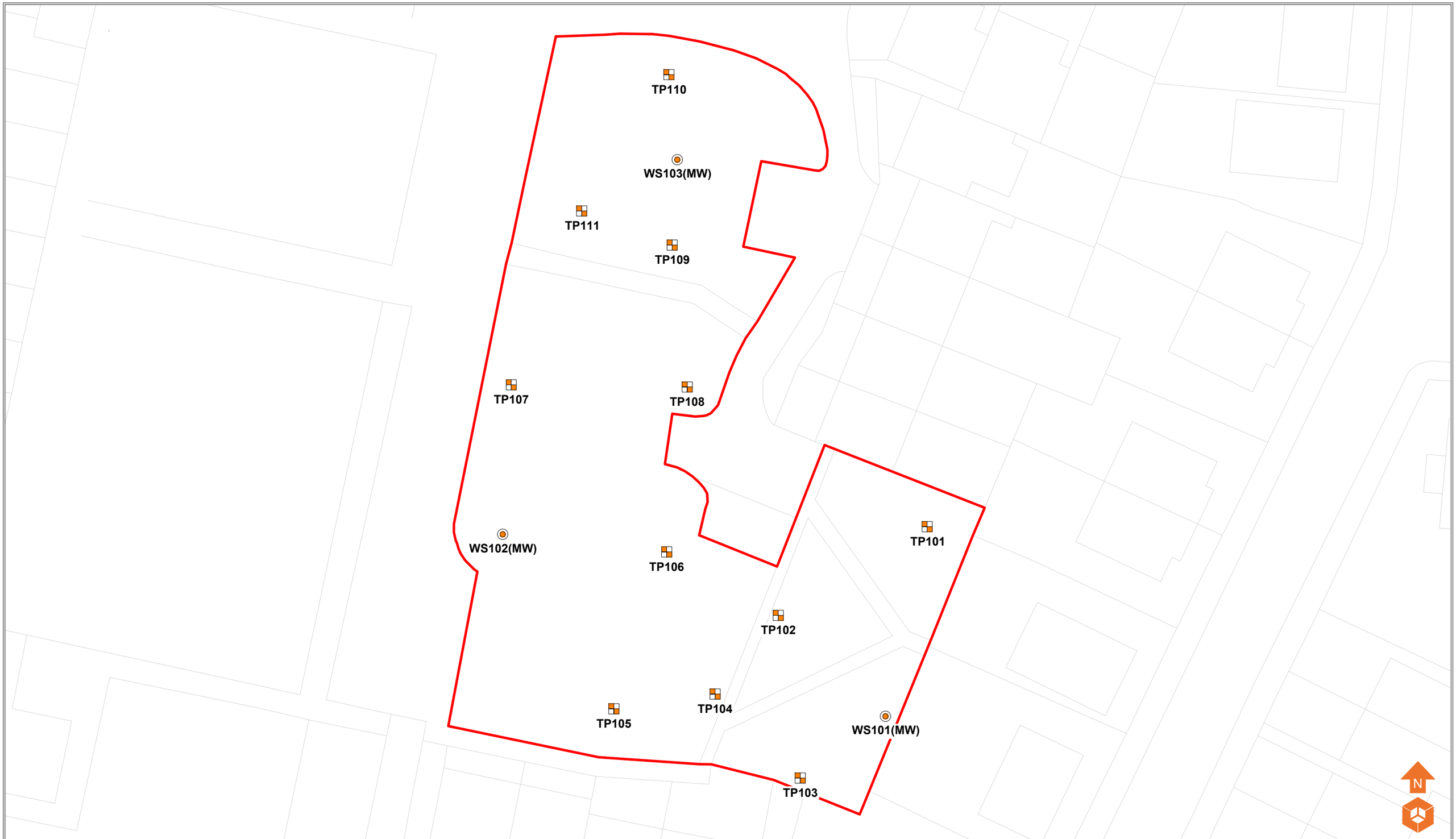
P1	REVA	28.07.2023	LM	EF
Phase	Issue	Date	Drawn	Checked

Job Title: Lordship Close, Moston

Drawing Title: Site Features Plan

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Location Symbols

- Approximate Window Sample Probehole Location with Install (E3P April 2024)
- Approximate Trial Pit Location (E3P April 2024)

Notes:

P1	REVA	16.04.2024	EB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Client: AJP

Job No: 16-713

Date: 16.04.2024

Drawing No: 005

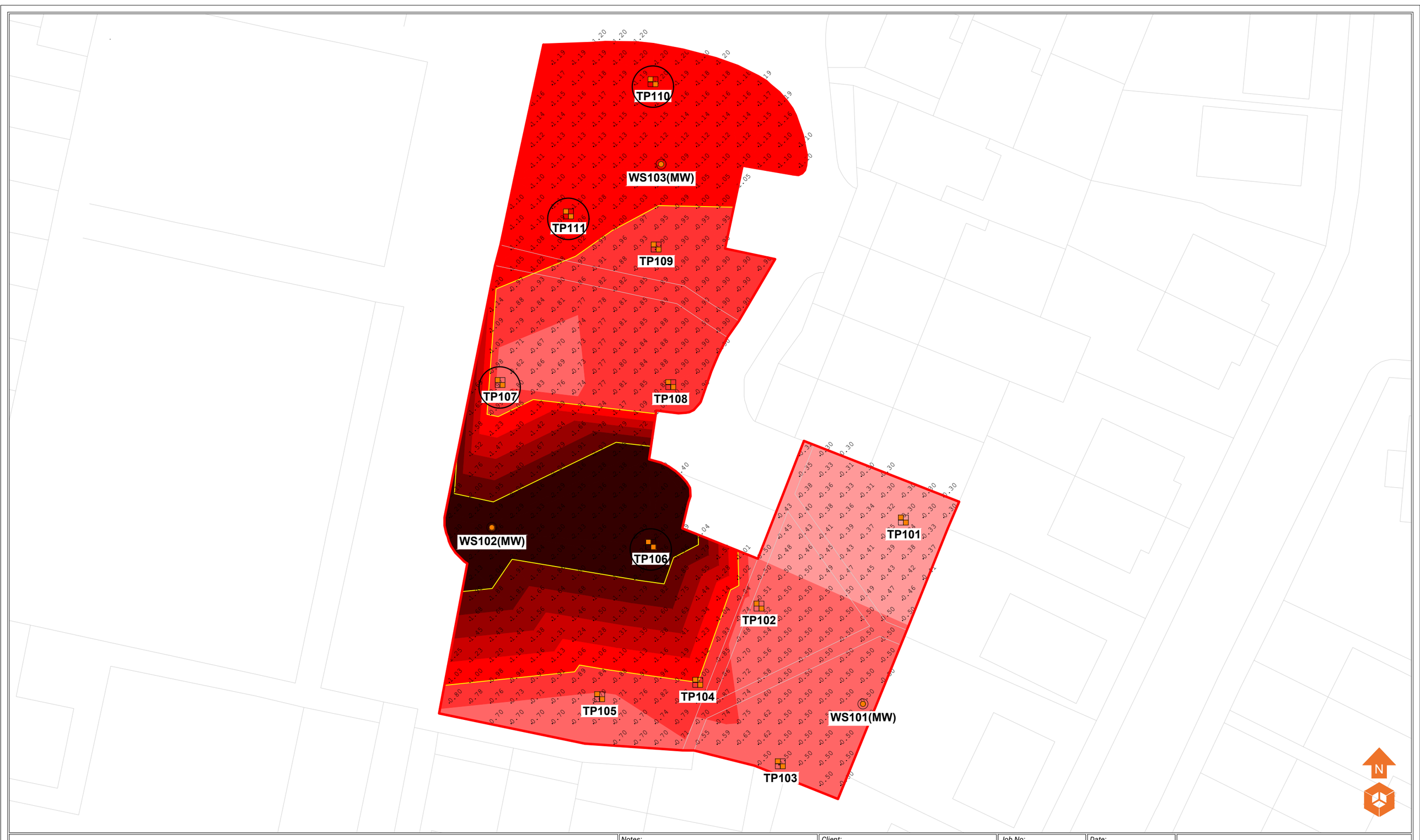
Scale: NTS@ A3

Job Title: Lordship Close, Moston

Drawing Title: Exploratory Hole Location Plan

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Location Symbols

- Approximate Window Sample Probehole Location with Install (E3P April 2024)
- Approximate Trial Pit Location (E3P April 2024)

Made Ground Depth (m)

- Depth of Made Ground 0.25 - 0.49m
- Depth of Made Ground 0.50 - 0.74m
- Depth of Made Ground 0.75 - 0.99m
- Depth of Made Ground 1.00 - 1.24m
- Depth of Made Ground 1.25 - 1.49m
- Depth of Made Ground 1.50 - 1.74m
- Depth of Made Ground 1.75 - 1.99m
- Depth of Made Ground >2.00m
- Base of Made Ground Not Encountered

Notes:

P1	REVA	16.04.2024	EB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Client: AJP

Job No: 16-713

Date: 16.04.2024

Drawing No: 006

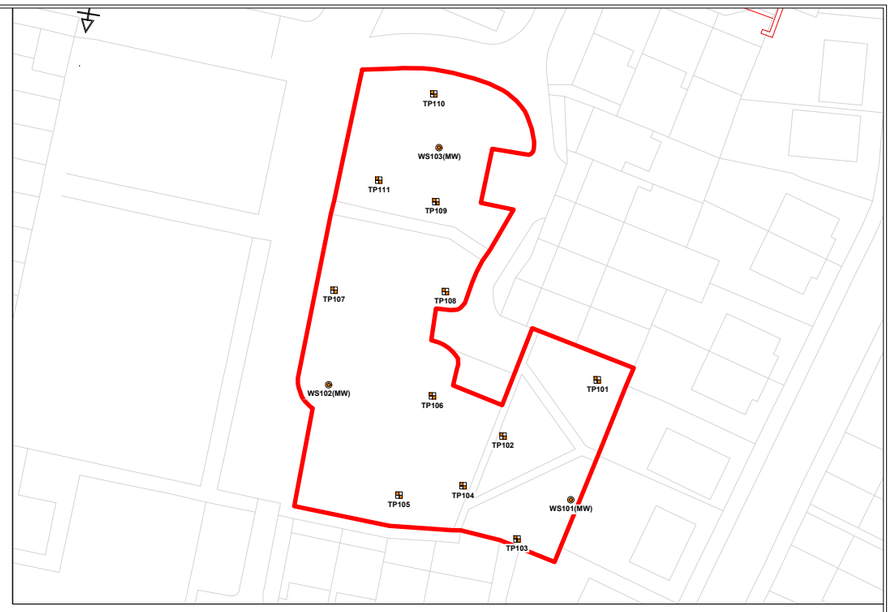
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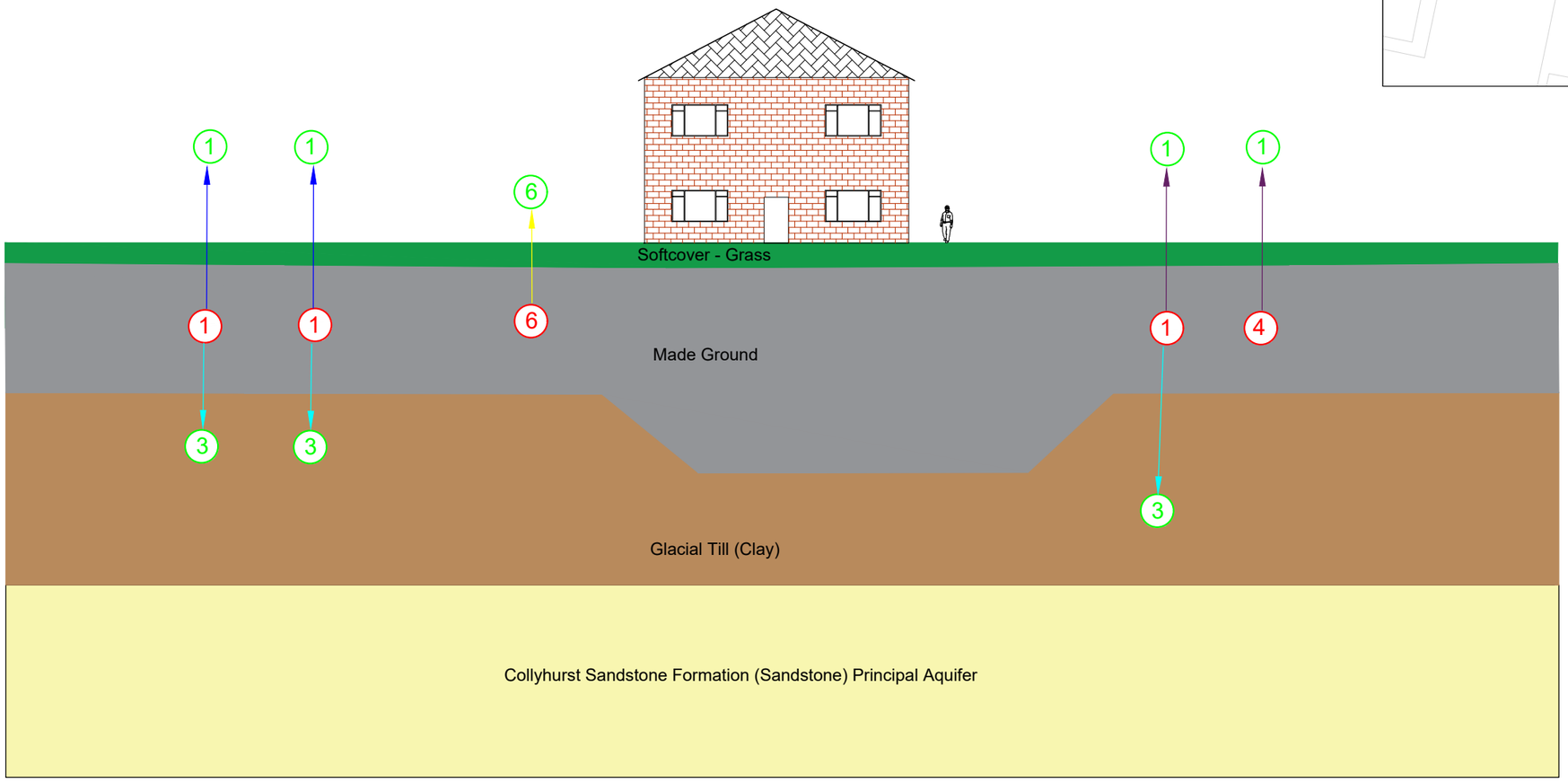
Job Title: Lordship Close, Moston

Drawing Title: Depth of Made Ground Plan

e3p
Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Geology Key

- Soft Cover Grass
- Made Ground
- Glacial Till
- Collyhurst

Sources

1. Heavy Metals, Non Volatile PAH's, Non Volatile TPH's (Made Ground)
4. Ground Gases (Infilled Pond)
6. Sulphate (Made Ground)

Pathways

- Dermal Contact / Ingestion
- Inhalation / Accumulation
- Vertical / Lateral Migration
- Sulphate Attack on Concrete

Receptors

1. Future End Users
3. Groundwater (Secondary B Aquifer)
6. Building Structure

Notes:

P1	REVA	16.05.2024	OW	JC	MD
Phase	Issue	Date	Drawn	Checked	PM

Client: AJP

Job No: 16-713

Date: 16.05.2024

Drawing No: 010

Scale: NTS

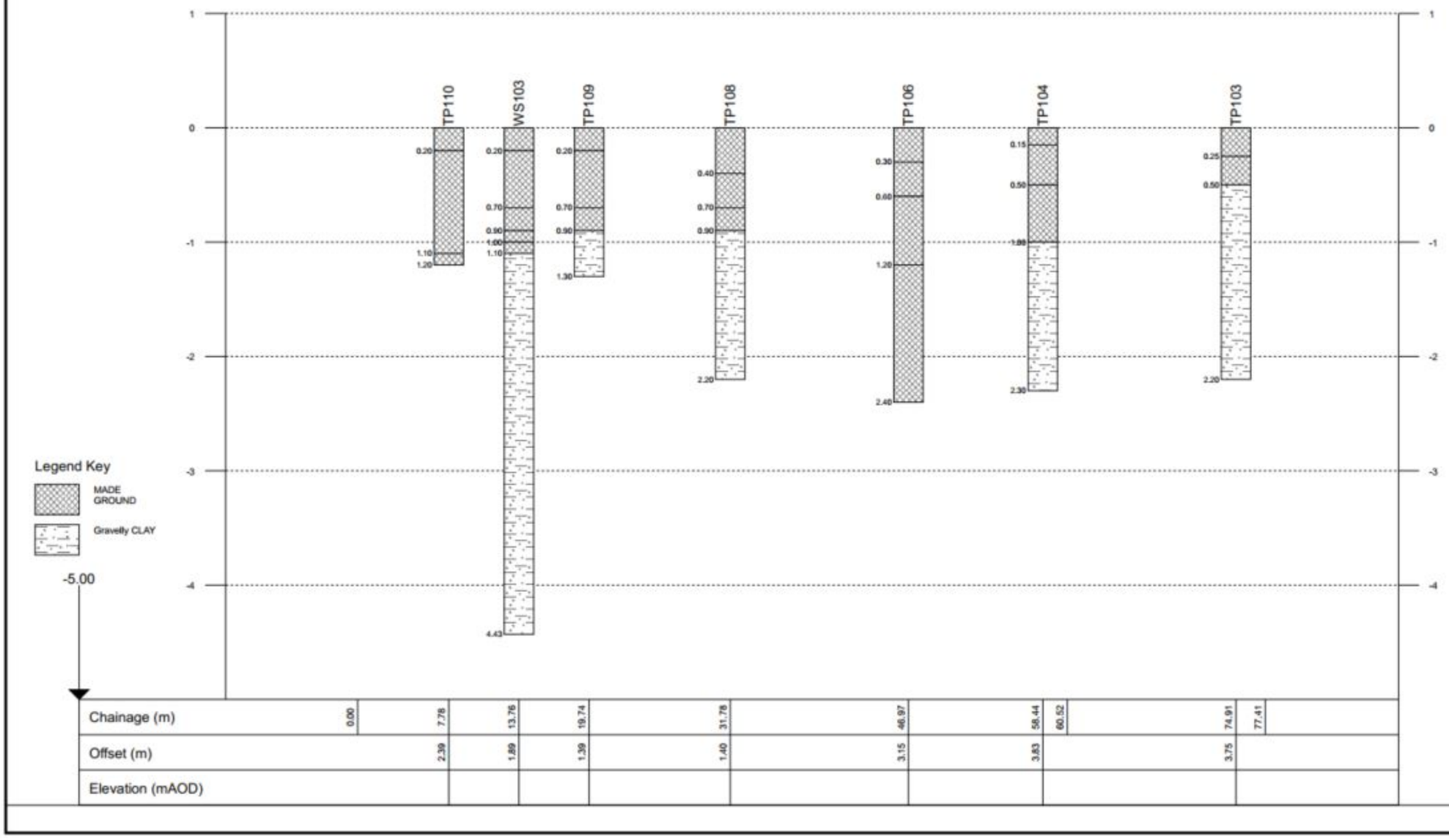
Job Title: Lordship Close, Moston

Drawing Title: Conceptual Site Model

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Project Id: 16713	Title: Section line 1
Project Title: Lordship Close	Vertical Scale: 1:46
Location: Moston	Horizontal Scale: 1:449
Client: AJP	Engineer:



Information

Cross section created using Holebase with E3P site investigation information

Notes:

P2	REVA	16.04.2024	EB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Client: AJP

Job No: 16-713

Date: 16.04.2024

Drawing No: 016

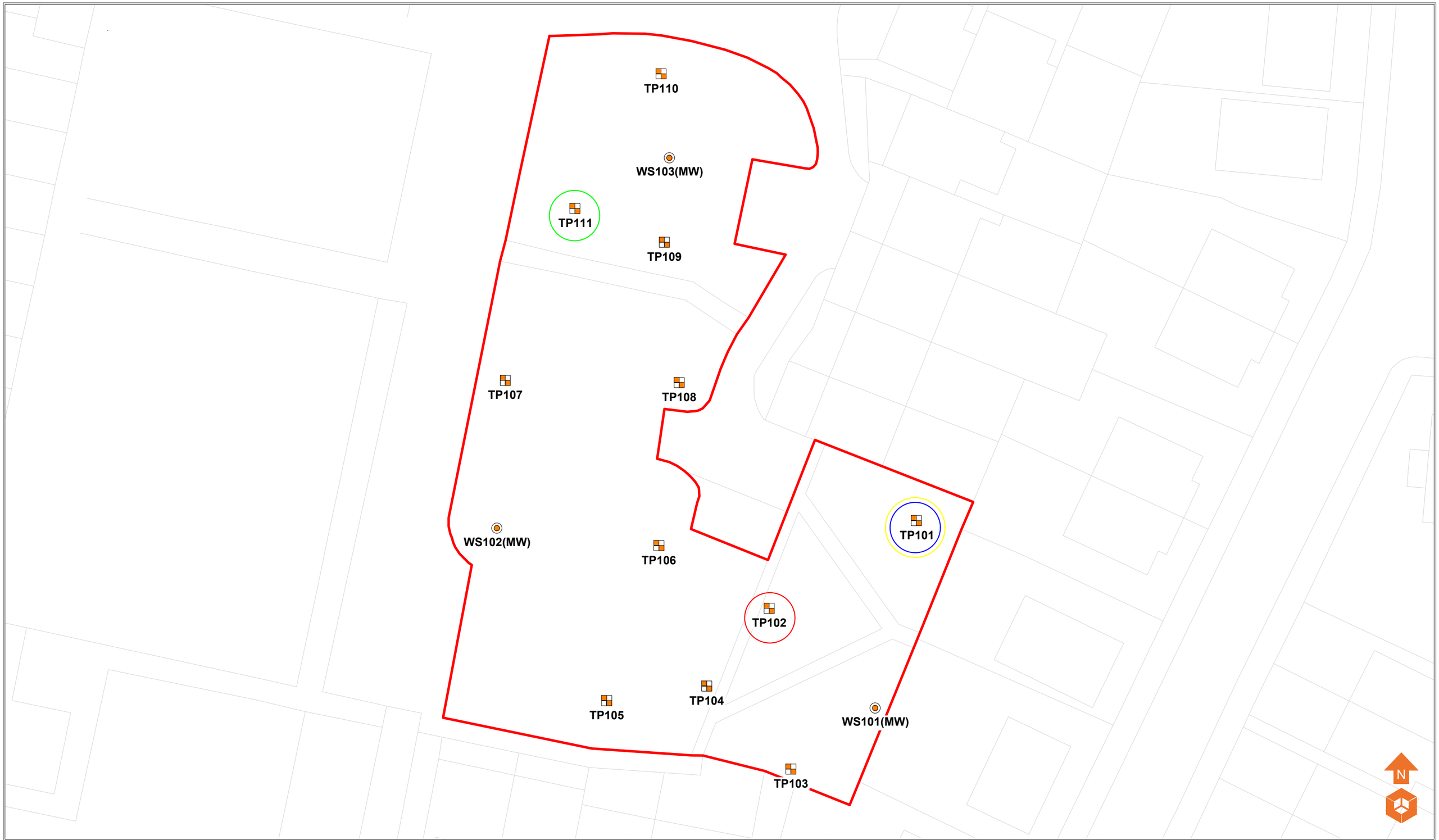
Scale: N/A

Job Title: Lordship Close, Moston

Drawing Title: Cross Section Line

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Urmston, Manchester, M41 7JQ
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Location Symbols

- Approximate Window Sample Probehole Location with Install (E3P April 2024)
- Approximate Trial Pit Location (E3P April 2024)

Contamination Issues

- Dibenzo (a,h) Anthracene
- TPH C12-16 (Aromatic)
- Lead
- Benzo(a) Pyrene

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	16.05.2024	OW	JC	JS

Client: AJP

Job No: 16-713

Date: 16.05.2024

Drawing No: 018

Scale: NTS@ A3

Job Title: Lordship Close, Moston

Drawing Title: Contamination Issues Plan

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APPENDIX V
PHOTOGRAPHS



PLATE 1 VIEW FACING EAST



PLATE 2 VIEW OF SITE FACING SOUTH



PLATE 3 TP103 – EXCAVATION & ARISING

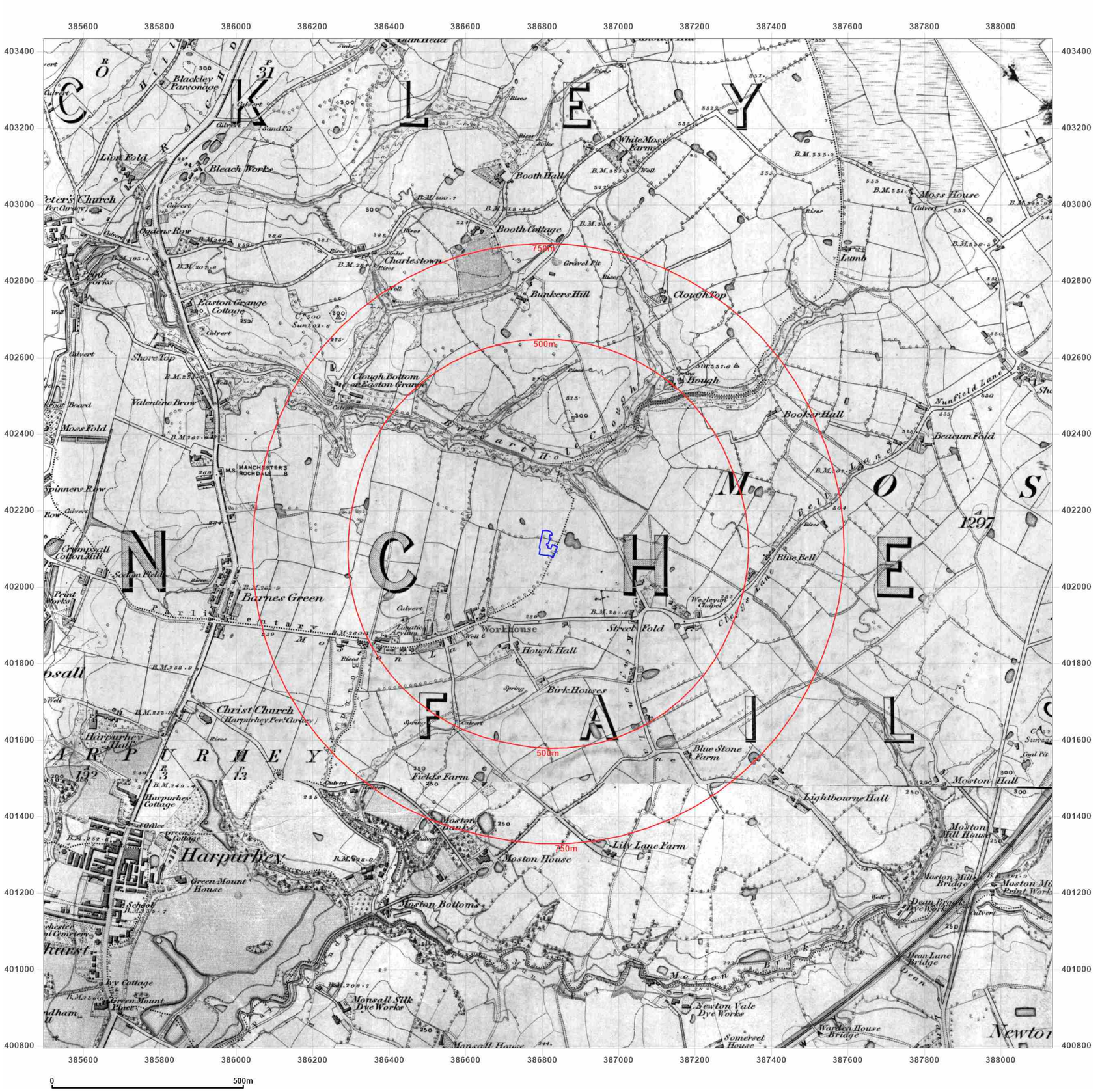


PLATE 4 OBSTRUCTIONS NOTED WITHIN TP107 & TP110



APPENDIX VI
HISTORICAL MAPS





Groundsure INSIGHTS

Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

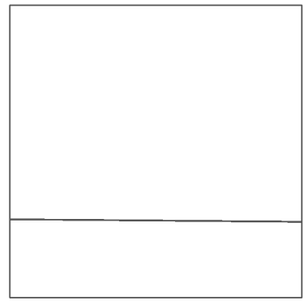
Map date: **1848**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1845
Revised N/A
Edition 1848
Copyright N/A
Levelled N/A



Surveyed 1845
Revised N/A
Edition 1848
Copyright N/A
Levelled N/A

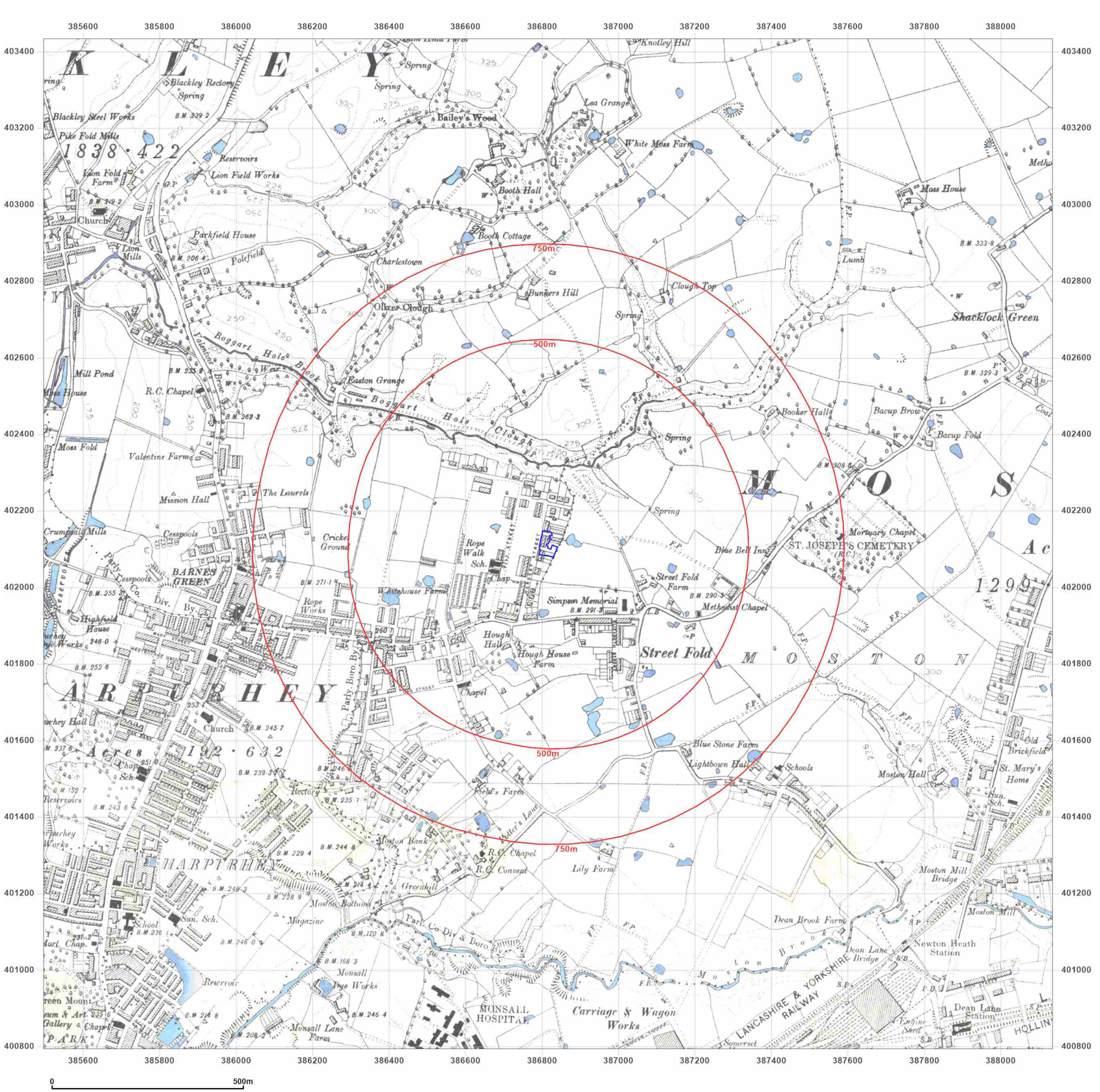
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Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1891**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1891
Revised 1891
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1891
Revised 1891
Edition 1891
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386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1906**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed 1844
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1906
Edition 1906
Copyright N/A
Levelled N/A

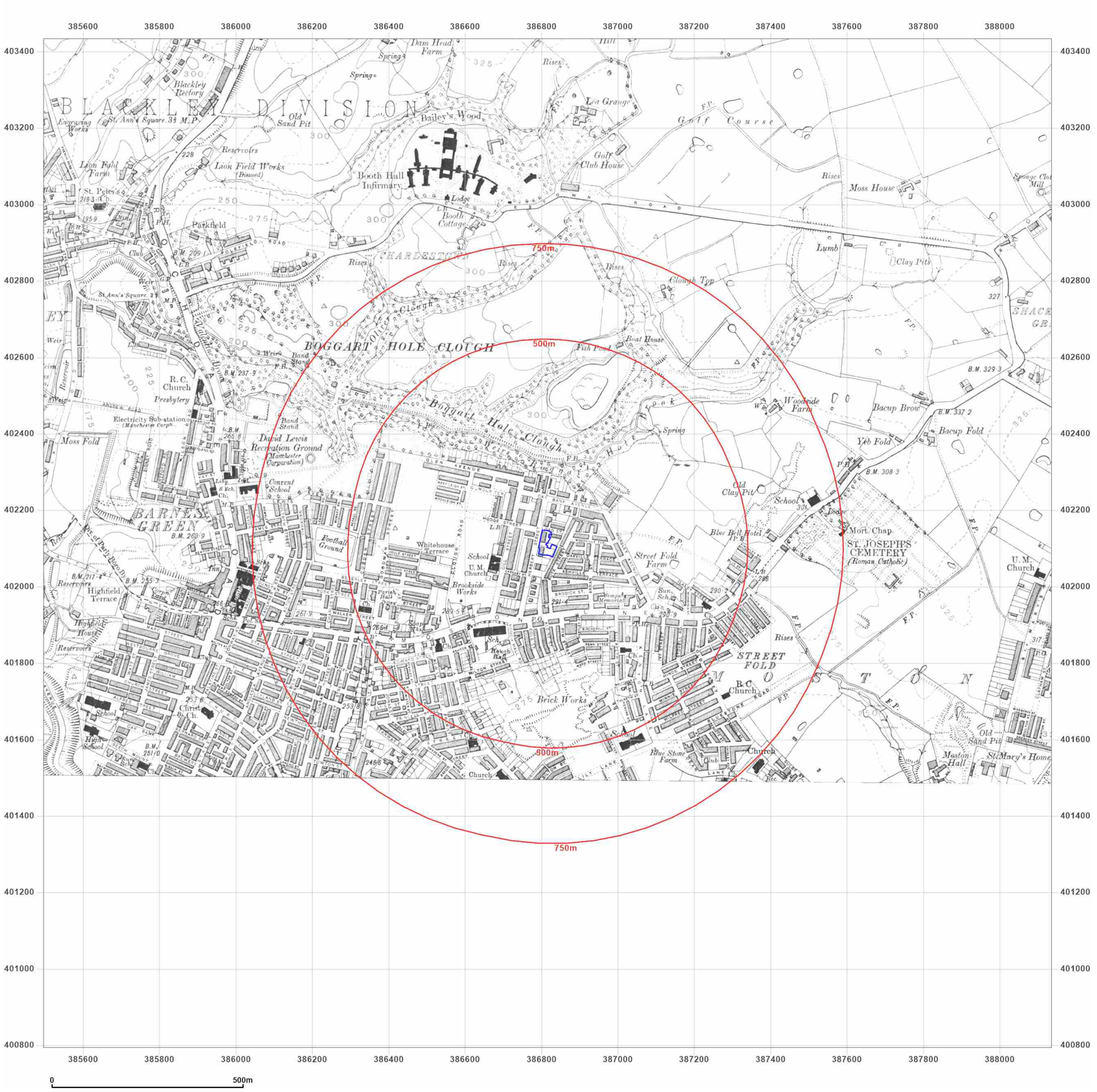
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1915**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1915
Edition N/A
Copyright N/A
Levelled N/A

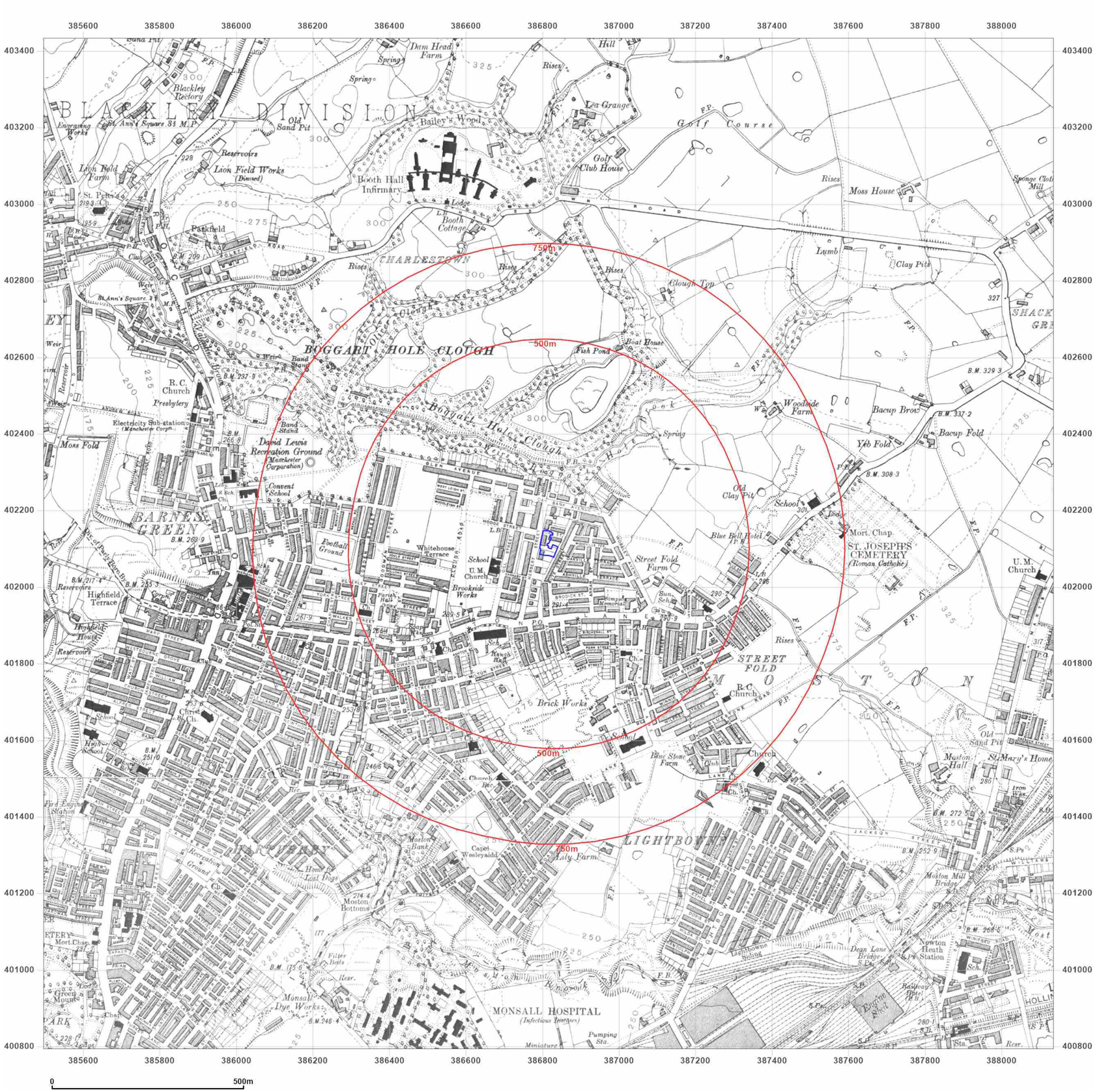
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Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1923
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Levelled N/A

Surveyed 1844
Revised 1921
Edition 1923
Copyright N/A
Levelled 1906

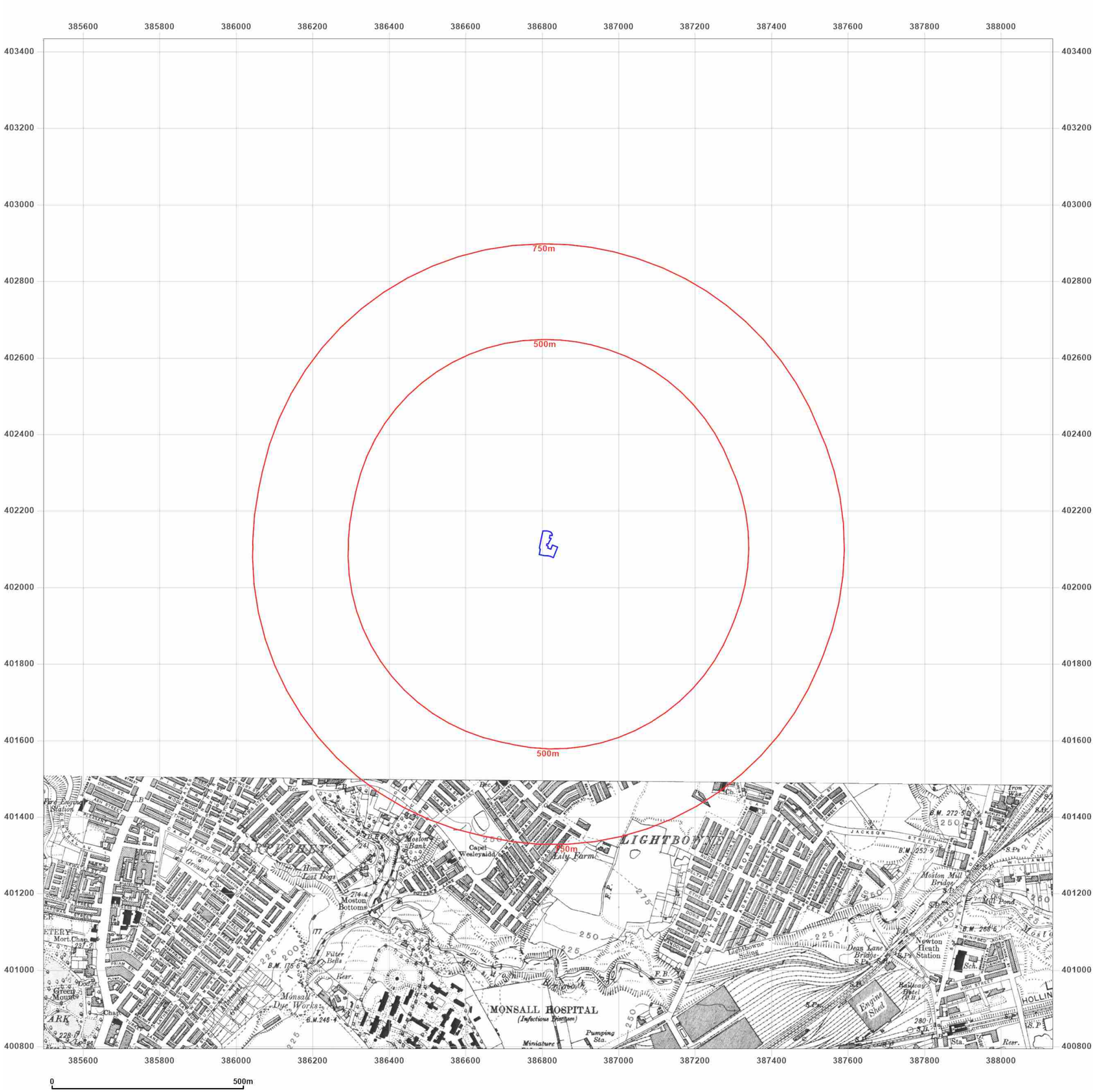
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Report Ref: GS-V6L-LMG-J22-4AC
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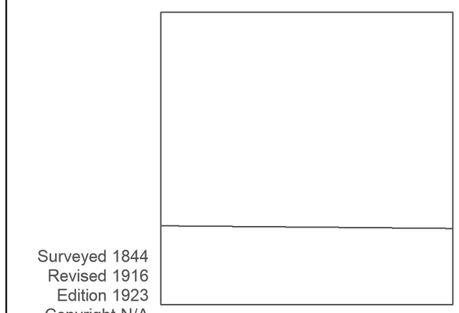
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Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

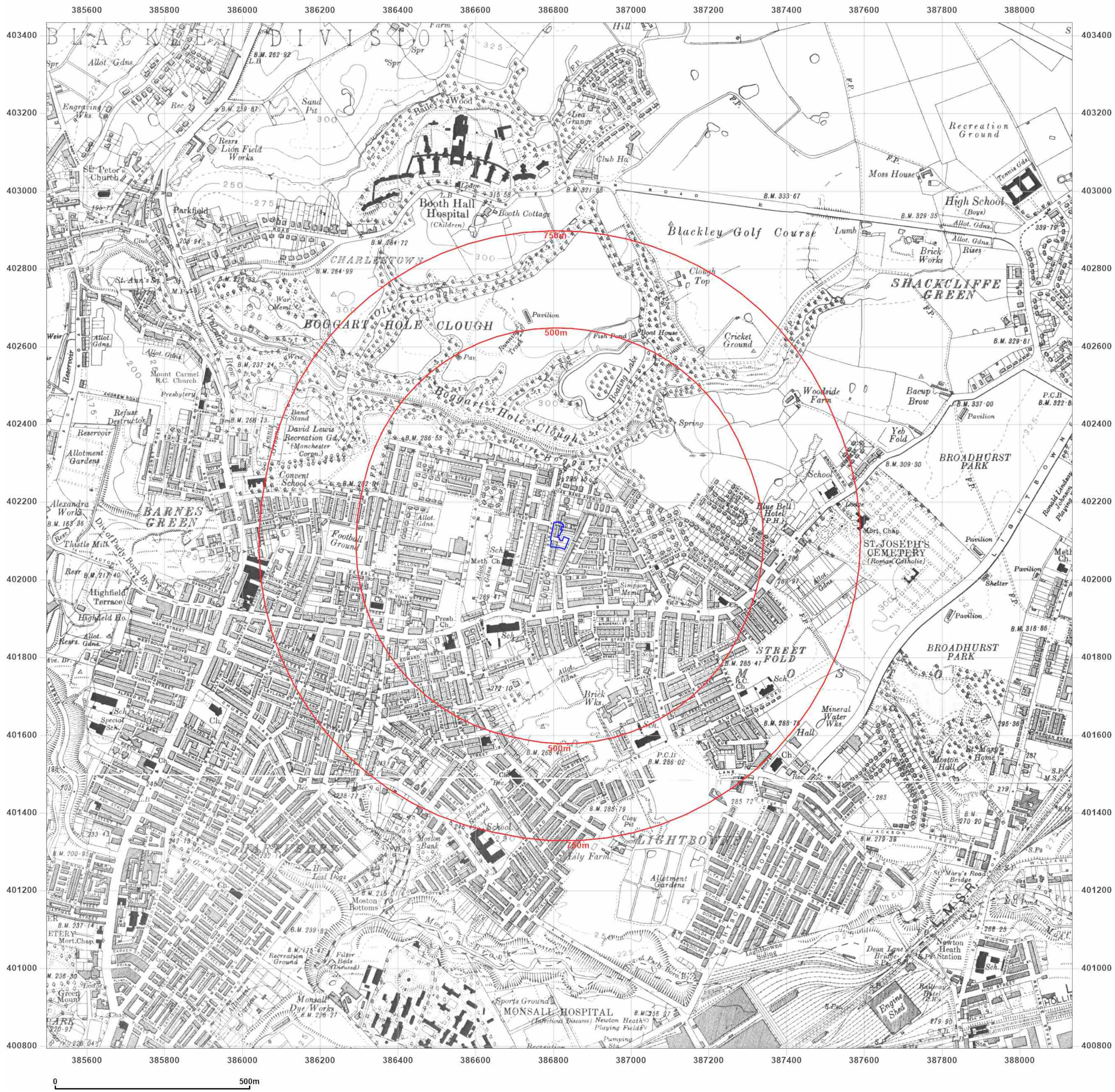
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1933**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
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Surveyed 1844
Revised 1933
Edition 1933
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
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Surveyed 1844
Revised 1938
Edition 1938
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: Provisional

Map date: **1956**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1956
Edition N/A
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: Provisional

Map date: **1966**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1966
Revised 1966
Edition N/A
Copyright N/A
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1975**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1975
Revised 1975
Edition N/A
Copyright N/A
Levelled N/A

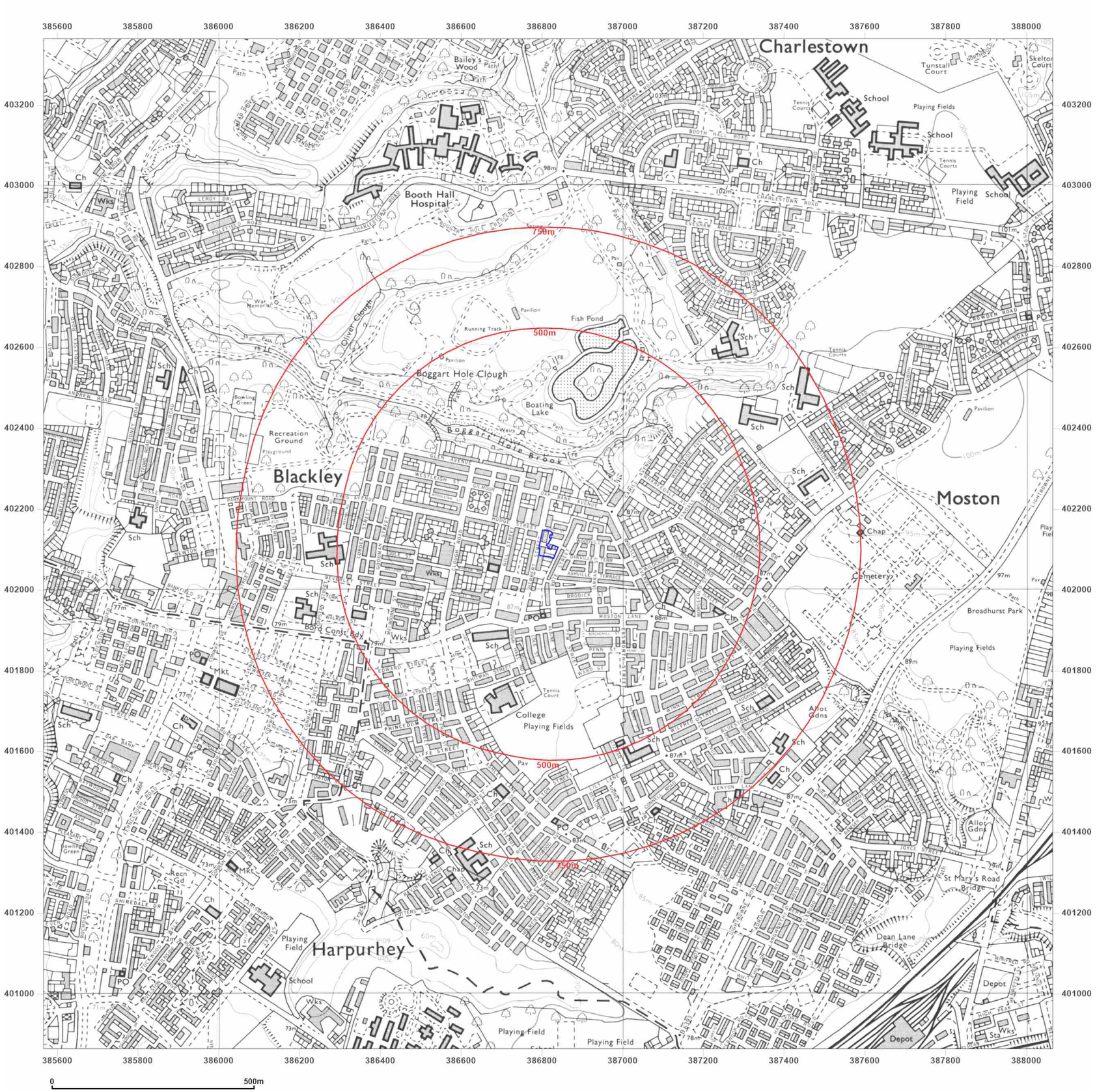
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1980**

Scale: 1:10,000

Printed at: 1:10,000

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Edition N/A
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1988**

Scale: 1:10,000

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Surveyed 1987
Revised 1988
Edition N/A
Copyright N/A
Levelled N/A

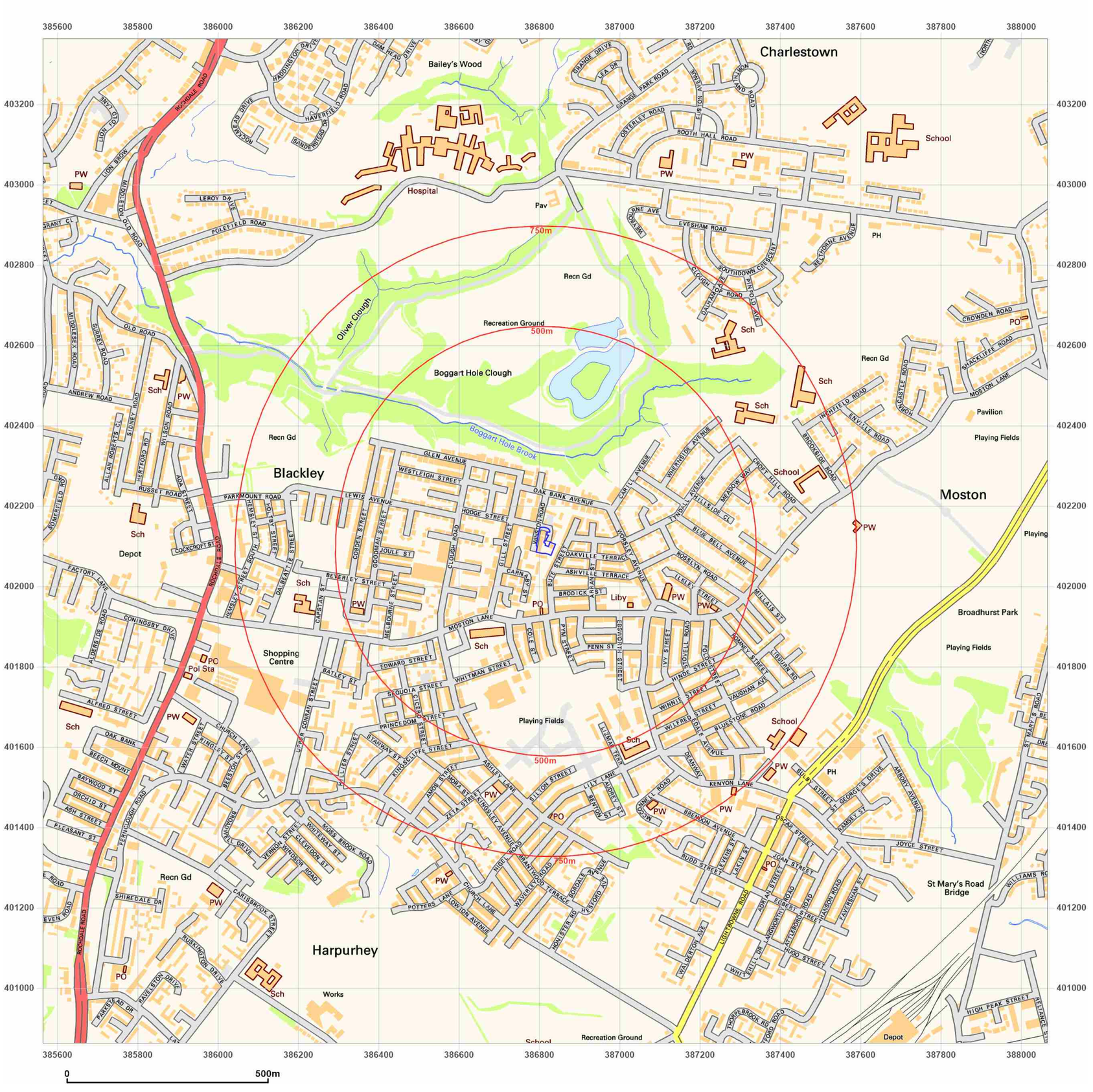
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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **2001**

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Printed at: 1:10,000

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2001

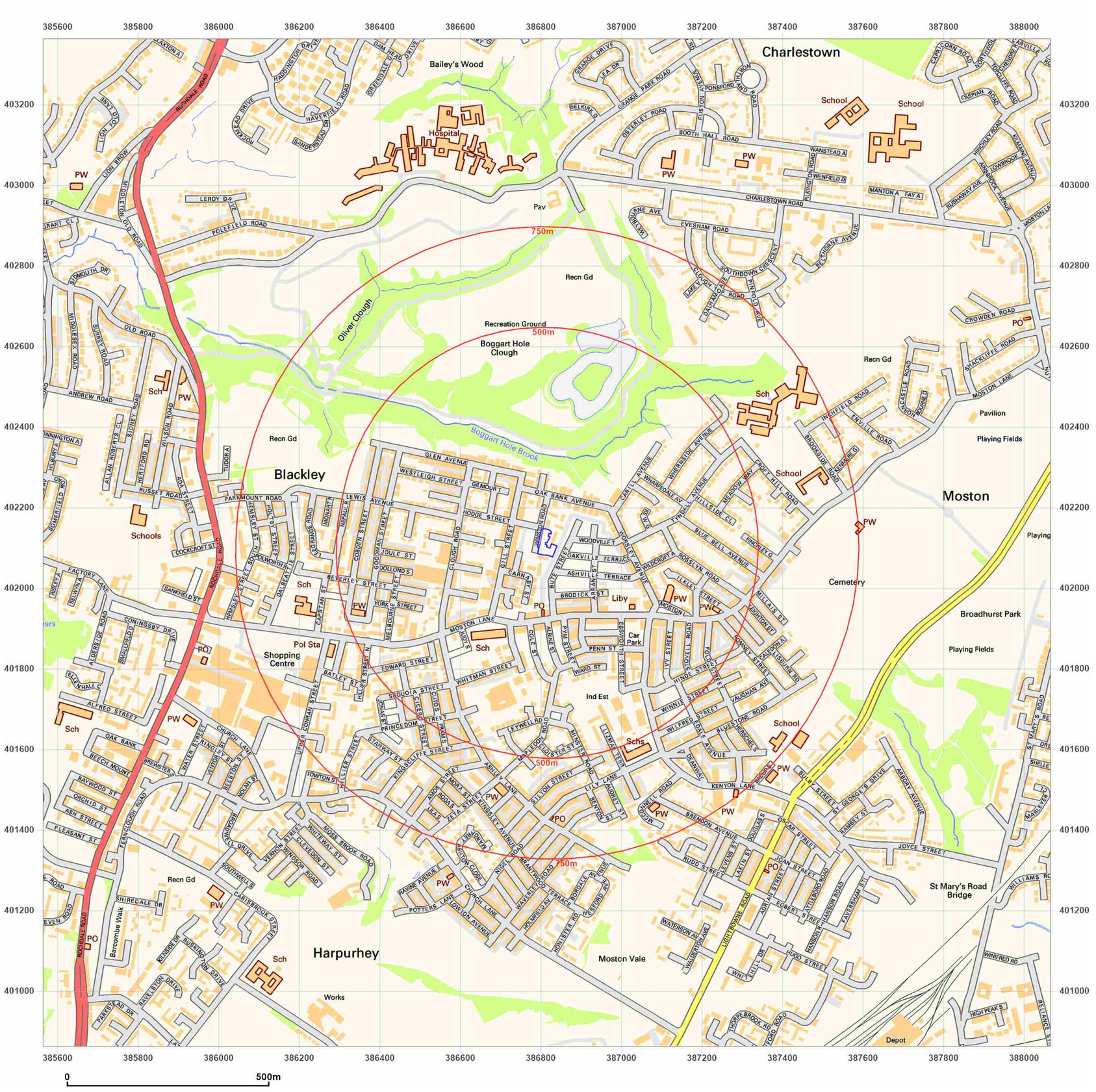
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **2010**

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2010

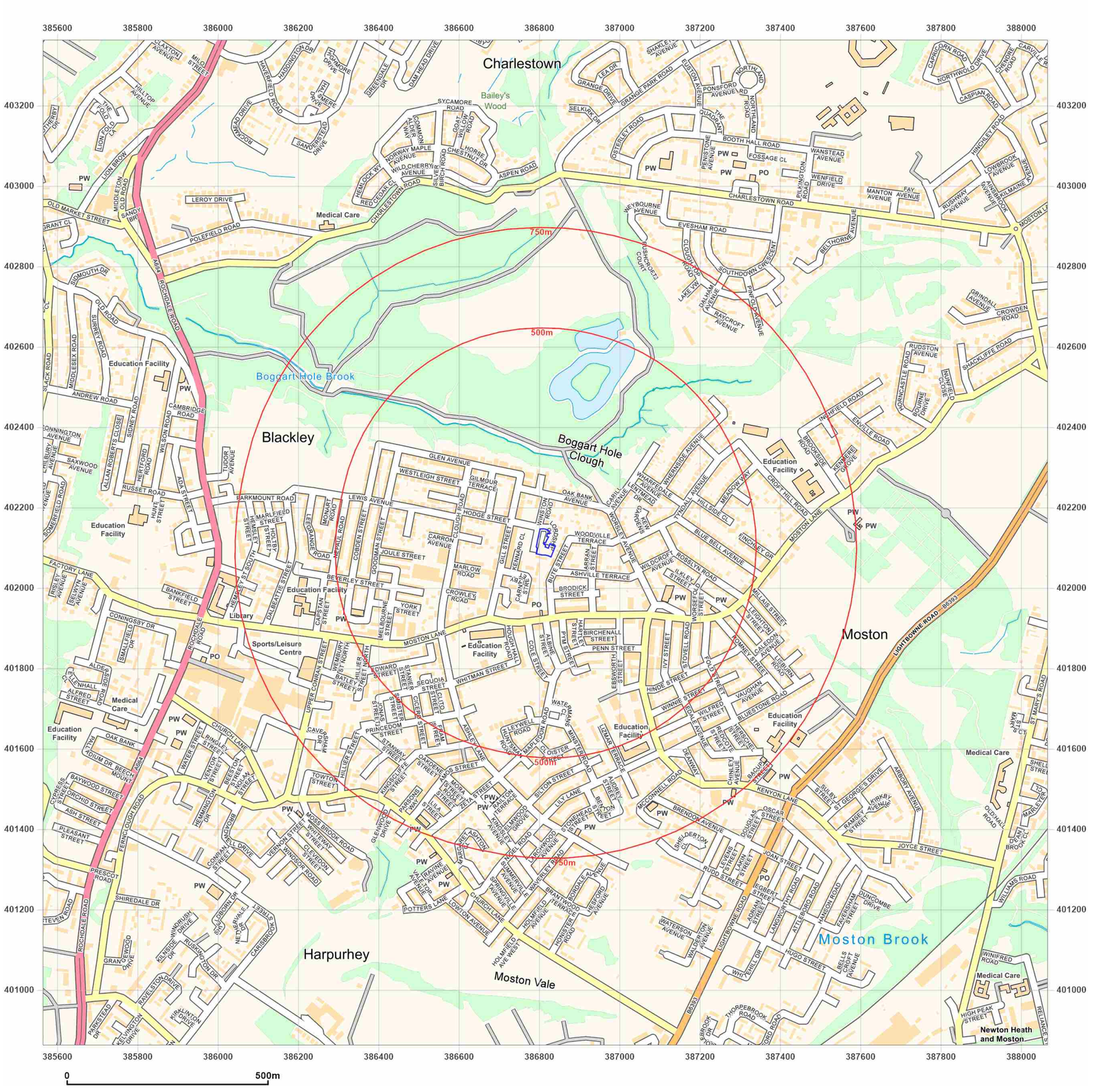
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **2023**

Scale: 1:10,000

Printed at: 1:10,000

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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
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Map Name: County Series

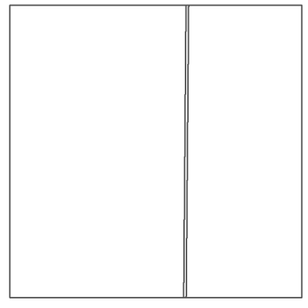
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Scale: 1:2,500

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Surveyed 1893
Revised 1893
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1893
Revised 1893
Edition N/A
Copyright N/A
Levelled N/A

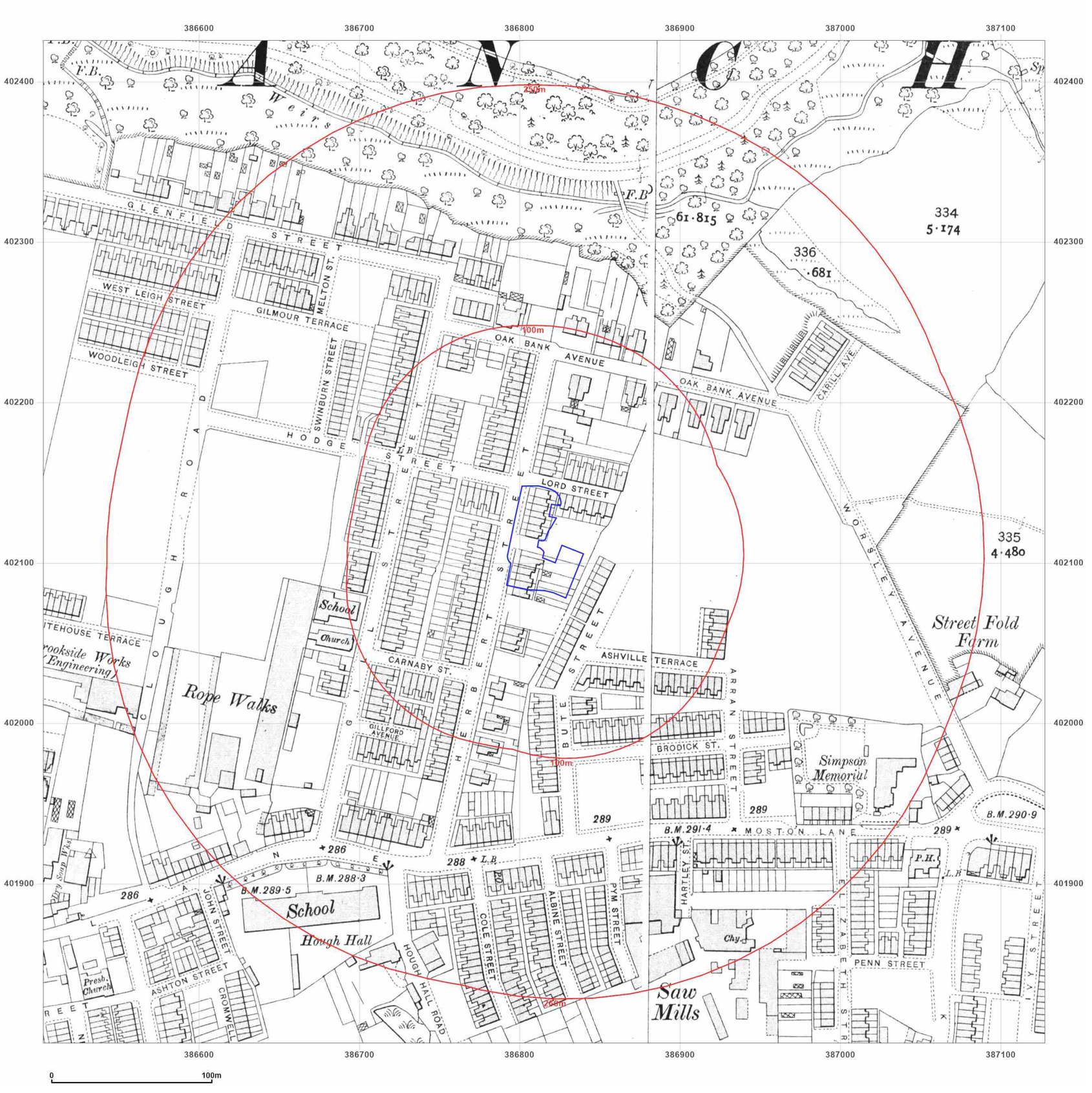
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Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1909**

Scale: 1:2,500

Printed at: 1:2,500

N
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Revised 1909
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Copyright N/A
Levelled N/A

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Revised 1909
Edition N/A
Copyright N/A
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Grid Ref: 386815, 402113

Map Name: County Series

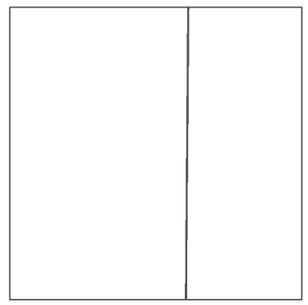
Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1922
Revised 1922
Edition N/A
Copyright N/A
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Revised 1922
Edition N/A
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Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: County Series

Map date: **1932-1933**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1932
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1933
Revised 1933
Edition N/A
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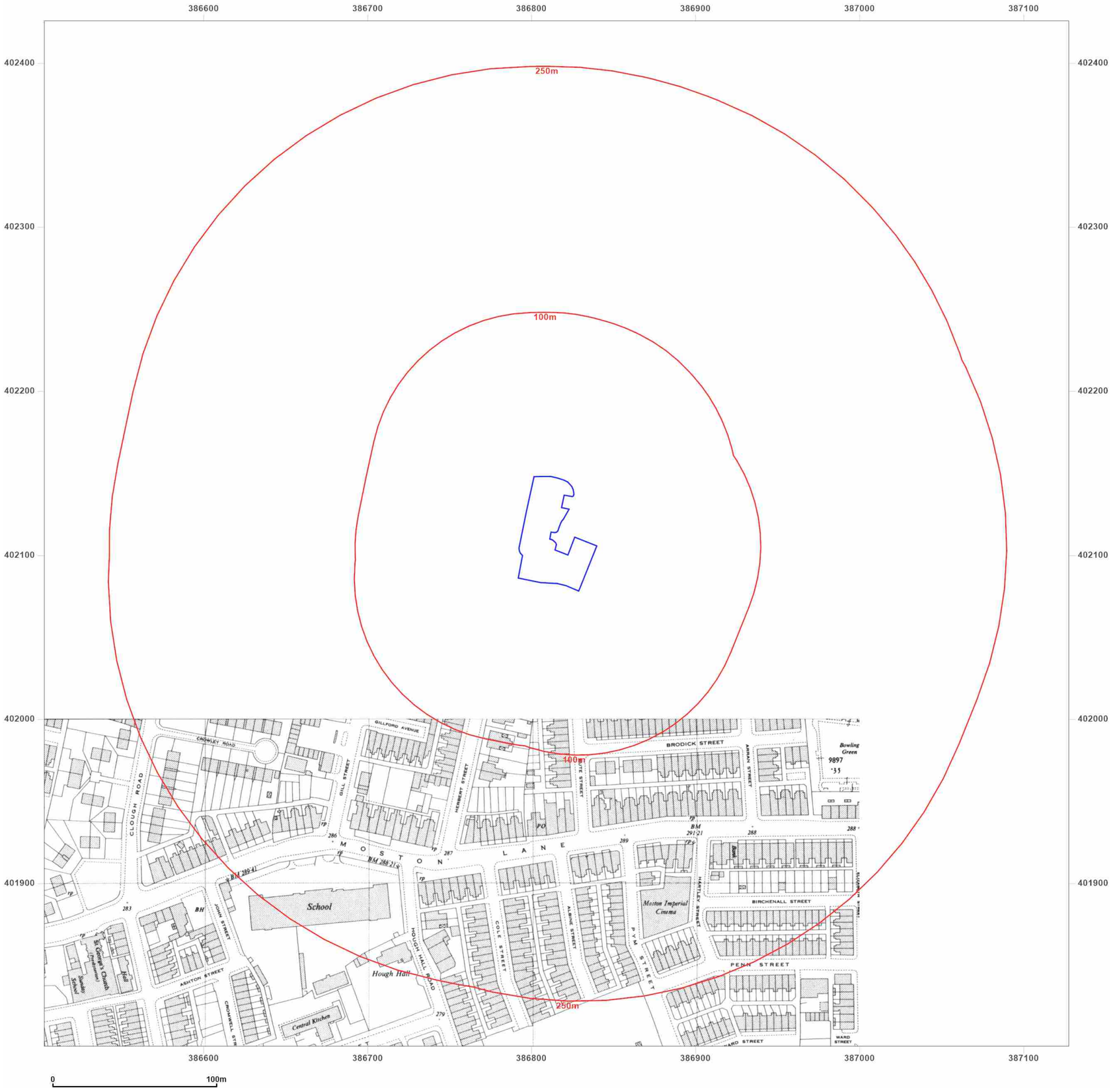
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Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1950**

Scale: 1:2,500

Printed at: 1:2,500

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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1950-1951**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1950 Revised 1950 Edition N/A Copyright N/A Levelled 1929	Surveyed 1950 Revised 1950 Edition N/A Copyright N/A Levelled 1929

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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1951**

Scale: 1:1,250

Printed at: 1:2,000

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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1950-1955**

Scale: 1:2,500

Printed at: 1:2,500

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Revised 1950
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1950
Revised 1950
Edition N/A
Copyright N/A
Levelled 1948

Surveyed 1951
Revised 1951
Edition 1955
Copyright N/A
Levelled 1949

Surveyed 1950
Revised 1950
Edition N/A
Copyright N/A
Levelled N/A

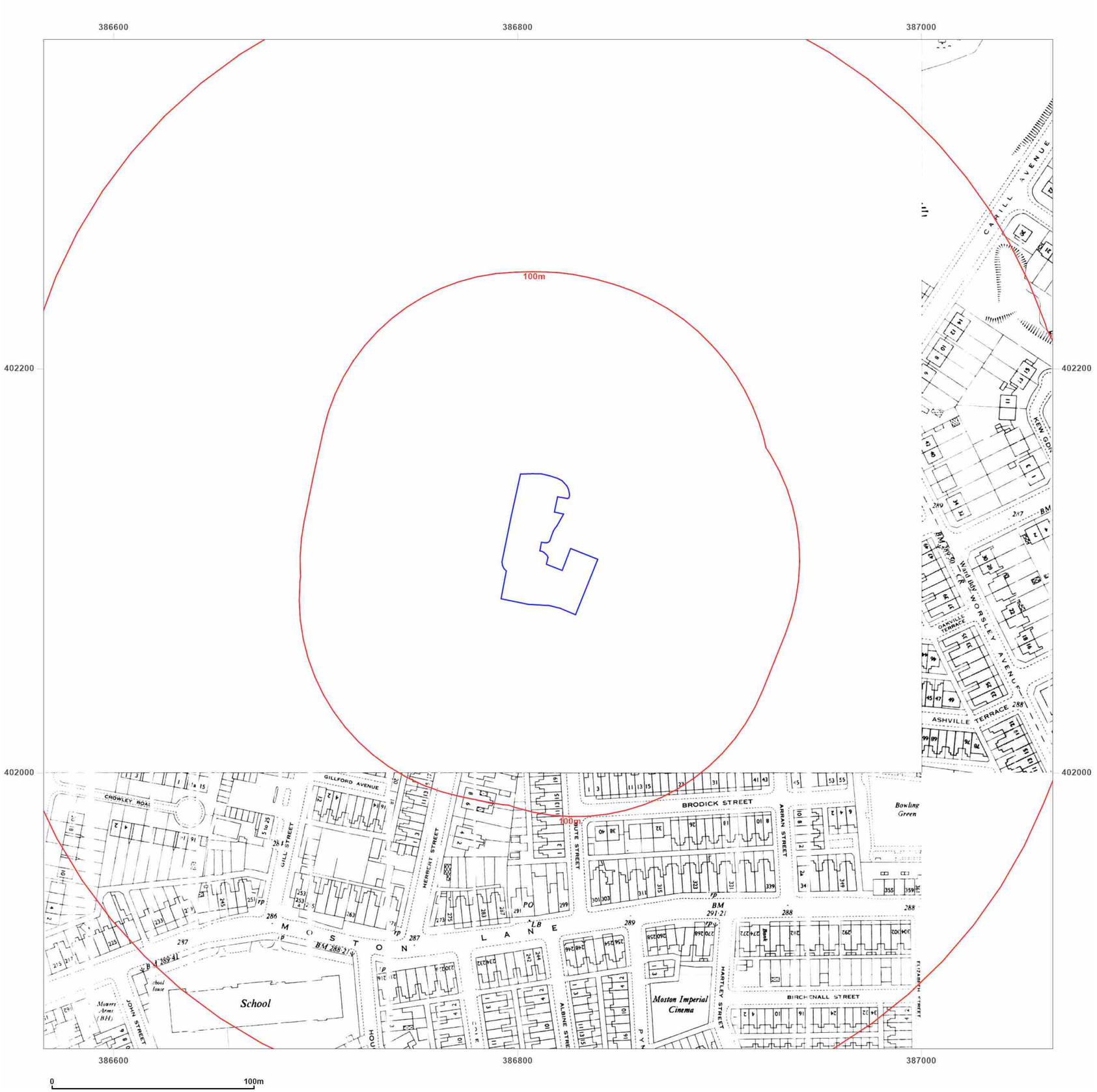
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1952-1957**

Scale: 1:1,250

Printed at: 1:2,000

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Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised 1951
Edition N/A
Copyright 1952
Levelled 1948

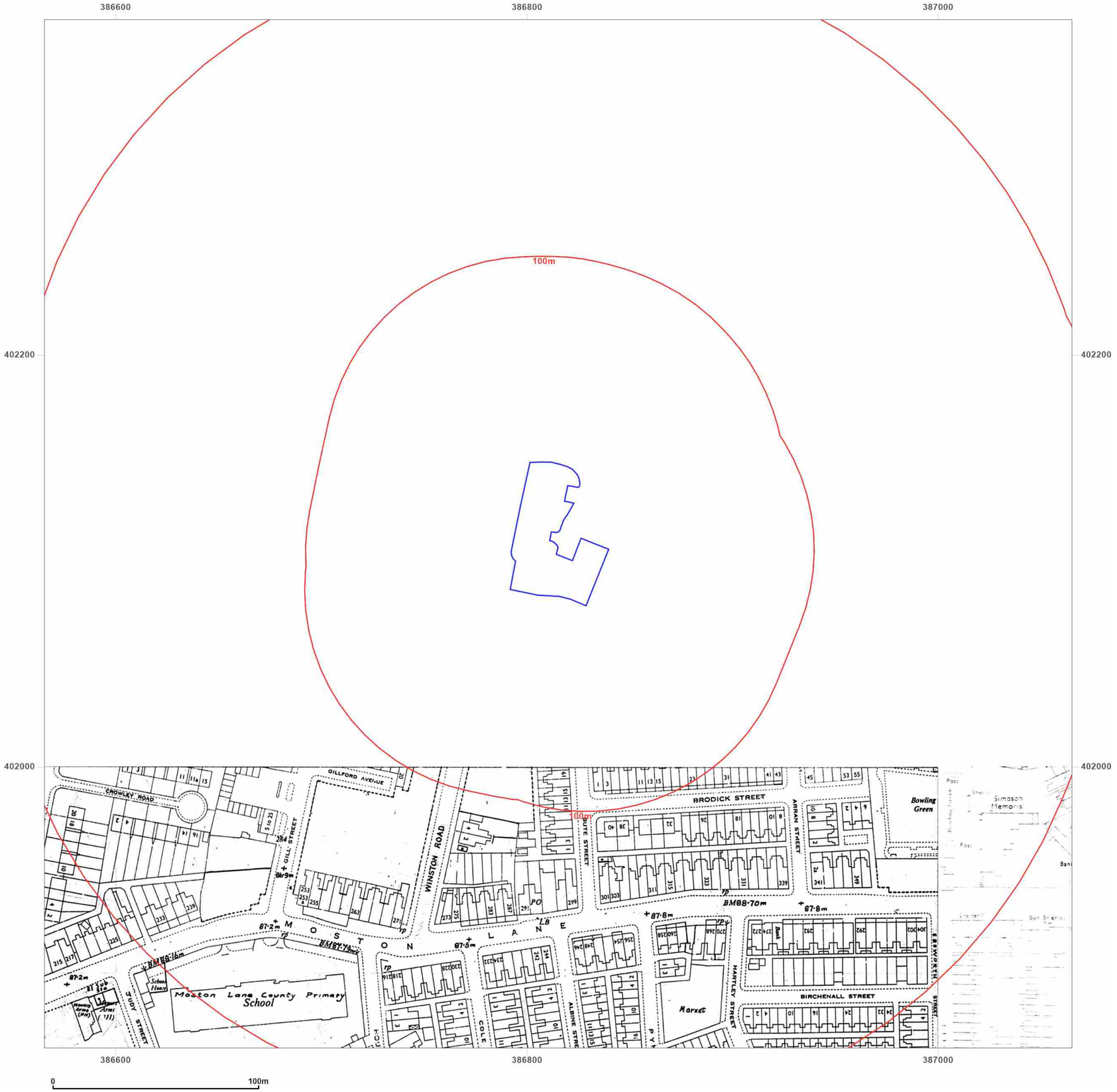
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1975-1979**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A
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Edition N/A
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Surveyed N/A
Revised N/A
Edition N/A
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1981**

Scale: 1:1,250

Printed at: 1:2,000

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Revised N/A
Edition N/A
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1981-1985**

Scale: 1:1,250

Printed at: 1:2,000

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Revised 1980
Edition N/A
Copyright 1981
Levelled 1964

Surveyed 1964
Revised 1985
Edition N/A
Copyright 1985
Levelled 1964

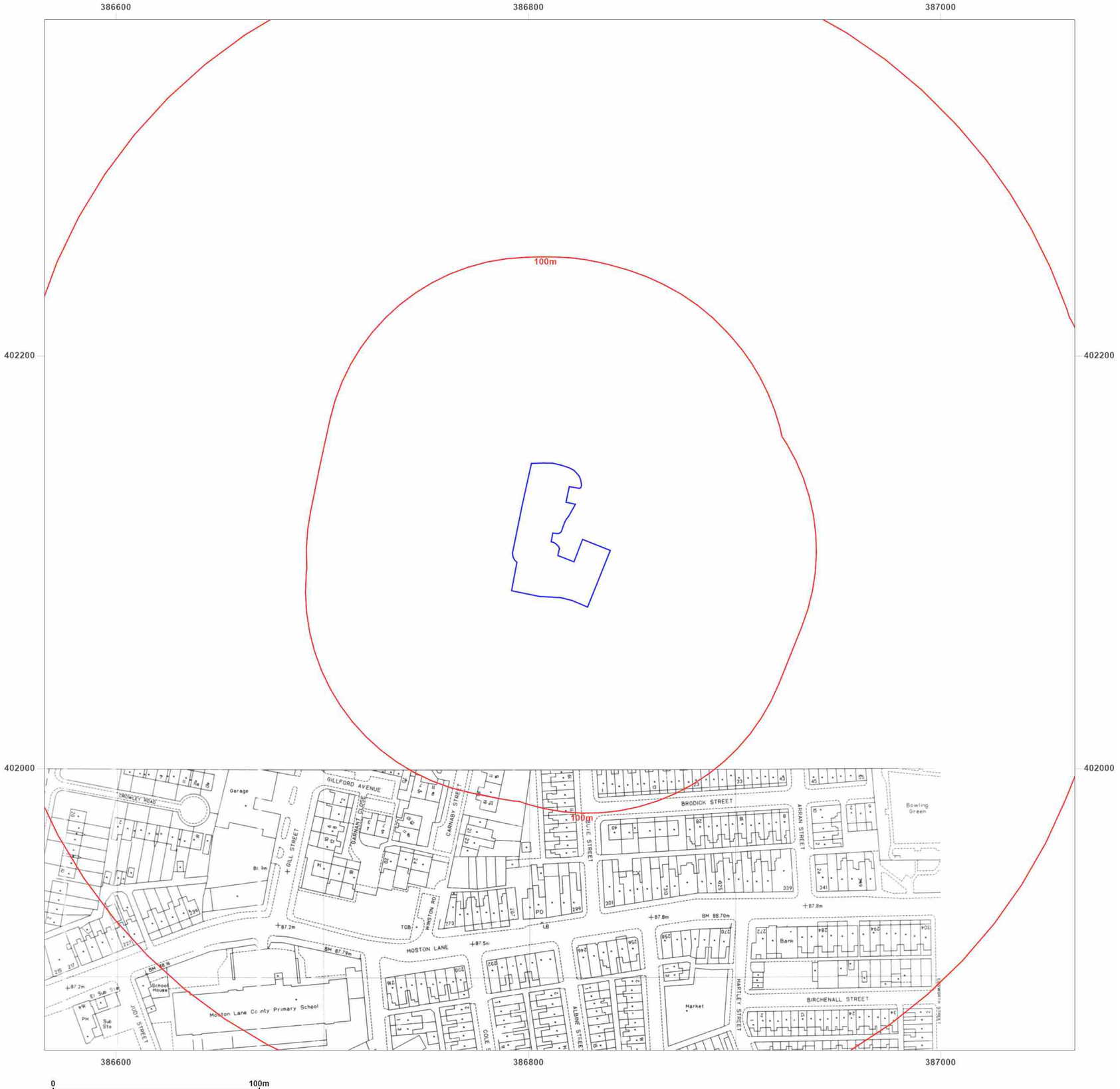
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1992**

Scale: 1:1,250

Printed at: 1:2,000

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Revised 1992
Edition N/A
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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1988-1992**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1952 Revised 1989 Edition N/A Copyright 1989 Levelled N/A	Surveyed 1964 Revised 1988 Edition N/A Copyright 1988 Levelled 1964

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Site Details:

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Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: National Grid

Map date: **1990-1993**

Scale: 1:1,250

Printed at: 1:2,000

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Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

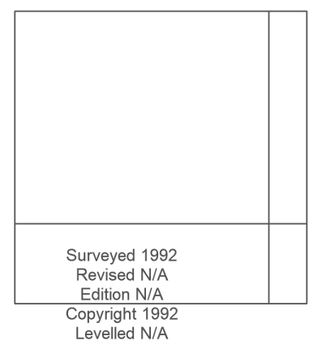
Map Name: National Grid

Map date: **1992-1993**

Scale: 1:1,250

Printed at: 1:2,000

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Site Details:

386801, 402117

Client Ref: 005320
Report Ref: GS-V6L-LMG-J22-4AC
Grid Ref: 386815, 402113

Map Name: LandLine

Map date: **2003**

Scale: 1:1,250

Printed at: 1:1,250

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APPENDIX VII
EXPLORATORY HOLE LOGS



Trial Pit Log

TrialPit No: TP101
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386834.00 - 402105.00	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 × 0.70	Scale 1:30
Client: AJP		Depth 1.80	Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.30			MADE GROUND: Brown slightly sandy clay, with frequent rootlets and fragments of brick and plastic (re-worked topsoil).
	0.50	HVP	68.9	0.50			Firm brown mottled grey CLAY
	0.70	ES					Firm light brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	1.00	D					
	1.00	HVP	73.2				
				1.80			End of Pit at 1.80m

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Trial Pit Photographs



Trial Pit 101



Trial Pit 101 Spoil

Remarks: 1. Complete 2. Co-ordinates are based on W3W: drama.deal.idea

Stability: STABLE

Trial Pit Log

TrialPit No: TP102
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386822.00 - 402099.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 × 0.70 Depth 1.40	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			MADE GROUND: Brown slightly sandy CLAY, with frequent rootlets (re-worked topsoil).
	0.30	ES					MADE GROUND: Brown to black slightly clayey gravel. Gravel is fine to coarse, angular to sub rounded of mudstone, concrete, brick, ash and clinker. With fragments of glass and plastic.
	0.60	HVP	66.3	0.50			Firm brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	0.80	B					
	1.00	ES					
1.30 ▼				1.10			Brown fine to medium SAND.
				1.40			End of Pit at 1.40m

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Trial Pit Photographs



Trial Pit 102



Trial Pit 102 Spoil

Remarks: 1. Terminated at 1.40 m bgl due to unstable granular deposits 2. Water strike encountered 1.20 m bgl 4. Very slow water ingress 4. Co-ordinates are based on W3W: since.flood.hops

Stability: UNSTABLE

Trial Pit Log

			TrialPit No TP103 Sheet 1 of 1
Project Name: Lordship Close	Project No. 16713	Co-ords: 386825.00 - 402084.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	B		0.25			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
	0.40	ES					MADE GROUND: Brown sandy clay, with fragments of brick, plastic and glass.
	0.50	HVP	101.6	0.50			Stiff greyish orange gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone. (Becoming firm to stiff 1.00 m bgl)
	1.00	ES					
	1.00	HVP	94.7				
				2.20			End of Pit at 2.20m

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4

Trial Pit Photographs



Trial Pit 103



Trial Pit 103 Spoil

Remarks: 1. Complete 2. Co-ordinates are based on W3W: poem.name.mops

Stability: STABLE

Trial Pit Log

TrialPit No: TP104
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386816.00 - 402093.00	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70	Scale 1:30
Client: AJP		Depth 2.30	Logged J. CLAYTON

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.15			MADE GROUND: Brown slightly sandy CLAY, with frequent rootlets (re-worked topsoil).
	0.50	HVP	100.8	0.50			MADE GROUND: Brown to black slightly gravelly sandy clay. Gravel is fine, sub angular to sub rounded of brick.
	0.80	ES					MADE GROUND: Light grey/brown gravelly clay. Gravel is fine to coarse, angular to sub rounded of sandstone. With fragments of brick.
	1.00	HVP	114.6	1.00			Stiff brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	1.50	D					
				2.30			End of Pit at 2.30m

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Trial Pit Photographs



Trial Pit 104



Trial Pit 104 Spoil

Remarks: 1. Complete 2. Old pipe uncovered 0.80 m bgl in the northern end of the trial pit 3. Co-ordinates are based on W3W: shape.jokes.length

Stability: STABLE

Trial Pit Log

			TrialPit No TP105 Sheet 1 of 1
Project Name: Lordship Close	Project No. 16713	Co-ords: 386804.00 - 402093.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
	0.40	B					MADE GROUND: Dark grey clayey fine to medium sand, with fragments of brick and concrete.
				0.70			Stiff brown mottled grey gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	1.00	HVP	107.7				
	1.20	ES					
				2.20			End of Pit at 2.20m

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4

Trial Pit Photographs



Trial Pit 105



Trial Pit 105 Spoil

Remarks: 1. Complete 2. Co-ordinates are based on W3W: ears.exam.gained

Stability: STABLE

Trial Pit Log

TrialPit No: TP106
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386810.00 - 402105.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 × 0.70 Depth 2.40	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
				0.60			MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
	0.80	ES					MADE GROUND: Dark grey fine to medium sand, with fragments of brick and concrete.
				1.20			Firm to stiff brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	1.40 1.50	HVP ES	77.5				
				2.40			End of Pit at 2.40m

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4

Trial Pit Photographs



Trial Pit 106



Trial Pit 106 Spoil

Remarks: 1. Complete 2. Co-ordinates are based on W3W: double.wonderfully.fuels

Stability: STABLE

Trial Pit Log

TrialPit No: TP107
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386798.00 - 402120.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70 Depth 0.60	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	B					MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
	0.40	ES		0.30			MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
				0.60			End of Pit at 0.60m

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Trial Pit Photographs



Trial Pit 107



Trial Pit 107 Spoil

Remarks: 1. Terminated due to brick obstruction that could not be advanced through - likely historical building foundations. 2. Co-ordinates are based on W3W: plans.ritual.hurry

Stability: STABLE

Trial Pit Log

TrialPit No: TP108
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386813.00 - 402120.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70 Depth 2.20	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
				0.40			MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
				0.70			MADE GROUND: Brown gravelly clay, with whole brick cobbles throughout. Gravel is fine to medium, sub angular to sub rounded of sandstone.
	1.00	HVP	74.1	0.90			Firm brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
	1.20 1.30	B ES+D					
				2.20			End of Pit at 2.20m

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4

Trial Pit Photographs



Trial Pit 108



Trial Pit 108 Spoil

Remarks: 1. Complete 2. Co-ordinates are based on W3W: rivers.tells.lace

Stability: STABLE

Trial Pit Log

TrialPit No: TP109
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386814.00 - 402132.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 × 0.70 Depth 1.30	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
	0.40	B					MADE GROUND: Brown to black slightly clayey gravel. Gravel is fine to coarse, angular to sub rounded of mudstone, concrete, brick, ash and clinker. With fragments of glass, plastic, slate and ceramic.
	0.60	ES		0.70			MADE GROUND: Red brick.
	1.00	HVP	110.3	0.90			Stiff brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
				1.30			End of Pit at 1.30m

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Trial Pit Photographs



Trial Pit 109



Trial Pit 109 Spoil

Remarks: 1. Complete 2. Old pipe uncovered 1.20 m bgl at the southern end of the trial pit 3. Co-ordinates are based on W3W: mercy.prove.wires

Stability: STABLE

Trial Pit Log

TrialPit No: TP110
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386814.00 - 402144.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 x 0.70 Depth 1.20	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown slightly sandy CLAY, with frequent rootlets (re-worked topsoil).
	0.50	ES					MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
				1.10			MADE GROUND: Red brick.
				1.20			End of Pit at 1.20m

1
2
3
4

Trial Pit Photographs



Trial Pit 110



Trial Pit 110 Spoil

Remarks: 1. Terminated due to brick obstruction that could not be advanced through - likely historical building foundations. 2. Co-ordinates are based on W3W: force.rips.nights

Stability: STABLE

Trial Pit Log

TrialPit No: TP111
Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386805.00 - 402135.00 Level:	Date 11/04/2024
Location: Moston		Dimensions (m): 2.20 × 0.70 Depth 1.10	Scale 1:30
Client: AJP			Logged J. CLAYTON

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
	0.50	ES					MADE GROUND: Brown sandy clay, with fragments of brick, plastic and glass.
				1.00			MADE GROUND: Red brick.
				1.10			End of Pit at 1.10m

Trial Pit Photographs



Trial Pit 111



Trial Pit 111 Spoil

Remarks: 1. Terminated due to brick obstruction that could not be advanced through - likely historical building foundations. 2. Co-ordinates are based on W3W: chefs.added.boats

Stability: STABLE

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386831.00 - 402090.00	Hole Type WS
Location: Moston		Level:	Scale 1:50
Client: AJP		Dates: 11/04/2024 -	Logged By J. CLAYTON

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10			MADE GROUND: Brown slightly sandy CLAY, with frequent rootlets (re-worked topsoil).
					0.50			MADE GROUND: Brown sandy gravelly clay. Gravel is fine to medium, sub angular to sub rounded of sandstone. With fragments of brick and glass.
		1.00		N=17 (2,2/3,4,5,5)				Stiff, high strength brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone. (Becoming very stiff, very high strength 2.00 m bgl)
		1.50	U					
		2.00		N=33 (4,5/6,8,9,10)				
		3.00		50 (7,10/50 for 270mm)				
					3.42			End of borehole at 3.42 m

1 2 3 4 5 6 7 8 9 10

Remarks

1. Refusal within very stiff CLAY 2. Handpit from 0.00-1.20 m bgl 3. Monitoring well installed 4. Response zone is 1.00-3.00 m bgl 5. Co-ordinates are based on W3W: voted.forks.senses

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386798.00 - 402105.00	Hole Type WS
Location: Moston		Level:	Scale 1:50
Client: AJP		Dates: 11/04/2024 -	Logged By J. CLAYTON

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.20			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
		1.00		N=38 (4,6/9,11,9,9)				MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
					1.20			MADE GROUND: Red brick.
		1.50	ES		1.50			MADE GROUND: Reddish brown fine to medium sand, with fragments of brick and concrete.
		2.00		N=28 (5,8/6,7,7,8)	2.00			MADE GROUND: Brown gravelly clay. Gravel is fine to coarse, angular to sub rounded of sandstone. With fragments of brick and concrete.
		2.50	U		2.30			Very stiff, very high strength brown gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone.
		3.00		50 (6,8/50 for 240mm)				
					3.39			End of borehole at 3.39 m

Remarks

1. Refusal within very stiff CLAY 2. Handpit from 0.00-1.20 m bgl 3. Monitoring well installed 4. Response zone is 1.00-2.00 m bgl 5. Co-ordinates are based on W3W: guides.sulk.roses 6. No recovery on the SPT at 3.00 m

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Lordship Close	Project No. 16713	Co-ords: 386814.00 - 402138.00	Hole Type WS
Location: Moston		Level:	Scale 1:50
Client: AJP		Dates: 11/04/2024 -	Logged By J. CLAYTON

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20			MADE GROUND: Brown sandy clay, with frequent rootlets (re-worked topsoil).
		0.70	ES		0.70			MADE GROUND: Brown to black slightly clayey sandy gravel. Gravel is fine to medium, sub angular to sub rounded of mudstone, brick and concrete. With fragments of plastic.
		1.00	ES		0.90			
		1.00		N=10 (3,2/2,3,3,2)	1.00			MADE GROUND: Black clayey fine to medium sand, with fragments of timber (Sweet slight hydrocarbon odour and black staining noted).
		1.50	U		1.10			MADE GROUND: Concrete cobble.
								MADE GROUND: Gravel. Gravel is fine to coarse, angular to sub rounded of concrete.
		2.00		N=20 (3,3/3,5,5,7)				Very stiff, high strength brown slightly sandy gravelly CLAY. Gravel is fine to coarse, angular to sub rounded of sandstone. (Becoming very stiff, very high strength 2.00 m bgl)
		3.00		N=37 (5,7/9,9,9,10)				
		4.00		50 (8,10/50 for 275mm)				
					4.43			End of borehole at 4.43 m

Remarks

1. Refusal within very stiff CLAY 2. Handpit from 0.00-1.20 m bgl 3. Monitoring well installed 4. Response zone is 2.00-4.00 m bgl 5. Co-ordinates are based on W3W: silks.activism.analogy 6. Sweet slight hydrocarbon odour and black staining noted 0.70 m bgl

APPENDIX VIII
CHEMICAL TESTING RESULTS



Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-11519-1
Initial Date of Issue:	19-Apr-2024
Re-Issue Details:	
Client	E3P
Client Address:	Taylor Road Trafford Park Urmston Manchester M41 7JQ
Contact(s):	Jack Clayton / Jess Sheridan; jsheridan@e3p.co.uk
Project	Lordship Close
Quotation No.:	Q23-31421
Order No.:	007928
No. of Samples:	13
Turnaround (Wkdays):	5
Date Approved:	19-Apr-2024
Approved By:	
Details:	David Smith, Technical Director

Date Received:	15-Apr-2024
Date Instructed:	15-Apr-2024
Results Due:	19-Apr-2024

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793113	1793114	1793115	1793116	1793117	1793118	1793119	1793120
				Client Sample ID.:		TP101	TP101	TP102	TP103	TP104	TP105	TP106	TP107
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND	CLAY
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	0.7	0.3	0.4	0.1	1.2	0.8	0.4
				Bottom Depth (m):		0.2	0.8	0.4	0.5	0.2	1.3	0.9	0.5
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type		U	2192		N/A	-		-	-	-		-	
Asbestos Identification		U	2192		N/A	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	
Moisture		N	2030	%	0.020	11	8.4	5.7	11	14	18	3.9	4.7
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones and Roots	Stones and Roots	Stones	Stones and Roots	Stones and Roots
Soil Texture		N	2040		N/A	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
pH at 20C		M	2010		4.0	8.2	7.4	8.5	7.9	7.2	7.1	8.5	8.4
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010	0.040	< 0.010	< 0.010	< 0.010	0.011	< 0.010	< 0.010
Total Sulphur		U	2175	%	0.010	0.072	0.024	0.027	0.066	0.052	0.019	0.062	0.14
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	4.4	5.6	26	4.6	3.5	5.1	4.9	22
Sulphate (Total)		U	2430	%	0.010	0.14	0.056	0.093	0.10	0.17	0.14	0.081	0.12
Arsenic		M	2455	mg/kg	0.5	14	8.2	22	14	19	8.2	16	14
Cadmium		M	2455	mg/kg	0.10	0.22	< 0.10	0.85	0.19	0.28	< 0.10	0.45	0.29
Chromium		M	2455	mg/kg	0.5	17	26	34	18	33	28	26	19
Copper		M	2455	mg/kg	0.50	63	28	80	52	49	19	79	43
Mercury		M	2455	mg/kg	0.05	0.36	0.06	0.18	0.32	0.59	< 0.05	0.26	0.15
Nickel		M	2455	mg/kg	0.50	17	32	25	15	16	20	19	22
Lead		M	2455	mg/kg	0.50	150	25	240	90	95	13	130	65
Selenium		M	2455	mg/kg	0.25	0.34	1.1	0.62	0.47	0.49	0.48	0.74	0.52
Zinc		M	2455	mg/kg	0.50	160	64	200	110	110	43	130	89
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon		M	2625	%	0.20	3.8	1.3	3.9	3.9	3.0	0.75	2.3	6.2
TPH >C6-C8	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C12-C16	EH_1D_Total	N	2670	mg/kg	1.0	6.1	6.5	7.1	3.9	4.3	5.5	8.5	4.1
TPH >C16-C21	EH_1D_Total	N	2670	mg/kg	1.0	9.7	6.6	15	9.9	6.3	8.2	26	7.9
TPH >C21-C25	EH_1D_Total	N	2670	mg/kg	1.0	7.3	7.2	12	7.9	5.5	5.2	14	9.0
TPH >C25-C35	EH_1D_Total	N	2670	mg/kg	1.0	17	15	31	15	11	12	32	49
TPH >C35-C40	EH_1D_Total	N	2670	mg/kg	1.0	3.8	1.8	6.6	6.3	4.0	4.0	7.4	14
Total TPH >C6-C40	EH_1D_Total	M	2670	mg/kg	10	43	37	71	43	31	35	88	84

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793113	1793114	1793115	1793116	1793117	1793118	1793119	1793120
				Client Sample ID.:		TP101	TP101	TP102	TP103	TP104	TP105	TP106	TP107
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND	CLAY
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	0.7	0.3	0.4	0.1	1.2	0.8	0.4
				Bottom Depth (m):		0.2	0.8	0.4	0.5	0.2	1.3	0.9	0.5
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Dichlorodifluoromethane		U	2760	µg/kg	1.0								
Chloromethane		M	2760	µg/kg	1.0								
Vinyl Chloride		M	2760	µg/kg	1.0								
Bromomethane		M	2760	µg/kg	20								
Chloroethane		U	2760	µg/kg	2.0								
Trichlorofluoromethane		M	2760	µg/kg	1.0								
1,1-Dichloroethene		M	2760	µg/kg	1.0								
Dichloromethane		N	2760	µg/kg	50								
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0								
1,1-Dichloroethane		M	2760	µg/kg	1.0								
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0								
Bromochloromethane		U	2760	µg/kg	5.0								
Trichloromethane		M	2760	µg/kg	1.0								
1,1,1-Trichloroethane		M	2760	µg/kg	1.0								
Tetrachloromethane		M	2760	µg/kg	1.0								
1,1-Dichloropropene		U	2760	µg/kg	1.0								
Benzene		M	2760	µg/kg	1.0								
1,2-Dichloroethane		M	2760	µg/kg	2.0								
Trichloroethene		N	2760	µg/kg	1.0								
1,2-Dichloropropane		M	2760	µg/kg	1.0								
Dibromomethane		M	2760	µg/kg	1.0								
Bromodichloromethane		M	2760	µg/kg	5.0								
cis-1,3-Dichloropropene		N	2760	µg/kg	10								
Toluene		M	2760	µg/kg	1.0								
Trans-1,3-Dichloropropene		N	2760	µg/kg	10								
1,1,2-Trichloroethane		M	2760	µg/kg	10								
Tetrachloroethene		M	2760	µg/kg	1.0								
1,3-Dichloropropane		U	2760	µg/kg	2.0								
Dibromochloromethane		U	2760	µg/kg	10								
1,2-Dibromoethane		M	2760	µg/kg	5.0								
Chlorobenzene		M	2760	µg/kg	1.0								
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0								
Ethylbenzene		M	2760	µg/kg	1.0								
m & p-Xylene		M	2760	µg/kg	1.0								
o-Xylene		M	2760	µg/kg	1.0								

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793113	1793114	1793115	1793116	1793117	1793118	1793119	1793120
				Client Sample ID.:		TP101	TP101	TP102	TP103	TP104	TP105	TP106	TP107
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND	CLAY
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	0.7	0.3	0.4	0.1	1.2	0.8	0.4
				Bottom Depth (m):		0.2	0.8	0.4	0.5	0.2	1.3	0.9	0.5
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Styrene		M	2760	µg/kg	1.0								
Tribromomethane		U	2760	µg/kg	1.0								
Isopropylbenzene		M	2760	µg/kg	1.0								
Bromobenzene		M	2760	µg/kg	1.0								
1,2,3-Trichloropropane		N	2760	µg/kg	50								
N-Propylbenzene		U	2760	µg/kg	1.0								
2-Chlorotoluene		M	2760	µg/kg	1.0								
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0								
4-Chlorotoluene		U	2760	µg/kg	1.0								
Tert-Butylbenzene		U	2760	µg/kg	1.0								
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0								
Sec-Butylbenzene		U	2760	µg/kg	1.0								
1,3-Dichlorobenzene		M	2760	µg/kg	1.0								
4-Isopropyltoluene		U	2760	µg/kg	1.0								
1,4-Dichlorobenzene		M	2760	µg/kg	1.0								
N-Butylbenzene		U	2760	µg/kg	1.0								
1,2-Dichlorobenzene		M	2760	µg/kg	1.0								
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50								
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0								
Hexachlorobutadiene		N	2760	µg/kg	1.0								
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0								
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0								
N-Nitrosodimethylamine		M	2790	mg/kg	0.50								
Phenol		M	2790	mg/kg	0.50								
2-Chlorophenol		N	2790	mg/kg	0.50								
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50								
1,3-Dichlorobenzene		M	2790	mg/kg	0.50								
1,4-Dichlorobenzene		N	2790	mg/kg	0.50								
1,2-Dichlorobenzene		M	2790	mg/kg	0.50								
2-Methylphenol		M	2790	mg/kg	0.50								
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50								
Hexachloroethane		N	2790	mg/kg	0.50								
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50								
4-Methylphenol		M	2790	mg/kg	0.50								
Nitrobenzene		N	2790	mg/kg	0.50								

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793113	1793114	1793115	1793116	1793117	1793118	1793119	1793120
				Client Sample ID.:		TP101	TP101	TP102	TP103	TP104	TP105	TP106	TP107
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND	CLAY
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	0.7	0.3	0.4	0.1	1.2	0.8	0.4
				Bottom Depth (m):		0.2	0.8	0.4	0.5	0.2	1.3	0.9	0.5
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Isophorone		M	2790	mg/kg	0.50								
2-Nitrophenol		N	2790	mg/kg	0.50								
2,4-Dimethylphenol		N	2790	mg/kg	0.50								
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50								
2,4-Dichlorophenol		N	2790	mg/kg	0.50								
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50								
Naphthalene		M	2790	mg/kg	0.50								
4-Chloroaniline		N	2790	mg/kg	0.50								
Hexachlorobutadiene		M	2790	mg/kg	0.50								
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50								
2-Methylnaphthalene		M	2790	mg/kg	0.50								
4-Nitrophenol		N	2790	mg/kg	0.50								
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50								
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50								
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50								
2-Chloronaphthalene		M	2790	mg/kg	0.50								
2-Nitroaniline		N	2790	mg/kg	0.50								
Acenaphthylene		M	2790	mg/kg	0.50								
Dimethylphthalate		M	2790	mg/kg	0.50								
2,6-Dinitrotoluene		N	2790	mg/kg	0.50								
Acenaphthene		M	2790	mg/kg	0.50								
3-Nitroaniline		N	2790	mg/kg	0.50								
Dibenzofuran		M	2790	mg/kg	0.50								
4-Chlorophenylphenylether		M	2790	mg/kg	0.50								
2,4-Dinitrotoluene		N	2790	mg/kg	0.50								
Fluorene		M	2790	mg/kg	0.50								
Diethyl Phthalate		M	2790	mg/kg	0.50								
4-Nitroaniline		N	2790	mg/kg	0.50								
Azobenzene		M	2790	mg/kg	0.50								
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50								
Hexachlorobenzene		M	2790	mg/kg	0.50								
Phenanthrene		M	2790	mg/kg	0.50								
Anthracene		M	2790	mg/kg	0.50								
Carbazole		M	2790	mg/kg	0.50								
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50								

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793113	1793114	1793115	1793116	1793117	1793118	1793119	1793120
				Client Sample ID.:		TP101	TP101	TP102	TP103	TP104	TP105	TP106	TP107
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND	CLAY	MADE GROUND	CLAY
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	0.7	0.3	0.4	0.1	1.2	0.8	0.4
				Bottom Depth (m):		0.2	0.8	0.4	0.5	0.2	1.3	0.9	0.5
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM		DURHAM	
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**								
Fluoranthene		M	2790	mg/kg	0.50								
Pyrene		M	2790	mg/kg	0.50								
Butylbenzyl Phthalate		N	2790	mg/kg	0.50								
Benzo[a]anthracene		M	2790	mg/kg	0.50								
Chrysene		M	2790	mg/kg	0.50								
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50								
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50								
Benzo[b]fluoranthene		M	2790	mg/kg	0.50								
Benzo[k]fluoranthene		M	2790	mg/kg	0.50								
Benzo[a]pyrene		M	2790	mg/kg	0.50								
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50								
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50								
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50								
Naphthalene		M	2800	mg/kg	0.10	0.13	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.35	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene		M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.22	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2800	mg/kg	0.10	1.3	< 0.10	1.0	2.4	0.35	< 0.10	0.96	0.20
Anthracene		M	2800	mg/kg	0.10	0.46	< 0.10	0.22	0.56	< 0.10	< 0.10	0.21	< 0.10
Fluoranthene		M	2800	mg/kg	0.10	3.3	< 0.10	1.6	3.7	0.67	< 0.10	1.8	0.40
Pyrene		M	2800	mg/kg	0.10	3.0	< 0.10	1.5	3.2	0.58	< 0.10	1.6	0.35
Benzo[a]anthracene		M	2800	mg/kg	0.10	1.7	< 0.10	0.74	1.6	< 0.10	< 0.10	0.80	< 0.10
Chrysene		M	2800	mg/kg	0.10	1.8	< 0.10	0.83	1.8	< 0.10	< 0.10	0.89	< 0.10
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	2.4	< 0.10	0.93	2.0	< 0.10	< 0.10	1.1	< 0.10
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	0.86	< 0.10	0.36	0.75	< 0.10	< 0.10	0.31	< 0.10
Benzo[a]pyrene		M	2800	mg/kg	0.10	2.2	< 0.10	0.71	1.7	< 0.10	< 0.10	0.85	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	1.4	< 0.10	0.52	1.0	< 0.10	< 0.10	0.57	< 0.10
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	0.42	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	1.4	< 0.10	0.52	1.1	< 0.10	< 0.10	0.55	< 0.10
Total Of 16 PAH's		N	2800	mg/kg	2.0	20	< 2.0	8.9	21	< 2.0	< 2.0	9.6	< 2.0
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793121	1793122	1793123	1793124	1793125
				Client Sample ID.:		TP108	TP108	TP110	TP111	WS103
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.3	0.5	0.5	0.7
				Bottom Depth (m):		0.2	1.4	0.6	0.6	0.8
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
ACM Type		U	2192		N/A	-		-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	15	18	5.2	4.9	6.4
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones and Roots	Stones, Roots, Wood and
Soil Texture		N	2040		N/A	Clay	Clay	Loam	Clay	Clay
pH at 20C		M	2010		4.0	7.1	7.9	8.6	8.5	8.1
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.20
Total Sulphur		U	2175	%	0.010	0.046	< 0.010	0.057	0.058	0.41
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.3
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	4.2	3.9	3.2	3.4	190
Sulphate (Total)		U	2430	%	0.010	0.11	0.14	0.11	0.098	0.57
Arsenic		M	2455	mg/kg	0.5	9.5	8.5	11	12	6.2
Cadmium		M	2455	mg/kg	0.10	0.14	< 0.10	0.13	0.16	< 0.10
Chromium		M	2455	mg/kg	0.5	12	30	19	18	12
Copper		M	2455	mg/kg	0.50	37	19	48	43	29
Mercury		M	2455	mg/kg	0.05	0.13	< 0.05	0.25	0.22	0.14
Nickel		M	2455	mg/kg	0.50	11	20	16	16	11
Lead		M	2455	mg/kg	0.50	58	16	120	100	45
Selenium		M	2455	mg/kg	0.25	0.26	0.59	0.40	0.33	< 0.25
Zinc		M	2455	mg/kg	0.50	59	37	110	100	74
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon		M	2625	%	0.20	3.3	0.34	5.6	3.1	6.6
TPH >C6-C8	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	EH_1D_Total	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	5.3	< 1.0
TPH >C12-C16	EH_1D_Total	N	2670	mg/kg	1.0	6.0	6.2	8.3	40	6.2
TPH >C16-C21	EH_1D_Total	N	2670	mg/kg	1.0	6.1	6.0	30	270	16
TPH >C21-C25	EH_1D_Total	N	2670	mg/kg	1.0	5.5	5.5	19	160	9.0
TPH >C25-C35	EH_1D_Total	N	2670	mg/kg	1.0	13	10	58	270	30
TPH >C35-C40	EH_1D_Total	N	2670	mg/kg	1.0	2.8	< 1.0	9.9	48	3.2
Total TPH >C6-C40	EH_1D_Total	M	2670	mg/kg	10	33	29	130	790	65

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793121	1793122	1793123	1793124	1793125
				Client Sample ID.:		TP108	TP108	TP110	TP111	WS103
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.3	0.5	0.5	0.7
				Bottom Depth (m):		0.2	1.4	0.6	0.6	0.8
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Dichlorodifluoromethane		U	2760	µg/kg	1.0					< 1.0
Chloromethane		M	2760	µg/kg	1.0					< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0					< 1.0
Bromomethane		M	2760	µg/kg	20					< 20
Chloroethane		U	2760	µg/kg	2.0					< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0					< 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0					< 1.0
Dichloromethane		N	2760	µg/kg	50					< 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0					< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0					< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0					< 1.0
Bromochloromethane		U	2760	µg/kg	5.0					< 5.0
Trichloromethane		M	2760	µg/kg	1.0					< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0					< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0					< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0					< 1.0
Benzene		M	2760	µg/kg	1.0					< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0					< 2.0
Trichloroethene		N	2760	µg/kg	1.0					< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0					< 1.0
Dibromomethane		M	2760	µg/kg	1.0					< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0					< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10					< 10
Toluene		M	2760	µg/kg	1.0					< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10					< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10					< 10
Tetrachloroethene		M	2760	µg/kg	1.0					< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0					< 2.0
Dibromochloromethane		U	2760	µg/kg	10					< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0					< 5.0
Chlorobenzene		M	2760	µg/kg	1.0					< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0					< 2.0
Ethylbenzene		M	2760	µg/kg	1.0					< 1.0
m & p-Xylene		M	2760	µg/kg	1.0					< 1.0
o-Xylene		M	2760	µg/kg	1.0					< 1.0

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793121	1793122	1793123	1793124	1793125
				Client Sample ID.:		TP108	TP108	TP110	TP111	WS103
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.3	0.5	0.5	0.7
				Bottom Depth (m):		0.2	1.4	0.6	0.6	0.8
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Styrene		M	2760	µg/kg	1.0					< 1.0
Tribromomethane		U	2760	µg/kg	1.0					< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0					< 1.0
Bromobenzene		M	2760	µg/kg	1.0					< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50					< 50
N-Propylbenzene		U	2760	µg/kg	1.0					< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0					< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0					< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0					< 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0					< 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0					< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0					< 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0					< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0					< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0					< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0					< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0					< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50					< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0					< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0					< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0					< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0					< 1.0
N-Nitrosodimethylamine		M	2790	mg/kg	0.50					< 0.50
Phenol		M	2790	mg/kg	0.50					< 0.50
2-Chlorophenol		N	2790	mg/kg	0.50					< 0.50
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50					< 0.50
1,3-Dichlorobenzene		M	2790	mg/kg	0.50					< 0.50
1,4-Dichlorobenzene		N	2790	mg/kg	0.50					< 0.50
1,2-Dichlorobenzene		M	2790	mg/kg	0.50					< 0.50
2-Methylphenol		M	2790	mg/kg	0.50					< 0.50
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50					< 0.50
Hexachloroethane		N	2790	mg/kg	0.50					< 0.50
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50					< 0.50
4-Methylphenol		M	2790	mg/kg	0.50					< 0.50
Nitrobenzene		N	2790	mg/kg	0.50					< 0.50

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793121	1793122	1793123	1793124	1793125
				Client Sample ID.:		TP108	TP108	TP110	TP111	WS103
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.3	0.5	0.5	0.7
				Bottom Depth (m):		0.2	1.4	0.6	0.6	0.8
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Isophorone		M	2790	mg/kg	0.50					< 0.50
2-Nitrophenol		N	2790	mg/kg	0.50					< 0.50
2,4-Dimethylphenol		N	2790	mg/kg	0.50					< 0.50
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50					< 0.50
2,4-Dichlorophenol		N	2790	mg/kg	0.50					< 0.50
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50					< 0.50
Naphthalene		M	2790	mg/kg	0.50					< 0.50
4-Chloroaniline		N	2790	mg/kg	0.50					< 0.50
Hexachlorobutadiene		M	2790	mg/kg	0.50					< 0.50
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50					< 0.50
2-Methylnaphthalene		M	2790	mg/kg	0.50					< 0.50
4-Nitrophenol		N	2790	mg/kg	0.50					< 0.50
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50					< 0.50
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50					< 0.50
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50					< 0.50
2-Chloronaphthalene		M	2790	mg/kg	0.50					< 0.50
2-Nitroaniline		N	2790	mg/kg	0.50					< 0.50
Acenaphthylene		M	2790	mg/kg	0.50					< 0.50
Dimethylphthalate		M	2790	mg/kg	0.50					< 0.50
2,6-Dinitrotoluene		N	2790	mg/kg	0.50					< 0.50
Acenaphthene		M	2790	mg/kg	0.50					< 0.50
3-Nitroaniline		N	2790	mg/kg	0.50					< 0.50
Dibenzofuran		M	2790	mg/kg	0.50					< 0.50
4-Chlorophenylphenylether		M	2790	mg/kg	0.50					< 0.50
2,4-Dinitrotoluene		N	2790	mg/kg	0.50					< 0.50
Fluorene		M	2790	mg/kg	0.50					< 0.50
Diethyl Phthalate		M	2790	mg/kg	0.50					< 0.50
4-Nitroaniline		N	2790	mg/kg	0.50					< 0.50
Azobenzene		M	2790	mg/kg	0.50					< 0.50
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50					< 0.50
Hexachlorobenzene		M	2790	mg/kg	0.50					< 0.50
Phenanthrene		M	2790	mg/kg	0.50					0.83
Anthracene		M	2790	mg/kg	0.50					< 0.50
Carbazole		M	2790	mg/kg	0.50					< 0.50
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50					< 0.50

Results - Soil

Project: Lordship Close

Client: E3P				**Chemtest Job No.:**		24-11519	24-11519	24-11519	24-11519	24-11519
Quotation No.: Q23-31421				**Chemtest Sample ID.:**		1793121	1793122	1793123	1793124	1793125
				Client Sample ID.:		TP108	TP108	TP110	TP111	WS103
				Sample Location:		TOPSOIL	CLAY	MADE GROUND	MADE GROUND	MADE GROUND
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.1	1.3	0.5	0.5	0.7
				Bottom Depth (m):		0.2	1.4	0.6	0.6	0.8
				Date Sampled:		11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024	11-Apr-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**					
Fluoranthene		M	2790	mg/kg	0.50					1.7
Pyrene		M	2790	mg/kg	0.50					1.5
Butylbenzyl Phthalate		N	2790	mg/kg	0.50					< 0.50
Benzo[a]anthracene		M	2790	mg/kg	0.50					0.93
Chrysene		M	2790	mg/kg	0.50					0.90
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50					0.71
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50					< 0.50
Benzo[b]fluoranthene		M	2790	mg/kg	0.50					1.5
Benzo[k]fluoranthene		M	2790	mg/kg	0.50					< 0.50
Benzo[a]pyrene		M	2790	mg/kg	0.50					1.3
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50					0.64
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50					< 0.50
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50					0.81
Naphthalene		M	2800	mg/kg	0.10	< 0.10	< 0.10	0.11	0.13	< 0.10
Acenaphthylene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2800	mg/kg	0.10	< 0.10	< 0.10	0.14	0.18	< 0.10
Fluorene		M	2800	mg/kg	0.10	< 0.10	< 0.10	0.11	0.19	< 0.10
Phenanthrene		M	2800	mg/kg	0.10	0.47	< 0.10	1.4	1.6	0.39
Anthracene		M	2800	mg/kg	0.10	< 0.10	< 0.10	0.33	0.39	< 0.10
Fluoranthene		M	2800	mg/kg	0.10	0.90	< 0.10	2.9	2.6	0.65
Pyrene		M	2800	mg/kg	0.10	0.81	< 0.10	2.6	2.2	0.57
Benzo[a]anthracene		M	2800	mg/kg	0.10	0.43	< 0.10	1.4	1.1	0.32
Chrysene		M	2800	mg/kg	0.10	0.44	< 0.10	1.6	1.3	0.32
Benzo[b]fluoranthene		M	2800	mg/kg	0.10	0.61	< 0.10	2.0	1.5	< 0.10
Benzo[k]fluoranthene		M	2800	mg/kg	0.10	0.18	< 0.10	0.77	0.57	< 0.10
Benzo[a]pyrene		M	2800	mg/kg	0.10	0.49	< 0.10	1.9	1.2	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2800	mg/kg	0.10	0.33	< 0.10	1.2	0.83	< 0.10
Dibenz(a,h)Anthracene		N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10
Benzo[g,h,i]perylene		M	2800	mg/kg	0.10	0.26	< 0.10	1.2	0.80	< 0.10
Total Of 16 PAH's		N	2800	mg/kg	2.0	4.9	< 2.0	18	15	2.3
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

APPENDIX IX
GEOTECHNICAL TESTING RESULTS



MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client e3p

Address Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

Contract Lordship Close

Job Number MRN 24005/79
Date of Issue 13 May 2024
Page 1 of 5

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

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

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

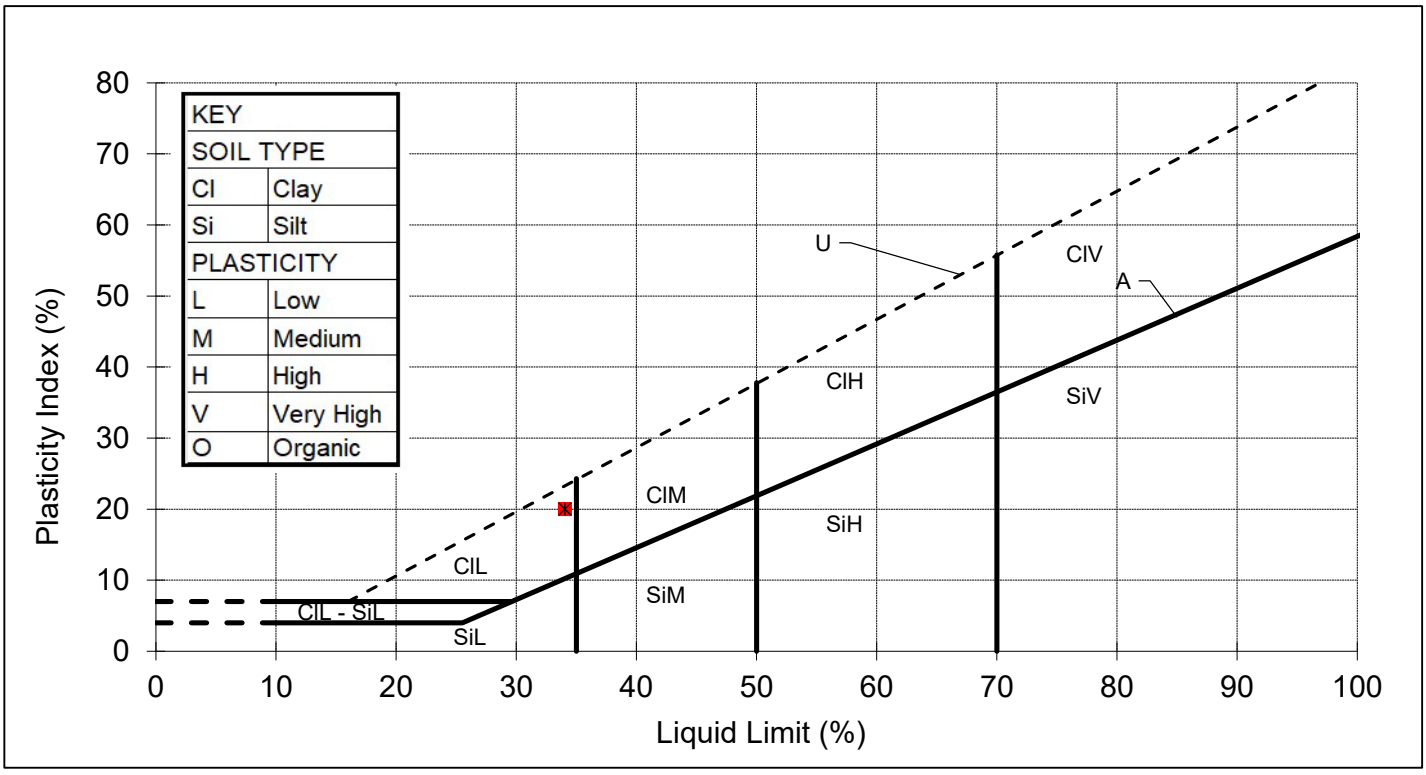
CLIENT	e3p
SITE	Lordship Close
JOB NUMBER	MRN 24005/79

SAMPLE LABEL	WS101 1-1.45	DATE SAMPLED	11-Apr-24
SAMPLE No.	456101	DATE RECEIVED	17-Apr-24
DATE TESTED	18-Apr-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.4	34.3	0.995	
Determination 2 (avg)	20.2	34.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19.1	34	14	20	99



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 13-May-24

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

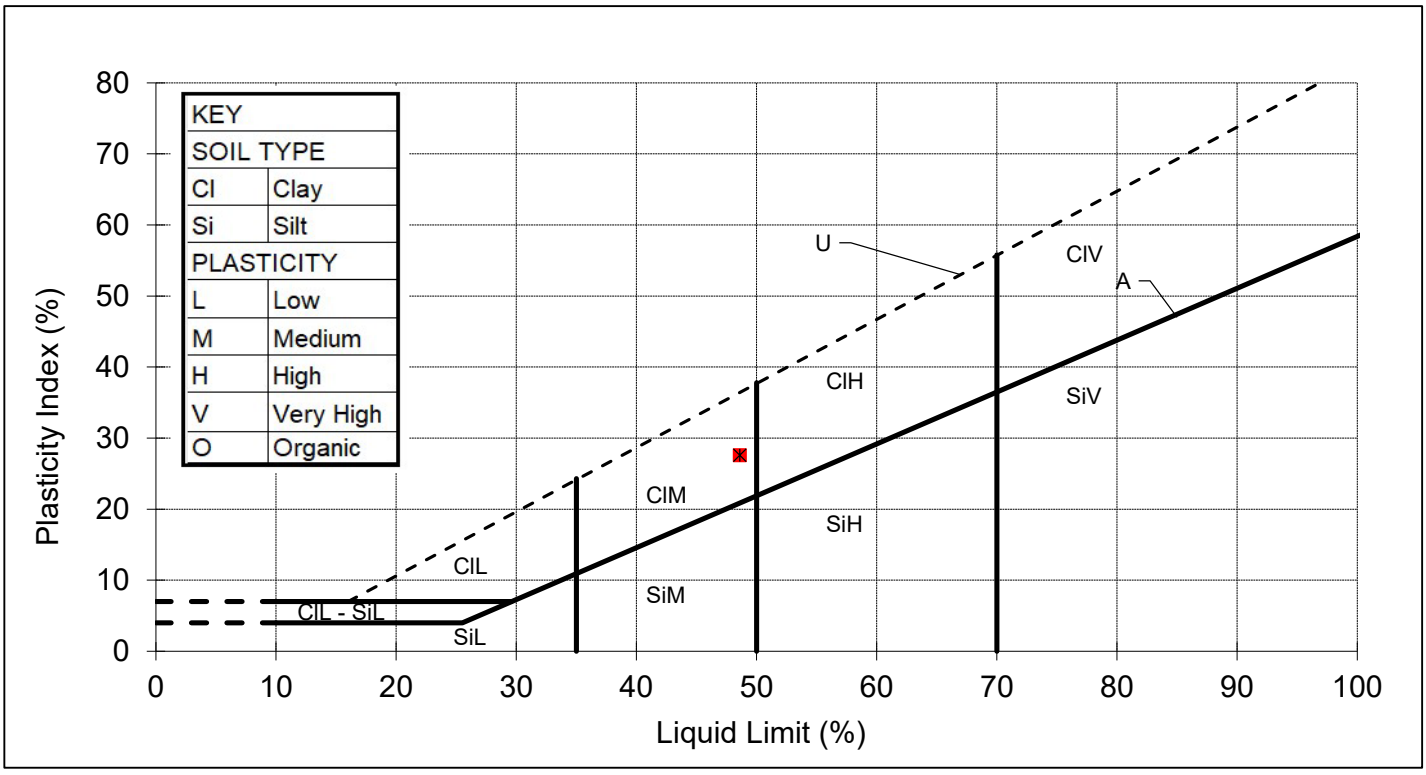
CLIENT	e3p
SITE	Lordship Close
JOB NUMBER	MRN 24005/79

SAMPLE LABEL	WS103 1-1.45	DATE SAMPLED	11-Apr-24
SAMPLE No.	456102	DATE RECEIVED	17-Apr-24
DATE TESTED	18-Apr-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	17.4	46.5	1.045	
Determination 2 (avg)	17.5	46.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
25.6	49	21	28	94



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 13-May-24

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

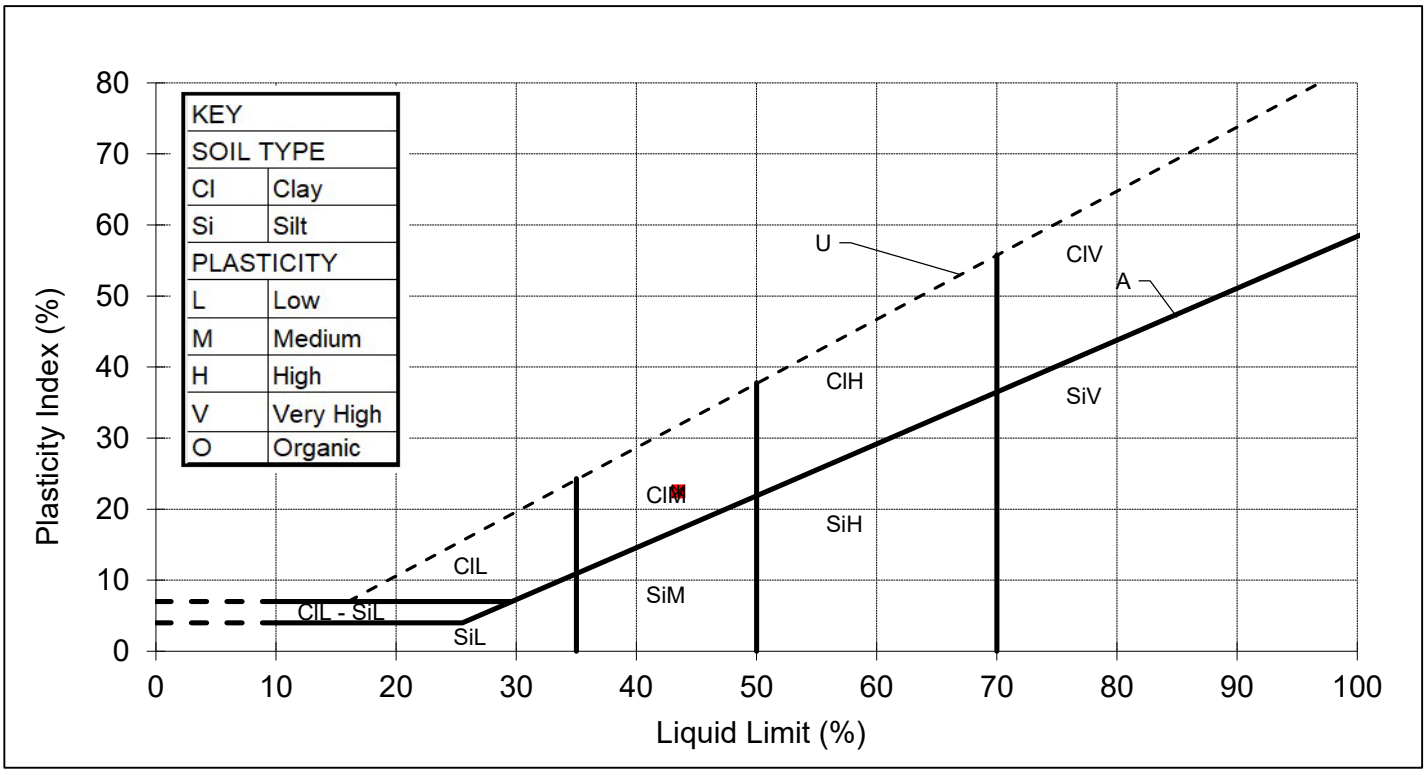
CLIENT	e3p
SITE	Lordship Close
JOB NUMBER	MRN 24005/79

SAMPLE LABEL	TP103 1.3	DATE SAMPLED	11-Apr-24
SAMPLE No.	456104	DATE RECEIVED	17-Apr-24
DATE TESTED	18-Apr-24	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.9	42.8	1.017	
Determination 2 (avg)	18.9	42.7		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
26.7	43	21	22	95



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 13-May-24

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 2.5kg RAMMER
BS 1377-2:2022 Cl.11
PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

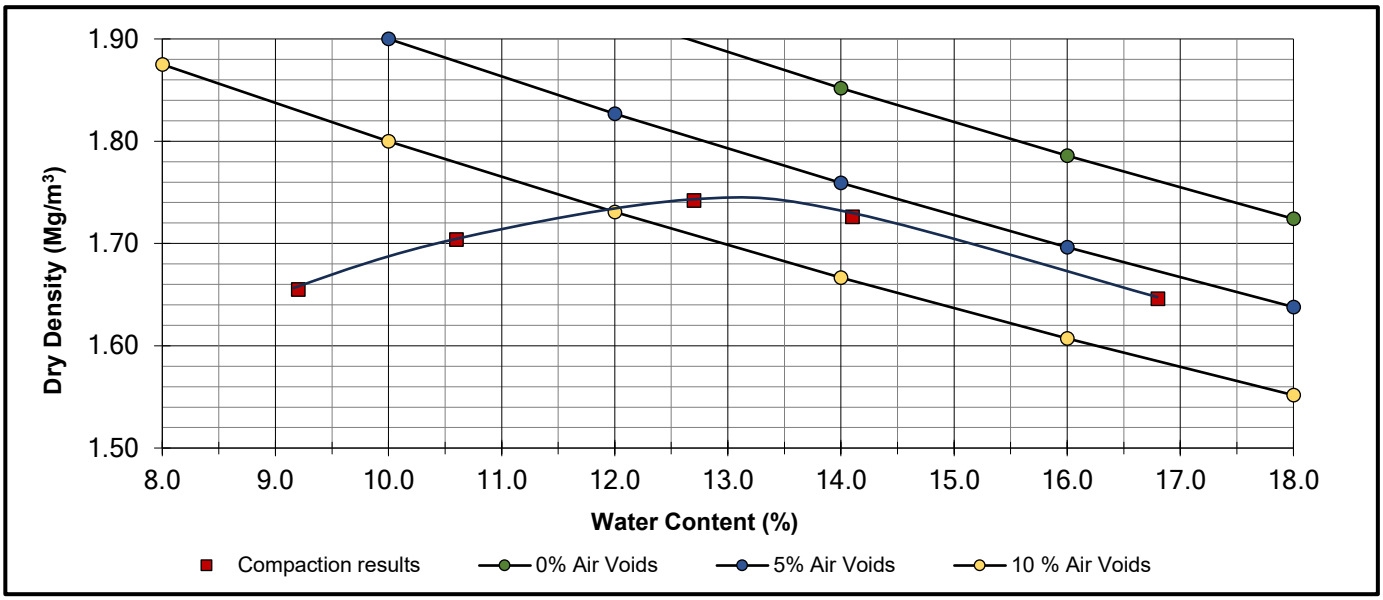
CLIENT	e3p
SITE	Lordship Close
JOB NUMBER	MRN 24005/79

SAMPLE LABEL	TP105 0.4	DATE SAMPLED	11-Apr-24
SAMPLE NUMBER	456103	DATE RECEIVED	17-Apr-24
DATE TESTED	22-Apr-24	SAMPLED BY	Client

MATERIAL	Made Ground
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	0 %	GRADING ZONE	Zone 2
RETAINED 20mm	1 %	PARTICLE DENSITY	2.50 Mg/m3 (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m^3)
1	9.2	1.655
2	10.6	1.704
3	12.7	1.742
4	14.1	1.726
5	16.8	1.646



OPTIMUM WATER CONTENT	**13**	(%)
MAXIMUM DRY DENSITY	**1.74**	(Mg/m^3)

REMARKS
As received water content = 16.0%

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

SIGNED

DATE 13-May-24

APPENDIX X
ORIGIN OF CHEMICAL ASSESSMENT CRITERIA



CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene (iii)	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	

